GUIDELINES FOR THE REDUCTION OF TYPE 2 DIABETES MELLITUS AMONG OLDER PEOPLE LIVING WITH HIV IN HARARE URBAN DISTRICT, ZIMBABWE

by

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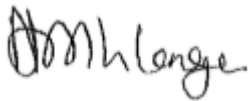
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DECLARATION

I Nongiwe Mhlanga declare that the thesis **Guidelines for the reduction of type 2 diabetes mellitus among older people living with HIV in Harare urban district, Zimbabwe** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality. I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

15 June 2023

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DEDICATION

This thesis is dedicated to Mr Benjamin Dumazulu Mhlanga. Give rest oh Lord to your son who has fallen asleep.

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ABSTRACT

Background: The reduction of Type 2 Diabetes among older people living with HIV (older PLWH) is a pertinent issue due to increase in the number of PLWH who are ageing and developing age related chronic conditions like Type 2 Diabetes.

Aim: The purpose of the study was to develop guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare.

Methods: The study used a qualitative approach supported by a scoping review of literature and an integrated literature review. The scoping review of literature identified risks of Type 2 Diabetes development. An exploratory descriptive design collected data from older PLWH and from nurses caring for older PLWH. Both samples were recruited purposively from five clinics in a low socio-economic area. Data analysis used Braun and Clark' 6 steps. Findings from the two data sources were triangulated with an integrative literature review to develop guidelines. Ethical approval reference number for study is 14056739_CREC_CHS_2022.

Findings: The scoping review of literature mapped out five risks for Type 2 Diabetes development among older PLWH. These risks were long duration of HIV infection, use of older generation antiretroviral therapy with adverse effects of ART; lack of knowledge, a high body mass index and presence of hypertension. From the older PLWH it was concluded that physical activity included domestic chores, economic activities and exercise and healthy eating included consumption of whole grains, higher proportions of carbohydrates and lesser of protein, fruit and vegetables. Older PLWH had challenges of pain, fatigue, and depressive symptoms to implement self-care practices. The data from nurses concluded that screening included; risk assessment, signs and symptoms screening and random blood glucose testing. Health education was done in groups and individually with promotion of healthy eating and physical activity. These nursing interventions were determined by risks presented by older PLWH

Guidelines: Conditional guidelines included; use of metformin and screening PLWH from a younger age than the general population. Strong guidelines included; screening for excess risks, challenges and self-care practices, routine laboratory testing, involvement of a multidisciplinary team, providing individualised health education which promoted healthy lifestyle adjustments of eating and physical activity.

KEY TERMS: Guidelines; Harare Urban District; Human Immunodeficiency Virus; Older people living with HIV; Reduction; Type 2 Diabetes

LIST OF ABBREVIATIONS AND ACRONYMS

AGREE 11	Appraisal of Guidelines for Research and Evaluation II
AIDS	Acquired Immunodeficiency Syndrome
ANAC	Association of Nurses in AIDS Care
ART	Antiretroviral Therapy
ARV	Antiretroviral Drug
BMI	Body Mass Index
CA	Critical Appraisal Skills Program
cART	Combined Antiretroviral Therapy
CCASAnet	Caribbean, Central and South American network for HIV epidemiology
CCR5	Chemokine Receptor 5 inhibitor
CD4	Cluster designation 4
CDC	Centres for Disease Control and Prevention
CES-D	Centre for Epidemiological Study Depression Scale
CHC	Chronic Health Care
CINAHL	Cumulated Index to Nursing and Allied Health Literature
dl	decilitre
DSM- 1V	Diagnostic and Statistical Manual of Mental Disorders 5th edition
DSM-V	Diagnostic and Statistical Manual of Mental Disorders 4th edition
FI	Fusion Inhibitor
FINDRISC	Finnish Diabetic Score
GoZ	Government of Zimbabwe

gp	Glycoprotein
HbA1C	Glycated Haemoglobin
HIV	Human Immunodeficiency Virus
HOMA-IR	Homeostatic Model Assessment for Insulin Resistance
ICONA	Italian Cohort Naïve Antiretrovirals
IDF	International Diabetes Federation
ILO	International Labour Organisation
mm^3	Cubic millimetre
mmol	millimoles
mmol/litre	millimoles per litre
MoHCC	Ministry of Health and Child Care
NCD(s)	Non-communicable disease(s)
NNRTI	Non-nucleoside reverse transcriptase inhibitor
NRTI	Nucleoside analogue reverse transcriptase inhibitor
NtRTI	Nucleotide Reverse Transcriptase Inhibitor
OECD	Organisation for Economic Co-operation and Development
OGTT	Oral Glucose Tolerance Test
PI	Protease inhibitors
PLWH	People Living with Human Immunodeficiency Virus
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
SADC	Southern African Development Community
TREAT	Trial to Reduce Cardiovascular Events with Aranesp Therapy
UK	United Kingdom
UNAIDS	Joint United Nations Programme of HIV and AIDS

USA	United States of America
WHO PEN	World Health Organisation Package of Essential non-communicable Disease Interventions: for Primary Health Care
WHO	World Health Organisation
ZIMASSET	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
ZimStat	Zimbabwe National Statistics Agency

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CHAPTER 1

INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 Introduction

The reduction of Type 2 Diabetes Mellitus, hereafter referred to as Type 2 Diabetes, among older people living with HIV (older PLWH) is a pertinent issue due to the increase in the number of PLWH who are ageing. The Association of Nurses in AIDS Care (ANAC) (2021) predicts that by 2030 at least 70% of all PLWH will be over 50 years. This increase in the number of PLWH who are ageing emanates from the first case of Human Immunodeficiency Virus (HIV) being reported as far back as four decades ago in 1981 and the effectiveness of antiretroviral therapy (ART) (United States Preventative Taskforce, 2019). As such, the development of chronic conditions associated with ageing, such as Type 2 Diabetes is concerning among older PLWH because multimorbidity presents a myriad of health, social and economic challenges.

The World Health Organisation (WHO) (2020a) defines Diabetes as a group of metabolic disorders characterised by hyperglycaemia in the absence of any treatment. The symptoms of Type 2 Diabetes are polydipsia, polyuria, polyphagia, unexplained weight loss, fatigue and vision changes (WHO, 2020a). There are at least fourteen types of metabolic conditions classified as Diabetes and these include, gestational diabetes, Type 1 Diabetes and Type 2 Diabetes (WHO, 2020a). Goyal, Jialal and Castano (2021) distinguish Type 2 Diabetes by describing the condition in its singularity; as a chronic metabolic condition characterised by constant hyperglycaemia caused by insulin resistance in peripheral tissue. WHO (2020a) add that Type 2 Diabetes is caused by partial dysfunction of beta cells of the pancreas that produce insulin. Age is a risk factor for the development of Type 2 Diabetes among other risk factors, namely: obesity; first-degree relative with Type 2 Diabetes; history of gestational diabetes; physical inactivity; Afro-Caribbean, Hispanic and South Asian ethnicity (WHO, 2020a). Notably, HIV infection is excluded as a risk for the development of Type 2 Diabetes. This exclusion of HIV infection as a risk for the development of Type 2 Diabetes by the WHO (2020a) is explained by Masenga et al. (2020) who posit that knowledge on the pathogenesis of Type 2 Diabetes was acquired on HIV negative people as such, there is still uncertainty whether similar

aetiology and pathophysiologic pathways exist for PLWH. To reduce risks of developing Type 2 Diabetes, WHO (2020a) lists physical activity and healthy eating as risk reduction measures.

Even though ageing is a risk of developing Type 2 Diabetes, the Organisation for Economic Co-operation and Development (OECD)/WHO (2020a) assert that ageing is indicative of successful healthcare and health policies. Ageing is defined as an irreversible decline in the physiologic process that results in age-related diseases such as cardiovascular diseases, Type 2 Diabetes, musculoskeletal diseases and cancers (Li et al., 2021). Pagiatakis, Musolino, Gornati, Bernardini and Papait (2021) further explain that ageing is influenced by both genetics and environmental factors such as smoking, obesity, diet and stress. Although there is influence of genetics and environmental factors on ageing, The United Nations (UN) cited in Scherbov and Sanderson (2019) posit that older age is from 60 years. However, the age of older adults varies across different populations such that there is flexibility in what age constitutes older age (Scherbov & Sanderson, 2019). In a study that explored the nexus between Type 2 Diabetes and ageing, Palmer, Gustafson, Kirkland and Smith (2019) highlight that dysfunction of multiple organs that characterises ageing is similar to the dysfunction of systems and organs which also characterises Type 2 Diabetes as a result of cellular senescence in both ageing and Type 2 Diabetes. The authors, Palmer et al. (2019) describe cellular senescence as growth arrest of cells from cell resistance to apoptosis. Cellular senescence leads to decreased physical activity, early mortality and organ dysfunction (Palmer et al., 2019). Zhu et al. (2021) explain that cellular senescence marks the beginning of ageing. Ageing is characterised by chronic inflammation which is attributed partially to the cellular senescence and obesity (Zhu et al., 2021).

Elaborating on the chronic inflammation characteristic of ageing, Franceschi, Garagnani, Parini, Giuliani and Santoro (2018) describe the concept of inflammaging which refers to the chronic, low grade and sterile inflammation that occurs during ageing. Inflammaging contributes to the pathogenesis of several age-related conditions such as Type 2 Diabetes (Fransechi et al., 2018). This chronic inflammation characterising ageing occurs in the absence of any infection and is detrimental contributing to several age-related chronic conditions (Fransechi et al., 2018). Inflammaging is responsible for lowering resistance to infections (Fransechi

et al., 2018). These consequences of ageing which have implication for PLWH are further explained by Palmer et al. (2019) who concurs with Zhu et al. (2021) that ageing results in lesser resilience to infections. This decline in resilience to infections is also characteristic of development of Acquired Immunodeficiency Syndrome (AIDS) defining illnesses as a result of HIV (Palmer et al., 2019). Thet et al. (2022) also explain that PLWH age much faster than the general population with premature ageing occurring approximately 10 years earlier. Thet et al. (2022) cite the WHO (2002) who delineate that from 50 years, PLWH are regarded as elderly. As such in this study older PLWH are from the age of 50 years.

The Joint United Nations Programme of HIV and AIDS (UNAIDS) (2022) defines HIV as a retrovirus that affects Cluster Designation 4 (CD4) cells and macrophages resulting in immune dysfunction and immunodeficiency. HIV in contrast to Type 2 Diabetes (which is associated with ageing) mostly infects the productive age group (15-49 years) especially the young women and adolescent girls (Govender et al., 2018). UNAIDS (2022) also reveals that HIV prevalence is highest in Eastern and Southern Africa where at least 20.6 million people were living with HIV by the end of 2021. The WHO (2007) explain that there are four clinical stages to HIV infection in adults and adolescents more than 15 years.

The first stage is characterised by persistent generalised lymphadenopathy and there are no symptoms (WHO, 2007). The second clinical stage is characterised by rapid multiplication of HIV in the body with flu like symptoms and there is weight loss of less than 10% (WHO, 2007). The third clinical stage is the moderately symptomatic stage characterised by oral candidiasis, weight loss of more than 10%, severe bacterial infections and respiratory infections as well as persistent diarrhoea of unexplained origin (WHO, 2007). The fourth stage is AIDS which is marked by AIDS defining illnesses such as pneumocystis pneumonia, herpes simplex infections, HIV encephalopathy (WHO, 2007). Without treatment, The United States Department of Health and Human Services (2022) reveals that from stage one to the development of AIDS, PLWH live up to three years.

However, the WHO (2007) classification of HIV is not used by all countries with some countries using a three-stage classification described by the Centre for Disease Control and Prevention (CDC). Parekh et al. (2018) explain these three stages to HIV infection. The first stage is the acute stage which typically lasts two to four weeks

and is characterised by rapid multiplication of HIV in the body with flu like symptoms and a sharp increase in the antigen p24 (Parekh et al., 2018). The second stage is the asymptomatic stage which is characterised by low levels of HIV multiplication, and the production of antibodies (Parekh et al., 2018). The third stage is AIDS which is marked by a depletion in CD4 cells and a weakening of the host's immune response, resulting in the development of opportunistic infections and cancers (Parekh et al., 2018).

Treatment of HIV, which the United States Preventative Taskforce, (2019) attributes to longevity of PLWH involves the use of ART. Ministry of Health and Child Care (MoHCC) (2016) in Zimbabwe highlight that to date the available classes of drugs include; Protease Inhibitors (PI), Integrase Inhibitors, Nucleoside Analogue Reverse Transcriptase Inhibitors (NRTIs), Non-nucleoside Reverse Transcriptase Inhibitors (NNRTI), Nucleotide Reverse Transcriptase Inhibitors (NtRTIs), Fusion Inhibitors (FIs) and Chemokine Receptor 5 inhibitor's (CCR5 inhibitors).

Tseng, Seet and Phillips (2015) illustrate Shepard's (2022) recollection of early use of ART by noting that in 1996, the NNRTIs were introduced adding to the PI that had been introduced in 1995 and NRTI (Zidovudine) having been introduced earlier in 1987. Tseng et al. (2015) explain that this breakthrough in ART treatment came with combining of different classes of drugs as opposed to monotherapy which had long term consequences of lipoatrophy, a high pill burden and did not achieve virological suppression. Shepard (2022) describes ART intervention from 1996 as significantly having improved life expectancy of PLWH and "*normalised HIV*". Although the breakthrough in ART came in 1996 from the description by Shepard (2022); in Africa, Ford, Calmy and Mills (2011) note that it was only in 2001 that combined ART became available to developing countries due to inequitable distribution of ART. At the time, combined ART was available in developed countries, it was prohibitively expensive for developing countries to roll out ART programs at large scale and HIV management programs were mainly preventive (Ford et al., 2011).

Availability of combined ART in developing countries only became feasible after India began manufacturing combined ART at a lower cost in 2001 supplying at least 80% of ART needs of the developing countries including Zimbabwe (Ford et al., 2011). Current treatment for HIV includes the use of combined ART (cART), Phanuphak and Gulick (2020) explain that these current standards of HIV care entail the use

ARVs as soon as possible after being diagnosed with HIV. The treatment encompasses the use of two NRTIs combined with any other class such as a PI, an integrase inhibitor or a NNRTI (Phanuphak & Gulick, 2020).

The current study focuses on Harare Urban District, in the northeast part of Zimbabwe in Southern Africa. Most of the population in Harare is in the productive age group of between 15 to 64 years (City of Harare, 2020). This group is most vulnerable to HIV infection as explained by Govender et al. (2018). The city has a population of 1 973 906 at the end of 2017 constituting 14.3% of the total population of Zimbabwe. The City of Harare as the local authority provides primary healthcare services to the population through two infectious diseases hospitals (Wilkins Hospital and Beatrice Road Infectious Diseases Hospital); four dental clinics, twelve polyclinics, 38 satellite clinics, seven primary care clinics, and ten family health service clinics. The City of Harare (2020) notes that in 2019, "*one stop clinics*" were initiated providing treatment and diagnostic services for Tuberculosis, HIV and Diabetes. Support for this initiative was provided by the World Diabetes Federation, the Global Fund on HIV and national government of Zimbabwe. The City of Harare (2020) also notes that the leading cause of death is HIV related infections accounting for 18.8% of all deaths recorded in the city at the end of 2018.

1.2 Background

The prevalence of Type 2 Diabetes among PLWH varies significantly among different populations. Høgh et al. (2022) note that the lack of a global prevalence of Type 2 Diabetes among PLWH is due to heterogeneity of PLWH studied who develop Type 2 Diabetes. Despite the heterogeneity of the population of PLWH, Nansseu, Bigna, Kaze, Noubiap (2018) in a systematic review of 44 studies from 2000 to 2017 concluded that globally Type 2 Diabetes incidence among PLWH was 13.7 per 1000 person-years. Nansseu et al. (2018) also found that incident Type 2 Diabetes was highest among older PLWH.

1.2.1 Global Prevalence of Type 2 Diabetes in older PLWH

Studies conducted in North America, have illustrated that Type 2 Diabetes prevalence is higher in PLWH in comparison to the general population. Sarkar and Brown (2021) in a study

in the United States of America (USA) found that the prevalence of Type 2 Diabetes among PLWH was 19.3% among women and 12.2% among men. In another study in the USA, Tiozzo et al. (2021) concluded that the prevalence of Type 2 Diabetes among PLWH can be up to four times higher than in the general population. Results by Tiozzo et al. (2021) were also similar to findings by Sarkar and Brown (2021) who concluded that Type 2 Diabetes prevalence among PLWH was higher (15.9%) in comparison to the general population in the USA who had a prevalence of Type 2 Diabetes of 12.2%.

In the study conducted by Tiozzo et al. (2021) the prevalence of Type 2 Diabetes was also found to be higher among PLWH who were older and had a longer duration of HIV infection (more than 16 years). Buenda, Sears, Griffin and Mgbere (2021) in their study also the USA; Texas, elaborate on ageing in relation to the prevalence of Type 2 Diabetes among PLWH like Tiozzo et al. (2021) and found higher prevelance of Type 2 Diabetes among PLWH aged more than 60 years. Buenda et al. (2021) argue that ageing is a constant predictor of Type 2 Diabetes among PLWH. The findings by Buenda et al. (2021) also note by the prevalence of Type 2 Diabetes among PLWH is 15%. in North America, a study conducted in Canada found a higher Type 2 Diabetes incidence among PLWH of 7.4 per 1000 person-years compared to 7.2 person-years among the general population (Bratu et al., 2021). Another study in Canada, estimated that prevalence of Type 2 Diabetes among PLWH was higher (10.8%) compared to the general population (9.9%) (Nanditha et al., 2021). Remarkably, Nanditha et al. (2021) also concluded that despite the higher prevalence of Type 2 Diabetes among PLWH, the age at which Type 2 Diabetes is diagnosed in PLWH was similar to the age at which the general population is diagnosed with Type 2 Diabetes.

Variations in the prevalence of Type 2 Diabetes are also observed in studies conducted in South America. In one study conducted in Brazil, the estimated prevalence of Type 2 Diabetes among PLWH; the study found a Type 2 Diabetes among PLWH was 7.14% (da Cunha et al., 2020). da Cunha et al. (2020) like studies conducted in North America, (Buenda et al., 2021); (Tiozzo et al., 2021), also concluded that among PLWH prevalence of Type 2 Diabetes was higher among older people. This study by da Cunha et al. (2020) have also confirms the heterogeneous prevalence of Type 2 Diabetes among PLWH in South America. Similarly, a multi-

country study concluded that Type 2 Diabetes was prevalent in 12% of older PLWH in Latin America (Belaunzaran-Zamudio et al., 2020).

Belaunzaran-Zamudio et al. (2020) focussed on seven countries in South America inclusive of Brazil; these were, Chile, Argentina, Honduras, Haiti, Mexico and Peru. The researchers make an almost similar prediction to the ANAC (2021) when they forecast that by 2030, 75% of the population of PLWH in high-income countries will be more than 50 years. Also illustrating the issue of a high prevalence of Type 2 Diabetes among older PLWH, another study conducted in South America- Mexico; compared the prevalence of Type 2 Diabetes between younger PLWH (less than 50 years) and older PLWH (more than 50 years) (Mata-Marín et al., 2020). Mata-Marín et al. (2020) concluded that the prevalence of Type 2 Diabetes among older PLWH was 18.3% whilst among younger PLWH prevalence was 1.5%. From these findings in North and South America, the high prevalence of Type 2 Diabetes among PLWH and in the general population affirms the WHO (2020a) assertion of Type 2 Diabetes predisposition due to Hispanic ethnicity.

In Europe, a study conducted in the United Kingdom (UK), found an almost similar prevalence of Type 2 Diabetes among PLWH to that found by Tiozzo et al. (2021) in the USA (15.9%); Duncan et al. (2018), in a study in the UK concluded that Type 2 Diabetes was prevalent in 15.1% of PLWH. In addition, Gooden, et al. (2022) in a population-matched control study, found that the risk of developing Type 2 Diabetes among PLWH in the UK was higher than prevalence among HIV negative people. Gooden et al. (2022) in contrast to Sarkar and Brown (2021) in the USA; found that older males living with HIV were more likely to develop Type 2 Diabetes in comparison to older women living with HIV. The distinct variations in the prevalence of Type 2 Diabetes are likewise evidenced in another European country -Denmark. Høgh, et al. (2022) in a study in Denmark, concluded that Type 2 Diabetes among PLWH was 6% in comparison to 3.8% among the general population.

Using a regional observational cohort study design, Han et al. (2019) in Asia included twelve countries; China and Hong Kong SAR, Cambodia, Indonesia, India, Malaysia, Japan, Philippines, Singapore, Taiwan, South Korea, Vietnam and Thailand. From the study, Han et al. (2019) concluded that the prevalence of Type 2 Diabetes among PLWH was 7%. The authors Han et al. (2019) like Høgh, et al. (2022) also found significant variations in the prevalence of Type 2 Diabetes among PLWH in different

countries. The heterogeneous prevalence of Type 2 Diabetes among PLWH observed in Asia by Han et al. (2019) is substantiated by Marbaniang, et al. (2019) in India who found a Type 2 Diabetes prevalence of 9% among PLWH. Marbaniang (2019) also noted that in India prevalence of Type 2 Diabetes was 19% higher than in the general population of similar age in India. Of note, the higher prevalence of Type 2 Diabetes among PLWH in India than in other Asian countries resonates, with the WHO (2020a) assertion that South Asian ethnicity is a risk for Type 2 Diabetes. Bijker et al. (2019) also conducted a study in seven Asian countries, namely Singapore, India, Vietnam, Cambodia, Taiwan, South Korea and Hong Kong. Remarkably, findings by Bijker et al. (2019) mirrored those of Han et al. (2019) by concluding that Type 2 Diabetes was prevalent in 7% of PLWH in Asia. The authors Bijker et al. (2019) also concluded that the prevalence of Type 2 Diabetes was higher among PLWH older than 50 years. In light of this, the studies on prevalence of Type 2 Diabetes among PLWH conducted in Asia (Han et al., 2019); (Marbaniang et al., 2019) illustrate the higher prevalence of Type 2 Diabetes among older PLWH in comparison to the general population as well as variations in prevalence among different population groups.

Contrasting findings of the prevalence of Type 2 Diabetes among PLWH are also illustrated in studies conducted in the Middle East. In Saudi Arabia, a study conducted by Farahat et al. (2019) concluded that Type 2 Diabetes was the most common co-morbidity among PLWH. The authors, Farahat et al. (2019) also concluded that Type 2 Diabetes was prevalent in 15.4% of PLWH. In contrast to the findings by Farahat et al. (2019) and also in the Middle East, a study conducted in Iran by Rasoolinejad et al. (2019) concluded that prevalence of Type 2 Diabetes among PLWH was 5.8%. The authors Rasoolinejad et al. (2019), noted that the prevalence of Type 2 Diabetes increased among PLWH aged more than 40 years. From the literature evaluated in the Middle East, it is also concluded that there are variations between countries of Type 2 Diabetes prevalence among PLWH.

1.2.2 Prevalence and Incidence of Type 2 Diabetes in Africa

According to Njuguna et al. (2018) in Sub-Saharan Africa, the prevalence of Type 2 Diabetes among PLWH ranges from 1% to 26%. Njuguna et al. (2018) like Rasoolinejad et al. (2019) in the Middle East study, outline that Type 2 Diabetes was

more prevalent among older PLWH. In the systematic review of fifteen studies, Njuguna et al. (2018) reveal that Ethiopia, South Africa, Cameroon, and Tanzania have the highest prevalence of Type 2 Diabetes among PLWH. A similar systematic review was conducted of African studies by Prioreschi et al. (2017) found that there was no difference between Type 2 Diabetes prevalence between PLWH and the general public.

Reiterating the high prevalence of Type 2 Diabetes in Tanzania, a finding within the prevalence range of 1-26% concluded by Njuguna et al. (2018) was drawn from a cross-sectional study conducted by Memiah et al. (2022), who found that Type 2 Diabetes prevalence was 17.1%. At the lower end of the prevalence range posited by Njuguna et al. (2018) and contrary to their findings-that South Africa has a high prevalence, Rajagopaul, and Naidoo, (2021) in a study conducted in South Africa; eThekwini Municipality in KwaZulu-Natal concluded that Type 2 Diabetes prevalence among PLWH was 2%. Notably, Rajagopaul, and Naidoo, (2021) similar to Han et al. (2019) found that among PLWH, HIV infection was not a determinant of Type 2 Diabetes however age and a high Body Mass Index (BMI) were constant predictors of Type 2 Diabetes among PLWH. Another study conducted in South Africa, found a 9% prevalence of Type 2 Diabetes among PLWH from four health facilities in KwaZulu-Natal (Umar & Naidoo, 2021). Umar and Naidoo (2021) also concluded that Type 2 Diabetes prevalence was higher among older PLWH.

In Nigeria, Muhammad et al. (2017) used a cross-sectional study design and concluded that Type 2 Diabetes was higher among PLWH in contrast to HIV negative people. The authors Muhammad et al. (2017) also reported a higher prevalence of Type 2 Diabetes among older PLWH. Another study in Nigeria also noted the higher prevalence of Type 2 Diabetes among PLWH (Ojong et al., 2022). Remarkably, Ojong et al. (2022) explain that Type 2 Diabetes was higher among PLWH who were virally suppressed in comparison to those who are ART naïve. The conclusion that there is no difference in the prevalence of Type 2 Diabetes among the general population and those living with HIV made by Prioreschi et al. (2017) was confirmed by a study conducted in Kenya, Nigeria, Uganda and Tanzania. Using a cohort study design, and a sample of only older PLWH, Chang et al. (2022) found that Type 2 Diabetes prevalence among older PLWH was 13.4%.

From the studies conducted in Africa it is concluded that Type 2 Diabetes prevalence among PLWH is high in Tanzania. Significant variations in prevalence of Type 2 Diabetes among PLWH are also noted in the South African context, whilst there is general consensus in Nigeria of a higher prevalence of Type 2 Diabetes among PLWH in comparison to the general public.

1.2.3 Prevalence of Type 2 Diabetes among older PLWH in Zimbabwe

In Zimbabwe, Njuguna et al. (2018), found that prevalence of Type 2 Diabetes among PLWH ranged from 0.8 to 2.1%. In Harare, Chimbetete et al. (2017) in a retrospective cohort analysis found that the incidence of Type 2 Diabetes was 2.8 per 1000 person-years. In addition, Chimbetete et al. (2017) concluded that in Zimbabwe incidence and risks of developing Type 2 Diabetes among PLWH were similar to the general population. Chimbetete et al. (2017) also found that Type 2 Diabetes incidence was higher among older PLWH. In contrast to findings from Njuguna et al. (2018) systematic review, Cheza, Tlou and Zhou (2021) in a study also conducted in Zimbabwe in Chitungwiza found that prevalence of Type 2 Diabetes among PLWH was 6.9% which is higher than findings posited by Njuguna et al. (2018). Notably, in Zimbabwe by end of 2021, the prevalence of Type 2 Diabetes among the general population was 1.5% with at least 106 400 cases of Type 2 Diabetes (International Diabetes Federation (IDF), 2022).

In their findings, Cheza et al. (2021) further predicted that the cumulative incidence of Type 2 Diabetes among PLWH would more than double after five years. Also, another study conducted in Zimbabwe, in Gweru, Gonah, Moodley and Hlongwana (2020) found that the prevalence of Type 2 Diabetes among PLWH was 8.4%. Remarkably, these findings by Gonah et al. (2020) resonate with findings by Cheza et al. (2021) who found a higher prevalence of Type 2 Diabetes among PLWH in comparison to Njuguna et al. (2018). Furthermore, and similar to Chimbetete et al. (2018); Gonah et al., (2020) noted that prevalence of Type 2 Diabetes was higher among PLWH aged more than 60 years.

The variations in the prevalence of Type 2 Diabetes further affirm the heterogeneity of PLWHs' and the likelihood of developing Type 2 Diabetes described by Høgh et al. (2021). Despite these variations in the prevalence of Type 2 Diabetes among

PLWH, Smit et al. (2018) justify the need for reduction measures for non-communicable diseases (NCDs) among PLWH in a study that described the growing burden of NCDs among PLWH. The authors Smit et al. (2018) used an individual-based multi-disease model and predicted that by 2035 the average age of PLWH in Zimbabwe will increase from 31 years to 45 years. Smit et al. (2018) also predicted that with the increase in the mean age of PLWH there was a two-fold likelihood of developing co-morbidities including Type 2 Diabetes. According to Smit et al. (2018), PLWH living with co-morbidities were likely to contribute 15.2% of the NCD burden in Zimbabwe by 2035 whilst they represent 5% of the population. From the studies conducted in Zimbabwe it is concluded that there are contrasting findings on the prevalence of Type 2 Diabetes among PLWH the next section describes the research gap identified.

1.2.4 Research gap

Two major gaps have been identified in the previous literature on the context with which guidelines for the reduction of Type 2 Diabetes among older PLWH are developed. The first is a population gap and the second is a practical knowledge gap. Firstly, several studies Sakar and Brown (2021); Marbaniang (2019); Cheza et al. (2021) have described the higher prevalence of Type 2 Diabetes among PLWH in comparison to the general population. Some studies Nansseu et al. (2018), da Cunha et al. (2020); Chimbetete et al. (2017) have further made a distinction between younger PLWH and older PLWH by noting the higher prevalence of Type 2 Diabetes among older PLWH. Despite this increased vulnerability of developing Type 2 Diabetes among older PLWH few studies such as Belaunzaran-Zamudio et al. (2020) have focussed exclusively on older PLWH. As such, there is a population gap of underrepresentation of older PLWH in previous studies. Miles (2017) defines a population gap as an underrepresentation of a population in the evidence base. Research on guidelines for the reduction of Type 2 Diabetes in older PLWH is justified as there is evidence of an increased risk of developing Type 2 Diabetes in this population. The study addresses another population gap with regards to the geographical location of studies on Type 2 Diabetes among PLWH in Zimbabwe as the few studies conducted in Zimbabwe some have been conducted outside Harare. To substantiate this population gap, Gonah et al. (2020); Cheza et al. (2021)

conducted studies outside Harare Urban District- Gweru and Chitungwiza respectively. Given this, the study complemented the findings by Chimbetete et al. (2018) who conducted the study in Harare Urban District at Newlands Clinic.

Secondly, Miles (2017) describes a practical knowledge gap as professional practice deviating from research findings. The WHO (2020a) describes several risks of developing Type 2 Diabetes and outlines measures to reduce the incidence of Type 2 Diabetes. However, these reduction measures described by the WHO (2020a) may not fully include risks posed by HIV and ART use. Masenga et al. (2020) explains that the lack of inclusion of HIV and ART specific risks may be due to Type 2 Diabetes being defined before recognition of new risks posed by HIV. Previous studies: Mata-Marín et al. (2020:); Duncan et al. (2018); Smit et al. (2018) have illustrated the theoretical aspects; that older PLWH are at increased risk of developing Type 2 Diabetes, however, there are very few studies that focus on evidence-based practice research of reducing the development of Type 2 Diabetes among older PLWH in the field of nursing. Grove and Gray (2021) reiterate the issue of the practical knowledge gap described by Miles (2017) by noting that evidence-based practice in nursing research aims to integrate research findings to address a practice problem. In evidence-based practice, research findings, patient needs and clinical expertise are integrated to ensure positive health outcomes for patients and families (Grove & Gray, 2021). It is from this background that research on guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District becomes pertinent.

1.3 Statement of the Problem

The reduction of Type 2 Diabetes among PLWH is founded on the clinical expertise to identify older PLWH most likely to develop Type 2 Diabetes and initiate measures to reduce Type 2 Diabetes. However, the absence of nursing guidelines for reducing Type 2 Diabetes risks among older PLWH founded on clinical skills to identify older PLWH at ART clinics poses a challenge to nursing practice as case finding of Type 2 Diabetes becomes difficult. This failure to find cases of Type 2 Diabetes by nurses among older PLWH emanates from not recognising, then not mitigating risks for Type 2 Diabetes among older PLWH. This failure to identify cases at risk of developing Type 2 Diabetes is problematic as interventions to reduce Type 2 Diabetes are not implemented leading to older PLWH developing Type 2 Diabetes and consequential

multimorbidity of Type 2 Diabetes and HIV infection. Anecdotal evidence from informal discussions with nurses in Harare has also shown an increase in the number of older PLWH who present with Type 2 Diabetes complications at ART clinics in Harare Urban District due to failure to identify older PLWH at risk of developing Type 2 Diabetes. Additional, anecdotal evidence from the state newspaper, The Herald also indicated that NCDs like Type 2 Diabetes are the leading cause of death among PLWH in Zimbabwe (Nsingo, 2019). This development of Type 2 Diabetes in older PLWH is concerning as it negatively affects patient quality of life in virally suppressed older PLWH and reverses the gains made from ART of decreased morbidity in older PLWH.

The failure to identify cases of Type 2 Diabetes among older PLWH is evidenced by the study conducted by, Gonah et al. (2020) who highlighted that in ART clinics more than 50% of PLWH did not know their diagnosis of Type 2 Diabetes. Substantiating this issue of PLWH not knowing their Type 2 Diabetes diagnosis in ART clinics, Chimbetete et al. (2018) in their study setting description of Newlands Clinic in Harare; reveal that screening for Type 2 Diabetes through Glycated Haemoglobin (HbA1c) screening is not done routinely for PLWH. This lack of screening and subsequent failure to identify cases of Type 2 Diabetes among older PLWH is reiterated and explained by Frieden et al. (2020) who note that screening in some ART clinics may not be feasible due to lack of cost-effectiveness and concerns of work overload. The challenges in identifying cases of Type 2 Diabetes among older PLWH persist against a background of an increasing number of older PLWH developing Type 2 Diabetes. According to Cheza et al. (2021) in their study in Zimbabwe observed an increase in the prevalence of Type 2 Diabetes among PLWH from 6.9% at baseline in 2009 to 20.69% after 10 years. As such the guidelines for the reduction of Type 2 Diabetes among older PLWH provide new insight on how to improve interventions like screening and health education for Type 2 Diabetes reduction among older PLWH.

1.4 Significance of the study

The study is significant to nursing practice as it seeks to close a practical knowledge gap. There is evidence in the literature that shows the increase in the prevalence of Type 2 Diabetes among older PLWH in Zimbabwe and several scholars Smit et al. (2018); Gonah

et al. (2020); Cheza et al. (2021) have outlined risks associated with this higher prevalence of Type 2 Diabetes among older PLWH. Despite this availability of theory related to the increased risk of Type 2 Diabetes among older PLWH, there is a void of practical knowledge in nursing that mitigates the increased vulnerability to Type 2 Diabetes among older PLWH.

Therefore, this study through the development of guidelines to reduce Type 2 Diabetes is significant to nursing in six main ways. First, in developing these guidelines to reduce Type 2 Diabetes among older PLWH, one of the studies' objectives is to identify risks associated with the development of Type 2 Diabetes among older PLWH. The identification or mapping of these risks is significant to nursing practice as it enables the screening of older PLWH at risk of developing Type 2 Diabetes, significantly contributing to holistic health assessment and improved care outcomes.

Second, the study is significant to Nursing Practice as it enables nurse practitioners to identify older PLWH who face challenges in reducing Type 2 Diabetes. This significance emanates from one of the study's objectives of describing challenges faced by older PLWH in reducing Type 2 Diabetes. Through identification of the older PLWH who face challenges in reducing Type 2 Diabetes, the study enables nurse practitioners to implement client-centered interventions to reduce Type 2 Diabetes with consideration of these challenges faced by older PLWH.

Third, the study is significant to nursing through providing evidence where a population gap in literature existed. The study focussed on older PLWH and their vulnerability to Type 2 Diabetes, and studies previously conducted focussed on all PLWH (younger and older) despite the significant evidence of older PLWH disproportionally being affected by HIV and ART specific Type 2 Diabetes risks. In light of this, the study provides evidence for intervention focussed on older PLWH.

Four, the study is significant to nursing as it enables duplication of similar studies to be conducted in other settings outside Harare Urban District. This argument is based on the premise that guidelines for the reduction of Type 2 Diabetes developed in this study are based on findings from data collected in Harare Urban District which has its' unique population demographic characteristics such as a younger population, an ageing population of PLWH and an increasing burden of Type 2 Diabetes among older PLWH. Guidelines developed therefore, consider these population characteristics which are existent in a low resource setting to optimise the reduction of Type 2 Diabetes.

The fifth way the study is significant to nursing research as it complements similar studies on Type 2 Diabetes and HIV infection conducted in Harare Urban District. This significance allows the contrasting and comparing of findings of similar studies to draw a concrete evidence base that influences practice.

The sixth way the study is significant for policymakers in nursing. The study, by providing guidelines on the reduction of Type 2 Diabetes among older PLWH provides evidence-based information for policymakers. Policies that will utilise information from this study include policies on the management of older PLWH and policies on reducing Type 2 Diabetes in different population groups.

1.5 Purpose of the study

The main purpose of the study is to develop guidelines for nurses to reduce Type 2 Diabetes among older PLWH in Harare Urban District, Zimbabwe.

1.6 Research Questions

The study addressed the following research questions;

- What are the excess risk factors associated with developing Type 2 Diabetes in older PLWH? (Method of data collection: scoping literature review).
- What are the self-care practices older PLWH perform to reduce Type 2 Diabetes? (Method of data collection: semi-structured interview guide to older PLWH).
- What are the challenges in reducing Type 2 Diabetes among older PLWH? (Method of data collection: semi-structured interview guide to older PLWH)
- What are the nursing interventions implemented to reduce Type 2 Diabetes among older PLWH with excess risk? (Method of data collection: semi-structured interview guide to nurses).
- Are nursing interventions for reducing Type 2 Diabetes determined by excess risks older PLWH have? (Method of data collection: semi-structured interview guide to nurses)
- What nursing guidelines can be used for the reduction of Type 2 Diabetes among older PLWH with excess risks for developing Type 2 Diabetes? (Method of developing guidelines, qualitative data triangulation of (1) an integrative

review of literature, (2) findings from interviews with older PLWH and (3) findings from nurses providing care to older PLWH)

1.7 Research Objectives

The objectives of conducting the study were to:

- Describe the excess risks associated with Type 2 Diabetes in older PLWH.
- Describe the self-care practices older PLWH perform to reduce Type 2 Diabetes.
- Describe the challenges older PLWH experience in reducing Type 2 Diabetes.
- Describe nursing interventions for the reduction of Type 2 Diabetes among older PLWH.
- Determine whether nursing interventions to reduce Type 2 Diabetes are influenced by excess risk presented by older PLWH.
- Develop nursing guidelines for the reduction of Type 2 Diabetes among older PLWH with excess risk of developing Type 2 Diabetes.

1.8 Definition of concepts

This section describes key concepts used in the study and operational definitions also applied in the study.

1.8.1 Definition of Key Concepts

In this current study;

Guidelines: refer to statements of recommendations that maximise patient care (Olayemi, Asare & Benneh-Akwasi Kuma, 2017). They are general rules or information that outline how Type 2 Diabetes should be prevented in older PLWH (Cambridge English Dictionary, 2022)

HIV refers to a retrovirus that affects Cluster Designation 4 (CD4) cells and macrophages resulting in immune dysfunction and immunodeficiency (UNAIDS, 2022)

Older PLWH refers to persons aged 50 years and above who are living with HIV or are newly diagnosed with HIV (Thet at al., 2022).

Prevention refers to actions that stop something from happening (Cambridge English Dictionary, 2023). In this study, these are the actions that stop the development of Type 2 Diabetes among older PLWH.

Reduction refers to the act of diminishing or making smaller in degree. (Collins English Dictionary, 2020). In this study it refers to, diminishing or making smaller in degree the risks or diminishing the hyperglycaemia which characterises progression to Type 2 Diabetes among older PLWH.

Type 2 Diabetes is a chronic metabolic condition characterised by constant hyperglycaemia caused by insulin resistance in peripheral tissue (Goyal et al., 2021). Moreover Type 2 Diabetes in this study will be delineated by the WHO (2020a) five diagnostic criteria for the Type 2 Diabetes, which include; (1) fasting venous or capillary blood glucose more than 7mmol/litre (126g/dl); (2) 2-hour post-load venous plasma glucose more than 11.1mmol/litre (200mgldL); (3) random plasma glucose more than 11.1mmol/litre (4) HbA1c more than 6.5mmol/litre and (5) 2-hour post-load capillary plasma glucose more than 12.2mmol/L.

1.8.2 Definition of Operational Terms

In the current study:

Risk is something that puts someone in danger or a hazardous situation. It includes factors that put PLWH in danger of acquiring Type 2 Diabetes (Merriam-Webster Dictionary, 2022).

Self-care refers to actions of individuals that are focused on themselves or the environment that moderate conditions that are in the interests of that person's well-being or health (Renpenning & Taylor, 2003). Self-care requires knowledge and skills (Renpenning & Taylor, 2003).

Antiretroviral therapy (ART) refers to the use of a combination of three or more antiretroviral drugs to treat HIV infection. ART suppresses HIV replication and is lifelong treatment (WHO, 2015).

Glycated Haemoglobin Test (HbA1C) refers to a test used to measure the average blood glucose level over two or three months. It is derived from glucose attaching to haemoglobin and the amount of attachment is proportional to the blood sugar, the normal values should be less than 6.5% (d'Emden, 2014).

Viral Suppression refers to a viral load that is below the detectable level using a viral assay (WHO, 2015).

CD4 Cell Count refers to a test that measures the amount of CD4 cells (T cells in the body). The test is indicative of the destruction of the immune system due to HIV as well as the effect of ART. The normal range of CD4 cells is between 500 and 1500 cells/mm^3 (Garcia & Guzman, 2021).

Body Mass Index (BMI) is used for screening obesity. It is calculated by dividing the weight in kgs by the height squared in m^2. Four categories interpret the BMI; (1) less than 18.5kg/m^2 is equivalent to underweight; (2) between 18.5 and 24.9kg/m^2 is equivalent to a healthy weight; (3) between 25 and 29.9kg/m^2 is equivalent to overweight and (4) 30kg/m^2 and more indicates obesity (CDC, 2022).

Insulin refers to an anabolic hormone secreted by the β cells in the islets of Langerhans in the pancreas. Insulin is responsible for the metabolism of carbohydrates, fats and glucose in the body and achieves this through stimulating the formation of glycogen in the body (Bennett, 2018).

1.9 Theoretical grounding of the study

According to Creswell and Creswell (2018), a research paradigm or worldview is a basic set of beliefs that guides the activities in research. There are four types of research paradigms; constructivism, post-positivism, transformative and pragmatism. The study utilised a pragmatic worldview.

1.9.1 Pragmatism Paradigm

Creswell and Creswell (2018) explain that research that follows a pragmatism paradigm is problem centred. The pragmatic worldview studies are also oriented on practice solutions and are pluralistic (Creswell & Creswell, 2018). Saunders, Lewis and Thornhill (2019) also explain that use of the pragmatic worldview is determined by the research question. In view of Creswell and Creswell (2018) explanation, this study through the development of guidelines for the reduction of Type 2 Diabetes is oriented on the nursing practices to reduce Type 2 Diabetes among older PLWH. The authors, explain further that pragmatists use many approaches and methods to collect data. Weaver (2018) further adds that the pragmatic worldview focusses on "*what works*". Similarly, this study used, a scoping review of the literature, an

explorative study design and integrative review of literature with triangulation of three qualitative data sources. Creswell and Creswell (2018) outline that the advantage of using different data sources ensures that the researcher has a better understanding of the problem.

Shah, Shah and Khaskhelly, (2019) contrast the research paradigms and reveal that unlike post-positivism and constructivism which believe in singular and multiple realities, the pragmatism worldview believes in both singular and multiple worldviews. Pragmatism is adopted from a continuum perspective rather than from two opposite ends (Saunders et al., 2019). This implies that the outcomes of the research take the lead in conducting the research (Shah et al., 2019). In this study, the guidelines for the reduction of Type 2 Diabetes guide the research process. In addition to believing in single and multiple world views, Shah et al. (2019) highlight that to achieve the outcome the orientation may be scientific, subjective or objective. In the same way, this study uses a scientific orientation of a scoping review of the literature, an exploratory descriptive design and an integrative review of literature. A contrary view is presented by Saunders et al. (2019) on the use of the pragmatic worldview for qualitative studies, who uphold the use of the constructivist paradigm for qualitative studies. However, the problem orientation of this study and the need for an outcome of guidelines for reducing Type 2 Diabetes, orients the study toward the pragmatic paradigm. Grove and Gray (2021) substantiate this use of pragmatism for qualitative approaches using the exploratory descriptive design which is used in in this study.

1.9.2 Orem's Self-Care Care Deficit Nursing Model

The study was underpinned by Orem's Self-Care Deficit Nursing Model. Orem's Self-Care Deficit Nursing Model is composed of three sub-theories; the theory of nursing systems, the theory of self-care and the self-care deficit theory (Nieswiadomy & Bailey, 2018). The concepts that form the basis of the theories are; self-care, self-care agency, self-care demand, nursing agency and nursing system (Nieswiadomy & Bailey, 2018). Self-care according to Orem are activities that people perform on their own to maintain health and well-being (Polit & Beck, 2020). In this study, self-care are the activities that older PLWH perform to reduce Type 2 Diabetes.

The self-care theory in nursing guides older PLWH to engage in self-care practices to reduce Type 2 Diabetes. Renpenning and Taylor (2003) highlight that for persons to perform self-care activities, these self-care activities are regulated by age, socio-cultural factors, developmental stage, health, availability of resources, economic status and the therapeutic self-care demands. The self-care theory frames the research objective, describe self-care practices older PLWH perform to reduce Type 2 Diabetes

The self-care deficit theory describes situations when nursing becomes necessary (Smith & Parker, 2015). The self-care deficit nursing theory is based on the presupposition that people must be able to manage themselves (Smith & Parker, 2015). When people are unable to manage themselves, nursing care becomes relevant and this nursing care comes in form of teaching or creating an environment where the person can provide self-care (Renpenning &Taylor, 2003). The self-care deficit theory framed the research objective describe challenges experienced by older PLWH in reducing Type 2 Diabetes.

The nursing system theory provides direction to the nurses in a primary health care setting to reduce Type 2 Diabetes among older PLWH. The theory describes how the needs of older PLWH will be met by the nurse, the older PLWH or both. The nursing system theory outlines that nursing actions are wholly compensatory, partially compensatory or supportive educative (Renpenning & Taylor, 2003). This theory is oriented towards the research objectives of describing nursing interventions for the reduction of Type 2 Diabetes among older PLWH and determining whether nursing interventions are influenced by risks older PLWH present.

1.10 Research Design and Methods

The study followed an overall qualitative approach. In addition to the qualitative approach two systematic literature reviews were used and these included a scoping review of the literature, and an integrative literature review.

The scoping review of literature: The scoping review of literature which was conducted to fulfil the research objective; describe the excess risks associated with

Type 2 Diabetes in older PLWH. Peters et al., (2022) explain that scoping reviews are conducted for several reasons. Scoping reviews of literature are useful to examine evidence that is emerging which is still unclear. In this study, the new evidence is the vulnerability of older PLWH to Type 2 Diabetes. This is in light of several studies having been conducted on PLWH; both young and old and how they are at risk of Type 2 Diabetes. However, risks associated only with older PLWH remain a new phenomenon. Secondly, Peters et al. (2022) explain that scoping reviews are also conducted as preliminary research to map evidence and set boundaries for the main study. In this study, the scoping review was conducted to define the excess risks faced by older PLWH and set boundaries for the guidelines to be developed in mitigating these risks faced by older PLWH.

The exploratory descriptive study: The study also used an exploratory descriptive research design. Grove and Gray (2021) describe qualitative exploratory descriptive study designs as studies that seek to explore a new topic concurrently describing a situation. Grove and Gray (2021) add the benefit of the exploratory descriptive study is that it allows nurse researchers to examine and describe a new intervention. Similarly, in this study, the researcher seeks to explore and describe guidelines for the reduction of Type 2 Diabetes among older PLWH. Grove and Gray (2021) further argue that exploratory descriptive researchers use a pragmatic orientation as they seek to address a research problem. Furthermore, the outcomes of exploratory descriptive studies are applied to a practice problem. Correspondingly, this study addressed the research problem of a theoretical practical gap due to the lack of guidelines for reducing Type 2 Diabetes among older PLWH.

Triangulation of qualitative data sources: This data analysis method was be used to meet the last research objective (describe guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District). This method involved the triangulation of the qualitative sources. These sources are firstly the results from the older PLWH, secondly results from the nurses providing care to older PLWH and lastly an integrative literature review. Stonbraker, Richards, Halpern, Bakken and Schnall (2019) refers to triangulation as the use of multiple data sources or multiple methods of qualitative designs. The authors further note that triangulation serves to enhance the validity of a particular phenomenon. In this research, triangulation was used to enhance the contextualisation of best practice recommendations to reduce

Type 2 Diabetes among older PLWH in Harare Urban District.

1.10.1 Population of the study

To identify the studies for the scoping review of literature, studies were identified from three databases-CINAHL, PubMed and Cochrane Library using the keywords, 'diabetes', 'risks', 'people living with HIV'. The literature search yielded a total of 996 studies, from 2012 to 2022.

The exploratory descriptive research design, used two populations in two phases (Phase 1 and Phase 2). The first population was older PLWH who accessed ART clinics in Harare Urban District. This first population fulfilled the research objectives; to describe self-care practices older PLWH perform to reduce Type 2 Diabetes and to describe challenges older PLWH experience in reducing Type 2 Diabetes.

The second population consisted of the nurses' providing healthcare to older PLWH in Harare Urban District. This population provided data to fulfil the research objectives; describe nursing interventions for the reduction of Type 2 Diabetes among older PLWH, to determine whether nursing interventions to reduce Type 2 Diabetes are influenced by excess risk presented by older PLWH

Triangulation of data sources used population from the exploratory descriptive study which included, older PLWH and nurses providing care to older PLWH and studies from an integrative review of literature. The population of the integrative review of literature was based on 1168 research articles from 2013 to 2023 that were screened using key words "reduction" "Diabetes"; "people living with HIV". This data analysis method sought to fulfil the objective develop guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

The study design, corresponding study objectives and populations are shown in Table 1.1 below:

Qualitative Approach	Research Objectives	Study population
Scoping review of literature	Describe excess risks associated with the development of Type 2 Diabetes among older PLWH	996 studies conducted from 2012 to 2022 from three databases CINAHL, PubMed and Cochrane Library. After a literature search with keywords "diabetes', 'risks', 'people living with HIV'.
Exploratory Research design	Phase 1: To describe self-care practices older PLWH perform to reduce Type 2 Diabetes To describe the challenges older PLWH experience in reducing Type 2 Diabetes.	Older PLWH in Harare Urban District
	Phase 2: To describe nursing interventions for the reduction of Type 2 Diabetes among older PLWH. To determine whether nursing interventions to reduce Type 2 Diabetes are influenced by excess risk presented by older PLWH.	Nurses providing healthcare services to older PLWH in Harare Urban District
Qualitative data triangulation from (1) findings from older PLWH, (2) findings from nurses providing care to older PLWH and (3) integrative literature review	To develop nursing guidelines for the reduction of Type 2 Diabetes among older PLWH with excess risk of developing Type 2 Diabetes.	1. Older PLWH in Harare Urban District 2. Nurses providing healthcare services to older PLWH in Harare Urban District 3. 1168 studies conducted from 2013 to 2023 from three databases CINHAL, PubMed and Cochrane Library. After a literature search with keywords, reduction diabetes and People living with HIV

Table 1.1: Methods of the multi-method approach

1.10.2 Sampling

The Scoping Review of literature: A five-step approach was used for the scoping review of the literature. The first step involved the identification of studies by the researcher by checking titles and abstracts, then the research supervisor reviewed 10% of these studies and an agreement was reached for the number of articles to be included using the basis of the inclusion and exclusion criteria. The second step

involved the researcher reviewing all the articles that were agreed upon by the researcher and the research supervisor and applying the inclusion and exclusion criteria again with the inclusion of "ageing" as a variable in the studies conducted. The research supervisor then reviewed at least 10% of the studies selected by the researcher. The third step involved the research supervisor checking all the articles the researcher was unsure about and checking the final selected articles.

The exploratory descriptive design in the exploratory descriptive study design, non-probability sampling was utilised to select samples from both older PLWH and nurses providing healthcare to older PLWH. The sampling technique utilised was purposive sampling for both population groups (older PLWH and nurses providing care to older PLWH).

Triangulation of data sources: The purposively sampled older PLWH and nurses providing care to older PLWH from the exploratory study design contributed to data for triangulation with an integrative review of literature whose studies were selected from three databases, PubMed, CINAHL, and Cochrane Library. Grey literature was screened and articles were selected from targeted websites WHO and the Zimbabwe MoHCC. Article selection was based on the key words; "reduction" "diabetes", "people living with HIV".

1.10.3 Data Collection

The scoping review of literature: To extract data from the articles selected from the scoping review, the Souza data extraction tool was utilised. The tool allowed the collection of; the geographical setting of the study, the population sampled, sample size, research objectives, research designs and key concepts related to the study objective: excess risks associated with the development of Type 2 Diabetes among older PLWH.

The exploratory descriptive design. Data was collected through interviews using a semi-structured interview guide. Two semi-structured interview guides were used to collect data from the two sampled groups; older PLWH and nurses providing healthcare to older PLWH. The first data collection tool collected data from older PLWH about self-care practices to reduce the development of Type 2 Diabetes and the challenges experienced by older PLWH in reducing Type 2 Diabetes.

The second data collection tool was for the nurse's providing healthcare to older PLWH. This semi-structured interview guide collected data about nursing interventions for the reduction of Type 2 Diabetes among older PLWH, whether nursing interventions to reduce Type 2 Diabetes were determined by excess risk presented by older PLWH and nursing guidelines for the reduction of Type 2 Diabetes among older PLWH with excess.

Triangulation of data sources: Data collected from the exploratory descriptive study design was triangulated with an integrative review of literature. Data extraction from the integrative review included year of study, objectives of study, origins of studies, and outcomes aligned to the measures for the reduction of Type 2 Diabetes.

1.10.4 Ensuring Rigor

Grove and Gray (2021) explain that the findings from qualitative research can be applied in other contexts. In light of this, qualitative researchers need to ensure that their findings are credible, dependable, confirmable and transferable to ensure rigor. Kumar (2021) adds that these four elements indicate trustworthiness criteria in qualitative studies.

Dependability. According to Kumar (2021) dependability pertains to ensuring that similar results are obtained if research processes are duplicated. To ensure dependability, the researcher detailed all research processes so that other researchers can duplicate the study.

Credibility: Kumar (2021) describes credibility as the extent to which the results of the study are believable from the perspective of the research participants. This study explored older PLWH and nurses' practices in reducing Type 2 Diabetes, as such Kumar (2021) highlights the best people to ensure concordance with the findings is to present the findings to the older PLWH and nurses providing care to older PLWH.

Confirmability: Confirmability refers to the degree to which study findings can be corroborated by other researchers (Kumar, 2021). This is achieved by the second researcher following similar processes conducted in this research.

Transferability: Refers to the extent to which results in a qualitative study can be transferred to a similar setting (Kumar, 2021). Transferability was ensured by an audit

trail of processes employed in conducting the study.

1.10.5 Ethical Considerations

According to Nieswiasdomy and Bailey (2018), the need for ethical research conduct is necessary because of historical accounts such as the Tuskegee study which provide accounts of unethical conduct in nursing research. Polit and Beck (2020) also explain that in nursing research, ethical principles are particularly important because of the blurring between the constituents of nursing practice and data collection. Nieswiasdomy and Bailey (2018) define ethics as the rules and principles governing research. Given the need to protect the rights of research subjects, the following ethical principles were adhered to:

Seeking Permission: The first permission sought was from the institutional review board – The College of Human Sciences Research Ethics Review Committee and approval was granted (approval number 14056739_CREC_CHS 2022) (Appendix A). Permission to conduct the study was also sought from the City of Harare Health Department and this was also granted (Appendix H).

Informed Consent: Polit and Beck (2020) explain that informed consent entails the transmission of information from the researcher to the study participant with the participant agreeing to participate in the study. The authors also outline that informed consent entails four elements; transmission of the information to the prospective participant, (2) understanding of the information by the participant (3) competence to provide consent by the participant and (4) the consenting of the participant to participate in the study. In this study, participants were provided with an information sheet that contained all information about the study such as the purpose, their level of involvement in the study and potential harm. Secondly, the researcher recruited only participants who were competent to provide informed consent and excluded those living in institutions such as prisons or those with mental health illnesses. After the provision of information and its comprehension, participants signed the informed consent form to show their willingness to participate.

Anonymity and Confidentiality: Grove and Gray (2021) explain that study participants have the right to anonymity and privacy. This means that the identity of the participants will not be revealed to other people and the information they would

have shared will be kept confidential. To ensure privacy data collection was done in a private room and no names were taken during the interview process. After data collection, the researchers ensured confidentiality by keeping all information identifiable to the research participants in a locked cupboard and a password-protected computer which were only accessible to the researchers.

1.11 Chapter Outline of the Study

Chapter 1: Chapter 1 introduces the study by illustrating the relevance of the research through a description of the increase in the number of PLWH who are ageing with HIV and are becoming susceptible to age-related chronic illnesses like Type 2 Diabetes. The chapter also defines Type 2 Diabetes, HIV and introduces the context of the Harare Urban District where the study took place. The background of the study is also explored in Chapter 1 with a description of the prevalence and incidence of Type 2 Diabetes in older PLWH across the world. The chapter gives insight into the problem that motivated the study and how the study is significant to the nursing profession. The chapter also outlines the study objectives and research questions. Chapter 1 further provides an outline of definitions of the concepts used throughout the study. The chapter ends with a description of how the study would be conducted and the theoretical framework that underpins the study.

Chapter 2: The chapter reviews literature conducted in the past on Type 2 Diabetes among older PLWH. The chapter reviews the literature on self-care practices that older PLWH perform to prevent Type 2 Diabetes. Chapter 2 explores the literature on challenges older PLWH experience in reducing Type 2 Diabetes. The chapter also discusses healthcare interventions for the reduction of Type 2 Diabetes among older PLWH. Furthermore Chapter 2 describes the global and Zimbabwean policies and guidelines that frame the guidelines for the reduction of Type 2 Diabetes among older PLWH. The last section of Chapter 2 describes Orem's self-care deficit nursing model which forms the theoretical framework of the study.

Chapter 3. The chapter describes the methods used in conducting the study. The chapter begins by describing the pragmatic worldview that shapes the study. After the description of the pragmatic paradigm the overall qualitative study approach that

guides the study is explained. Chapter 3 further outlines the research design that is employed- the exploratory descriptive design and triangulation of the qualitative data sources. The study setting, of Harare Urban District clinics, is also detailed in Chapter 3 as well as the study population and how sampling of, older PLWH and nurses working in Harare Urban District was done. The chapter also explains the stages of data collection, and how data was analysed. Also included in Chapter 3 are the measures taken by the researcher to ensure rigor. Chapter 3 also describes ethical principles considered whilst conducting the study. The chapter ends with a description of the methods used to develop guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

Chapter 4: Chapter 4 is the scoping review of literature on risk factors associated with the development of Type 2 Diabetes among older PLWH. The chapter begins with an outline for the scoping review of literature and further describes the method used to conduct the scoping review of literature. In addition, Chapter 4 details the findings of the scoping review of literature. This includes findings from the numeric analysis, which is followed by the results from the thematic analysis of the studies. The last section of Chapter 4 discusses the findings of the scoping review of literature.

Chapter 5. Chapter 5 presents and discusses the findings from the study. Chapter 4 presents findings from the exploratory descriptive study by firstly, describing findings from Phase 1 data collection where data was collected from 23 older PLWH. Two themes pertaining to self-care practices among older PLWH are presented and four themes pertaining to challenges experienced by older PLWH are also presented. Secondly, Phase 2 findings from the 9 nurses providing care to older PLWH are presented where three themes are outlined, one theme pertaining to whether nursing interventions are determined by excess risks is also described. After the presentation of the findings Chapter 5 further discusses these findings in relation to previous studies conducted.

Chapter 6. The sixth chapter develops the guidelines for the reduction of Type 2 Diabetes among older. These guidelines were developed through triangulation of data from three sources (1) data analysed from interviews with older PLWH (self-care practices and challenges), (2) data analysed from interviews with nurses providing care to older PWLH (interventions used) and (3) an integrative review of literature of

recommendations for the reduction of Type 2 Diabetes among older PLWH. The chapter then triangulates outcomes of the integrative review of literature with the outcomes from the exploratory descriptive study; the explorative descriptive study.

Chapter 7: The chapter presents the guidelines for the reduction of Type 2 Diabetes among older PLWH. The chapter begins by outlining how the guidelines were developed, then the eight guidelines are described in four main categories of screening, use of a multidisciplinary team, health education and pharmacological interventions. The monitoring framework for the guidelines are described as well as challenges that are envisioned in implementing the guidelines.

Chapter 8: The chapter presents the conclusions drawn from the study. The chapter begins with a summary of the study and then details the findings in relation to the research questions. The recommendations and limitations are presented in Chapter 8 and the chapter ends with a concluding statement on the importance of developing guidelines for the reduction of Type 2 Diabetes among older PLWH.

1.12 Conclusion to Chapter 1

Chapter 1 introduced the study describing the pertinent issue of developing guidelines to reduce Type 2 Diabetes among older PLWH due to an increase in the number of PLWH who are ageing. The chapter provided a background to the study by highlighting the prevalence of Type 2 Diabetes among older PLWH. From this background, in Zimbabwe, there are studies conducted by Gonah et al. (2020) that highlight a higher prevalence of Type 2 Diabetes among PLWH in comparison to the general population. In addition, other studies around the world such as the study conducted by Duncan et al. (2018) in the UK show a higher prevalence of Type 2 Diabetes among older PLWH in comparison with younger PLWH. Despite the higher prevalence of Type 2 Diabetes among older PLWH, measures to reduce the development of Type 2 Diabetes among older PLWH are not available. The unavailability of these guidelines to reduce Type 2 Diabetes poses a problem for nursing practice as case finding of older PLWH at risk of Type 2 Diabetes is not implemented. As such the chapter presents the study purpose which is to develop nursing guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District. The chapter further outlines the research

objectives and describes how the study is significant to nursing practice, research and policy-making.

Chapter 1 also details the methodology of the study, a qualitative approach that includes; a scoping review of the literature, an exploratory descriptive research design and triangulation of qualitative data sources. Orem's self-care model is also described as the theoretical framework that underpins the study. The chapter further outlines the ethical principles considered in conducting the study and ends with an outline of the chapters of the study. The next chapter, Chapter 2 reviews current literature on Type 2 Diabetes among older PLWH.

CHAPTER 2

LITERATURE REVIEW

Chapter 2 reviews literature related to the development of guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District. The chapter reviews the literature to provide an understanding of Type 2 Diabetes among older PLWH and serves to enable interpretation of the findings of the study. Saunders et al. (2019) also add that literature reviews not only enable understanding of the research but also provide insight into the trends of previous studies. Polit and Beck (2020) further outline that the literature review should have a plan that is guided by specific research objectives. Therefore, this literature reviewed is guided by the study objectives and concludes with the theoretical framework.

2.1 Self-care practices older PLWH perform to reduce Type 2 Diabetes

Given the excess risks to the development of Type 2 Diabetes, older PLWH ought to implement self-care practices to prevent Type 2 Diabetes. The WHO (2020b) lists two main strategies of self-care to reduce Type 2 Diabetes, physical activity and diet modification. Despite the excess risks and preventive strategies available, Sinclair et al. (2022) argue that older people seldom implement self-care practices to prevent Type 2 Diabetes because more than half of older people are unaware of the risks of developing Type 2 Diabetes or the presence of Metabolic Syndrome which results in the development of Type 2 Diabetes. In Zimbabwe, Gonah et al. (2020) as discussed in Chapter 1, section 1.3 also reveals that more than 50% of older PLWH do not know their Type 2 Diabetes status as such instigating self-care practices to reduce Type 2 Diabetes may not occur.

Notwithstanding the lack of implementation of self-care practices to reduce Type 2 Diabetes among older PLWH, Duncan et al. (2020) in a mixed-method study with older PLWH with a mean age of 54 years concluded that dietary interventions and physical activity result in a reduction of Type 2 Diabetes. Duncan et al. (2020) made the conclusion on physical activity and dietary modification after a six-month intervention that involved 10 000 steps a day and following a diet modified from the Mediterranean diet and the dietary approach to stop Hypertension, Diabetes diet. Bavaro et al. (2021) also note that in older PLWH, interventions that include physical activity and dietary management aimed at weight reduction are critical in improving insulin resistance

hence, achieving glycaemic control. Substantiating this assertion by Bavaro et al. (2021), Duncan et al. (2020) found that from their intervention goals of; reducing weight by 7% in six months, reducing BMI to less than 22.5m/m^2 and reducing waist circumference to less than 90 cm in men and 80 cm in women resulted in the lowering of the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) score of participants.

2.1.1 Physical Activity to reduce Type 2 Diabetes among Older PLWH

Physical activity reduces the development of Type 2 Diabetes among older PLWH and also in the general population (Johs, Kellar-Guenther, Jankowski, Neff & Erlandson, 2019). Concurring with Johs et al. (2019), a study conducted by Quiles, Ciccolo and Garber (2017) in the USA also found that development of Type 2 Diabetes was associated with lower volumes of physical activity among older PLWH. Willig et al. (2020) illustrated that Type 2 Diabetes risk was reduced by 26% with moderate intensity physical activity and by 53% with high intensity physical activity. For physical activity to reduce this risk of Type 2 Diabetes, there is a need for habitual exercise (Willig et al., 2020).

The effects of physical activity in reducing Type 2 Diabetes are well documented. The WHO (2020c) cites Pedro, Guariglia, Peres, and Moraes (2017) who argue that aerobic exercise among older PLWH reduces blood glucose in older PLWH however such glucose reduction does not have any association with an increase in insulin concentration. Willig et al. (2020) also explain that physical activity lowers blood glucose levels among PLWH. In addition, aerobic exercise and resistance training have also been shown to reduce Type 2 Diabetes among older PLWH by improving immune function (Ozemek, Erlandson & Jankowski, 2020). This improvement in immune function as a result of exercise is particularly beneficial in the presence of the risk posed by a long duration of HIV infection and a low CD4 cell nadir concluded by Høgh et al. (2022); Samad et al. (2017); and Galli et al. (2012). In Canada, a feasibility study conducted by Buckinx (2022) used a twelve-week intervention done three times a week for 45 minutes each session involving a variety of physical activities among older PLWH. Following these interventions that included hand grip, walking and muscle strength exercises, Buckinx et al. (2022) found that varied exercises were

beneficial to older PLWH especially those who had a duration of HIV longer than 20 years as such physical activity improved muscle strength, increased walking speed and leg power.

Despite the benefits of exercise in reducing the occurrence of Type 2 Diabetes, Johs et al. (2019) in their study in the USA, argue that older PLWH live highly sedentary lives. Willig et al. (2020) quantify this assertion of low physical activity among older PLWH in the USA made by Johs et al. (2019) by revealing that 68% of older PLWH have very low levels of physical activity. In comparison to other groups vulnerable to Type 2 Diabetes, older PLWH display the lowest physical activity levels with only 13% engaging in high levels of physical activity (Willig et al., 2020). In comparison among the general population 49.8% moderately exercise and 31.2% have high levels of physical activity (Willig et al., 2020). Similarly, Quigley, Baxter, Keeler, and MacKay-Lyons (2019) argue that older PLWH are seldom physically active. A parallel conclusion from Johs et al. (2019); Willig et al. (2020) Quigley et al. (2019) is drawn from a study conducted by, Quiles et al. (2017) who concluded that the majority of older PLWH in the USA do meet minimum requirements for physical activity.

Although studies in developed countries note the lack of physical activity among older PLWH, some studies do describe the nature of physical activities performed by older PLWH. In a secondary data analysis conducted in an urban area in USA with 100 older PLWH, the authors, Voigt, Liu, Rowell-Cunsolo, Schnall, and Poghosyan (2023) like Buckinx et al. (2022) found that older PLWH engaged in walking as an exercise routine. In their findings, Voigt et al. (2022) concluded that older women living with HIV walked less frequently than men and walking in urban areas was hindered by traffic hazards. Physical activity among older PLWH is also viewed as a continuum from other activities of daily living such as domestic chores (Vader et al., 2017). Notably the authors Vader et al. (2017) conducted their study also using a qualitative design in Canada.

In an African population, a correlational study that assessed physical activity with insulin resistance and β cell function in Uganda, concluded that low physical activity levels are associated with β cell dysfunction and insulin resistance; hence the development of Type 2 Diabetes (Kitilya et al., 2022). Also, in Uganda, another study concluded that older PLWH have low levels of physical activity which increases their

risks of Type 2 Diabetes and cardiovascular disease (Wright et al., 2021). The authors Wright et al. (2021) in the observational mixed method study design used an accelerometer to measure physical activity levels among older PLWH in comparison to the general population and found that although older PLWH engaged in a variety of physical activities, only 20% met physical activity requirement. Women performed activities of daily living such as cooking and cleaning as part of their physical activities (Wright et al., 2021). A systematic review focussing on Sub-Saharan Africa by Vancampfort, Stubbs and Mugisha (2018) acknowledge that few studies have explored exercise in PLWH in Africa, in the review, the authors selected studies from Ethiopia, Malawi, South Africa and Nigeria. Vancampfort et al. (2018) like Wright et al. (2021) concluded that older PLWH have lower levels of physical activity in comparison to younger PLWH. Moreover, among PLWH, women and PLWH with a lower BMI were more likely to be physically active in comparison to men and PLWH with a higher BMI (Vancampfort et al., 2018). Notably, Vancampfort et al. (2018) reveal that older PLWH are less physically active compared to the other population groups because they are not engaged in productive economic activities. Havyarimana et al. (2021) in their study on physical activity among PLWH in Burundi concur with Vancampfort et al. (2018) that economic productivity among younger PLWH ensures physical activity. Reinforcing this assertion, Havyarimana et al. (2021) found that 80.2% of PLWH do engage in adequate levels of physical activity, using a sample of both young and old PLWH.

In terms of the nature of physical activities conducted by older PLWH, a phenomenological study conducted in a semi-rural community in South Africa; Chetty, Cobbing and Chetty (2022) found that older PLWH engaged in various physical activities that included activities of daily living, walking, aerobic exercise and strength, aerobic exercise and flexibility as well as exercises in religious groups. In addition, Chetty et al. (2022) noted that older PLWH engaged in physical activities through economic productive activities such as farming. Similarly in Uganda, Wright et al. (2021) concluded that older PLWH engage in various physical activities. The acceptability of walking in older PLWH is discussed in a study conducted by Kitilya et al. (2023) who describe the physical activities performed by older PLWH in Mwanza Tanzania in a qualitative study and reveal that walking was a commonly listed form of physical activity among PLWH. The authors Kitilya et al. (2023) note that older PLWH

would engage in long distance walking as part of their vending work, selling fruits and vegetables.

Physical activities performed by older PLWH in Africa include domestic chores. In the study in Tanzania, Kitilya et al. (2023) note that PLWH regard domestic chores such as cleaning and cooking as physical activity. Kitilya et al. (2023) explain that the perceptions of domestic work as physical activity are strongly influenced by cultural norms and values in a community. In their findings, Kitilya et al. (2023) found that women living with HIV reported such domestic chores as their means of exercise and felt that such chores adequately met their physical activity requirements without the need for additional physical activity. Similarly in a scoping review of literature, Safa, McClellan, Bonato, Rueda and O'Brien (2022) concluded that older women living with HIV reported the performance of activities of daily living and domestic chores as a means of physical activity whilst men engaged in exercise regimes. Safa et al. (2022) like Kitilya et al. (2023) note that domestic work as a means of physical activity among older women living with HIV was strongly influenced by gender norms in society.

2.1.1.1 Factors facilitating physical activity in older PLWH

According to Quigley et al. (2019) one of the drivers of physical activity among older PLWH is social support. Johs et al. (2019) concur with Quigley et al. (2019) and argue that the presence of social support to motivate older PLWH to exercise is crucial. This social support which motivated older PLWH includes friends, fellow church members, family and a supportive community that also engages in physical activity (Johs et al., 2019). Furthermore, Johs et al. (2019) reveal that such social support provides positive reinforcement that encourages older PLWH to continue with the physical activity. Duncan et al. (2020) also noted a significant enabler to achieving physical activity goals among older PLWH was a telephonic motivation from a dietician to older PLWH on a six- month intervention which included physical activity. Vancampfort et al. (2018) reiterate the same conclusion drawn by Duncan et al. (2020) and explain that physical activity among older PLWH is inadequate due to a lack of encouragement for self-care practices from primary health care centres. Vancampfort, et al. (2018) also note that public health interventions in primary care facilities focus on pharmacological interventions without support for physical activity. Noteworthy, the authors

Vancampfort et al. (2018) also concur that social support from family, friends and religious groups promotes physical activity among older PLWH.

Another significant factor influencing the use of physical activity as a self-care means to reduce the development of Type 2 Diabetes among older PLWH is knowledge of exercise in health-related quality of life. Quigley et al. (2019) in their study revealed that older PLWH knew the benefits of exercise, however, most of older PLWH were unaware of the specific parameters of physical activity for health benefits to reduce the occurrence of NCDs like Type 2 Diabetes.

2.1.2 Adherence to a healthy diet

According to Duncan et al. (2020), another self-management practice to reduce the development of Type 2 Diabetes is dietary self-management. Duncan et al. (2020) describe a Mediterranean diet as suitable for weight reduction in older PLWH. This Mediterranean diet emanates from the eating habits of people living in countries that border the Mediterranean Sea (Greece, Spain and Italy) (Queensland Government, 2021). The Queensland Government. (2021) describes the diet founded on vegetables and fruit which should consist of 50% of daily food intake, whole grains consisting of 25% of daily food intake and 25% of fish, poultry or legumes. The Mediterranean diet also lists water as the main beverage (Queensland Government, 2021). Other basic components of the Mediterranean diet are dairy products should be consumed daily, processed foods should be eaten minimally with preference of fresh foods, extra virgin olive oil should be used due to its monounsaturated properties and eating should be done with others (International Foundation of Mediterranean Diet, 2022). Duncan et al. (2020) notes that this Mediterranean diet should be individualised to meet cultural preferences. The diet should include; reduced saturated fat intake to less than 10% of daily caloric intake, restricted added sugar to less than 25g per day and including seven or more pieces of fruit and vegetables daily. Regarding carbohydrate intake, 50% of whole grains daily should be consumed daily and monounsaturated fat should be more than 15% of daily energy intake (Duncan et al., 2020).

Furthermore, Bavaro et al. (2021) also describe the Mediterranean diet as ideal for weight reduction among older PLWH. Moreover, in a systematic review of 13 studies

on the effectiveness of the Mediterranean diet in reducing central obesity in PLWH; Bendall et al. (2018) concluded that the Mediterranean diet achieved the reduction of central obesity. Recommendations to modify dietary habits to reduce Type 2 Diabetes among older PLWH are also made by Sneij (2019). These recommendations include an increase in vegetable and fruit intake and an increase in fibre intake. Like Duncan et al. (2020), Sneji (2019) found a reduction in BMI in their control group over six months of a nutritional education intervention involving health education to PLWH every month.

Self-care practices in older PLWH in adhering to a Mediterranean diet are further illustrated in the study by Duncan et al. (2020); in the study with older PLWH, the authors found that adherence to restrictions in sugar intake was achieved by 61% of older PLWH. The authors Duncan et al. (2020) also noted that the most difficult dietary modification for older PLWH to achieve was the use of monounsaturated fatty acids which was attained by only 14% of older PLWH. On the issue of using monounsaturated fatty acids in diets, Duda et al. (2020) assessed dietary patterns in PLWH in Poland and found that most (51.6%) of the respondents used vegetable oil for cooking. From their study, the authors concluded that there was no significant difference in eating habits between younger and older PLWH (Duda et al., 2020). Furthermore, Duda et al. (2020) also found that only a quarter of their respondents ate whole grains daily with the majority preferring white bread, white rice and pasta as a source of starch. Duda et al. (2020) notes that this selection of "*full milled*" grains deprives older PLWH from B vitamins contained in whole grains.

Regarding the consumption of fruit and vegetables, Duda et al. (2020) concluded that 22.6% of PLWH ate fruit and vegetables several times a day. In the description of dietary patterns of older PLWH, Duda et al. (2020) concluded that the majority of older PLWH perceived their diets are good with 25.3% describing their diet as poor. Reiterating this need for consumption of fruits and vegetables, a community food garden program which allowed community members to grow fruit and vegetables and also provided health education on healthy diet was implemented in the USA with results that food gardens improved access to fresh fruit and vegetables hence increased consumption (Palar et al., 2019). In discussing how food gardens assist with to access fresh fruit and vegetables, Palar et al. (2019) outline that community food

gardens provided a variety of fresh fruit and vegetables without additional transport costs to markets to access fruit and vegetables.

Similarly, describing dietary self-care practices among older PLWH in Africa, a study in South Africa found that 76.7% of older PLWH had nutritional wellness (Oduro and Kissah-Korsah, 2021). Furthermore, Oduro and Kissah-Korsah (2021) in a study that assessed nutrition patterns among older PLWH, found that 38.9% had at least three servings of fruit and vegetables daily. Contrasting findings to those by Oduro and Kissah-Korsah (2021) are described by Wright et al. (2020). Wright et al. (2020) found that older PLWH adhere to a homogenous diet. The authors, Wright et al. (2021) found that diet among older PLWH in Uganda was mostly, the staple "matoke" a type of banana and sweet potato. In addition, in their study, Wright et al. (2021) found that meals would also typically include vegetables and a protein source, in most cases this protein source was chicken. Elaborating on the issue of consumption of a homogenous diet in Africa, a study conducted in rural Zambia found that PLWH consumed diets composed mostly of carbohydrates (which was influenced by the staple food in Zambia) with little diversity (Masa et al., 2018). Masa et al. (2018) note that the consumption of higher portions of carbohydrates and lack of diversity in diets of PLWH was positively correlated to low socio-economic status, which made it expensive to adhere to diverse diet with higher proportions of fruit and vegetables. In their findings, Masa et al. (2018) concluded that higher proportions of vegetables were consumed in comparison to protein sources, and when these protein sources were consumed it was mostly beef and chicken

2.1.2.1 Factors facilitating healthy eating

Given the benefits of the Mediterranean diet, Henry, Quintana, Moore, Garcia, and Montoya (2019) assessed adherence to a Mediterranean diet among PLWH with a mean age of 54.5 years. The findings revealed that eating habits among older PLWH were influenced by proximity to grocery stores, food preferences which may include undesirable eating habits (Henry et al, 2019). Facilitators of a healthy eating plan among older PLWH also included information on nutrition from a health care provider, affordability of healthy foods, the desire to prevent NCDs, the availability of a structured eating plan and social support (Henry et al., 2019). Oduro and Kissah-Korsah (2021) like Henry et al. (2019) describe the issue of affordability on healthy

eating, and conclude that nutritional wellness among older PLWH was positively associated with an increase in financial stability. Older PLWH who were on government grants showed lesser nutritional wellness in comparison to those who described themselves as financially stable (Oduro & Kissah-Korsah, 2021). Similar to results by Henry et al. (2019), Oduro and Kissah-Korsah (2021) concluded that the desire to prevent NCDs among older PLWH facilitated healthy eating habits. Moreover, Duncan et al. (2020) found that older PLWH were more likely to modify diets to reduce Type 2 Diabetes to avoid additional pill burden associated with a second chronic illness.

One of the risks of developing Type 2 Diabetes is a lack of knowledge on modifiable risks for Type 2 Diabetes (Kigaruki et al., 2018) Therefore, providing health education on nutrition promotes self-care practices of healthy eating to reduce Type 2 Diabetes among older PLWH (Henry et al., 2019). This availability of information from a healthcare provider to promote the self-care practice of healthy eating, is reiterated by Stonbraker et al. (2019) who listed nutrition information as the fourth of ten-priority information sought by PLWH when visiting a healthcare facility. The importance of nutrition information required by PLWH as outlined by Stonbraker et al. (2019) was ranked fourth required information from; first- medication adherence, second- appointment logistics and third- prevention of transmission risks. In their study, Stonbraker et al. (2019) also observed that the information required by PLWH was not always the information prioritised by health care workers when providing health education, to justify this, Stonbraker et al. (2019) found that nutrition information ranked 14th as a topic for teaching PLWH among care providers. Sneji (2019) also affirms that health education on nutrition for older PLWH improves self-care practices to prevent Type 2 Diabetes among older PLWH. Moreover, health education improves nutrition habits of PLWH especially among those with a long duration of HIV which is positively correlated to higher knowledge levels on nutrition (Duda et al., 2020).

2.2 Challenges experienced by Older PLWH in reducing Type 2 Diabetes

Older PLWH experience unique challenges as a result of HIV infection, ART use and or ageing to implement self-care practices to reduce Type 2 Diabetes. Such self-care practices that present challenges for older PLWH to reduce Type 2 Diabetes are

physical activity and healthy eating. Addressing such challenges experienced by older PLWH is imperative as it guides health care workers to improve the self-efficacy of older PLWH to reduce Type 2 Diabetes. Challenges in reducing Type 2 Diabetes include those affecting healthy eating only, those affecting the physical activity and those that affect both physical activity and healthy eating. These challenges include frailty, depression, the high cost of healthy food, and lack of knowledge to prevent Type 2 Diabetes.

2.2.1 Depression

The high prevalence of depression among older PLWH is explained by Luo et al. (2020), who found that prevalence of depression among older PLWH was 44.8% in China. Luo et al. (2020) further argue that prevalence of depression was higher among older PLWH in comparison to older people in the general population. This high prevalence of depression among older PLWH was associated with a negative perception of ageing which is associated with depression as PLWH age (Luo et al., 2020). In the USA, the issue of loss of social support through death among older PLWH as a significant cause of lack of self-care (Johs et al., 2019).

Depression as a self-care barrier among older PLWH living is extensively described in a study conducted in Ethiopia by Abadiga (2019). Abadiga (2019) found that at least 41.7% of their respondents experienced some form of depression; with prevalence increasing with age. Depression is also the most common mental health condition in PLWH and is characterised by loss of sleep, loss of concentration and decreased appetite (Abadiga et al., 2019). Factors associated with depression among older PLWH include perceptions of HIV-related stigma, monthly income, loss of social support, presence of opportunistic infections, adverse drug reactions and comorbidities like Hypertension. In a South African facility-based study van Coppenhagen and Duvenage (2019) used the Centre for Epidemiological Study Depression Scale (CES-D) to assess depression among PLWH and concluded that prevalence of depression among PLWH was 53.7%. The South African study, acknowledges that depression in PLWH is under-diagnosed and under treated (van Coppenhagen & Duvenage., 2019). Similar to Abadiga et al. (2019), van Coppenhagen and Duvenage (2019) outline that depression in PLWH is characterised

by loss of interest in life, loss of sleep, loss of appetite, low self-worth, low energy and difficulty in concentrating. These symptoms however mirror some symptoms of HIV infection itself contributing to the under diagnosis of depression in PLWH (van Coppenhagen & Duvenage, 2019). Notably, in describing the causes of depression van Coppenhagen and Duvenage (2019) reveal that some ART agents have neuropsychiatric effects. These drugs include Efavirenz which has been associated with depression and suicidal ideation and its withdrawal correspondingly results in improvement in depressive symptoms (van Coppenhagen & Duvenage, 2019).

The effects of depression on older PLWH affect self-care practices in adhering to a healthy diet as well as practising physical activity routines (Johs et al., 2019). According to Henry et al. (2019) one of the barriers to adhering to a Mediterranean diet is depression. Thet et al. (2022) also reiterate the effects of depression on diet among older PLWH (median age 58 years) who had a mean duration of HIV infection of 20 years in a longitudinal study conducted in Thailand. The authors, Thet et al. (2022) discuss that depression in older PLWH is associated with weight loss or weight gain. Furthermore, the authors concluded that with an increase in the age of older PLWH, characteristics of poor nutrition such as fatty liver, lipodystrophy, hypertriglyceridemia and dyslipidaemia persist due to depression (Thet et al., 2022). These characteristics of poor nutrition infer lesser attention to the self-care practice of maintaining adequate nutrition among depressed older PLWH (Thet et al., 2022).

Depression also impacts physical activity as a self-care practice to reduce Type 2 Diabetes in older PLWH. In the study conducted in China, Zou et al. (2022) found that depression in older PLWH resulted in low self-efficacy to engage in physical activity. Depression, anxiety and feelings of inferiority are a common occurrence among older PLWH (Zou et al., 2022). Moreover, depression results in older PLWH lacking motivation to participate in physical activity (Johs et al., 2019). Johs et al. (2019) quote a participant from their study who highlighted that even the motivation (will power) to get out of bed is a struggle due to depression.

Interventions to improve self-care management in older PLWH should consider the factors associated with depression in older PLWH (Abadiga, 2019). Such interventions include community education to prevent stigma of PLWH, prevention and

management of comorbidities and opportunistic infections, management of drug side effects and ensuring viral suppression in older PLWH (Abadiga, 2019).

2.2.2. Lack of information

Several studies inclusive of Stonbraker et al. (2019); Henry et al. (2019); Quigley et al. 2019) have outlined the need for comprehensive health education to facilitate self-care practices to reduce risks of Type 2 Diabetes among older PLWH. Henry et al. (2019) explains that large amounts of information for self-care management of HIV are required as HIV is a complex infection. Despite the acknowledgment that there is a need for a large volume of information healthcare workers are often challenged by a lack of guides that outline what specific topics to teach older PLWH (Stonbraker et al., 2019). Compounding the issue of lack of guidelines for specific topics on health education patient factors such as education levels and cultural differences also exist that affect the information provided to older PLWH in self-care management (Stonbraker et al., 2019).

Validating the importance of health education in facilitating self-care behaviour, Matchanova (2021) in a USA study argue that the issue of health education is not only controlled by health care providers but also dependent on the patient. The authors, Matchanova et al. (2021) used a sample of 220 PLWH with a mean age of 49.3 years and found that lower health literacy is associated with lower levels of self-efficacy in the management of health-related conditions. In this case the reduction of Type 2 Diabetes in older PLWH. Health literacy according to Matchanova et al. (2021) is the extent to which persons can obtain, understand, communicate and process health information and make decisions regarding their health.

Health literacy is influenced by fundamental competencies such as numeracy skills and knowledge of words (Matchanova et al., 2021). Low health literacy among older PLWH is associated with lower self-care skills in managing HIV infection as well as lower levels of motivation to manage chronic illness (Matchanova et al., 2021). Concurring with Matchanova et al. (2021); Maduka et al. (2020) found that older PLWH who were health literate were virally suppressed and engaged in self-care practices that optimised their health. These conclusions by Matchanova et al. (2021) and Mduka et al. (2020) imply that low fundamental competencies of basic word and numeracy

skills are a challenge among older PLWH as they have negative consequences for self-care behaviour. As such, health care workers need to identify older PLWH at risk with such low health literacy levels to improve self-efficacy in reducing Type 2 Diabetes. In addition, to being influenced by low levels of fundamental competencies, Fazeli, Woods, Gakumo, Mugavero and Vance (2020) also found that the low levels of health literacy among older PLWH were also influenced by the presence of depressive symptoms, substance abuse and a lack of social support. In their study Fazeli et al. (2020) found that such low levels of health literacy were higher among older PLWH and resulted in poor healthcare engagement.

2.2.3 Cost of Healthy Food

The high cost of food leading to poor diet in older PLWH is described in a study conducted in a "*resource-rich setting*" in Canada by Bekele et al. (2018). Poor nutrition due to lack of affordability among older PLWH is associated with living in large urban areas, having a large number of dependents, low household income levels, failure to meet household costs, alcohol consumption and depression (Bekele et al., 2018). Similarly, the issue of financial assistance to improve nutritional status among older PLWH is described in the study conducted by O'Donnell, Palar, Steward, and Arnold, (2019) in the USA. The high food costs in the USA affects the nutritional status of PLWH even with the availability of grants due to stagnant amounts of grants (O' Donnell at al., 2019). The authors O'Donnell et al. (2019) recommend the supplemental provision of food for older PLWH which is medically tailored to prevent nutritional deficiencies. Similarly, in the United Kingdom, Duncan et al. (2020) conclude that diets for older PLWH should be individualised to mitigate the effects of high food costs.

In studies conducted in Africa, according to Wright et al. (2021) found that older PLWH have homogenous diets due to the high cost of healthy food. Wright et al. (2021) make this conclusion from their study conducted in Uganda. Similarly, Oduro and Kissah-Korsah (2021) in South Africa further reveal that older PLWH who described themselves as financially stable were more likely to report that they maintained a healthy eating plan. Oduro and Kissah-Korsah (2021) also explain that one of the protective factors to ensure older PLWH afford healthy food has been the availability

of financial grants which provide an income to maintain the healthy eating plan. Noteworthy, although Oduro and Kissah-Korsah (2021) explain that government grants may be protective to older PLWH in enabling the purchase of healthy food, in the USA, O'Donnell et al. (2019) explain that the effects of high food prices are still felt by older PLWH as the government grants are stagnant.

This issue of cost of healthy food is not only related to the actual cost of the food itself. Henry et al. (2019) describes that healthy eating in older PLWH is also influenced by proximity to grocery stores. The issue of proximity to grocery stores affecting cost of healthy eating among older PLWH is illumined by O'Donnell et al. (2019) who revealed that older PLWH who have to travel to access healthy food maybe deterred by the additional transport costs associated with the long distances to purchase healthy food.

2.2.4 Chronic Pain in HIV

Another issue that hinders self-care practices in older PLWH is chronic pain. Addis, DeBerry, and Aggarwal (2020) in a systematic review of literature explain that chronic pain is widespread and affects at least 25-90% of PLWH even among those with a high CD4 cell count who are virally suppressed. Karris et al. (2020) in a survey in the USA assessing chronic pain among older PLWH (above 50 years) found that 66% of all older PLWH experienced chronic pain. Among these older PLWH who experienced chronic pain, Karris et al. (2020:) concluded that only 46% used pain medication to relieve the pain. Moreover, chronic pain in older PLWH is associated with multimorbidity and tobacco use (Karris et al., 2020). Karris et al. (2020) further note that chronic pain in HIV among older PLWH is compounded by depression, substance abuse, social isolation and post-trauma. Compounding, the high prevalence of HIV-related chronic pain Lu, Fu, Wei and Zhang (2021) also in a narrative review of literature reveal that more than 53% of PLWH describe their HIV-related chronic pain as severe.

Causes of chronic pain in PLWH are explained in the narrative reviews conducted by Addis et al. (2020); Lu et al. (2021) and include chronic inflammation, HIV-induced neuropathy and ART-induced neuropathy. Lu et al. (2021) elaborately describes this aetiology of chronic pain associated with HIV by outlining that ART-induced neuropathy is caused by the use of PIs and NRTIs. Lu et al. (2020) lists NRTIs inclusive of Stavudine, Zidovudine, Didanosine and Zalcitabine as causes of ART-

induced neuropathy. Karris et al. (2020) also concur with Addis et al. (2020) and Lu et al. (2021) by explaining that chronic pain in older PLWH is caused by HIV associated neuropathy and ART induced neuropathy. Remarkably, the use of the NRTIs' Stavudine, Zidovudine and Didanosine is also associated with the development of lipodystrophy which causes Type 2 Diabetes with the use of older generation ART, as described by Høgh et al. (2022); Samad et al. (2017). From this, the researcher notes the dual influence of older-generation NRTIs' (Stavudine, Zidovudine and Didanosine) on the development of Type 2 Diabetes. Firstly, directly causing lipodystrophy resulting in Type 2 Diabetes and secondly causing ART-induced neuropathy which causes pain resulting in incapacity to reduce Type 2 Diabetes through physical activity. With regards to HIV-induced neuropathy Liu et al. (2020) explain that glycoprotein 120 (gp120) and glycoprotein 41 (gp41) change shape as they engage the CD4 cell receptor C-C Chemokine Receptor 5 and CXC Chemokine Receptor 4, this directly activates hyperalgesia in the dorsal root ganglion neurons, resulting in HIV induced neuropathy. Chronic pain in older PLWH impacts the overall function of older PLWH (Karris et al., 2020). Addis et al. (2020) explain that chronic pain affects the quality of life in PLWH because it is mostly located in the joints, head, legs and back. The authors Addis et al. (2020) also elaborate that in HIV, chronic pain is described as "*chronic widespread pain*" as it affects more than one anatomical location.

Similar studies describing pain in older PLWH have been conducted in Africa. In a systematic review of studies from Sub-Saharan Africa, describing corelates of physical activity, HIV chronic pain was associated with less physical activity among older PLWH (Vancampfort et al., 2018). Vancampfort et al. (2018) highlight that the causes of pain among PLWH vary as well as the severity of pain described by PLWH. In addition, causes of pain in older PLWH could also be a result of HIV and ART induced neuropathy and chronic inflammation (Vancampfort et al., 2018). A similar method of a systematic review of South African studies was conducted by Wadley et al. (2022) who sought to describe differences in pain locations and pain intensity among PLWH in South Africa. The findings by Wadley et al. (2022) indicated that there was no difference in pain sites between men and women. Furthermore, Wadley et al. (2022) also note that most common reported pain locations among PLWH included head, feet and ankles, abdomen and chest. In Uganda, Reynolds et al. (2022) like Vancampfort et al. (2018) included a cohort of older PLWH using a qualitative approach in a rural

area to assess the health priorities and wellbeing of older PLWH. In their findings, Reynolds et al. (2022) concluded that older PLWH were concerned about general body pain especially in their joints which impacted physical activity.

In Africa, the effects of pain of physical activity are elaborated by Vancampfort et al. (2018) who note that older PLWH rely on jobs in the informal sector which are physically demanding requiring physical fitness and this presence of pain affects their physical activity routines which in turn affects economic production. Reynolds et al. (2022) justify findings by Vancampfort et al. (2018) by explaining that chronic pain affected farming activities and these farming activities included digging, weeding, cattle rearing, harvesting, splitting wood and gardening activities. However, Reynolds et al. (2022) notes that older PLWH did not only attribute inability to perform farming activities only to chronic pain but also to declining physical function associated with ageing.

2.2.5 Frailty

According to Quigley et al. (2019), the challenges faced by older PLWH in engaging in physical activity are the effects of HIV infection, ART use and comorbidities. Elaborating on findings of HIV infection as a barrier to physical activity by Quigley et al. (2019), Vancampfort et al. (2018) argue that the self-care practice of physical activity among older PLWH is negatively affected by lower CD4 cell count, a high viral load, presence of opportunistic infections and high HIV clinical stage (described in Chapter 1 section 1). Concurring with Vancampfort et al. (2018), a study in China found that one of the challenges experienced by PLWH to engage in physical activity was a CD4 cell count lower than 350 cells/mm^3 (Zou, Sun, Zhang & Li, 2022). Low CD4 cell count in older PLWH is indicative of a decline in immune function leading to opportunistic infections, tumours and progression towards WHO clinical stage 4 described in Chapter 1 section 1. The development of opportunistic infections is further illustrated by Johs et al. (2019) who concluded that with acute illness older PLWH cannot engage in physical activity due to ill health and hospitalisation, even after hospitalisation, they are too weak to engage in physical activity. This weakness due to ill health is clearly defined through description of frailty. Frailty refers to the overall susceptibility to unfavourable health outcomes due to various stressors resulting in an

inability to maintain homeostasis (Kehler, Milic, Guaraldi, Fulop & Falutz, 2022). Frailty is characterised by a dysregulation of physiological systems inclusive of metabolic regulation and the musculoskeletal system (Kehler et al., 2022).

Guaraldi et al. (2022) describe the issue of a low CD4 cell count impacting physical activity in a correlational study between frailty in older PLWH and low CD4 cell count. The study by Guaraldi et al. (2022) concluded that there was an inverse relationship between a higher frailty score (using Frailty Phenotype) and CD4/CD8 cell count up to 900 cells/mm^3 among older PLWH. This implies that older PLWH become frailer when they have a CD4 cell count of 900 cells/mm^3 or less (Guaraldi et al., 2022). The researcher of this paper notes a congruent relationship between a low CD4 cell count which causes frailty and negatively impacting the ability to perform physical activities and the risk posed by a low CD4 cell count to the development of Type 2 Diabetes described by Høgh et al. (2022); Samad et al. (2017); Galli et al. (2012).

To develop guidelines for the reduction of Type 2 Diabetes among older PLWH, the challenge posed by frailty should be considered. Kehler et al. (2022) note that frailty is reversible and cite the European AIDS Society which recommends the annual screening for frailty for all PLWH over 50 years. Numerous screening tools are available for screening for frailty including the Frailty Phenotype, frailty index and clinical frailty score (Kehler et al., 2022).

2.2.6 Fatigue

One of the challenges in performing physical activity among older PLWH is the presence of fatigue (Goswami, Baker, Wang, Khalil & Kunisaki, 2015). Langseth et al. (2022) describe fatigue as an overwhelming feeling of tiredness which increases with an increase in physical activity and is characterised by a lack of energy and inertia resulting in the reduction of a person's normal capabilities. Fatigue is 60% to 85% prevalent among PLWH and common causes of fatigue amongst PLWH include ageing, anxiety, depression, chronic pain, sleep disturbances, chronic inflammation and the presence of other medical comorbidities (Goswami et al., 2015). In a study conducted in Norway on the prevalence and risk factors associated with fatigue among PLWH the authors Langseth et al. (2022) found that the prevalence of fatigue among PLWH was 38.5% with 18% suffering from chronic fatigue using a sample of 244

respondents (Langseth et al., 2022). Langseth et al. (2022) compare their findings of prevalence of fatigue with the general population by citing Jong et al. (2010) who found that fatigue among the general population ranges from 7% to 42%. In describing factors associated with fatigue, Langseth et al. (2022) like Goswani et al. (2015) note the presence of multimorbidity. In addition, the authors Langseth et al. (2022) concluded that other predictors of fatigue among PLWH were a lack of sleep, severe depression and previous experience of trauma or the reporting of post-traumatic stress disorder. Of note, Langseth et al. (2022) and Goswani et al. (2015) revealed that multimorbidity was associated with fatigue among PLWH, expanding on this assertion, the study conducted by Siegler, Moxley and Glesby (2021) revealed that older PLWH who have comorbidities of cerebrovascular disease, urinary incontinence, gait disorders and peripheral neuropathy reported fatigue more often. In their study in New Zealand, Siegler et al. (2021) also used a sample of only older PLWH and concluded that 50% of all older PLWH reported fatigue as a concern.

In Africa, studies have described the challenge of fatigue among older PLWH include a study conducted in Ethiopia by Gebreyesus, Belay, Berhe, and Haile (2020) who reveal that there is unclear evidence on the prevalence of fatigue among PLWH in Africa. In their findings, Ghebreyesus et al. (2020) found that 51.7% of their respondents stated fatigue as a challenge in the performance of day-to-day activities. Associated factors of fatigue among PLWH included; parity, presence of multimorbidity, depression, being physically inactive and a CD4 cell count of 200-499 cells/mm^3. Notably these findings by Gebreyesus et al. (2020) reiterate the presence of multimorbidity and depression as predictors of fatigue among PLWH which are also described in studies outside Africa by Siegler et al. (2021); Langseth et al. (2022); Goswani et al (2015). Another study conducted in Zambia and the UK comparatively explored musculoskeletal functioning between two cohorts of adult PLWH in the UK and Zambia and found that PLWH in the UK reported higher presence of fatigue (72%) in comparison to the Zambian cohort (62%) (Van de Ven, Ngalamika, Martin, Davies, and Vera (2019). Van de Ven et al. (2019) also concluded that from the Zambian cohort, the presence of fatigue was the only significant predictor of poor health, vitality and mental health.

2.3 Health-care interventions to reduce Type 2 Diabetes among older PLWH

According to Nimitphong, Jiriyasin, Kasemasawachanon and Sungkanuparph (2022), current interventions in the reduction of Type 2 Diabetes among PLWH include pharmacological interventions and health education on lifestyle modifications (physical exercise and diet). Duncan et al. (2018) add that effective screening serves as an effective starting point for the identification of older PLWH at risk of Type 2 Diabetes, this enables the implementation of interventions for the reduction of Type 2 Diabetes. Bernabe-Ortiz, Perel, Miranda, and Smeeth, (2018) in a population based Peruvian study, used a two-step screening process for Type 2 Diabetes. Firstly, it involved an objective assessment of people at risk of an adverse health outcome (Bernabe-Ortiz et al., 2018). Secondly, the screening included a confirmatory test such as HbA1c, oral glucose tolerance test, random capillary blood test, or fasting blood glucose test as described in Chapter 1 section 1.3 (Bernabe-Ortiz et al., 2018). Galaviz et al. (2021) note that in PLWH there is no optimal objective assessment tool to screen and identify PLWH at risk of Type 2 Diabetes to enable interventions.

Concerning the use of the HbA1c to screen for Type 2 Diabetes among PLWH, Sakar and Brown (2019) indicate that the test does not accurately detect Type 2 Diabetes in PLHW. The use of the HbA1c test for PLWH is discouraged because; firstly, it underestimates glucose levels due to the use of medications that cause haemolysis administered to PLWH for Pneumocystis Pneumonia prevention, like trimethoprim-sulfamethoxazole (Sakar & Brown, 2019). Secondly, the NRTI which are thymidine analogues cause macrocytosis resulting in a lowering of HbA1c results (Sakar & Brown, 2019). Daultrey et al. (2021) also confirm the assertion by Sarkar and Brown (2019) in a systematic review of studies using different tests to detect Type 2 Diabetes in PLWH. The authors Daultrey et al. (2021) concluded that where HbA1c was used to diagnose Type 2 Diabetes prevalence of Type 2 Diabetes was lower in comparison to studies where an oral glucose tolerance test was used. Despite the low efficacy of HbA1c tests in PLWH, the tests continue to be used in PLWH as there is no standardised method of diagnosing Type 2 Diabetes in PLWH (Daultrey et al., 2021). This lack of standardised diagnostic tests for Type 2 Diabetes for PLWH coupled with the unavailability of an optimal standardised tool to objectively assess PLWH at risk of Type 2 Diabetes the latter described by Galaviz et al. (2021) results in different practices to identify cases of Type 2 Diabetes.

Provision of health education for older PLWH should be individually structured to meet the individual needs of the patients (Samad et al., 2017). Duncan et al. (2018) also reiterate that health education should be focussed on individual older PLWH. Stonbraker and Larson (2016) in an integrative review of literature in Latin America and the Caribbean found that PLWH trusted healthcare workers for the provision of information on self-management of HIV. In their study, Stonbraker and Larson (2016) found that PLWH preferred health education on a one-on-one basis as provision of health education on HIV in groups was associated with a lack of confidentiality in a context where HIV infection was stigmatised. Furthermore, Stonbraker and Larson (2016) also found that despite the preference of individual health education sessions, for health education to be effective there is need for both group sessions and individual sessions.

Pharmacological interventions to reduce Type 2 Diabetes are also described in the UK, Dyson et al. (2018) argue that the use of pharmacological interventions in PLWH to reduce Type 2 Diabetes is of little value due to drug interactions with ART. However, in contrast, a study conducted in Thailand argues that the use of metformin to prevent Type 2 Diabetes in PLWH is beneficial (Nimitphong et al., 2022). Metformin in PLWH results in a decrease in body weight and BMI after 6 months of use and also a significant reduction in HOMA-IR and HbA1c after 6 months of use (Nimitphong et al., 2022). In addition, Nimitphong et al. (2022) found no reported adverse effects with the use of metformin to prevent Type 2 Diabetes in PLWH.

To develop guidelines for the reduction of Type 2 Diabetes among older PLWH, an exploration of current interventions of screening, pharmacological interventions and health education by healthcare workers around the world in necessary to identify best practices. Frieden et al. (2020) highlight that best practices for preventing and managing NCDs such as Type 2 Diabetes are in developed countries which are characterised by resource availability and the use of multidisciplinary teams. This section explores the different interventions to reduce Type 2 Diabetes in different countries.

2.3.1 Global health care interventions

Globally there are variations in the practices to reduce Type 2 Diabetes among older PLWH. Most interventions, however, include screening, pharmacologic interventions and health education described by Nimitphong, et al. (2022); Duncan et al. (2018).

2.3.1.1 Interventions in the United Kingdom

According to Duncan et al. (2018), screening measures for older PLWH for Type 2 Diabetes should be enhanced to include screening for HIV-specific risk factors as well as conventional diabetes risks in the general population. Furthermore, screening using the HbA1c should be avoided as some ARVs underestimate hyperglycaemia (Duncan et al., 2018).

The screening for Type 2 Diabetes among older PLWH in the UK is also described in a study by Ekong et al. (2020) who found that 88.5% of healthcare providers provided BMI screening for older PLWH in the last 15 months. Moreover, 79.9% of healthcare workers working with older PLWH either performed a random glucose test or an HbA1c test in the past 15 months (Ekong et al., 2020). The authors Ekong et al. (2020) in their discussion note that although HbA1c testing or random glucose testing and BMI measurement were performed the rates of conducting these tests were lower in comparison to routine monitoring for blood pressure, viral load, smoking, and medications recorded which were conducted by more than 90% of healthcare workers. In the UK, Pereira et al. (2022) following a ten-year assessment of a clinic providing services only to older PLWH concluded there were more cases of multimorbidity and polypharmacy indicative of improved screening for NCDs including Type 2 Diabetes. Pereira et al. (2022) also attributed the success of the clinic for older PLWH to the use of a multidisciplinary team.

2.3.1.2 Interventions in the United States of America

In the USA, Lazar et al. (2019) concluded that testing for co-morbid conditions among PLWH fell short of the recommendations. The authors, Lazar et al. (2019) concluded that 66% of all PLWH are tested for Type 2 Diabetes in ART clinics. In addition, in the USA, Black people and Hispanics were most likely to be tested for Type 2 Diabetes in comparison to Caucasians (Lazar et al., 2019). Turrini et al. (2020) also affirm the

assertion by Lazar et al. (2019), of inadequate screening for Type 2 Diabetes of older PLWH. The causes of inadequate screening according to Turrini et al. (2020) include underestimation of potential risks for developing Type 2 Diabetes among healthcare workers and older PLWH.

Considering these reports highlighting inadequate screening for Type 2 Diabetes among older PLWH in the USA, Galaviz et al. (2021) in their study in the USA sought to expand the Finnish Diabetic Score (FINDRISC) to include a measure of insulin resistance, the HOMA-IR which measures the association between blood glucose and insulin resistance. The FINDRISC according to Galaviz et al. (2021) is a commonly used short questionnaire used to assess the risk of diabetes in the general population in the USA. Bernabe-Ortiz et al. (2018) further explain the questions which constitute the FINDRISC include BMI, age, history of Type 2 Diabetes in the family, levels of physical activity, consumption of fruit and vegetables, use of antihypertensive drugs and waist circumference. From the assessment, the authors Galaviz et al. (2021) concluded that adding the HOMA-IR assessment did not improve the FINDRISC tool in identifying PLWH at risk of Type 2 Diabetes. The reason for this lack of improvement to screen for Type 2 Diabetes was the lack of inclusion of specific HIV-associated risks in the FINDRISC (Galaviz et al., 2021).

2.3.2 Interventions in Africa

In Africa, there is paucity of literature pertaining to interventions done by healthcare workers for the reduction of Type 2 Diabetes among older PLWH. In this section, two countries in the SADC region Zambia and Zimbabwe detail variations in practices in screening, health education and pharmacological interventions to prevent Type 2 Diabetes in PLWH. In terms of screening, different approaches are used with varying levels of effectiveness in identifying Type 2 Diabetes among PLWH inclusive of older PLWH. Despite these differences, one recommendation that resonates amongst most studies in Africa is the need to integrate the management of chronic NCDs with ART clinics as a means to curb fragmented care.

2.3.2.1 Healthcare in Zambia

In Zambia, like in the USA, a screening tool to effectively assess PLWH for Type 2 Diabetes was also piloted; the Chronic Health Care (CHC) checklist (Baumgartner, Nyambe, Vasudevan, Kasonde & Welsh, 2022). Baumgartner et al. (2022) in their study assessed health care provider-initiated screening for Type 2 Diabetes among PLWH used the six-point CHC checklist for PLWH to prevent Type 2 Diabetes in 19 clinics. The providers would ask specific Type 2 Diabetes screening questions which included; (1) increased frequency of micturition, (2) increased thirst, (3) increased fluid intake, (4) poor eyesight, (5) increased appetite and (6) increased hunger pangs (Baumgartner et al., 2022). A positive response to any one of these questions, would require healthcare workers to perform a random blood sugar test (Baumgartner et al., 2022). Noteworthy, the performance of the random blood sugar test, aligns with recommendations by Bernabe-Ortiz et al. (2018) of a two-point screening procedure for Type 2 Diabetes. Although there is a similarity, in the use of checklists in the USA study by Galaviz et al. (2021) and the Zambian study by Baumgartner et al. (2022), there are significant differences in the questions asked. The FINDRISC in the USA focussed on WHO risks of Type 2 Diabetes in the population (described in Chapter 1 section 1) whilst the CHC checklist questions focussed on symptoms of Type 2 Diabetes (described in Chapter 1 section 1).

The authors Baumgartner et al. (2022) also explain that the screening tool for PLWH was developed after acknowledging the increase in the number of PLWH developing Type 2 Diabetes. In addition, the screening tool was developed through a consultative process between the Ministry of Health and an international not-for-profit organisation working in Zambia, FHI 360. In concluding their assessment, Baumgartner et al. (2022) reported that the screening tool was unable to identify every potential case of Type 2 Diabetes among PLWH. This conclusion by Baumgartner et al. (2022) of the CHC failing to identify PLWH at risk of Type 2 Diabetes is also similar to the conclusion drawn by Galaviz et al. (2021) regarding the expansion of the FINDRISC in the USA being unable to identify all PLWH predisposed to Type 2 Diabetes. In hindsight, the researcher of this paper opines that the lack of efficacy of both tools (FINDRISC and the CHC checklist) resonates with the assertion by Masenga et al. (2020) that Type 2 Diabetes pathophysiology was described before the advent of HIV as such, measures

to screen Type 2 Diabetes which do not include HIV specific risks may not fully identify PLWH vulnerable to Type 2 Diabetes.

Baumgartner et al. (2022) noted that follow-up after the positive response to any of the six questions on the CHC checklist with a random blood glucose test was challenging due to the unavailability of glucometers and glucometer test strips. Another challenge described by Baumgartner et al. (2022) was a lack of understanding among healthcare workers on the need to screen for Type 2 Diabetes among PLWH. Healthcare workers' lack of understanding of Type 2 Diabetes risks among PLWH is similar to the challenge described by Turrini et al. (2020) in the USA. Baumgartner et al. (2022) also found that low usage of the CHC checklist for screening for Type 2 Diabetes in PLWH was due to the tool having been channelled to the 19 clinics through the not-for-profit organisation; FHI 360 and not directly from the Ministry of Health. With regards to health education, health care service providers who used the CHC checklist were required to provide health education on nutrition, diabetes and diet regulation (Baumgartner et al., 2022).

2.3.2.2 Interventions in Zimbabwe

With regards to screening for Type 2 Diabetes among older PLWH, Chimbetete et al. (2018) explain that PLWH are not routinely screened for Type 2 Diabetes using the HbA1c test. Frieden et al. (2020) elaborate on the issue of screening Type 2 Diabetes among PLWH by noting that currently, MoHCC does not have guidelines for screening NCDs among PLWH. However, Gonah et al. (2020) note that healthcare workers do screen the general population and PLWH through random blood glucose testing only when they present with symptoms of Type 2 Diabetes. This practice is similar to the CHC checklist described by Baumgartner et al. (2022) in Zambia. However, the authors Gonah et al. (2020) criticise the practice by arguing that most PLWH do not routinely visit ART clinics. PLWH in Zimbabwe who are virally suppressed make use of community ART working groups; which are groups of 7-10 people who take turns to collect ARVs for members which means other members miss the opportunity for screening for Type 2 Diabetes (Gonah et al., 2020). Frieden et al. (2020) substantiate the criticism by Gonah et al. (2020) by concluding that 3 monthly refill visits enable screening and health education. In addition, there is a general shortage of screening

equipment and consumables, especially glucometer test strips for the measurement of random blood sugar (Gonah et al., 2020). Remarkably, the challenge of shortage of glucose test strips is also described by Baumgartner et al. (2022) in Zambia. With regards to healthcare worker proficiency in screening for Type 2 Diabetes, healthcare workers expressed the need to be trained in endocrinology to enable them to be proficient in preventing Type 2 Diabetes among PLWH (Gonah et al., 2020).

One of the measures described by Nimitphong, et al. (2022) is the use of pharmacological interventions. In Zimbabwe, pharmacological interventions to reduce Type 2 Diabetes in Zimbabwe are not utilised due to the unavailability of antidiabetic drugs as a consequence of lack of financing for NCDs (Gonah et al., 2020).

2.4 Statutes, Guidelines, Manuals, Statutes and Policies regulating Type 2 Diabetes and HIV management

Several guidelines have been developed by international bodies and in Zimbabwe for the management of HIV and AIDS and the prevention of Type 2 Diabetes. These guidelines are important as they inform current practices in the management of HIV and prevention of Type 2 Diabetes. Duncan et al. (2020) explain that it is important to develop guidelines that are aligned with other current guidelines to ensure the acceptability of newly developed guidelines. This section discusses policies, guidelines, statutes and manuals developed locally in Zimbabwe and internationally that align with the development of guidelines for the reduction of Type 2 Diabetes in Harare Urban District.

2.4.1 International Guidelines

International guidelines aligned to the reduction of Type 2 Diabetes among older PLWH include; the IDF Global Guideline for Diabetes: 2012. The WHO has also developed three main guidelines, these are; (1) the WHO Consolidated Guidelines on HIV Prevention, Testing, Treatment, Service Delivery and Monitoring: Recommendations for a public health approach, (2) The WHO Guidelines for Physical Activity and Sedentary Behaviour and (3) WHO Package of Essential Noncommunicable (Pen) Disease Interventions: for Primary Health Care (2020).

2.4.1.1 The WHO Consolidated Guidelines on HIV Prevention, Testing, Treatment, Service Delivery and Monitoring: Recommendations for a public health approach 2021

The WHO Consolidated Guidelines on HIV Prevention, Testing, Treatment, Service Delivery and Monitoring: Recommendations for a public health approach (2021) were developed to guide the diagnosis of HIV, use of ART, management of HIV and service delivery for ART.

The WHO (2021) describe the need for the prevention of NCDs such as Type 2 Diabetes in ART clinics based on recognition of the increasing number of older PLWH developing NCDs in low and middle-income countries as well as the high mortality due to NCDs. The WHO (2021) further acknowledges that current tools for screening for NCDs developed for the general population underestimate the risk for PLWH. In addition, the WHO has no specific guidelines for assessing PLWH for NCDs (WHO, 2021). In summation, the WHO (2021) recommends cardiovascular risk assessment for all PLWH and the implementation of strategies to reduce NCDs applied in the general population to be implemented for PLWH. These strategies applied in the general population to be applied in PLWH include management of obesity, managing unhealthy diets, encouraging physical activity, cessation of smoking and management of hypertension.

In addition to recognising the increased risk of NCDs on PLWH, the WHO (2021) guidelines also acknowledge the effects on mental health and or depression on PLWH (WHO, 2021). The WHO (2021) notes that PLWH are at risk of developing depression and this affects treatment outcomes by reducing self-efficacy in adhering to treatment plans. Moreover, ART clinics provide the opportunity to identify depression among PLWH and such assessment of mental health and depression should be included as part of routine care (WHO, 2021).

According to Le Tourneau et al. (2022) one of the main strengths of the WHO (2021) is the service delivery guidelines. The authors, Le Tourneau et al. (2022) note that the WHO (2021) allow for management of HIV without placing additional burden on patients and service providers through increased hospital appointments. In addition, Le Tourneau et al. (2022) further commends the WHO (2021) for enabling the reduced

frequency visits as the reduced visits was preferred by PLWH and had no impact on HIV mortality or viral suppression.

2.4.1.2 World Health Organisation Package of Essential Noncommunicable (Pen) Disease Interventions: for Primary Health Care (2020)

The WHO Package of Essential Noncommunicable (Pen) Disease Interventions: for Primary Health Care (2020) (WHO PEN) was developed to mitigate the growing burden of NCDs in low- and middle-income countries. In its opening statement, the WHO PEN, notes an overall growing decline in the incidence of deaths due to NCDs from 2000 to 2016, however, reveals that there was a 5% increase in Diabetes risk over the same period (WHO, 2020b). The WHO PEN outlines interventions to detect, diagnose, treat and care for four NCDs; cardiovascular diseases (heart diseases, hypertension and stroke), cancer, diabetes and chronic respiratory diseases.

With regards to Type 2 Diabetes, lifestyle modifications in diet and physical activity are the mainstay of managing Type 2 Diabetes (WHO, 2020b). In addition, the assessment of Type 2 Diabetes includes an assessment of the three parameters, (1) risks of Type 2 Diabetes (2) symptoms of Type 2 Diabetes and (3) signs of Type 2 Diabetes the (WHO, 2020b). The risks which are assessed for Type 2 Diabetes include physical inactivity, obesity, history of gestational diabetes or pre-eclampsia, first-degree relative with Type 2 Diabetes, and history of cardiovascular disease, hypertension, or dyslipidaemia (WHO, 2020b). Further assessment includes assessment of symptoms of Type 2 Diabetes, which include polydipsia, polyuria, polyphagia, unexplained weight loss, fatigue and vision changes (WHO, 2020b). The third assessment is an assessment of signs of Type 2 Diabetes and these are; presentation of chronic complications, Kussmaul's respirations, severe dehydration, altered level of consciousness and metabolic deterioration. The WHO (2020b) further lists the four diagnostic tests for Type 2 Diabetes which are fasting plasma glucose, random plasma glucose, oral glucose tolerance test and the HbA1c test.

In an assessment of the capacity of twelve low- and middle-income countries to implement interventions for NCDs outlined in the WHO PEN (2020b), Albelbeisi et al. (2021) concluded there are gaps in diagnostic investigations, equipment and medications. In addition, Albelbeisi et al. (2021) found that the readiness index score

to implement the WHO PEN (2020b) in terms of diagnostic investigations ranged from 0% to 59,4%. This issue of low capacity and challenges to implementing diagnostic investigations is not unique to low-middle-income countries, Duncan et al. (2018) also noted inadequate screening measures for Type 2 Diabetes among older PLWH in the UK. Albelbeisi et al. (2021) also concluded that availability of basic equipment affected the implementation of interventions outlined in the WHO PEN. The authors reveal an index score of 29.2% to 51.2% in low- to middle-income countries for basic equipment. Similarly, in Zimbabwe, Gonah et al. (2020) reveal that basic equipment shortages affect screening for Type 2 Diabetes among PLWH.

2.4.1.3 World Health Organisation Guidelines for Physical Activity and Sedentary Behaviour

In 2020, the WHO released the first Guidelines for Physical Activity and Sedentary Behaviour. The guidelines were targeted at adults and older adults living with chronic conditions that included, HIV, Type 2 Diabetes, Cancer and Hypertension. Specific to older PLWH, WHO (2020c) recommends 150 to 300 minutes of weekly moderate-intensity aerobic physical activity. Alternative to moderate intensity exercise, older PLWH can perform 75 to 150 minutes of weekly vigorous-intensity aerobic physical activity or an equal combination of weekly vigorous-intensity and moderate activity (WHO, 2020c). Should aerobic exercises be tolerated beyond the recommended minutes and not contradicted, WHO (2020c) recommends increased time performing moderate, vigorous, or a combination of vigorous and moderate aerobic exercise. The WHO (2020c) further recommends that such physical activity should be regular. In addition to aerobic exercise, muscle strengthening exercise for two to three days weekly for all major muscle groups is recommended (WHO, 2020c). Lastly, WHO (2020c) recommends the performance of varied multicomponent physical exercise for three or more days a week with an emphasis on physical training and functional balance. Noteworthy, WHO (2020c) acknowledges that all forms of activity count, as physical activity contributing to exercise.

According to Bull et al. (2020), the WHO (2020c) guidelines are commendable because of the inclusion of special populations such as people living with chronic conditions and other special populations. In addition, Bull et al. (2020) note that the

guidelines came at the right time when estimates show that one in four adults does not meet the stipulated requirements for physical activity. Despite these commendations by Bull et al. (2020), Zenu et al. (2023) in a later (2023) assessment of adherence to the WHO guidelines (2020c) concluded that 61% of adults in Ethiopia do not adhere to WHO physical activity guidelines. Factors associated with non-adherence include; older age, lack of social support and low levels of happiness (Zenu et al.,2023). Given the conclusions by Zenu et al. (2023) on the lack of physical activity among older adults, this study focussed on promoting physical activity among older PLWH as a self-care intervention to reduce Type 2 Diabetes.

2.4.1.4 International Diabetes Federation 2012: Global Guidelines for Type 2 Diabetes

The IDF (2012) Global Guidelines for Type 2 Diabetes were developed as a revision of the Global Guidelines developed in 2005. In terms of screening for Type 2 Diabetes, the IDF 2012 Global Guidelines for Type 2 Diabetes do not recommend universal screening of Type 2 Diabetes (IDF, 2012). Furthermore, IDF (2012) notes that when screening is conducted for Type 2 Diabetes it should be determined by the local prevalence of Type 2 Diabetes in the community. A two-step approach is outlined in the screening of Type 2 Diabetes, the first step is a risk assessment questionnaire and the second step is any of four diagnostic tests recommended by the WHO which are outlined in Chapter 1, section 1.8. In addition, the IDF (2012) notes that in limited-care resource settings, diagnostic tests should only be performed on high-risk individuals, whilst in areas where there is comprehensive care HbA1c testing should be routine.

Concerning older people, the IDF (2012) recommend screening practices similar to the general population. Furthermore, IDF (2012) stipulates that education on diabetes for older people should take into consideration, disability, ethnicity, needs of carers, culture, nutritional preferences, language and geographical preferences. On this issue of consideration for local context, Home et al., (2013) in a study that compared the application of international diabetes guidelines including the IDF (2012) guidelines in low-income countries found that 36% of countries applied the IDF (2012) in developing national guidelines. Home et al. (2013) further notes that the IDF guidelines for Type 2 Diabetes were the second most used guidelines in local contexts second to the

American Diabetes Guidelines. The authors, Home et al. (2013) attribute the applicability of the IDF guidelines on diabetes to the guidelines being evidence based and the ability of the guidelines to be adapted to local contexts.

2.4.2 Statutes, Guidelines, Manuals and Policies regulating reduction of Type 2 Diabetes and HIV in Zimbabwe

In Zimbabwe, policies and statutes that govern Type 2 Diabetes prevention and care and treatment of HIV include The Constitution of Zimbabwe, The National Health Strategy 2016-2020, National Policy HIV/AIDS Zimbabwe and Public Health Act: Chapter 15:17, No.11/2018). Other policies include; Zimbabwe National Nutrition Strategy 2014-2018, The Operational and Service Delivery Manual for the Prevention Care, Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe. This section details how these policies and statutes apply in the development of guidelines for the reduction of Type 2 Diabetes among older PLWH.

2.4.2.1 The Constitution of Zimbabwe (Act 20 of 2013)

The Constitution of Zimbabwe (Act 20 of 2013) replaced the first constitution drafted from the Lancaster House Agreement at independence in 1980. Act 20 of 2013 is the supreme law in the country and one of its founding values is the respect for individual dignity and the value of each person. Concerning the respect of individual worth, Chapter 2, outlines provisions for elderly persons. Within Chapter 2, Section 21b and 21d of the Constitution of Zimbabwe outlines the need to provide social support, food and facilities for elderly care and the development of programs that promote the productivity of elderly people respectively (GoZ, 2013). Also outlined in section 76 of the Constitution of Zimbabwe is the right to healthcare for all people living with a chronic illness. In addition, chapter 4 section 82 of Act 20 of 2013 elaborates on the rights of elderly people by stipulating the provision of financial support to elderly persons above the age of 70 in form of welfare services and social security (GoZ, 2013). This provision of financial support is notable as it enables mitigation of cost of healthy food which is outlined as a challenge in the self-care practice of healthy eating described in section 2.2.3.

Regarding the provisions made for healthcare and social services outlined in Act 20 of 2013, Pillay, Chimbga and Van Hout (2021) criticise the reiteration of the phrase "*provisions will be made within limits of resources available to the state*" in the constitution which does not legally bind the Zimbabwean government to provide the resources needed by people such as older PLWH or other vulnerable groups. Moreover, Pillay et al. (2021) argue that the issue of providing resources within the limits of the state weakens public health institutions' commitment to abide by the provisions of the constitution. This is particularly evidenced by the study conducted by Gonah et al. (2020) who describe the unavailability of glucometer test strips to screen for Type 2 Diabetes.

2.4.2.2 Public Health Act: Chapter 15:17, No.11/2018

The Public Health Act Chapter 15:17, No.11/2018 follows through the provisions of Act 20 of 2013. Chapter 15:17, No.11/2018 also outlines the provision of health care for everyone within the limits of the resources of the state (GoZ, 2018). Part VII, section 84 outlines measures for the prevention and monitoring of NCDs in Zimbabwe (GoZ, 2018). Section 84b highlights that evidence-based interventions should be implemented to improve health education and prevent modifiable risks of NCDs (GoZ, 2018). Furthermore, Part VII, Section 84d of Chapter 15:17, No.11/2018 advocates for improved screening and control of NCDs (GoZ, 2018). Regarding health education, Section 84h outlines the need to increase awareness of signs and symptoms of NCDs to enable timeous health-seeking behaviour (GoZ, 2018).

According to Muzvondiwa and Batterham (2022), Chapter 15:17, No.11/2018, part VII provides commendable guidance on the prevention and control of NCDs, the inclusion of the clause on providing resources within the limits of the state defeats the need for screening. Muzvondiwa and Batterham (2022) note that a shortage of medications and poor functioning of equipment results in people losing trust in health delivery and renders screening practices unhelpful.

2.4.2.3 The National Health Strategy for Zimbabwe 2016-2020

The National Health Strategy for Zimbabwe 2016-2020 was published in 2016 as a follow-up to the 2009-2013 National Health strategy which was extended to 2014-2015

(MoHCC, 2016). Recently, MoHCC Zimbabwe announced they are working on developing the 2020-2025 National Health Strategy for Zimbabwe (MoHCC, 2020). As such, the National Health Strategy 2016-2020 remains the current strategy for health in Zimbabwe. The National Health Strategy for Zimbabwe 2016-2020 lists 3 main goals and 20 objectives. These three goals are: (1) to strengthen priority health programmes, (2) to improve service delivery and (3) to improve the enabling environment for service delivery.

Poor case finding of Type 2 Diabetes among older PLWH described by Gonah et al. (2020); Chimbetete et al. 2018) is due to inadequate screening. This issue of poor case finding of Type 2 Diabetes is not unique to older PLWH as it also occurs in the general population as acknowledged in the situation analysis on Diabetes in the National Health Strategy for Zimbabwe 2016-2020 (MoHCC, 2016). The strategy outlines two major challenges with reduction and management of diabetes which are an underutilisation of initial services and commodities, in particular anti-diabetic drugs and glucometer test strips (MoHCC, 2016).

The first goal of the National Health Strategy for Zimbabwe 2016-2020 is to strengthen priority health programmes; within this first goal, the second priority program is NCDs. Concerning this study, the key objectives of the second priority program of NCDs include Objective 6, a reduction in the incidence of NCDs by 50%; Objective 7, improve the mental health of the population and Objective 9, improve quality of life for older people and increasing life expectancy from 61.5 years to 65 years. In view of the projected two-fold increase in NCDs including Type 2 Diabetes among older PLWH described by Smit et al. (2018) in Chapter 1 section 1.2.3, the development of guidelines for the reduction of Type 2 Diabetes older PLWH aligns with Priority 2 of the National Health Strategy for Zimbabwe 2016-2020. Moreover, the researcher of this paper argues that the strategy's objective of increasing life expectancy to 65 years also means an increase in the number of older PLWH. Smit et al. (2018) substantiate this by noting that the mean age of PLWH will increase to 45 years by 2035.

The National Health Strategy for Zimbabwe 2016-2020 further outlines two strategies to achieve objective 6 (reduction in the incidence of NCDs), these include patient education on healthy lifestyle and improved screening (MoHCC, 2016). Similar strategies to reduce Type 2 Diabetes among older PLWH are described by

Nimitphong, et al. (2022); Duncan et al. (2018) in section 2.3. Strategies to achieve objective 9 (increase life expectancy from 61.5 years to 65 years) include a multisectoral approach, establishing community support programs and improving the quality of care for geriatric patients. Notably, the use of a multisectoral approach is described by Pereira et al. (2022) in the UK as described in section 2.3.1.1 as effective in the provision of care for older PLWH as it improved screening for Type 2 Diabetes and other NCDs.

Objective 13 of the National Health Strategy for Zimbabwe 2016-2020 aims to reduce obesity among children, adolescents and adults (MoHCC, 2016). One of the interventions to achieve this is through the promotion of physical activity and healthy eating. With regards to healthy eating, the National Health Strategy for Zimbabwe 2016-2020 includes the consumption of a diversified diet that includes at least five servings of fruit and vegetables and the decrease in consumption of sugary beverages (MoHCC, 2016). Likewise, this recommendation on the consumption of at least five servings of fruit and vegetables is also substantiated in the UK study by Duncan et al. (2020) who recommend seven servings of fruit and vegetables daily.

On evaluation of the implementation of the National Health Strategy for Zimbabwe 2016-2020, Bakasa (2020) concludes that the implementation of the strategy has faced challenges due to changes in the national strategic plan. The author, Bakasa (2020) revealed that the when the National Health Strategy for Zimbabwe 2016-2020 was developed, Zimbabwean policies had been guided by the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET), however with the change in government in 2017, the Medium-Term Plan 2017-2020, was set up which focussed more on a transformative agenda. This change in national policy according to Bakasa (2020) resulted in shifting of the implementation environment of the National Health Strategy for Zimbabwe 2016-2020.

2.4.2.4 National Policy for HIV/ AIDS for the Republic of Zimbabwe 1999

The National Policy for HIV/AIDS for the Republic of Zimbabwe was published in 1999. The policy was developed to provide a supportive environment for HIV prevention, treatment, support and care (GoZ, 1999). Section 5.1 of the National Policy for HIV/ AIDS for the Republic of Zimbabwe describes medical and nursing care for PLWH; the

guiding principle 12 within section 5.1 outlines that care for PLWH should be comprehensive, cost-effective, affordable and accessible to PLWH (GoZ, 1999). In light of guideline 12, the development of guidelines for reduction of Type 2 Diabetes is crucial as it facilitates comprehensive care for older PLWH.

The National Policy for HIV/ AIDS for the Republic of Zimbabwe's eighth strategy to provide comprehensive, accessible and affordable care for PLWH outlined in Section 5.1 is the promotion of good nutrition habits through the provision of nutrition education (GoZ, 1999). This strategy to provide nutrition education as a means to manage HIV infection is also described as an effective intervention for health care workers to prevent Type 2 Diabetes among older PLWH (Nimitphong et al., 2022). Specific to nursing care, the National Policy for HIV/ AIDS for the Republic of Zimbabwe guiding principle 14, promotes the involvement of support groups, family members and households as support for PLWH (GoZ, 1999). This involvement of support systems in providing care for PLWH is also appropriate as means of preventing Type 2 Diabetes in older PLWH as one of the factors facilitating physical activity as a self-care practice among older PLWH (Quigley et al., (2019); Johs et al., (2019)).

2.4.2.5 The Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe

The Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe was published in 2017 by the National AIDS and TB program, a division within the MoHCC (MoHCC, 2017). One of the reasons for the development of the Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe was to ensure adequate linkages for PLWH (MoHCC, 2017). The manual was developed as a second edition with the first manual having been developed in 2014.

The Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe outlines that HIV treatment services are available at all healthcare facilities in the country (MoHCC, 2017). These healthcare facilities include; primary healthcare clinics, first-level referral centres (district hospitals, mission hospitals and private hospitals), second level referral centres (provincial hospitals and private hospital and the third level referral centres (central hospitals) (MoHCC, 2017). The

provision of ART is initiated immediately after evaluating clinical and psychosocial readiness (MoHCC, 2017). In addition, the Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe outlines the integration of NCDs treatment with HIV services. This outline of NCD and HIV services stipulates the screening for cardiovascular risks and depression annually (MoHCC, 2017). With regards to depression and anxiety, the Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe includes a 14-question screening tool for depression. The tool includes questions on; (1) lack of sleep, (2) suicidal ideation, (3) not being able to fulfil duties, (4) indecision, (5) gastrointestinal disturbances, (6) feelings of being run down, (7) hallucinations, (8) tendencies to cry (9) fear of trivial issues (10), unhappiness, (11) short-temperedness (12) failure to concentrate (13) thinking deeply and (14) nightmares (MoHCC, 2017). A score above seven on the screening tool warrants referral and counselling. The issue of the presence of depression outlined in the Operational and Service Delivery Manual for the Prevention Care and Treatment of HIV in Zimbabwe is significant for older PLWH due to the effects of depression on self-care to prevent Type 2 Diabetes. Section 2.2.1 in this chapter (2) describes the effects of depression on self-efficacy to perform physical activity. In addition, the manual, also outlines that PLWH with a viral load of more than 1000copies/mm^3, missed clinical appointments, and indications of treatment failure should also be screened for depression as this is indicative of treatment failure occurring as a consequence of poor self-care (MoHCC, 2017). The seeking of an underlying cause of poor ART treatment outcomes by screening for depression is also significant to this study as it could mitigate treatment failure which is one of the risks of developing Type 2 Diabetes in older PLWH with a long duration of HIV.

2.4.2.6. Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe

Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe were developed in 2016 by the AIDS and TB Directorate in the MoHCC and the National Medicines and Therapeutics Policy Advisory Committee. In adults, the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe outline that treatment with ART should be initiated as soon as a positive

HIV test is confirmed. However, priority ART treatment should be provided to adults with a CD4 cell count of less than 350 cells/mm^3 of blood or those who have a WHO clinical stage of 3 or 4 (MoHCC, 2016). The guidelines also list the ART classes of drugs and note that Fusion Inhibitors and CCR5 inhibitors are not available for use in Zimbabwe. Of note this implies that drug classes that do cause weight gain in older PLWH such as the integrase inhibitors as described by Duncan et al. (2018) are in use.

The Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe also list three types of visits for PLWH, these are; firstly, a clinical visit which is a scheduled appointment where monitoring blood tests are reviewed and health assessment is done every six months (MoHCC, 2016). Secondly, a refill visits where the patient collects their prescription and does not see a nurse or doctor (MoHCC, 2016). Thirdly, the unscheduled visit where the patient attends clinic when there is a problem (MoHCC, 2016). With regards to the opportunity to screen and provide health education for Type 2 Diabetes, the clinical visit and unscheduled visit provide the opportunity to implement such Type 2 Diabetes reduction measures.

To reduce the occurrence of Type 2 Diabetes among PLWH, Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe acknowledge the high risk of Type 2 Diabetes, Hypertension and depression among PLWH (MoHCC, 2016). With regards to depression, which reduces self-efficacy in adhering to a healthy diet and exercising (section 2.2.1), the depression screening tool (described in section 2.4.2.5) is prescribed for use. The guidelines for ART further outline that strategies for reducing modifiable risk factors should be implemented such as controlling hypertension, diet and physical activity for all PLWH regardless of age (MoHCC, 2016).

In a study that assessed the implementation of the ART guidelines in six sub-Saharan African countries (Zimbabwe, South Africa, Malawi, Tanzania and Kenya), Ambia et al. (2017) assessed the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe. In their assessment over two data collection periods, the authors Ambia et al. (2017) found that in 2013, 40% of health facilities in Zimbabwe had the guidelines and this increased to 80% in 2016. Ambia et al. (2017) further commend the monitoring CD4 cell count of ART patients in health facilities, by noting

that from the study, only Uganda and Zimbabwe had full information on CD4 cell count of patients, indicative of adherence to the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe.

2.4.2.7. The Zimbabwe National Nutrition Strategy 2014-2018

The Zimbabwe National Nutrition Strategy 2014-2018 focuses on addressing malnutrition in particular stunting in the first 1000 days of life as well as an overall mandate to address malnutrition challenges in children above three years, adolescents and adults in rural or urban communities and those who are wealthy or poor (GoZ, 2014). The strategy includes ten guiding principles that provide direction to the implementation of the strategy (GoZ, 2014).

Outlined in the Zimbabwe National Nutrition Strategy 2014-2018 is key result area 3, which acknowledges the role of clinical nutrition services in reducing the incidence of NCDs and management of communicable diseases (GoZ, 2014). Key result area 3's goal is to increase the proportion of adults who practice healthy lifestyle habits by 40% (GoZ, 2014). These lifestyle habits outlined include the cessation of smoking, alcohol use, use of fats and salts, and physical activity (GoZ, 2014). The Zimbabwe National Nutrition Strategy 2014-2018 further lists the promotion of diversified diets that includes the eating of at least five servings of fruits and vegetables daily, the reduction of intake of sugary drinks, promotion of physical activity and the reduction of sodium intake to less than 400mg daily as strategies to (GoZ, 2014).

2.5 The Theoretical Framework: Orem's Self-care Deficit Nursing Theory

This study's theoretical framework is Orem's self-care Deficit Nursing Theory. Orem's self-care defict Nursing theory has been successfully used in analysing self-care of PLWH in a study by Alencar, Parenti, Lopes, Ramos, and Ciosak (2019) in Brazil who concluded that among PLWH self-care decreases with an increase in age and lack of social support. In Africa, Bekele (2019) has also used Orem's self-care deficit nursing theory to study the challenges of dietary and lifestyle interventions to prevent Type 2 Diabetes. Orem's self-care model was developed in the 1950s by Dorothea Orem (Nieswedomy & Bailey, 2018). Didisen, Binay and Yardimci (2017) explain that nurses

need to understand the self-care practises of people so that they can understand the potential inadequacies of such self-care.

2.5.1 Concepts

Basic concepts in Orem's self-care deficit nursing theory include self-care, self-care agency, self-care deficit, nursing agency, self-care agency, self-care demands, self-care requisites and nursing system (Nieswedomy & Bailey, 2018). Smith and Parker (2015) outline that four of the basic concepts in the Self-care Deficit Nursing theory relate to the patient, these are; self-care, self-care agency, self-care deficit and self-care demands. Two of the basic concepts relate to the nurse and these are the nursing agency and nursing system. Orem's self-care nursing deficit model also defines one peripheral concept "basic conditioning factors" which relate to both the self-care agent and the nurse agent (Smith & Parker, 2015). In addition, Smith and Parker (2015) cite Orem (2001) who describes an agent as "*a person who engages in a course of action or one who has the power to do so*". Therefore, the six concepts in Orem's self-care nursing deficit theory relate to the patient (the older PLWH) and the nurse.

2.5.1.1 The peripheral concept: Basic conditioning factors

According to Smith and Parker (2015), basic conditioning factors relate to two patient-centred concepts which are self-care agency and self-care demands. Basic conditioning factors also relate to one nurse concept, the concept of nursing agency (Smith & Parker, 2015). The basic conditioning factors affect the basic concepts and include factors such as age, gender, presence of social support, socio-cultural orientation, environmental factors, developmental state, health state and availability of resources (Smith & Parker, 2015). In this study, basic conditioning factors such as the presence of social support affect older PLWH self-efficacy to engage in physical activity as described by (Johs et al. (2019); Quigley et al, (2019); Duncan et al. (2020) in section 2.1.1.1. Another example of the basic conditioning factors that influence older PLWH is the high cost of food affecting self-efficacy to adhere to a healthy diet in section 2.2.3 by Bekele et al. (2018). Moreover, in this study a basic conditioning factor affecting nursing agency is described by Baumgartner et al. (2022) in Zambia and Turrini et al. (2022) in the USA who note that a lack of understanding of the need to screen for Type 2 Diabetes in older PLWH affects healthcare workers interventions

to reduce Type 2 Diabetes which is described in section 2.3.1. With regards to basic conditioning factors Smith and Parker (2015) explain that resources available for healthcare influence self-care demands. In this study, Gonah et al. (2020) in section 2.3.2.2 note the unavailability of glucometer test strips as a conditioning factor affecting Type 2 Diabetes reduction measures among older PLWH. The figure below shows Orem's self-care deficit model and the basic conditioning factors related to this study.
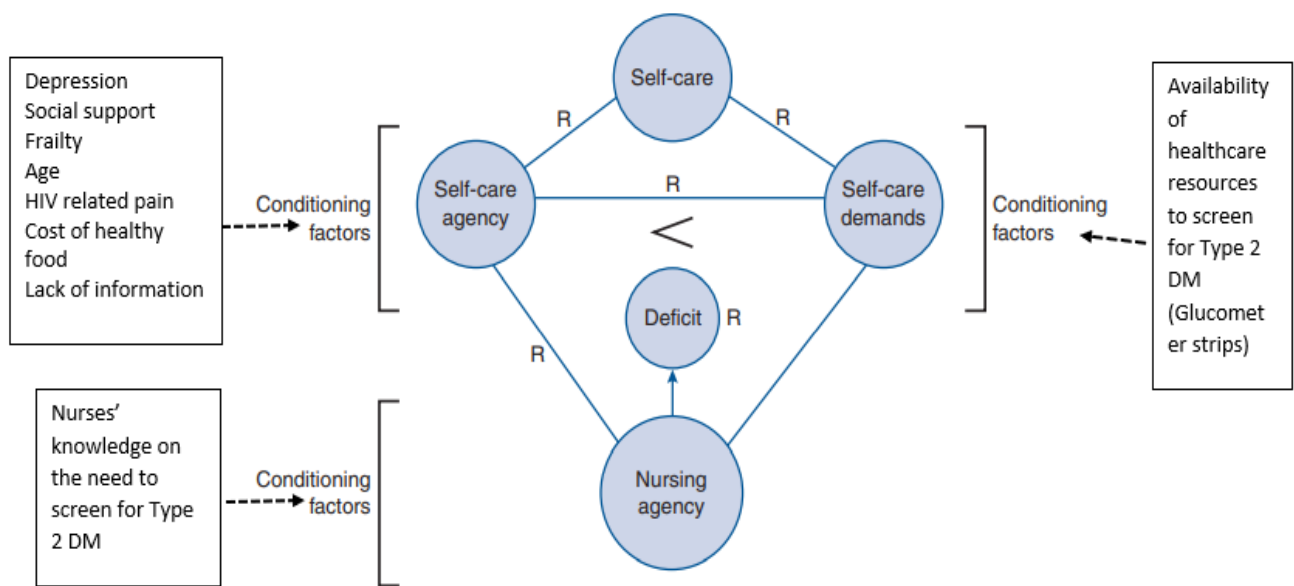
Figure 2:1. Orem's self-care deficit nursing model adapted from Smith and Parker (2015:128)

The figure above shows the influence of conditioning factors discussed in the literature on the concepts of the Self-care Deficit Nursing Model

2.5.1.2 Basic Concepts of Orem's Self-care Deficit Nursing Model

Self-care: According to Renpenning and Taylor (2003), self-care refers to an action for self. It is action through which inputs are made to one's self or the environment to maintain health, well-being and life. Khademian, Kazemi Ara, and Gholamzadeh, (2020) elaborate that self-care refers to activities that people implement to maintain restore and improve their health.

Self-care Agent: Orem (2001) cited in Smith and Parker (2015) refers to the self-care agent as the person receiving self-care. The authors refer to dependent self-care

agent who perform self-care needs for those that are dependent such as infants. Furthermore, the person who is to perform self-care (self-care agent) must assess what needs to be done and what should be done (Smith & Parker, 2015).

Self-care agency: Smith and Parker (2015) cite Orem (2001) who defines self-care agency as an acquired ability to meet one's own continuous needs for care that regulate life, health, human development and well-being. It is the maturing person's capability to deliberate action to care for self (Smith & Parker, 2015). Lambermon, Vandenbussche, Dedding and van Duijnhoven (2020) explain that the self-care agency is conditioned by the peripheral factors which include; health status, age, developmental state, life experiences, availability of resources and socio-cultural background.

Descriptions of self-care agency use words that include "*power*", "*capability*" and "*ability*" (Smith & Parker, 2015). In this study self-care agency can be viewed in a hierarchical formation firstly, the foundational capabilities and dispositions which are basic skills of remembering to take ART to maintain an optimum CD4 cell count as a low CD4 cell nadir and a long duration of HIV are associated with developing Type 2 Diabetes (Duncan et al., 2018).

Secondly, are the power components which include; how older PLWH value their health, their ability to acquire knowledge or health literacy as described by Matchanova et al. (2021) and Mduka et al. (2020) in section 2.2.2 and physical energy to perform self-care which is affected by the presence of frailty described by Vancampfort (2018); Quigley et al. (2019); Guaraldi et al. (2022); Zou et al. (2022) in section 2.2.5.

The third and concrete level of the hierarchy would be the capabilities of estimative, transitional and productive operations. These start with capabilities to learn about reducing Type 2 Diabetes (estimative), then deciding on a course of action (transitional) and lastly productive operations which are specific self-care capabilities like following a Mediterranean diet and adhering to a physical activity regime. Smith and Parker (2015) explain that if the capabilities to perform self-care are non-existent, then the presence of others such as a nurse or a family member is necessary. The hierarchical structure of Orem's self-care agency is shown in figure 2.2 below
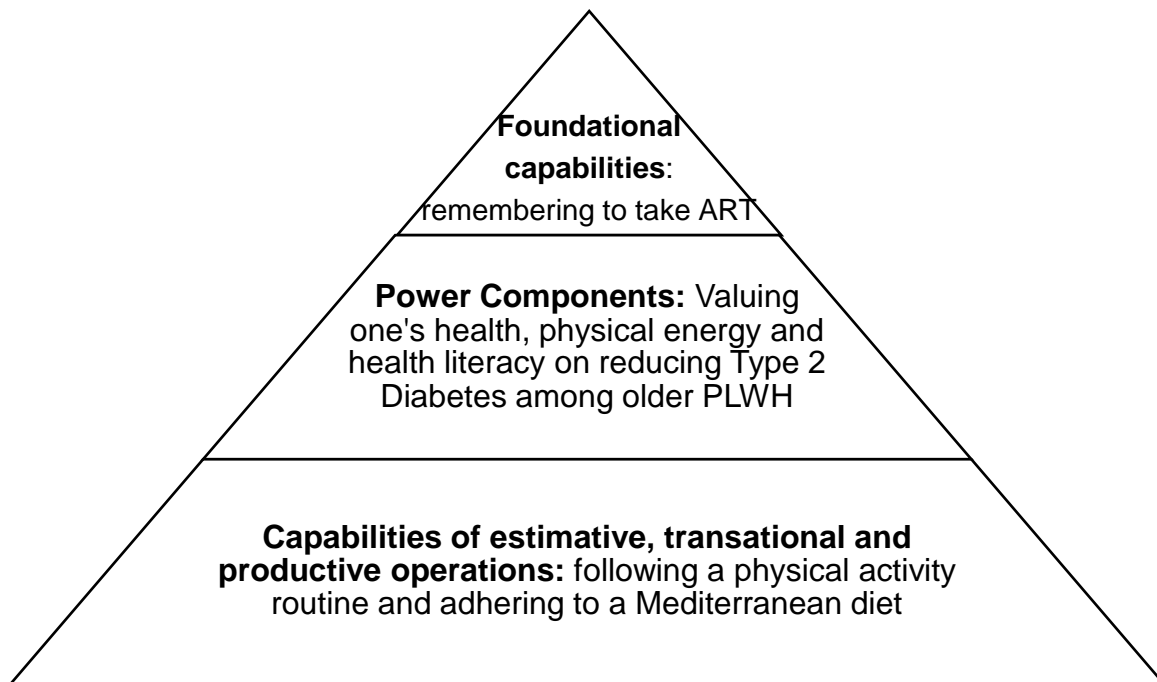
Figure 2:2. Orem's structure of self-care agency, source:(Smith & Parker, 2015)

Self-care requisites: Three types of self-care requisites provide the framework for therapeutic self-care demands (Smith & Parker, 2015). These include the universal, developmental and health deviation self-care requisites (Smith & Parker 2015).

The universal self-care requisites are important as they maintain the physical and functional unit of people (Didisen et al., 2017). These universal self-care needs include; air, water, elimination, food, maintaining a balance between activity and rest, maintaining a balance between solitude and social interaction, hazard prevention and maintaining normalcy (Didisen et al., 2017). In reference to this study, the universal self-care requisite of maintaining a balance between solitude and social interaction is important as social support facilitates physical activity among older PLWH described by Vancampfort et al. (2018) in section 2.1.1.1.

Smith and Parker (2015) also describe three types of developmental self-care requisites, these include the general developmental needs of all humans which are normally done by dependent care agents. The second are the requisites met by people in a positive mental state and involve the setting of goals and taking responsibility, likewise in this study taking responsibility conforms to the implementation of self-care practices to reduce Type 2 Diabetes which are physical activity and adhering to

healthy eating habits. The third developmental self-care requisites are those actions that occur as a result of the loss of a loved one, terminal illness, or the loss of a job. These actions that occur as a result of a loss, in this study equate to actions such as adherence to ART among older PLWH and seeking other forms of social support in the case of the loss of a loved one.

According to Smith and Parker (2015), the third self-care requisites are the health deviation self-care requisites, which are specific actions that people undergo when they have injuries, diseases or are being provided with medical care. In this study, this includes adhering to ART clinic appointments as well as accepting chronic illness of HIV among the older PLWH.

Self-care deficit: According to Smith and Parker (2015) the concept of self-care deficit illustrates an association between two other concepts self-care agency and therapeutic self-care demand. A self-care deficit occurs when a person's self-care agency is insufficient to meet their self-care requisites (Gonzalo, 2023). Gonzalo (2023) further notes that the self-care deficit can be partial or complete. A partial self-care deficit is when the self-care agency can provide themselves with some care (Smith & Parker, 2015). For instance, in this study older PLWH can provide some care for themselves to prevent Type 2 Diabetes. Gonzalo (2023) also adds that self-care deficit demarcates when nursing care is required. Smith and Parker (2015) elaborate on the assertion by Gonzalo (2023) by explaining that for nursing systems to be planned and implemented, there must be a self-care deficit or anticipated self-care deficit. Likewise in this study, there is both anticipated and actual self-care deficit in reducing Type 2 Diabetes among PLWH. The actual or potential self-care deficit includes the lack of knowledge for the reduction of Type 2 Diabetes, presence of depression and presence of frailty.

Therapeutic self-care demands refer to actions that must be done over time for one's life, health and well-being (Gonzalo, 2023). Emphasis on therapeutic self-care demand is placed on the therapeutic outcomes (Smith & Parker, 2015). Therapeutic self-care demands require nursing knowledge, knowledge of the person and knowledge of the environment to enable assessment of what needs to be done (Smith & Parker, 2015). In this study, therapeutic self-care demands relate to the needs of older PLWH who require reduction interventions for Type 2 Diabetes in Harare Urban District.

Nursing agency: According to Orem (2001) cited in Smith and Parker (2015) nursing agency is defined as "*the ability and power of the nurse*". The nursing agency is analogous to the self-care agency and is also affected by basic conditioning factors (Smith & Parker, 2015). The basic conditioning factors that affect the nursing agency include the nurses' educational level, family support and level of experience. Banfield (2011) notes that the concept of nursing agency in the Self-care deficit nursing theory provides the link between nursing science and nursing practice, whereby nursing science provides the knowledge for the nurse to produce a nursing system (nursing practice).

Nursing system: Smith and Parker (2015) define a nursing system as an "*action system*", it is actions that are sequential with purpose. These sequences of actions are to be accomplished with or for the self-care agency to promote health, life and well-being. Petiprin (2023) explains that the nursing system is composed of three subsystems; the interpersonal subsystem, the social contractual subsystem and the professional-technological subsystem. The interpersonal subsystem involves actions of entering and maintaining relationships with the patient or family, in this study, this involves the initial client visit for older PLWH into an ART clinic and subsequent visits for (1) refill of prescriptions (2) regular annual or bi-annual clinical reviews and (3) the visits when there is a problem as described by the MoHCC (2016) in section 2.4.2.6. The social contractual subsystem involves the nursing actions to collaborate with the patient and other patient support systems to outline the roles of each partner in the care of the patient (Smith & Parker, 2015). Typically, in Zimbabwe, among older PLWH the contractual subsystem actions may include an assessment of the social support system for older PLWH and the use of the community ART working groups described by Gonah et al. (2020) in section 2.3.2.2 in this Chapter. The third nursing subsystem, the professional-technological subsystem entails nursing actions that diagnose, prescribe, regulate, evaluate and manage cases (Smith & Parker, 2015). The professional-technological subsystem uses resources efficiently to facilitate positive patient outcomes (Smith & Parker, 2015). For example, this study entails nursing actions to reduce Type 2 Diabetes such as screening which includes the use of glucose testing using glucometers for Type 2 Diabetes among older PLWH and providing health education.

2.5.2 The Self- care Deficit Nursing Theory

Three theories also applicable to this study make up Orem's Self-care Deficit Nursing Model and these are the theory of self-care deficit, the nursing systems theory and the theory of self-care (Nieswedomy & Bailey 2018). Hartweg and Metcalfe (2022) similar to Nieswedomy and Bailey (2018) also explain the three theories within Orem's self-care model. The three theories are interrelated; the nursing systems theory includes the self-care deficit theory which in turn subsumes the self-care theory. This is shown in the figure below.
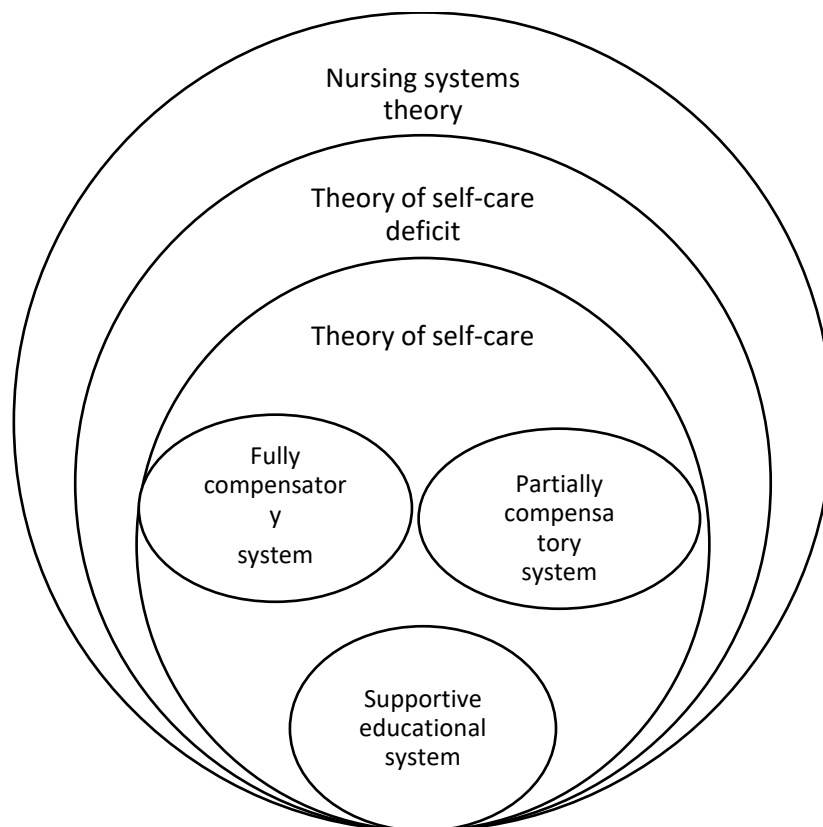
Figure 2:3. Three theories within Orem's Self-care Deficit Nursing Model

According to Smith and Parker (2015), each of the three theories outline one focal idea, presuppositions and presumptions. This focal idea forms the focus of the theory while the presuppositions are explicit to the specific theory and the propositions are statements made from the concepts and their relationships (Smith & Parker, 2015).

2.5.2.1 The Nursing Systems Theory

The nursing systems theory is focused on the outcomes of nursing (Smith & Parker, 2015). In addition, Didisen et al. (2017) assert that the nursing systems theory requires both the intellectual and practical functions. The theory encompasses the nurse evaluating the patients' usual self-care practices to meet their self-care requisites. This will determine the actual or potential self-care deficit, which then leads to the nurse developing one of three nursing systems to be implemented. The first of these nursing systems is the wholly compensatory nursing system where nursing actions fully compensate for the patient's inadequacies in self-care (Didisen et al., 2017). The second is the partly compensatory nursing system, where the nurse performs some self-care functions for the patient, assisting the patient as the need arises (Didisen et al., 2017). The third nursing system is the supportive educative nursing system which involves the nursing actions of regulating and developing the self-care agency of the patient (Didisen et al., 2017). With the supportive educative nursing system, the patient can provide self-care for themselves (Smith & Parker, 2015). Didisen et al. (2017) add that the supportive educative nursing system is founded on nurses providing education, guidance and creating an environment that provides patient support. In this study, the Nursing systems theory provides the framework for the research objectives: describe nursing interventions for the reduction of Type 2 Diabetes among older PLWH and determine whether nursing interventions to reduce Type 2 Diabetes are influenced by excess risk presented by older PLWH.

2.5.2.2 The self-care deficit theory

The emphasis of the self-care deficit theory is on "*why nursing care is essential*" (Smith & Parker, 2015). According to Orem (2001) cited in Smith and Parker (2015) nursing care is essential as people have limits on deciding, producing and knowing self-care. Smith and Parker (2015) further highlight that the theory of self-care deficit has two presuppositions, the first is that for people to perform self-care they must have values and should be capable of learning, they must be able to decide and they should also be able to manage themselves. The second set of presuppositions is that nursing occurs in a context where people are in a state where there is social dependency. Petiprin (2023) notes that the self-care deficit theory identifies five ways nursing can assist and these include; acting for and doing for the person; supporting; guiding;

teaching and creating a conducive environment for self-care. In this study, the theory of self-care deficit applies to objective 3 which describes challenges experienced by older PLWH in the reduction of Type 2 Diabetes. These challenges described in section 2.2 include the presence of pain, frailty, depression which require nursing to act for and do for older PLWH to enable self-care.

2.5.2.3 The theory of self-care

According to Orem (2001) cited in Smith and Parker (2015) the theory of self-care assumes that self-care is something that must be learned and should be done continuously throughout one's life to maintain life and well-being. Smith and Parker (2015) assert that for self-care to take place, the person should have; the motivation to care for themselves, the resources and they should be able to learn how to perform self-care. In addition, Didisen et al. (2017) explain that nurses should be able to understand the self-care practised by people, this understanding of people's self-care practises enables nurses to make decisions regarding current self-care and potential inadequacies in the self-care. The theory of self-care is also critical as it enables the nurses to design interventions that improve self-care needs of people (Didisen et al., 2017). Three concepts interact to define Orem's theory of self-care; these are; self-care agency, self-care and self-care requisites (Lambermon et al., 2020). Nazik and Eryilmaz (2013) also add the theory of self-care also includes the therapeutic self-care demands. Lambermon et al. (2020) explain that if any of the three concepts are out of balance it affects the other two concepts. Figure 2.4 below illustrate the relationship between the three concepts.
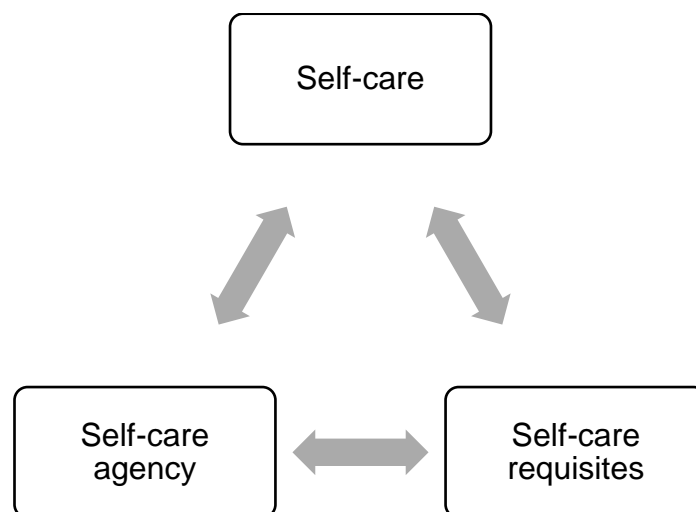
Figure 2:4. Orem's theory of self-care model source, (Lembermon et al., 2020)

Nazik and Eryilmaz (2013) argue that Orem's self-care theory assists in the reduction of health care costs as it capacitates individuals to care for themselves. The self-care theory in this study applies to two research objectives; to describe self-care practices performed by older PLWH to reduce Type 2 Diabetes and to describe the challenges faced by older PLWH in reducing Type 2 Diabetes. These challenges relate to basic conditioning factors that include socio-economic factors that affect the self-care agency like high cost of food described in section 2.2 of this chapter.

2.5.3 Strengths and limitations of the Self-care Nursing Deficit Model

In a study that evaluated the application of the self-care deficit nursing theory in a primary healthcare setting that managed chronic illnesses, Yip (2021) found that Orem's self-care deficit nursing theory has strengths and limitations in its application. Yip (2021) notes that one of the limitations of the self-care deficit nursing theory is the failure to take into account the psychological issues of the patient which are critical in the management of chronic illnesses. Moreover, Yip (2021) notes that this limitation can be addressed by complementing the self-care deficit nursing theory with other theories such as Roy's adaptation model (2009). Yip et al. (2021) also criticise the relationship between the nurse and public health education illustrated by Orem's self-care deficit nursing model. The authors note issues such as disease prevention, management and aftercare are inadequately addressed when nurses manage large populations. On this issue of failure to address large population groups, Hartweg and Metcalfe (2022) make a similar criticism of the self-care nursing deficit theory, by noting that the model fails to address population health which is the current focus globally.

2.6 Conclusion to Chapter 2

Chapter 2, the literature review discussed extant literature pertaining to the development of guidelines for the reduction of Type 2 Diabetes among older PLWH. The chapter described the self-care practices implemented by older PLWH, these included physical activity and dietary modification. These self-care practices illustrated that older PLWH engage in physical activity with social support from family and friends. In addition, older PLWH adhered to healthy eating habits if they were financially stable

and lived in close proximity to food markets. With regards to challenges in the implementation of self-care practices to reduce Type 2 Diabetes, the chapter discussed frailty, depression, pain, the high cost of healthy food and a lack of knowledge as major challenges.

Chapter 2 also outlined the current practices in the implementation of reduction measures for Type 2 Diabetes. These measures to reduce Type 2 Diabetes, were well articulated by Nimitphong et al., (2022); Duncan et al. (2018) who note that such interventions include screening, health education, and pharmacological interventions. Moreover, global guidelines influencing the development of guidelines for the reduction of Type 2 Diabetes were discussed such as the WHO PEN, the IDF guidelines for Type 2 Diabetes and the WHO guidelines for physical activity and sedentary life (2020) were analysed. Zimbabwean statutes, manuals, strategies and guidelines regulating the development of guidelines for the reduction of Type 2 Diabetes among older PLWH were also analysed. These included the Constitution of Zimbabwe 2013, Public Health Act: Chapter 15:17, No.11/2018), Zimbabwe National Nutrition Strategy 2014-2018, The Operational and Service Delivery Manual for the Prevention Care and Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe. Lastly, Chapter 2 described Orem's self-care deficit nursing theory as the theoretical framework guiding the study. The section outlined the application of the concepts of self-care, self-care requisites, nursing agency, and nursing system to concepts of the study and also outlined the application of the three models to the objectives of the study. From the literature reviewed in Chapter 2, it was noted that there was a scarcity of studies that described older PLWH self-care practices and challenges in reducing Type 2 Diabetes from Harare Urban District which the current study provides contribution in Chapter 5. Some studies that have explored self-care practices and challenges among older PLWH in reducing Type 2 Diabetes used an exploratory study design which was adopted for the study. The next chapter, Chapter 3, details the methodology implemented.

CHAPTER 3

RESEARCH METHODOLOGY

The previous chapter reviewed the literature for the development of guidelines for the reduction of Type 2 Diabetes. This current chapter presents the methodology of how the guidelines were developed. Saunders et al. (2019) cite Lewin (2005) who defines the research methodology as a collection of methods, principles, theories and values that are applied to address the research problem. A distinction is made between the research methodology and research methods, in which research methods refer to the procedures to collect and analyse data (Saunders et al., 2019). As such the research methods are subsumed within the research methodology, and this chapter details this methodology. The chapter outlines the qualitative approach to be applied in the study, the pragmatism research paradigm, the study population, the sampling techniques, the study setting, data collection, data analysis, ethical considerations, ensuring trustworthiness and the method to develop guidelines for the reduction of Type 2 diabetes among older PWLH in Harare Urban District.

3.1 The Research Philosophy: Pragmatism

According to Saunders et al. (2019), a research philosophy refers to the nature of knowledge and how knowledge is generated. Inherently, studies such as this one (guidelines for the reduction of Type 2 Diabetes among older PLWH); are developing knowledge. As such how this knowledge is developed is also influenced by how the researchers view the world (philosophy) (Saunders et al., 2019). There are four broad research philosophies; positivism, interpretivism, realism and pragmatism (Saunders et al., 2019). The study was guided by a pragmatism paradigm. This study adopted the pragmatism philosophy. Kaushik and Walsh (2019) trace the origins of pragmatism to the 1870s in the USA, Massachusetts. According to Kaushik and Walsh (2019), pragmatic worldview researchers should use a methodology that best suits the research problem. Pragmatic worldview methodologies are most applicable to multi-method studies or mixed methods studies (Kaushik & Walsh, 2019). In addition, the authors Kaushik and Walsh (2019) posit that these research philosophies have the common elements of; axiology, ontology, epistemology, methodology and rhetoric.

Epistemology: Expanding on the common elements of research philosophies, Saunders et al. (2019) define epistemology as what forms acceptable knowledge in a field of study. Furthermore, epistemology or what best constitutes knowledge, in pragmatism, the researcher accepts both subjective and observable phenomena to answer the research question (Saunders et al., 2019). As such in this study, the researchers used subjective experiences of older PLWH and nurses as well as objective phenomena from reviewed literature to develop guidelines for the reduction of Type 2 Diabetes among older PLWH.

Axiology: Axiology refers to what people believe should be the purpose of morals and values in research (Kaushik & Walsh, 2019). In terms of its axiology, in pragmatism, values play a critical role in interpreting the study results. According to Saunders et al. (2019), pragmatists use both objective and subjective points of view. In this study, the objective component is the themes generated from the scoping review of literature and the integrative review of literature respectively and the subjective points of view used were the responses solicited from the exploratory descriptive study design from the older PLWH and the nurses providing care to older PLWH.

Ontology: Ontology refers to what is assumed about the nature of reality (Kaushik & Walsh, 2019). With regards to the element of ontology, Saunders, et al. (2019) assert that pragmatists view the nature of reality as multiple and external and this nature should best answer the research question. Therefore, in this study, the use of a qualitative study with a scoping review of literature demonstrates the ontological view of the research.

Methodology: Kaushik and Walsh (2019:2) define methodology as a common understanding of the best ways to gain knowledge. In this study, a qualitative approach is used as the methodology to gain an understanding of the guidelines for reducing Type 2 Diabetes among older PLWH.

Rhetoric: Rhetoric is also defined as the common language used in research (Kaushik & Walsh, 2019). Rao (2022) notes that the language used in academic writing is much more formal, sophisticated and nuanced in comparison to the language used in informal conversation. In addition, Rao (2022) elaborates that such language used in

academic writing has terms that are specific to the subject. Likewise, this study will use the English language with terms used in healthcare sciences.

3.2 The qualitative approach

According to Creswell and Creswell (2018), qualitative research approaches take place in the natural setting of the participants. In this study, the natural setting of the participants was the ART clinics in Harare Urban District. In addition, Creswell and Creswell (2018) explain that qualitative approaches use multiple data sources which include interviews, observations and analysis of documents; as such, in this research the researcher analysed documents, and interviewed research participants. Qualitative studies also seek participants' meanings, and not what the researchers understand about the problem or what is concluded in the literature. In this study, the researchers sought the meaning of how older PLWH practice self-care to reduce Type 2 Diabetes and the challenges faced by older PLWH in reducing Type 2 Diabetes. This meaning according to Grove and Gray (2021) is subjective. In qualitative research, researchers also seek to provide a holistic account of people's experiences. Grove and Gray (2021) define an experience as a unique phenomenon to an individual which is affected by time, context and is specific to the individual. Polit and Beck (2020) also describe the characteristics of qualitative studies applied in this study. In qualitative studies, there is a merger of data collection strategies (triangulation). Similarly, to develop guidelines for the reduction of Type 2 Diabetes among older PLWH this study will triangulate reviewed literature, data collected from older PLWH and nurses providing care to PLWH.

3.3 The research design

The research design is the plan that determines how the research will be conducted (Grove & Gray, 2021). Saunders et al. (2019) assert that the research design is the plan which determines how the research questions will be answered. The research design in turn guides the selection of the population, how sampling will be conducted and how data will be collected and analysed (Grove & Gray, 2021). According to Creswell and Creswell (2018) there are five popular qualitative research designs; and these include phenomenology, grounded theory, narrative, ethnography and case studies. Grove and Gray (2021) like Creswell and Creswell (2018) acknowledge the

five types of qualitative studies and however, add that some qualitative studies cannot be classified into these five classes and are classified as exploratory-descriptive qualitative designs. The Figure 3.1 below illustrates the qualitative research design used and the two phases of data collection used in the exploratory-descriptive qualitative study design as well as integration of the scoping review of literature and the triangulation with the integrative review of literature.
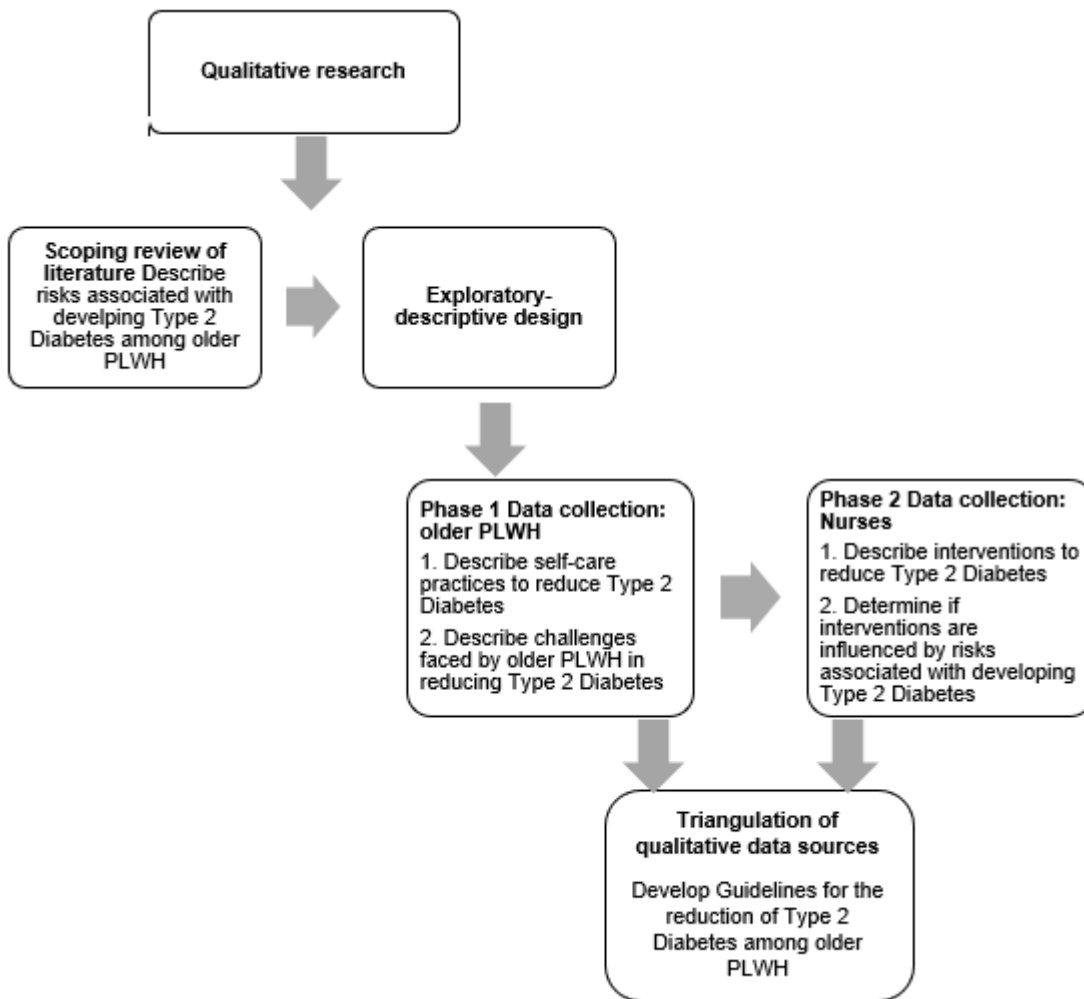
Figure 3:1. The qualitative study design

3.3.2 The exploratory descriptive study design

Exploratory qualitative research designs are also referred to as descriptive designs or naturalistic enquiry (Grove & Gray, 2021). Grove and Gray (2021) further reveal that exploratory-descriptive research designs are most suitable for the development of an intervention. As such the development of guidelines for the reduction of Type 2 Diabetes among older PLWH similarly seeks to develop the intervention described by

Grove and Gray (2021). On the development of interventions, Luciani et al. (2019) concur with Grove and Gray (2021) by noting that exploratory-descriptive qualitative study designs are especially useful in developing assessment tools in particular contexts. In this study, the context is Harare Urban District. Kim, Sefcik and Bradway (2017) in a systematic review of exploratory-descriptive qualitative research designs found that most exploratory qualitative research designs are conducted in nursing studies.

Another characteristic of exploratory-descriptive research designs is that they are developed for a purpose (Grove & Gray, 2021). Likewise in this study, the purpose of the study of developing guidelines to reduce the development of Type 2 Diabetes guides the selection of the study design. In addition, Grove and Gray (2021) explain that exploratory-descriptive qualitative studies are conducted to provide a description. With regards to providing descriptions, exploratory qualitative research designs explain the who, what, where and how of a particular experience to gain insight into the phenomena (Kim et al., 2017). This study provided a description of two situations about older PLWH; firstly, the self-care practices to reduce Type 2 Diabetes by older PLWH and secondly challenges older PLWH experience in reducing Type 2 Diabetes. This study also described nursing interventions to reduce Type 2 Diabetes among older PLWH and whether these interventions are determined by the excess risks of Type 2 Diabetes among older PLWH. The provision of descriptions from two populations of older PLWH and nurses necessitated two phases of data collection in the exploratory-descriptive qualitative study method. The first phase was a collection of data from older PLWH and the second data collection phase was from nurses.

3.3.2.1 Study Setting

The study setting according to Kumar (2021) refers to the physical and social context where the study is conducted. Kumar (2021) further adds that the study setting in qualitative research is important as the interpretation of results is dependent on the context. The study setting should describe the community, the size of the community, composition and structure of the community. This study was conducted in Harare Urban District, which is one of four districts in Harare Province; which is made up of Harare Urban District, Epworth, Chitungwiza and Harare Rural District. The total

population in Harare Urban district is 1 491 740 and is the largest district in Harare Province (ZimStat, 2022). Economic activities in Harare Urban District are mainly in the informal sector which has grown sizeably in the past decade with at least 94.5% of all employment in the informal sector (Chirisa & Mabeza, 2019). This growth in the informal sector is attributed to a 51% economic decline between 1999 and 2008 which resulted in significant unemployment; currently at 90% (Chirisa & Mabeza, 2019). The International Labour Organisation (ILO) (2017) reports that most people in Zimbabwe are employed in the agriculture sector which contributes to 29.3% of all employment. Other sectors of major employment include manufacturing, water and electricity, public administration, education, health, construction, health and financial services. Harare Urban District is surrounded by good soils and climate in terms of rainfall and temperature which support the agro-processing industry in the city as well as sprawling urban agriculture activities (Chirisa & Mabeza, 2019). The urban agriculture farming activities are mainly done in unused residential and industrial open spaces, and contribute significantly to food security and economic wellbeing in Harare Urban District (Chirisa & Mabeza, 2019).

With regards to health service provision, Harare Urban District is divided into two zones; Zone A and Zone B managed by two District Nursing Officers (City of Harare, 2020). The two zones further provide health care services through 12 polyclinics, 7 primary care clinics, 15 satellite clinics, 6 family health service clinics, 4 dental clinics and 2 hospitals (City of Harare, 2020). Polyclinics provide three types of clinic services, namely; primary health care, maternity services and family health services and are managed by three managers "*sisters in charge*" each responsible for a separate clinical unit. Polyclinics are open seven days a week and 24-hour services are provided for only maternity care (City of Harare, 2020). Satellite clinics on the other hand also offer primary health care services, family health services and selected satellite clinics offer maternity services. ART clinics are provided as part of the primary health services in both polyclinics and satellite clinics (City of Harare, 2020). City of Harare (2020) explains that ART services include HIV testing and counselling and ART initiation and administration including follow-up care.

This study accessed four polyclinics and one satellite clinic which were purposively selected in Harare Urban District and offer ART services to older PLWH. The

polyclinics were Mufakose Polyclinic, Glenview Polyclinic and Kambuzuma Polyclinic. Data was also collected from one satellite clinic, Glenview Satellite clinic.

Mufakose Polyclinic is located in the western part of Harare Urban District and serves residents from the densely populated low socio-economic suburb of Mufakose (City of Harare, 2018). Mufakose is one of the oldest residential suburbs in Harare and forms part of ward 34 which has a total catchment population of 21 471 (ZimStat, 2022). Ncube et al. (2019) cite the City of Harare (2018) which notes that the average nursing coverage per 100 000 people in Mufakose is 19. Kambuzuma Polyclinic is located in Kambuzuma suburb which borders Mufakose. Kambuzuma Polyclinic serves a catchment area of 36 061 people in ward 14 (ZimStat, 2022). Budiriro Polyclinic is located in the Southwest of Harare Urban District in Budiriro suburb which borders Mufakose and Glenview suburbs. Budiriro Polyclinic serves wards 43 and 33 and serves a population of 146 039 people (ZimStat, 2022:89). The average nursing coverage per 100 000 people in Budiriro is 15 (Ncube et al., 2019). Glenview Polyclinic and Glenview satellite clinic are located in the southcentral of Harare Urban District in Glenview suburb which is also densely populated and low socio-economic status community. The clinics serve three constitutional wards (30,31 and 32) with a total catchment of 103 453 people (ZimStat, 2022). The average nursing coverage per 100 000 people in Glenview is 18 (Ncube et al., 2019). The image below shows the Harare Urban District.
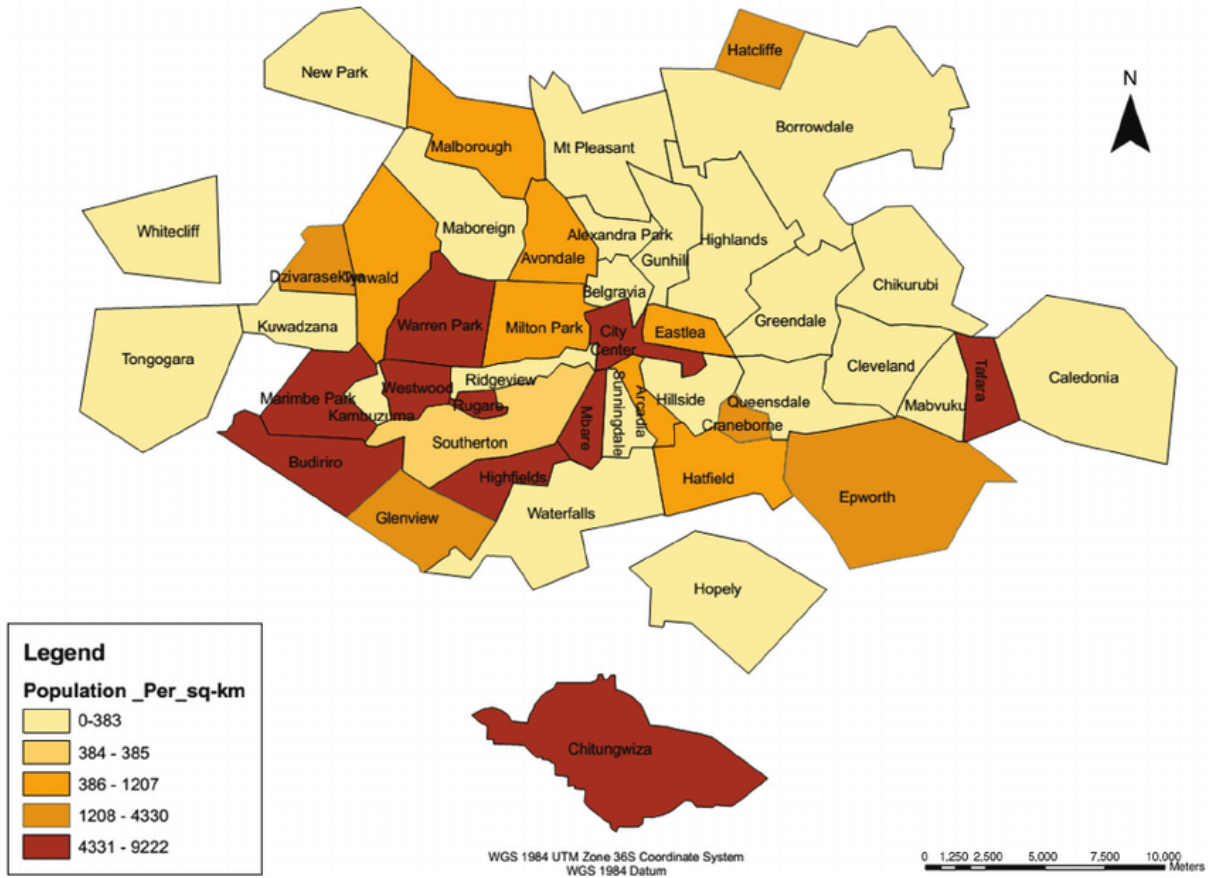
Harare Urban District: Image source: Chirisa, Nyamadzawo, Bandauko, and Mutsindikwa (2015).

3.3.2.2 The study population

The population refers to the people who are targeted by the research (Grove & Gray, 2021). There is a distinction between the target population and the accessible population. The target population refers to all the elements in a population that can be sampled (Grove & Gray, 2021). Polit and Beck (2020) add that the target population is where the results can be generalised. The accessible population refers to part of the elements in the population that the researcher has reasonable access to (Grove & Gray, 2021). This study used two data collection phases and had two different population groups. Polit and Beck (2020) assert that there is a need to delineate the characteristics that are specific to the target population (inclusion criteria) as well as the characteristics that elements must not have to be included in a study (exclusion criteria).

Phase 1 Population: The target population in the first phase of the data collection was older PLWH in Harare Urban District. The accessible population in the first phase of data collection were older PLWH accessing ART services from Glenview Polyclinic, Budiriro Polyclinic, Kambuzuma Polyclinic, Mufakose Polyclinic and Glenview satellite clinic. The inclusion/exclusion criteria for older PLWH were:

<u>Inclusion criteria</u>

Older PLWH accessing ART services in Harare Urban district aged more than 50 years

Older PLWH willing to take part in the study

<u>Exclusion criteria</u>

Older PLWH unwilling to participate in the study

Older PLWH diagnosed with Type 2 Diabetes as they would not benefit from study outcomes of guidelines for Type 2 Diabetes reduction as they already had Type 2 Diabetes.

Older PLWH residing in care facilities accessing ART in Harare Urban district who may not have full autonomy in making decisions on participating in the study

Older PLWH with mental illnesses that incapacitates them to discern the risks and benefits of participating in the study

Phase 2 Population: In the second phase of data collection, the target population was nurses providing care to older PLWH in Harare Urban district. The accessible population was nurses providing care for older PLWH in Glenview Polyclinic, Budiriro Polyclinic, Kambuzuma Polyclinic, Mufakose Polyclinic and Glenview satellite clinic. The inclusion and exclusion criteria were also defined for the nurses providing care to older PLWH.

<u>Inclusion criteria</u>

Nurses providing care to older PLWH in Harare Urban District

Nurses providing care to older PLWH who were willing to participate in the study

<u>Exclusion criteria</u>

Nurses providing care to older PLWH who are not willing to participate in the study.

3.3.2.3 Sampling and sampling size

Sampling is defined as the process of selecting part of the target population (Grove & Gray, 2021). Sampling is done as it is practical and economical to collect data from a sample rather than the entire population (Grove & Gray, 2021). Saunders et al. (2019) describe two broad sampling strategies, probability and non-probability sampling. In their discussion, Saunders et al. (2019) note that in probability sampling each element has an equal chance of being selected and probability sampling is most commonly used in quantitative research. Polit and Beck (2020) note that probability sampling on one hand is also referred to as random sampling where systematic bias is minimised through random sampling.   Non-probability sampling on the other hand there is no known probability of each element being selected (Saunders et al., 2019). Generalisation in non-probability sampling is possible however not on statistical inference (Saunders et al., 2019). Polit and Beck (2020) like Grove and Gray (2021) explain that non-probability sampling methods are commonly used in nursing because of the difficulty in finding participants. Furthermore, there are five types of non-probability sampling methods and these include; convenience sampling, purposeful sampling, theoretical sampling, quota sampling and network sampling. This study used purposive sampling in both phase 1 and phase 2 of data collection.

According to Polit and Beck (2020), purposive sampling is also known as judgemental sampling and it involves the researchers consciously using their judgment to choose participants. For instance, this conscious choice made by the researcher was judgement based on age of PLWH (Polit & Beck, 2020). Similarly, in phase 1 of this study, the researchers purposively chose older PLWH based on the researcher's judgement of the age of the older PLWH which was confirmed by clinic records. Grove and Gray (2020) note that purposive sampling may also be based on the researchers' knowledge that some participants are knowledgeable about a particular subject. Likewise, for the phase 2 data collection nurses were purposively chosen as they provided care to PLWH in ART clinics.

According to Kumar (2021) in qualitative studies, the size and the strategy of sampling are not as critical as the sample diversity. In addition, Kumar (2021) highlights that such diversity can also be obtained from a single element of the population. Grove

and Gray (2021) further reveal that qualitative study samples focus on the quality of information obtained from the participants. Grove and Gray (2021) also add that in qualitative studies, the sample size is deemed adequate when saturation and verification have been reached. Saturation refers to the point when additional sampling does not yield new information Kumar (2021). Kumar (2021) further notes that saturation only occurs when data is being collected on a one-to-one basis. Verification according to Grove and Gray (2021) occurs when researchers can confirm theoretical concepts or relationships in the study.

Phase one sample size: The first phase of data collection saturation was reached at 23 older PLWH in the five clinics (Glenview Polyclinic, Budiriro polyclinic, Mufakose polyclinic, Kambuzuma Polyclinic and Glenview satellite clinic). Key concepts that confirmed data verification on sampling older PLWH were the presence of pain when exercising, the cost of healthy food in discussing challenges in reducing Type 2 Diabetes and the lack of a structured exercise regime when practising self-care to reduce Type 2 Diabetes. No older person living with HIV withdrew during the interviews.

Phase two sample size. In the second phase of the data collection, data saturation was reached at 9 nurses providing care to older PWLH in all five clinics. Verification of data was confirmed when the key concept of the use of a multidisciplinary team for screening Type 2 Diabetes was expressed by participants. No nurse dropped out during the interviews.

3.3.2.4 Data Collection

In qualitative studies, the researchers usually know the sources of data (Polit & Beck, 2020). Data collection is also guided by the research questions (Polit & Beck, 2020). Nieswedomy and Bailey (2018) reiterate that data collection is informed by the research questions, the authors further highlight that data collection is also guided by the study design and the amount of knowledge available in the literature. Several methods of data collection are used in data collection and these include biophysiological measurements, observations and self-report methods such as interviews and questionnaires (Nieswedomy & Bailey, 2018).

In qualitative studies, flexible data collection techniques are used to allow participants to relate their experiences in a natural manner (Polit & Beck, 2020). Polit and Beck (2020) further explain that interviews are the most common data collection method used in qualitative studies. Nieswedomy and Bailey (2018) define interviews as an interaction whereby the researcher asks pre-set questions and the participants respond to the questions. Interviews can be conducted face-to-face or telephonically (Creswell & Creswell, 2018). Furthermore, Saunders et al. (2019) highlight that interviews can be conducted on a one-to-one basis or with the researcher interviewing small groups through focus group discussions. This study used one-to-one interviews in both phase 1 and phase 2 data collection. McGrath, Palmgren, and Liljedahl (2019) caution that interviews conducted in medical and nursing practice differ from interviews for research purposes because of the new theoretical basis of learning applied in research. This study used face-to-face interviews as a data collection method for both phases 1 and 2 of data collection. Saunders et al. (2019) reveal that there are three different types of interviews, namely, structured, semi-structured or unstructured (in-depth) interviews. This study used semi-structured interviews for both phase 1 and phase 2 of data collection.

Semi-structured interviews: Semi-structured interviews were used to collect data for both phase 1 and phase 2 data collection. According to Grove and Gray (2021) in semi-structured interviews, researchers have a list of broad topics or questions which guide the interview. In semi-structured interviews, the researcher's role is to facilitate the discussion and ensure that all the topics have been discussed (Grove & Gray, 2021). Saunders et al. (2019) also describe the semi-structured interviews together with the structured interviews as "*qualitative research interviews*". The authors Saunders et al. (2019) further indicate that when conducting semi-structured interviews, the sequence of questioning may vary from participant-to-participant dependent on the flow of the conversation. In exploratory-descriptive study designs like this study, Polit and Beck (2020) explain that the researcher may ask questions that are structured to align with the study purpose. Concurring with Polit and Beck (2020), McGrath et al. (2019) explain that it is important to prepare for a research interview by reviewing the literature on the purpose of the study. In addition, Saunders et al. (2019) reveal that during semi-structured interviews the researcher may take notes as part of data collection.

Phase 1 data collection: Data collection for older PLWH was conducted from the 12th of December 2022 till the 20th of December 2022 then from the 31st of January 2023 till the 10th of February 2023 by the researcher. The duration of interviews ranged from 19 minutes to 43 minutes with a mean interview time of 29 minutes. Interviews were conducted in Shona and audio recorded. Interviews for the older PLWH were conducted in a private room in ART clinics where older PLWH received care at the study settings in Mufakose Polyclinic, Glenview Polyclinic, Budiriro Polyclinic, Kambuzuma Polyclinic and Glenview Satellite Clinic.

A semi-structured interview guide was used to collect data (Appendix F). This interview guide was divided into three sections. The first section contained demographic variables which included; age of older PLWH, marital status, religion, occupation, duration living with HIV and duration on ART. The second section (Section B) sought to find out self-care practices to reduce Type 2 Diabetes among older PLWH. The section had three broad questions; the first question was "what is your daily diet pattern in efforts to reduce the occurrence of Type 2 Diabetes? The second question was, "what physical activity regime do you follow to reduce the occurrence of Type 2 Diabetes? During the interviewing participants in Section B, probing questions included, describing the proportions of your plate concerning fruit and vegetables, protein, and whole grain intake, how many hours do you exercise weekly? Would you describe your physical activity pattern as following a strict regime? The third question sought to elicit enablers to the adherence of a healthy diet and physical activity. The last section (Section C) of the interview guide for older PLWH sought to elicit data on challenges faced by older PLWH in reducing Type 2 Diabetes. Section C contained two questions "what challenges do you experience in adhering to a healthy diet? The second question was "what challenges do you experience in following an exercise regime?

Phase 2 data collection: the second phase of data collection for nurses providing care for older PLWH was conducted from the 12th of December 2022 till the 20th of December 2022 then from the 31st of January 2023 till the 10th of February 2023. Interviews were conducted by the researcher. The interviews were conducted in Shona and English and the duration of interviews ranged from 14 minutes to 37 minutes with an average interview duration of 23 minutes. All interviews were audiotaped.

The semi-structured interview guide for the nurses contained two sections Section A and Section B (Appendix E). Section A elicited demographic variables which included age, gender and years of experience providing HIV treatment, care and support services. Section B sought to elicit the nursing interventions for the reduction of Type 2 Diabetes among older PLWH. Three questions were asked, the first was what screening interventions do you implement to reduce Type 2 Diabetes? The second question was "what health education do you provide to reduce Type 2 Diabetes among older PLWH? A frequent additional probing question that was asked during the interviews was what topics do you educate older PLWH on in reducing Type 2 Diabetes? The third question was what indications determine the implementation of measures to reduce Type 2 Diabetes among older PLWH?

3.3.2.5 Data analysis

Data analysis in qualitative research involves developing meaning from the interviews (Creswell & Creswell, 2018). De Chesnay (2018) notes that in qualitative research data analysis makes sense of numerous, non-numeric and different data. It involves changing data from "*pieces to patterns*" (de Chesnay, 2018). Data analysis for phase 1 was conducted from the 12th to the 28th of February 2023 and phase 2 data analysis was conducted from the 1st to the 9th of March 2023.

Kumar (2021) explains that in qualitative research data analysis involves the identification of themes that emerge from the interviews. Polit and Beck (2020) describe a theme as an entity that gives meaning to participants' experiences and their different forms. Themes capture the meaning of experiences into a meaningful holistic view (Polit & Beck, 2020). As such, in this study thematic analysis was conducted to provide the meaning of participants' experiences. Braun and Clarke (2022) trace the origins of thematic analysis to the 1970s with the first guidelines developed in 1998 by Boyatzis. Braun and Clarke (2022) define thematic analysis as a method of analysing qualitative data through the development of meanings across a data set to answer a research question. The thematic analysis entails familiarising with the data, coding the data, developing themes and revising the coded data (Braun & Clarke, 2022). For this study data analysis was done manually using Braun and Clarke's (2006) six steps of thematic analysis. The researcher used the 6 steps for the phase 1 data collected

(interviews with older PLWH) then the six steps were repeated for the data collected during phase 2 (interviews with nurses). An independent coder was used to analyse the data to ensure objectivity.

Braun and Clarke's 6 steps of thematic analysis included; step 1 which was data familiarisation which entailed transcribing the data, reading and taking notes of the transcribed data (Campbell et al., 2021). The second step was to generate codes of the data (Campbell et al., 2021). Campbell et al. (2021) describe this step as the researcher actively organising data into groups and labelling the data with the codes. Braun and Clarke (2022) note that these labels are based on features of the data that answer the research questions.

The third step was to generate initial themes, this entailed organising the codes generated into themes and then looking for the meaning of relationships of these initial codes (Campbell et al., 2021). The fourth step was to review the initial themes that were generated, which meant reviewing the whole data set to ensure that there was enough data to support each theme generated (Campbell et al., 2021). The fifth step was to define the themes, which involved looking at the broader themes and aligning them to the research questions. In this study in phase one the themes had to be aligned with the research questions; what self-care practices do older PLWH perform to reduce Type 2 Diabetes? and what challenges do older PLWH experience in reducing Type 2 Diabetes? In phase two data analysis the researcher aligned the themes to research two questions. The first question was; what interventions are used to reduce Type 2 Diabetes among older PLWH? The second question which themes were aligned to was; what determines interventions for reduction of Type 2 Diabetes among older PLWH? According to Braun and Clarke (2006) cited in Campbell et el. (2021), the sixth step is to present the findings in a narrative format which this presentation is done in Chapter 5 of this study.

3.3.2.6 Ensuring Rigour

To ensure rigour or quality in qualitative studies, Johnson, Adkins and Chauvin (2020) highlight that regular steps should be taken in the designing, conducting and publishing of qualitative studies. The authors Johnson et al. (2020) explain that two

critical factors ensure rigour in qualitative studies; providing a rationale for decision-making through a framework of quality criteria and researcher reflexivity.

The Framework for quality criteria

Trustworthiness and authenticity in qualitative research are determined by four indicators and these are credibility, dependability, transferability and confirmability (Kumar, 2021). Polit and Beck (2020) discuss the issue of trustworthiness in qualitative research and trace these four indicators of trustworthiness described by Kumar (2021) to the works of Lincoln and Guba (1985), then later to the work of Guba and Lincoln (1994). Polit and Beck (2020) note that in the later works of Guba and Lincoln (1994), the fifth indicator of authenticity was added to the framework. This framework adopted for ensuring trustworthiness in qualitative studies is known as the parallel perspective as it parallels reliability and validity in quantitative studies (Polit & Beck, 2020). Another framework for ensuring rigour is also proposed by   Whittemore et al. (2001). This study used the parallel perspective framework by Guba and Lincoln (1994).

Credibility: Credibility equates to internal validity in quantitative studies and refers to the degree to which the findings of the study are believable from the participants' view (Kumar, 2021). A higher degree of trustworthiness in the study is achieved when study participants confirm, validate and approve the study findings (Kumar, 2021). Polit and Beck (2020) add that two aspects define credibility, firstly conducting the study in a manner that makes the results believable and secondly illustrating the credibility of the findings to the readers of the study. To ensure credible findings of the study, the researchers presented the study findings to the participants to confirm, validate and approve the findings. Secondly to ensure credibility of the study findings, the data from the older PLWH and the nurses were triangulated which made the results of the study believable.

Dependability: Dependability parallels reliability in quantitative studies and is defined as the degree to which similar results are obtained when the same study is conducted with different participants, in a different context and at a different time (Kumar, (2021). Polit and Beck (2020) further assert that dependability cannot be achieved if credibility is not achieved which equates to validity not being achieved if reliability is not achieved in quantitative studies. Johnson et al. (2020) note that to ensure dependability of study findings, researchers ought to provide a complete description of the methods and

procedures used to conduct the study to enable other researchers to duplicate the findings. The authors Johnson et al. (2020) explain that qualitative researchers should provide a "*thick*" description of the data collection methods, in particular time frames for data collection and analysis and study setting to enable duplication of the study. Likewise, sections 3.4.2.1 to section 3.4.2.5 in this chapter detail the study setting, methods used in sampling, collection of data and analysis of data. This description included information about; the interviews conducted, the length of the interviews, the questions asked, the data analysis procedures, the demographic variables of the participants and the time of the year the study was conducted. Furthermore, to enhance dependability, the analysed data was checked by a peer researcher, as a means of ensuring findings are consistent with what the researcher had found. Dependability in the study was also ensured by testing the data collection instruments on two nurses who did not form part of the final sample, and two older PLWH who also did not form part of the sample of older PLWH. This pre-testing of the data collection instruments provided the means of ensuring the researcher obtained similar results with the different participants.

Transferability: According to Kumar (2021) transferability parallels external validity in quantitative research and refers to the degree to which results of qualitative studies can be generalised or transferred to other contexts. Polit and Beck (2020) reiterate the definition by Kumar (2021) by highlighting that transferability refers to the "applicability of study findings to other settings". Transferability is achieved by describing the methods used in the study as well as the context which the study was conducted (Polit & Beck, 2020). Johnson, Adkins and Chauvin (2020) further explain the assertion by Polit and Beck (2020) by noting that qualitative researchers need to describe the study setting, population characteristics, and time frames of data collection and analysis. To ensure transferability, this study described sample characteristics of the older PLWH and the nurses providing care to older PLWH in Chapter 3, section 3.4.3.1; study setting in sections 3.4.2.1 and data collection and analysis in sections 3.4.2.4 and 3.4.2.5 respectively. In ensuring transferability, the description of the study setting is particularly important, as the boundaries of the geographical location and the demographic characteristics of the population ought to be explained. Likewise in this study a map of Harare Urban District outlining Mufakose, Budiriro, Glenview and Kambuzuma was provided in section 3.4.2.1. This outline of the study setting enables

other researchers to conduct similar studies outside this context and obtain similar results.

Confirmability: Confirmability is the equivalent of objectivity in quantitative studies (Kumar, 2021). Authenticity is defined as the degree to which results can be confirmed by other researchers (Kumar, 2021). It is the extent to which congruent meaning of results, the relevance of results and the accuracy of the findings can be achieved should a similar study be conducted by another researcher (Polit & Beck, 2020). Johnson et al. (2020) explain that confirmability can be achieved by minimising researcher bias on the outcomes of the study as well as explaining any researcher characteristics that could influence the study outcomes. In light of this, section 3.4.2.7 in this chapter describes the researcher's reflexivity. The researcher's reflexivity outlines the researcher's previous experience of providing primary health care services to older PLWH. Confirmability is also attained by adhering to all aspects that ensure rigour in qualitative studies such as dependability, transferability and credibility (Johnson et al., 2020). As such the researcher conformed to measures of ensuring dependability by member checking of analysed data, providing description of data collection and analysis procedures. Transferability was also ensured by describing the study setting.

Authenticity: In qualitative studies, authenticity refers to the extent to which the researcher captures the multiple views and perspectives of the different participants (Mauldin, 2020). In addition, authenticity refers to the extent the researcher fosters the changes between the different participants in the data analysis (Mauldin, 2020). Polit and Beck (2020) further reiterate that authenticity is when the researcher can show the various realities from the participants' perspectives. To ensure authenticity, quotes supporting each theme and subtheme from the participants are included in this report to enable an understanding of the context and experiences of older PLWH and nurses providing care to older PLWH in Harare Urban District.

Researcher Reflexivity

Reflexivity in qualitative studies is a way of ensuring rigour and refers to the researchers' reflection on their role in the research process (University of Melbourne, 2023). Polit and Beck (2020) note the importance of researcher reflexivity in qualitative studies as researchers collect the data and analyse the data. Peddle (2022) explains

that reflexivity takes into account the relationship between the researcher and the participants and enhances the credibility of qualitative findings. It is a reflection of the contextual relationship between the researcher and the participants (Dodgson, 2019). Reflexivity takes into account the researchers' experiences, beliefs and considers the readers of the research (University of Melbourne, 2023). The University of Melbourne (2023) notes the importance of reflexivity in qualitative research, especially among researchers who collect data through interviews from colleagues. Dodgson (2019) further highlights that to increase the credibility of the study findings reflexivity enhances the understanding of study findings by readers. During phase 1 of data collection, the researcher reflected on previously working at Glenview Polyclinic and on also being a nurse. In phase 2 data collection, the researchers reflected on being concerned from an experience when providing care to an older person living with HIV who had been diagnosed with Type 2 Diabetes, which partly motivated the study. In addition, to ensure objectivity of the data collection process, the researcher used a notebook and collected field notes for member checking during the data analysis.

3.3.2.8 Ethical considerations

Ethical considerations in research refer to a set of moral rules that guide the researcher to protect participants (Foundation for Professional Development, 2020). These considerations were applied in phase 1 (older PLWH) and phase 2 (nurses) of data collection in the exploratory descriptive study design (Method Two). Nieswedomy and Bailey (2018) reiterate that the rights of participants should be protected at all times when conducting research as well as when publishing results. The need for ethics in nursing research is traced back to the second world war in Germany (1942 and 1943) with the participation of nurses in unethical, deliberate infection of prisoners' wounds with glass or wood shavings to test the efficacy of sulphonamides (Nieswedomy & Bailey, 2018). Other unethical practices in research happened in other parts of the world at different times such as in 1932 in the USA, the Tuskegee study also involved nursing not providing treatment to black men infected with syphilis to study disease progression (Nieswedomy & Bailey, 2018). Given such unethical research practices, the Belmont report was developed in 1979 by the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research. The Belmont report provides guidelines for conducting research with human subjects. The report

stipulates three principles related to human subjects; beneficence, justice and respect for human dignity (Nieswedomy & Bailey, 2018).

Although the Belmont report stipulates the three ethical principles, Gelling, Ersser, Heaslip, Tait and Trenoweth (2021) explain the need for gatekeepers of research to ensure that these ethical principles are adhered to. Given this, Gelling et al. (2021) explain that the role of Institutional Review Boards is to review study plans and approve the studies ensuring they abide by ethical principles. This study was approved by the College of Human Sciences Research Ethics Committee- reference number 14056739_CREC_CHS_2022 (Appendix A). Permission was also sought and granted by the City of Harare Health Department (Appendix H).

Principle of Beneficence: The principle of beneficence obligates researchers to minimise harm and increase the benefits of participating in research (Polit & Beck, 2020). Two main rights are enshrined in the principle of beneficence; the right to be protected from harm and the right to be protected from exploitation (Polit & Beck, 2020).

According to Grove and Gray (2022), there are four forms of harm in research and these include emotional, physical, economic and social. To protect participants from any form of harm during the study, the participants were informed that they would notify the researcher of any form of discomfort and the researcher would immediately stop the interview. In addition, the College of Human Sciences Research Ethics Committee and participants were informed of the available referral system of social workers in the clinics who would provide counselling services should participants so require. The participants also benefitted from health education provided during and after the interviews. For the older PLWH, health education was in form of information on physical activity and healthy eating. Nurses were informed of additional risks posed by HIV and ART to the development of Type 2 Diabetes among PLWH and screening measures as well as health education for Type 2 Diabetes reduction among older PLWH.

Concerning the right to protection from exploitation, Polit and Beck (2020) explain that participants should be assured that the information they provide during interviews will not be used against them in any way. Similarly in this study information that was provided by the participants was used for research purposes only and not used to

prejudice them from any benefit or service they ought to have received. In this regard, during interviews, the researcher did expect to find incidental information such as inadequate screening for Type 2 Diabetes from the nurses, however such information was not used against the nurses who participated in the study.

Principle of Justice: The principle of justice includes the right to privacy and the right to fair treatment (Polit & Beck, 2020).

Grove and Gray (2021) note that the right to privacy includes the maintenance of anonymity and privacy. The authors Grove and Gray (2021) describe anonymity in research as when the participant's identity cannot be traced to their responses even by the researcher themselves. To ensure anonymity, in this study, the researchers used pseudonyms to code the responses from participants and no names were asked for during the study. Confidentiality in research mandates that researchers should keep information from research safe (Grove & Gray, 2021). Polit and Beck (2020) note that when collecting data, the information sought by the researcher should only be related to the study and not intrude into participants' lives beyond study needs. Given the descriptions of maintaining confidentiality and anonymity by Polit and Beck (2020); Grove and Gray (2021) this study kept confidential participant information in a password-locked computer. In addition, study information was only shared among the researchers and no names were used during data collection. Furthermore, participants were assured of these measures to ensure confidentiality and anonymity whilst no additional information was sought beyond information about self-care practices, challenges and interventions to reduce Type 2 Diabetes among older PLWH. In addition to uphold privacy and confidentiality, interviews were conducted in a private room, which was inside the ART clinic. The private room where interviews were conducted was separate from the waiting area of other patients or where nurses provided ART services.

The right to fair treatment in research mandates equitable distribution of benefits and burdens of a study (Grove & Gray, 2021). Polit and Beck (2020) elaborate on this explanation by noting that fair treatment in research is usually evidenced in the selection of participants. The authors Polit and Beck (2020) caution against selecting participants who are most likely to agree to participate such as people living in institutions (mental health facilities, prisons, and or aged care facilities), poor people,

dying people or people stigmatised as undesirable. In line with upholding the right to fair treatment of participants, this study did not include institutionalised people and socio-economic status was not considered as an inclusion criterion in selecting participants. Moreover, to ensure fair treatment, the researcher asked the nurses similar questions and the older PLWH were also asked the same questions.

Respect for Human Dignity: The respect for human dignity in research includes the right to full disclosure and the right to self-determination (Polit & Beck, (2020). Grove and Gray (2021) highlight that the right to full disclosure and the right to self-determination form the basis of informed consent. According to Polit and Beck (2020), the right to self-determination means that people have the right to decide to participate in a study and their refusal to participate should not be prejudicial to them in any form. Furthermore, participants have the right to ask questions during the study and to refuse to give information (Polit & Beck, 2020). To ensure the right to self-determination, participants consented by signing a consent form (Appendix B) to participate in this study and were informed of their right to withdraw at any time during the study. During the selection of participants, the participants rights to self-determination was also upheld by ensuring the gatekeepers did not influence the selection of participants. When selecting the nurses, researchers' judgement of them working at the ART clinic determined selection of the participants after the managers (who were the gatekeepers for the nurses) at the polyclinics notified the ART clinic department of the study. During selection of older PLWH the researcher's judgement of age of the older PLWH determined the selection, and this was not influenced by the gatekeepers who were the nurses.

The right to full disclosure warrants the researchers to provide full information about the study to participants (Polit & Beck, 2020). Nieswedomy and Bailey (2018) list the elements that should be included when disclosing information to participants. This information includes; the purpose of the study, benefits and potential risks, maintenance of confidentiality, contact details of the researchers should there be questions about the study, how possible harm will be managed, their right to withdraw from the study anytime and that participation is voluntary. In line with the right to full disclosure, in this study, an information sheet (Appendix D) was provided to participants which gave a full explanation of the study.

3.4 Triangulation of qualitative data sources

In healthcare, practice guidelines are defined as statements of recommendations that maximise patient care (Olayemi et al., 2017). Benzon, Joshi, Gan and Vetter (2019) note that practice guidelines are useful as they can bridge the gap between research and clinical practice. The authors, Benzon et al. (2019) further note that the development of clinical guidelines is a rigorous process that may not be fully understood by clinical experts. Benzon et al. (2019) cite the Institute of Medicine (2011) (USA) list of eight standards that should be included in the development of guidelines. These standards posit that the guideline development process should be transparent; conflict of interest should be managed, a systematic review of evidence should be done; the strength of the evidence foundation should be rated, the presentation of the guidelines and external review with updating of guidelines should be articulated.

Several methods can be used for the development of clinical guidelines. Common methods include the Delphi Technique, the Consensus Group Conference and the Nominal Group Technique (Benzon et al., 2019). Culleton (2015) criticises the development of guidelines using such consensus methods, noting that such guidelines are inundated with expert opinions. To avoid such expert opinion in the development of guidelines, Culleton (2015) recommends the use of transparent processes that minimise bias, which include the systematic retrieval of evidence that focusses on patient outcomes.

Alternate to these consensus techniques outlined by Benzon et al., (2019), McCaul, et al. (2018) argue that in resource-limited countries evidence-based guidelines could be developed to suit practice contexts through the synthesis of existing evidence. McCaul et al. (2019) support the development of evidence-based guidelines by revealing that consensus methods of developing guidelines may not always be feasible and negate evidence from developed countries that could be contextualised to local contexts in resource-limited settings like Harare Urban district. Concurring with McCaul et al. (2018), Olayemi, Asare and Benneh-Akwasi Kuma (2017) argue that guidelines can be developed from a systematic review of the evidence as well as weighing the harms and challenges of implementing a particular recommendation. In line with these assertions of McCaul et al. (2019) and Olayemi, Asare and Benneh-Akwasi Kuma (2017) the development of guidelines for the reduction of Type 2

Diabetes among older PLWH, qualitative data source triangulation was used. Wang et al. (2020) support the use of qualitative data in the development of guidelines and cite the WHO (2014) Handbook for guideline development which concurs that qualitative data can be used for guideline development. Further justifying the use of qualitative data source triangulation, Wang et al. (2020) recommend the inclusion of themes from interviews with key stakeholders who are targeted by the guidelines. In this study, the older PLWH and nurses providing care to older PLWH are the stakeholders whose interview findings were included in the development of the guidelines.

3.4.1 Qualitative data triangulation

Triangulation refers to the use of multiple data sources or multiple methods of qualitative designs to enhance the validity of a particular phenomenon (Stonbraker et al., 2019). Similar studies that have used triangulation include a qualitative study conducted by Stonbraker, et al. (2019) who sought to outline priority health-related topics for self-care among PLWH. Stonbraker et al. (2019) explain that qualitative data source triangulation is used for the same research purpose, however, the sources differ from person to person, are collected at different times and are from different contexts. In this study three data qualitative data sources are triangulated to develop guidelines for the reduction of Type 2 Diabetes among older PLWH. The data sources are from first, the findings from phase 1 data collection with older PLWH which outline the current self-care practices and challenges in the reduction of Type 2 Diabetes. The second qualitative data source is findings from phase 2 data collection from the nurses providing care to older PLWH who outline the current interventions to reduce Type 2 Diabetes among older PLWH. The third qualitative data source is an integrative literature review on the reduction of Type 2 Diabetes in older PLWH. This third qualitative data source is the systematic review of evidence described as one of the standards for developing guidelines by Benzon et al., (2019),

3.4.1.1 The integrative review of literature.

According to Loura et al. (2021), an integrative literature review is a type of research method that produces new knowledge on a given subject matter using a

comprehensive systematic approach. Integrative literature reviews facilitate the inclusion of relevant literature to support clinical decisions. To conduct the integrative literature review Whittemore and Knafl's updated (2005) five-step approach was used. The steps include:

Step 1: Identify the research topic and the research question. The research topic was identified as guidelines for the reduction of Type 2 Diabetes among older PLWH, from this topic, the research question derived was; what guidelines can be used to reduce Type 2 Diabetes among older PLWH?

Step 2: defining the eligibility for the inclusion and exclusion of studies. Studies included were from 2013 to 2023 which were in English and selected using keywords, reduction, Type 2 Diabetes and PLWH. Studies excluded were those not in English. Three databases were used for extracting the studies, CINAHL, Cochrane Library and PubMed. Grey Literature was searched through targeted websites such as the WHO, MoHCC Zimbabwe and the IDF.

Step 3: Defining the information to be extracted. This step involved outlining which recommendations to include for developing guidelines for reducing or preventing Type 2 Diabetes among older PLWH. This information included information on screening, health education and pharmacologic interventions to reduce Type 2 Diabetes.

Step 4: To evaluate the quality of studies included in the integrative review of literature, the Critical Appraisal Skills Program (CASP) checklists were used. Three different checklists were used and these included checklists for systematic reviews, cohort studies, and clinical trials Appendix I, J and K respectively. All checklists assessed studies based on the validity of results, the nature of results and the applicability of the results to the local context.

Step 5: Interpretation of results entailed the use of Microsoft excel to describe the study year, authors, objectives of the study, study designs used and outcomes of the study about the reduction of Type 2 Diabetes among older PLWH. The study designs and outcomes enabled the synthesis of data facilitating the classification of whether the recommendation pertains to screening, health education or pharmacologic interventions to reduce Type 2 Diabetes.

Step 6: Presentation of findings was done in a narrative format to enable triangulation of the findings with the qualitative data from older PLWH and nurses caring for older PLWH in Harare Urban district.

3.4.2 Ensuring rigour of guidelines developed

According to Hoffmann-Eßer et al. (2018), clinical practice guidelines developed have different qualities and before they can be used there is a need to ensure that the quality of the guidelines meets acceptable standards of use. To ensure quality guidelines there are different guideline appraisal tools such as the Appraisal of Guidelines for Research & Evaluation (AGREE) instrument later upgraded to the AGREE 11 tool. Hoffmann-Eßer et al. (2018) explain that the AGREE tool was first developed in 2003 and revised in 2009. Brouwers et al. (2020) also explain that the AGREE 11 tool is comprehensive and is not only used to assess the quality of recommendations but is also used by guideline developers to ensure conformity to quality standards in the development of guidelines. Likewise, in the development of guidelines for the reduction of Type 2 Diabetes among older PLWH, the AGREE 11 tool was used to ensure adherence to quality standards. The AGREE 11 tool contains 23 criteria distributed through 6 domains that capture the quality of guidelines, each domain specifying the different quality dimensions of the guideline (AGREE Next Steps Consortium, 2009). The criteria are rated on a Likert scale of 1-to even with 1 being strongly disagreed and 7 is strongly agreed (AGREE Next Steps Consortium, 2009).

The first domain is the scope and purpose; which rates the outlining of; the objective of the guideline, the target population of the guideline and the health question being addressed (AGREE Next Steps consortium, 2009). The second domain is the stakeholder involvement; which rates three items that include; guideline development involved relevant professionals, involvement of target population and clear definition of target users (AGREE Next Steps consortium, 2009). The third domain is the rigour of development which lists 8 items that should be rated. The items of the third domain include; use of systematic methods, criteria for selecting evidence defined, outlining of strengths and limitations of recommendations, explanation of link between evidence and recommendation is described, expert review of guidelines is outlined, procedure for updating guideline is presented and consideration of risks, benefits or side effects

of guideline is outlined (AGREE Next Steps consortium, 2009). The fourth domain is the clarity of presentation which rates that guidelines should be clear, should provide options and the guidelines is identifiable easily (AGREE Next Steps consortium, 2009). The fifth domain is the applicability which rates four criteria; enablers and barriers to guideline implementation are outlined, guideline should provide an outline of resources required to implement the guideline, a monitoring criterion is presented and implications for resources are outlined (AGREE Next Steps consortium, 2009). The last domain is the editorial influence which had two criteria which are the views of the funders did not influence the development of guidelines and declaration of competing interests (AGREE Next Steps consortium, 2009).

3.4.3 Review of guidelines
The guidelines developed were reviewed independently.

3.5 Conclusion to Chapter 3
Chapter 3 discussed the methodology of the study; the chapter described the pragmatic paradigm which was used to guide the study. Chapter 3 also outlined the qualitative approach with was employed in conducting the study. This qualitative approach was enhanced by the use of a scoping review of literature. Two phases of data collection were used for the exploratory descriptive research design, these were phase 1 where data was collected from older PLWH on self-care practices to reduce Type 2 Diabetes and phase 2 where data was collected from nurses providing care to older PLWH in Harare Urban district. For both phase 1 and phase 2 data collection purposive sampling was used to sample 23 older PLWH and 9 nurses providing care to older PLWH and both sample sizes were determined by data saturation and data verification. Chapter 3 also described the study setting of five polyclinics (Budiriro Polyclinic, Glenview Polyclinic, Glenview Satellite clinic, Kambuzuma Polyclinic and Mufakose Polyclinic) in Harare Urban district that serve people from low socio-economic status. Data collection for phases 1 and 2 used interviews aided by semi-structured interview guides, one for older PLWH (Phase 1) and another for nurses providing care to older PLWH (phase 2). Chapter 3 further outlined how the researcher ensured trustworthiness using the framework outlined by Lincoln and Guba (1994)

cited in Kumar (2021). In addition, chapter 3 outlined the ethical considerations applied to the study which included, the principle of beneficence, the principle of justice and the respect for human dignity. The chapter then described the method for the development of the guidelines which was the triangulation of qualitative data from an integrative literature review, data from older PLWH and nurses providing care to older PLWH. The next chapter (Chapter 4) presents the scoping review of literature.

CHAPTER 4

THE SCOPING REVIEW OF LITERATURE

Risks associated with the development of Type 2 Diabetes in older PLWH are in excess in comparison to the general population (Noubissi, Katte & Sobngwi, 2018). This is mainly due to older PLWH facing similar risks as the general population and additional risks posed by HIV infection and the use of ART (Noubissi et al., 2018). Moreover, in comparison to younger PLWH, the risks of developing Type 2 Diabetes are compounded by ageing which characterises Type 2 Diabetes.

The risks of developing Type 2 Diabetes in the general population include physical inactivity and unhealthy eating habits which result in obesity (Noubissi et al., 2018). As described in Chapter 1, section 1.1; WHO (2020a) outline risks in the general population which include; obesity, ageing, first-degree relative with Type 2 Diabetes; history of gestational diabetes; and specific ethnic groups like Afro-Caribbean, Hispanic and South Asian. In addition, urban dwelling is also associated with a higher risk of Type 2 Diabetes in comparison to rural dwelling (Meeks, Bentley, Adeyemo & Rotimi, 2021). Another modifiable lifestyle risk also attributed to the development of Type 2 Diabetes in the general population as well as in PLWH is smoking (Bavaro et al., 2021). In addition, to these risks PLWH face additional risks because of HIV infection and use of ART (Galaviz et al., 2021). Husain et al. (2017) explain the excess risks in PLWH by noting that Type 2 Diabetes in PLWH is associated with lipodystrophy and chronic inflammation. The authors further add that the antiretroviral drug classes of PI and NRTI are also associated with the development of Type 2 Diabetes. In light of these excess risks, the aim of the scoping review was to identify the excess risks of developing Type 2 Diabetes among older PLWH. This scoping review of literature was conducted as a preliminary study to guide this main study (guidelines for the reduction of Type 2 Diabetes among older PLWH).

4.1 Method of conducting the scoping review of literature

According to Peters et al. (2020), scoping reviews of literature are exploratory studies that methodically map the literature on a specific topic to identify concepts, sources of the evidence, literature gaps and theories. Munn et al. (2018) note that scoping

reviews are a relatively new approach to synthesising evidence. In a scoping review of scoping reviews, Pham et al. (2014) highlighted the popularity of scoping reviews of literature in health studies by noting that most (74.1%) scoping reviews are conducted for a health-related topic. Munn et al. (2018) also add that scoping reviews of literature are conducted as a precursor to systematic reviews or broader research. In this case, the scoping review of literature was conducted as a precursor to the broader study (guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District).

Frameworks for conducting scoping reviews of literature guide how a scoping review should be conducted. Peters, et al. (2022) recall that the first framework for conducting scoping reviews of literature was developed by Arksey and O'Malley in 2005 and broadly follows a five-step process. Arksey and O'Malley's 2005 framework for scoping reviews was later updated in 2015 by the Joanna Briggs Institute (JBI) (Arksey & O'Malley, 2005). Given this, the scoping review conducted used the six-step framework developed by Arksey and O'Malley (2005) and later updated by the JBI (2015).

Step 1: In conducting scoping reviews of literature, the first step was to identify the research questions derived from the research objective. Peters et al. (2022) explain that identifying the research question enables the delimitation of the inclusion and exclusion criteria and guides the literature search. Furthermore, the research questions developed should sufficiently address the population, context and concept. This study developed four research questions that sought to (1) find the populations from which previous studies describing risks of older PLWH developing Type 2 Diabetes were drawn from (2) contexts from which previous literature described risks associated with the development of Type 2 Diabetes among older PLWH (3) The main concepts which describe the development of Type 2 Diabetes among older PLWH and (4) the risks for the development of Type 2 Diabetes among older PLWH.

Step 2: The second step of the framework required the identification of the studies (Peters et al., 2022). This was done through a selection of studies through three databases, PubMed, CINAHL and the Cochrane Library as well as searching the grey literature through targeted websites such as the IDF and the WHO. This search was done using the keywords, "risks" Type 2 Diabetes" People living with HIV. The

literature search was conducted from 15th April 2022 to 13th July 2022 and follow-up searches were conducted till 31st of August 2022.

Step 3: Study selection from the three databases searched was the third step in the framework proposed by Arksey and O'Malley (Peters et al., 2022). To select these studies a two-step inclusion and exclusion criteria were used. The first inclusion and exclusion criteria were:

First inclusion criteria

Studies had to include the keywords: "risks", "people living with HIV" and "Type 2 Diabetes"

Studies should be original research studies

First exclusion criteria

Studies that were not original research

After the application of the first inclusion and exclusion criteria, a second inclusion and exclusion criteria were applied

Second inclusion criteria

Studies must include the concepts; "ageing people living with HIV" or "older people living with HIV "or" people above 50 years living with HIV".

Second exclusion criteria

Studies that did not include the concepts "ageing people living with HIV" or "older people living with HIV" or "people above 50 years living with HIV".

The selected studies were all in English to reduce distortion from translation and costs associated with translation.

According to Peters et al. (2022), the selection of studies is an iterative process that involves more than one reviewer. In this study, three processes and two reviewers were involved in the study selection. In the first process, the first reviewer selected the studies from the three databases using the keywords and selected the articles for inclusion. The second reviewer then reviewed at least 10% of these selected articles

and both reviewers agreed on the selected articles. The second step entailed the first reviewer applying the second inclusion criteria "ageing" older PLWH or PLWH more than 50 years and selecting the studies. Again, the second reviewer reviewed at least 10% of the articles selected by the first reviewer until an agreement was reached on the selected articles. The third and final step was the first reviewer reviewing selected articles again and referring the articles they were not sure of to the second reviewer for the final decision of inclusion. A total of 15 studies were selected for the final analysis.

Step 4: The fourth step in conducting the scoping review of literature was the data extraction (Peters et al., 2022). Peters et al. (2022) explain that the data extraction is guided by the research questions and the research objective. Data extracted should include the year of the studies, objectives, participants' characteristics, country of origin, study method, duration of intervention, details of the outcomes and relevance to the scoping review. To enable consistency in the extraction of data, this study used the Souza (2005) data extraction tool. Charting of the extracted data was done using Microsoft Excel.

Step 5: The fifth step according to Peters et al. (2022) is collating, summarising and presenting study findings. The decision process of selecting the study was first shown using a Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow chart. Davidson (2022) notes that a numeric analysis should be done for the studies selected. In this study the numeric analysis presented; the years of the studies analysed, the geographic location of the studies, study designs, population characteristics and sample sizes. The numeric analysis was done using Microsoft Excel and the findings of the numeric analysis were presented using tables. To extract the emerging themes of the study, a thematic analysis was done.

Step 6: According to Peters et al. (2022) the sixth step is an optional consultation step which entails confirming the results of the scoping review of literature with a sample of the population being studied. This step was not included in the scoping review of literature conducted.

4.2 Findings

To examine risks associated with the development of Type 2 Diabetes among older PLWH, a scoping review of literature was conducted. A numerical analysis of the

findings was done followed by a thematic analysis of the concepts defining risks associated with the development of Type 2 Diabetes.

4.2.1 Results from the numeric analysis

A total of 996 articles were screened using the key words "risks", Type 2 Diabetes and "People living with HIV" from three databases, Cumulative Index of Nursing and Allied Health Literature (CINAHL) (521), PubMed (421) and the Cochrane Library (48). The Mendeley reference manager was then used to remove duplicates and a total of 618 articles were further screened. The removal of duplicates entailed importing citations using database identifiers from the three databases on to the Mendeley reference manager manually. From there, all documents in the reference manager were selected and the function for checking duplicates was selected. The duplicates were highlighted and individually checked before deleting the duplicates from the library. The remaining references were then merged to form the final list in the Mendeley library. The inclusion and exclusion criteria were applied to 618 articles to yield 192 articles. From these 192 articles the second inclusion and exclusion criteria of "ageing" was applied which excluded 169 articles to yield a final selection of 23 studies. Further screening of the 23 articles further excluded eight articles; five that were not original research designs plus three that only described metabolic syndrome to yield a final selection of 15 articles. The decision process is shown in the Preferred reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow chart below.
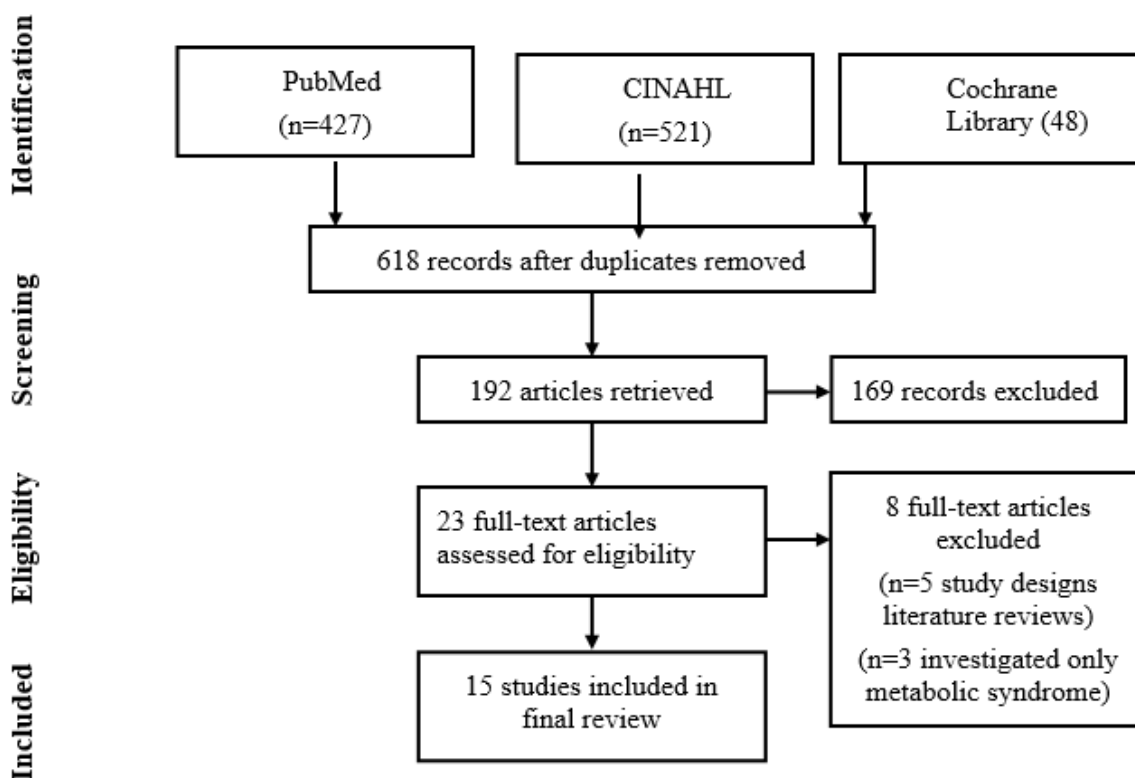
Figure 4:1. PRISMA Flow chart of the decision process, adapted from PRISMA. Source, (Mhlanga & Netangaheni, 2023)

Origins of the studies: From the final selection of the 15 studies, most (20%) studies were from Italy. The Italian studies included; Da Luca et al., (2017); (Guaraldi et al., 2018); (Galli et al., 2012) and the second most studies were from Zimbabwe (13.3%), these were; (Magodoro et al., 2016); (Chimbetete et al., 2017). Two studies were multi-country studies from Italy and Romania (Guaraldi et al., 2019) then another was from the Asia Pacific region (Han et al., 2019). One each study each was selected from the USA (Tiozzo et al., 2021), Canada (Samad et al., 2017), Tanzania (Kagaruki et al., 2018), Rwanda (Biraguma et al., 2019), Brazil (Cassenote et al., 2021), South Africa (Chiwandire et al., 2021, Denmark (Hogh et al., 2022) and UK (Duncan et al., 2018). The table 4.1 below shows the origins of the studies.

Place of Origin	Number of Studies (n=15)	Percentage
Italy	3	20%
Zimbabwe	2	13,30%
Italy and Romania	1	6,67%
Asia Pacific	1	6,67%
United Kingdom	1	6,67%
Denmark	1	6,67%
Tanzania	1	6,67%

Rwanda	1	6,67%
South Africa	1	6,67%
Canada	1	6,67%
USA	1	6,67%
Brazil	1	6,67%
Total	**15**	**100%**

Table 4:1. Origin of the studies; source: (Mhlanga & Netangaheni, 2023)

In summation most studies that mapped the risks were from Italy.

Type of study designs used: Most studies (60%) analysed used a cross-sectional study design. The studies that used a cross-sectional design were (Chimbetete et al., 2017), (Duncan et al., 2018), (Guaraldi et al., 2018), Kagaruki et al., 2018), Biraguma et al., 2019), (Cassenote et al., 2021), (Tiozzo et al., 2021), (Galli et al., 2012) and (Magodoro et al., 2016). Two studies (13.33%) used a secondary data analysis; (Samad et al., 2017); (Chiwandire et al., 2021). One study used a non-intervention cohort design (Høgh et al., 2022). One study also used a regional observational cohort design (Han et al., 2019). One study also used a cohort design (Da Luca et al., 2017) and a match control study was used by Guaraldi et al. (2019). Table 4.2 below shows the study designs used.

Study Design	Number of Studies (n=15)	Percentage
Cross-sectional study	9	60,00%
Secondary data analysis	2	13,33%
Non-intervention cohort study	1	6,67%
Regional observational cohort design	1	6,67%
Cohort study	1	6,67%
Match control study	1	6,67%
Total	**15**	**100%**

Table 4:2: Study designs used; source: (Mhlanga & Netangaheni 2023)

Therefore, from Table 4.2 above it was concluded that studies describing risks associated with Type 2 Diabetes among older PLWH used a cross-sectional study design.

Years studies conducted: The studies analysed were published from 2012 to 2022 with three studies (20%) being taken from 2017. The studies from 2017 were; (Samad et al., 2017), (Chimbetete et al., 2017); (Da Luca et al. 2017). Another three studies were published in 2018 and these were (Duncan et al., 2018), (Guaraldi et al., 2018) and (Kagaruki et al., 2018). Three studies were from 2019 and these were (Biraguma et al, 2019), (Guaraldi et al., 2019); (Han et al., 2019). Three studies were also

retrieved from 2021 and these were; (Cassenote et al., 2021), (Tiozzo et al., 2021); (Chiwandire et al., 2021). One study each was retrieved from 2012, 2016 and 2022 (Galli et al., 2012), (Magodoro et al., 2016); (Høgh et al., 2022). No studies were retrieved from 2013, 2014, 2015 and 2020. Table 4.3 below shows the distribution of studies selected according to the years published.

Year	Number of Studies n=15)	Percentage
2012	1	6,67%
2016	1	6,67%
2017	3	20,00%
2018	3	20,00%
2019	3	20,00%
2021	3	20,00%
2022	1	6,67%
Total	**15**	**100%**

Table 4:3: Distribution of studies according to year of publication; source (Mhlanga & Netangaheni, 2023)

From the table above it was concluded that studies describing risks associated with the development of Type 2 Diabetes among older PLWH were mostly between 2017 and 2021.

Results from the scoping review of literature identified different themes from different contexts which were used to map out the risks of Type 2 Diabetes. The table below shows the study contexts and sample characteristics used to identify these risks.

Authors, Year and Country	Sample Size and characteristics	Study Design	Outcome of Themes
Duncan, Goff and Peters (2018) UK	The first cohort (2005) n=337, median age 41 years. Second cohort (2015) n=338 median age 49 years	Cross-sectional study	-Long duration of HIV infection -Adverse effects of NRTIs and PIs in older PLWH -High BMI in older PLWH -Presence of hypertension predicts Type 2 Diabetes
Cassenote Grangeiro, Escuder, Abe, Santos, and Segurado, (2021) Brazil	6727 adult population more than 18 years from four of five regions in Brazil followed from 2003 to 2016	Multicentre cohort study.	-Long duration of HIV infection -Adverse effects of NRTIs and PIs in older PLWH
Da Luca, Lorenzini, Castagna, Puoti, Gianotti, Castelli, Mastroianni, Maggiolo, Antinori, Guaraldi and Lichtner, (2017) Italy	6505 respondents had been enrolled in the ICONA prospective study and followed up till September 2014.	Prospective cohort study	-High BMI in older PLWH

Chimbetete, Mugglin, Shamu, Kalesan, Bertisch, Egger, and Keiser (2017) Zimbabwe	4110 Participants from Newlands Clinic in Harare followed from 1 March 2004 to 29 April 2015	Longitudinal study	-High BMI in older PLWH
Høgh, Hove-Skovsgaard, Gelpi, Jensen, Gerstoft, Benfield, Storgaard and Nielsen (2022) Denmark	N=643. PLWH from 18 years residing in Greater Copenhagen. Data collected form March 2015 to April 2017 then follow up from April 2017 to April 2019.	Non-interventional cohort study	-Long duration of HIV infection -Long duration of HIV infection and low CD4 cell nadir -Use of older generation ART -High BMI in older PLWH
Tiozzo, Rodriguez, Konefal, Farkas, Maher and Lewis (2021) USA	N=82. PLWH mean age 48 years from the Adult HIV Clinic at the University of Miami (UM) Miller School of Medicine/Jackson Health Care System and other Miami-Dade County clinics	Analytical cross-sectional study	-Long duration of HIV infection
Magodoro, Esterhuizen and Chivese. (2016) Zimbabwe	N=1033. Median age of PLWH 42 years from Mpilo central hospital	Cross-sectional study design	-Long duration of HIV infection
Kagaruki, Mayige, Ngadaya, Kilale, Kahwa, Shao, Kimaro, Manga, Mbata, Materu, and Masumo, (2018) Tanzania	N=671. PLWH 18 years and older from Mbeya (rural) and Dar es Salam (urban)	Cross-sectional study	-Lack of knowledge of modifiable risk factors
Biraguma, Mutimura and Frantz., (2019) Rwanda	N=794. Mean age of PLWH 37.5 years from Northern, Southern Provinces and Kigali City	Cross-sectional study	-Lack of knowledge of modifiable risk factors
Chiwandire Zungu, Mabaso and Chasela., (2021) South Africa	2005 n=978; 2008 n=1023; 2017 n=2483 PLWH from the Southern African National HIV Prevalence Incidence Behaviour Communication Surveys in 2005, 2008 and 2017 aged more than 25 years.	Secondary data analysis	-Presence of hypertension predicts Type 2 Diabetes
Samad, Harris, Puskas, Ye, Chia, Chacko, Bondy, Lima, Montaner, Guillemi (2017) Canada	N=1065. Follow-up for a median of 13 years for PLWH older than 50 years from St Paul's	Secondary data analysis	-Long duration of HIV infection -Long duration of HIV infection and low CD4 cell nadir

	Hospital Vancouver British Columbia		-Use of older generation ART -Adverse effects of NRTIs and PIs in older PLWH
Guaraldi, Malagoli, Milic, Pintassilgo, Rossi, Riva, Franconi, Santoro, Sorin, Streinu-Cercel and De Rosa (2019) Italy	N=131 (young); n=32 (old); n=77 (geriatric). PLWH for more than 25 years from Modena HIV Metabolic Clinic and young participants were from Romanian HIV Clinic	Match control study	-Long duration of HIV infection -Use of older generation ART
Han, Jiamsakul Kiertiburanakul, Ng, Sim, Sun, Van Nguyen, Choi, Lee, Wong, Kamarulzaman (2019) Asia Pacific Region	N=1927. PLWH median age 35 years from TREAT Asia HIV observational database. 20 sites followed from 2003 to 2017	Regional observational cohort design	-Adverse effects of NRTIs and PIs in older PLWH

Table 4:4: Studies reviewed in the scoping review of literature, source:(Mhlanga & Netangaheni, 2023)

From the above fifteen studies, thematic content analysis was conducted, and five risks were identified that predispose older PLWH to Type 2 Diabetes. These risks included; (1) long duration of HIV infection, (1.1) long duration of HIV infection and a low CD4 nadir, (2) Use of older generation ART, (2.1) adverse effects of ART in older PLWH, (3) presence of hypertension, (4) a high BMI among older PLWH and (5) older PLWH lack of knowledge on modifiable risks of Type 2 Diabetes.

4.3 Emerging themes

Five themes emerged describing the excess risks associated with the development of Type 2 Diabetes among older PLWH. These themes were; the long duration of HIV infection, use of older generation ART, presence of hypertension, a high body mass index in older PLWH, and lack of knowledge on modifiable risk factors.

4.3.1 Theme 1: Long Duration of HIV infection.
A long duration of HIV infection was associated with the development of Type 2 Diabetes among older PLWH. This finding was drawn from conclusions made from seven of the fifteen studies identified in the scoping review of literature Duncan et al. (2018); Guaraldi et al. (2018); Magodoro et al. (2016); Guaraldi et al. (2019); Galli et

al. (2012), Høgh et al. (2022); Samad et al. (2017), Tiozzo et al. (2021) and Cassenote et al. (2021).

Findings by Duncan et al. (2018) from a study that collected data from a 2005 cohort and an older 2015 cohort found a higher prevalence of Type 2 Diabetes among the older 2015 cohort. The authors noted "*a longer duration of HIV infection*" was attributed to Type 2 Diabetes in the older 2015 cohort. Similarly, Guaraldi et al. (2019) collected data from three control groups with an HIV duration of 25 years, (1) a group who acquired HIV prenatally, (2) a group who acquired HIV after 25 years of age and (3) group who acquired HIV after 50 years of age. The authors Guaraldi et al. (2019) concluded that a longer HIV duration in people who acquired HIV after the age of 50 years is associated with Type 2 Diabetes

A long duration of HIV infection has been described as the single most critical risk to the development of Type 2 Diabetes among older PLWH (Noubissi et al., 2018). The authors Noubissi et al. (2018) however caution that individual risk contribution to the development of Type 2 Diabetes has not been quantified. Maseko and Masuku (2017) report that there was no association between HIV infection and the development of Type 2 Diabetes between the years 2000 and 2003 and reports began emerging of an increase in PLWH developing Type 2 Diabetes from 2007. In their study, Guaraldi et al. (2019) concluded that a longer duration of HIV infection of more than 25 years increased the likelihood of Type 2 Diabetes. From their findings, Guaraldi et al. (2019) concluded that HIV acquisition between the ages of 50-55 years coupled with a longer duration of more than 25 years increased the likelihood of Type 2 Diabetes. Remarkably, Guaraldi et al. (2019) explain that the acquisition of HIV infection after the age of 50 years is most likely to increase as a result of changing perceptions of sexual risk among older men.

To develop guidelines for the reduction of Type 2 Diabetes among older PLWH, it is imperative to understand how this long duration of HIV infection in older PLWH is associated with developing Type 2 Diabetes. Duncan et al. (2018) in their study in the United Kingdom also concluded that a long duration of HIV infection is associated with the development of Type 2 Diabetes in older PLWH and explain that ageing itself in PLWH who have a long duration of HIV infection predisposes to the development of Type 2 Diabetes among older PLWH.

The risk posed by a long duration of HIV infection is further reiterated by Samad et al. (2017) who conducted a study on the incidence and risks of Type 2 Diabetes with a sample of PLWH aged more than 50 years. Samad et al. (2017) concluded that chronic inflammation as a result of HIV infection among PLWH who have a long duration of HIV infection predisposes to Type 2 Diabetes. Seconding that chronic inflammation predisposes to Type 2 Diabetes in PLWH, Maseko and Masuku (2017) in a narrative review of literature explain that chronic HIV infection causes Type 2 Diabetes through an inflammatory response. Maseko and Masuku (2017) further note that PLWH who develop Type 2 Diabetes have high inflammatory markers of interleukin 6 (IL6) and sensitivity C reaction protein (hsCRP). Despite Type 2 Diabetes being caused by chronic inflammation due to HIV infection in older PLWH, Sauce et al. (2021) in a study that described the additional effect of HIV on chronic inflammation in older people more than 75 years compared older PLWH and older people without HIV. Sauce et al. (2021) used a sample with mean duration of HIV infection of 18.9 years, and the authors acknowledge that chronic inflammation leads to the development of Type 2 Diabetes. Findings from this study also concluded that HIV has no additional effect on chronic inflammation in older PLWH and the chronic inflammation is due to ageing (Sauce et al., 2021). These findings by Sauce et al. (2021) substantiate Duncan, et al. (2018) explanation that aging among older PLWH leads to the Development of Type 2 Diabetes.

Subtheme 1.1 Long duration of HIV infection and a low CD4 nadir

A subtheme to emerge was that a long duration of HIV infection and a low CD4 cell nadir is associated with the development of Type 2 Diabetes. This subtheme emerged from findings made by Høgh et al. (2022), Samad et al. (2017) and Galli et al. (2012)

Høgh et al. (2022) found an increase in incident Type 2 Diabetes among older PLWH with every five-year increment in age and further explain that a long duration of HIV infection combined with a lower CD4 cell nadir of less than 200 cell/ μL is associated with the development of Type 2 Diabetes. A similar conclusion on the long duration of HIV infection with a lower CD4 cell nadir and development of Type 2 Diabetes among older PLWH was also drawn by Spagnuolo et al. (2017). Similarly, Samad et al. (2017) adds that a lower CD4 cell nadir of less than 80cells/mm^3 is associated with Type 2 Diabetes among older PLWH with a long duration of HIV infection.

4.3.2 Theme 2. Use of Older Generation of Antiretroviral Therapy

This risk was identified from studies conducted by Samad et al. (2017), Høgh et al. (2022) and Guaraldi et al. (2019).

Older generation ART has been associated with the development of Type 2 Diabetes due to lipodystrophy among PLWH (Høgh et al., 2022). The study conducted by Samad et al. (2017) explicitly illustrates the years when older generation ART caused Type 2 Diabetes, concluding that incident Type 2 Diabetes was higher among older PLWH who used ART between 1997 and 2004. Notably, the recollection by Shepard (2022) on the breakthrough in ART described in Chapter 1 section 1, comes a year before (1996) the ART increased the risk of development of Type 2 Diabetes as concluded by Samad et al. (2017). The authors Samad et al. (2017) further explain that between 1997 and 2004 the older generation of ART associated with the development of ART included exposure to Zidovudine, Stavudine, Indinavir, Didanosine, Lopinavir and Nelfinavir. Høgh et al. (2022) also attribute the effects of older generation ART to the development of Type 2 Diabetes and like Samad et al. (2017) list Didanosine, Stavudine and Zidovudine -the thymidine analogues as the cause of Type 2 Diabetes in older PLWH.

Høgh et al. (2022) further explain that the lipodystrophy caused by older-generation ART resulted in a long-term shift of body fat from subcutaneous body fat to visceral body fat. Similarly, Samad et al. (2017) explain that older-generation ART was associated with the accumulation of visceral fat with concurrent peripheral fat accumulation. Sakar and Brown (2021) reiterate the issue of older-generation ART predisposing older PLWH to Type 2 Diabetes. Sarkar and Brown (2021) like Shepard (2022) explain that ART has evolved and the effects of older generation ART are substantially different from the effects of current ART. Older-generation ART especially the use of Stavudine was associated with an increase in visceral fat leading to Type 2 Diabetes even after the withdrawal of the drug (Sakar & Brown, 2021).

Subtheme 2.1 Adverse effects of ART in older PLWH predicts the development of Type 2 Diabetes

A subtheme to emerge from the theme use of older generation ART was the adverse effects of NRTI and PI in older PLWH. This subtheme was concluded from studies

conducted by Samad et al. (2021); Cassenote et al. (2020); Duncan et al. (2018); Han et al. (2019). Cassenote et al. (2020) from a conclusion drawn in their Brazilian study found that the use of some NRTI in older PLWH is associated with Type 2 Diabetes. Likewise, in their study, in the UK, Duncan et al. (2018) associated the use of NRTIs and PI with the development of Type 2 Diabetes in older PLWH.

The risk posed by adverse effects of two classes of ART is described in the study conducted by Samad et al. (2017) who explain that older generation PIs are the cause of Type 2 Diabetes among older PLWH. Samad et al. (2017) list exposure to specific PIs which are Nelfinavir, Lopinavir, Indinavir and Nelfinavir. Kumar and Samaras (2018) explain how the adverse effects of PI and NRTIs result in lipodystrophy by illustrating that PI and NRTI act by inhibiting DNA polymerase-γ resulting in a reduction of adipocyte mitochondrial DNA and subsequent mitochondrial toxicity. In turn, the reduced number of active adipocytes increases free fatty acids which are taken up and selectively deposited around visceral tissue or around the abdomen which characterises lipodystrophy leading to Type 2 Diabetes (Kumar & Samaras, 2018). Considering these adverse effects of some ART classes on older PLWH, Kumar and Samaras (2018) recommend the use of second-generation ART which has less risk in the development of lipodystrophy.

4.3.3 Theme 3. High BMI in older PLWH

A high BMI in PLWH was also attributed to the development of Type 2 Diabetes from studies conducted by; Duncan et al. (2018); Samad et al. (2017); Chimbetete et al. (2017); Guaraldi et al. (2018); Da Luca (2017); Høgh et al. (2022).

According to Duncan et al. (2018), their second cohort from 2015 was heavier with a higher BMI than the first 2005 cohort were more likely to develop Type 2 Diabetes. In conclusion, Duncan et al. (2018) noted that a high BMI above 27.4kg/m^2 increased likelihood of Type 2 Diabetes in older PWLH. According to Chimbetete et al. (2017), a high BMI above 30kg/m^2 is associated with the development of Type 2 Diabetes among PLWH above the age of 40 years. Similarly, Høgh et al. (2022) describe a high BMI also above 30 kg/m^2 as a risk of Type 2 Diabetes among older PLWH.

To develop guidelines for the reduction of Type 2 Diabetes, the causes of a high BMI in older PLWH also need understanding. Notably so, as a high BMI has also been described as a traditional risk of developing Type 2 Diabetes among the general

population (WHO, 2020); (Høgh et al. 2022). However, concerning older PLWH, Sakar and Brown, (2021) explain that particular populations are associated with a high BMI due to use of Integrase Inhibitors, these include older PLWH, African Americans and women.

The first cause of a high BMI according to Duncan et al. (2018); Sakar and Brown (2021) is weight gain after ART initiation. Kumar and Samaras (2018) explain further the issue of weight gain following ART initiation by noting that the weight gain typically occurs within 1-2 years after ART initiation and reaches a plateau after the two years. However, concern about weight gain after ART initiation should be raised when the BMI increases by more than 3% annually after ART initiation (Kumar & Samaras, 2018). Discussing the issue of weight gain on ART initiation, among older PLWH, Duncan et al. (2018) notes that weight gain on ART initiation is a modifiable risk of developing Type 2 Diabetes and contributes significantly to developing Type 2 Diabetes than fixed risks such as age. Kumar and Samaras (2018) caution that before initiating interventions to reduce weight among older PLWH, baseline BMI should be measured for comparison. To modify this weight gain at ART initiation, Duncan et al. (2018) recommend dietary modification on ART initiation.

A second cause of a high BMI among older PLWH according to Sakar and Brown (2021) is the effect of older generation ART, especially the long-term effects of Stavudine. Substantiating this assertion by Sakar and Brown (2021), in a study that explored obesity and weight gain in PLWH, Bailin, Gabriel, Wanjalla and Koethe (2020) reveal that the use of older generation thymidine analogues was associated with central adiposity and increased BMI with such fat redistribution persisting even after the change in treatment. Kumar and Samaras (2018) also reiterate the issue of first-generation NRTIs and PIs like Stavudine and Zidovudine, and note such ART is no longer recommended for use due to increase in BMI and associated lipodystrophy.

4.3.4 Theme 4. Presence of Hypertension
Studies conducted by Chiwandire et al. (2021); Duncan et al. (2018); Guaraldi et al., (2019) described the issue of hypertension as a predictor of Type 2 Diabetes in older PLWH. Findings from the study conducted in South Africa from data collected in 2005, 2008 and 2017 also found the presence of hypertension among older PWLH as a constant predictor of Type 2 Diabetes (Chiwandire et al., 2021). Similarly, Guaraldi et

al. (2019) in their match control study also concluded that acquisition of HIV after 50 years was associated with developing both Type 2 Diabetes and Hypertension.

According to Chiwandire et al. (2021), the risk of developing Type 2 Diabetes and Hypertension in PLWH increased with age above 45 years. However, Hypertension is a modifiable risk factor for the development of Type 2 Diabetes (Duncan et al., 2018)

Masenga et al. (2020) explain that Hypertension and Type 2 Diabetes share common pathways in their development among older PLWH. The development of both Type 2 Diabetes and Hypertension is associated with chronic inflammation (Masenga et al., 2020). Maseka and Masuku (2017) agree with Masenga et al. (2020) by revealing that chronic inflammation as a cause for the development of hypertension in older PLWH. Indicators of chronic inflammation in older PLWH who develop Hypertension include; elevated eosinophils, interleukin 6, interleukin 5, interleukin 17, tumour necrosis factor-alpha, intercellular adhesion molecule 1 and macrophage inflammatory protein 1 alpha (Masenga et al., 2020). Another cause for the chronic inflammation in older PLWH leading to both Type 2 Diabetes and Hypertension is age associated chronic inflammation (Masenga et al., 2020). As such due to the chronic inflammation associated with Hypertension, Type 2 Diabetes and ageing, 96% of older PLWH who develop Type 2 Diabetes also develop Hypertension (Masenga et al., 2020).

In this regard, the researcher opines that an understanding of how chronic inflammation leads to the development of both Type 2 Diabetes and Hypertension can enable the reduction of Type 2 Diabetes.

4.3.5 Theme 5. Lack of knowledge of modifiable risk factors
The issue of lack of knowledge on Type 2 Diabetes was drawn from evidence by Biraguma et al. (2019); Kagaruki et al. (2018).

The study conducted by Biraguma et al. (2019) in Rwanda concluded that older PLWH residing in the Southern and Northern provinces which are rural areas and Kigali City an urban area did not know about modifiable risk factors for Type 2 Diabetes like physical inactivity and an unbalanced diet.In their study that assessed levels of knowledge of NCD disease risk among PLWH in Rwanda, Biraguma et al. (2019) concluded that 74.3% of older PLWH more than 50 years had poor knowledge about NCDs such as Type 2 Diabetes. The authors Biraguma et al. (2019) discuss that older PLWH did not report they had no information regarding NCDs, however, the health

education they received focussed mainly on infectious diseases such as HIV. Biraguma et al. (2019) also concluded that older PLWH who had hypertension had more knowledge about NCDs.

Similarly, the study by Kigaruki et al. (2018) in Tanzania found that 42.4% of older PLWH from rural Mbeya and urban Da-res Salam had low levels of knowledge of modifiable risk factors for developing Type 2 Diabetes. The study sought to assess the knowledge levels and perceptions of PLWH to risks of Hypertension and Type 2 Diabetes (Kigaruki et al., 2018). The authors Kagaruki et al. (2018) concluded that age above 40 years was associated with low knowledge levels of Type 2 Diabetes, particularly the risks for Type 2 Diabetes and the lifestyle modifications to reduce Type 2 Diabetes.

According to Kagaruki et al. (2018), the low levels of knowledge among older PLWH are attributed to several reasons, which include low educational attainment, rurality, never having a blood glucose test in their life and negative perception about risk reduction measures for Type 2 Diabetes. Regarding perceptions towards knowledge of maintaining a healthy lifestyle, Kagaruki et al. (2018) present an interesting African perspective. The authors argue that older PLWH perceive the knowledge of lifestyle modification to reduce weight negatively as it is associated with HIV-related stigma. Such that measures to increase weight are seen as a means of HIV stigma avoidance (Kagaruki et al., 2018).

In the United Kingdom, older PLWH also repeated the same issue of obesity being desirable as described by respondents in Tanzania from the study conducted by (Kigaruki et al. 2018), Duncan et al. (2020) found that participants for a weight reduction intervention failed to fully comply as being overweight was "culturally desirable". Biraguma et al. (2019) also explains that low knowledge levels on Type 2 Diabetes risks were associated with low educational attainment, being hypertensive and having a low CD4 cell count (below 350 cells/mm^3). The issue of lack of knowledge on modifiable risks for Type 2 Diabetes among older PLWH is also illumined in a study conducted by Kileel, Dickins, Zheng, Fitch, and Looby (2022) in the USA with a sample whose median age was 54 years. The study by Kileel et al. (2022) found that older PLWH who had low levels of educational attainment had low knowledge levels

regarding the intake of high sugar amounts. Kileel et al. (2022) recommended culturally sensitive health education, that explains the linkage between the intake of sugar to obesity and subsequent Type 2 Diabetes.

Summary of themes.

The table 4.5 below summarises the main themes emerging from the scoping review of literature

Theme	Subtheme	Studies supporting the theme
Theme 1: long duration of HIV infection		Duncan et al. (2018); Guaraldi et al. (2018); Magodoro et al. (2016); Guaraldi et al. (2019); Galli et al. (2012), Høgh et al. (2022); Samad et al. (2017), Tiozzo et al. (2021) Cassenote et al. (2021).
	Subtheme 1.1: long duration of HIV infection and a low CD4 cell nadir	Høgh et al. (2022) Samad et al. (2017) Galli et al. (2012)
Theme 2: use of older generation ART		Samad et al. (2017), Høgh et al. (2022) Guaraldi et al. (2019)
	Subtheme 2.1: Adverse effects of ART on older PLWH	Cassenote et al. (2020:1); Duncan et al. (2018) and Han et al. (2019)
Theme 3: high body mass index		Duncan et al. (2018); Samad et al. (2017), Chimbetete et al. (2017); Guaraldi et al. (2018), Da Luca (2017) Høgh et al. (2022)
Theme 4: Presence of hypertension		Chiwandire et al. (202) Duncan et al. (2018) Guaraldi et al., (2019)
Theme 5: lack of knowledge of modifiable risk factors		Biraguma et al. (2019) Kagaruki et al. (2018)

Table 4:5: Summary of findings from the scoping review of literature

From the findings of the scoping review of literature it was concluded that five risks are associated with the development of Type 2 Diabetes among older PLWH.

4.4 Discussion of the scoping review of literature

From the scoping review of literature conducted, five main themes emerged associated with the development of Type 2 Diabetes among older PLWH. These themes were; long duration of HIV infection is associated with Type 2 Diabetes in older PLWH. The first theme had a subtheme long duration of HIV infection and a low CD4

nadir associated with Type 2 Diabetes in older PLWH. The second theme was the long duration of HIV infection and a low CD4 nadir is associated with Type 2 Diabetes in older PLWH. This second theme had a subtheme which was the adverse effects of ART in older PLWH. The third theme was high body mass index while the fourth theme was the presence of hypertension predicts the likelihood of developing Type 2 Diabetes. The last theme to emerge from the scoping review of literature was a lack of knowledge on modifiable risk factors among older PLWH predisposes to Type 2 Diabetes. In light of these findings, Peters et al. (2022) explain that when a scoping review of literature is conducted, the population, context and concepts are key in answering the research question. Similarly, this discussion of the findings of the scoping review of literature is guided by the context, population and concepts that characterise the risks for the development of Type 2 Diabetes

The studies describing the long duration of HIV infection among older PLWH were from various population groups in Europe, Africa as well as North and South America. In Europe, studies in Italy included three studies conducted by Guaraldi et al. (2018) and Guaraldi et al. (2019) and Galli et al. (2012) describe the long duration of HIV infection as a risk for Type 2 Diabetes. Noteworthy, the study by Galli et al. (2012) describes the risk posed by a long duration of HIV infection as early as 2012. This description by Galli et al. (2012) affirms the recollection by Maseko and Masuku (2017) who note that the first reports of an association between the development of Type 2 Diabetes and the long duration of HIV infection were in 2007. Through to 2022, the study by Høgh et al. (2022) in Denmark continues to describe the long duration of HIV infection as a risk to the development of Type 2 Diabetes.

In Southern Africa, where HIV prevalence is highest, according to estimates by UNAIDS (2022) risks posed by HIV infection and ART usage confound the problem of increasing prevalence of Type 2 Diabetes among PLWH due to a long duration of HIV infection. The study by Magodoro et al. (2016) in Zimbabwe also reiterates the long duration of HIV infection as a risk for Type 2 Diabetes. The finding of long-duration HIV infection predisposing PLWH to Type 2 Diabetes by Magodoro et al. (2016) could be significant to public health as it illustrates the growing burden of Type 2 Diabetes in a population with already a high burden of HIV. Smit et al. (2018) in their study in Zimbabwe predict an increase in the age of PLWH from 31 years in 2018 to 45 years in 2035, in cognisance of this prediction, health of PLWH is improving and their

average lifespan is increasing, and as a result, owing to their susceptibility to acquiring Type 2 Diabetes, there is an increased chance that the numbers of PLWH who are also living with co-morbidities such as Type 2 Diabetes will increase. This opinion is partly founded on the Smit et al. (2018) prediction that the co-morbidities will double among PLWH in Zimbabwe by 2035.

Noteworthy, in their description of the concept of a long duration of HIV infection predisposing to Type 2 Diabetes, the analysed studies from the scoping review of literature described different durations of what defines a long duration of HIV infection. The study in Brazil by Cassenote et al. (2021), concluded the average period to the development of Type 2 Diabetes was 10.8 years among PLWH. An almost similar duration of 9 years to the development of Type 2 Diabetes among PLWH was found in the Canadian study by Samad et al. (2017). In Italy, Guaraldi et al. (2018) described the longest duration (25 years) to the development of Type 2 Diabetes among older PLWH. The shortest duration to the development of Type 2 Diabetes (7 years) was described in Zimbabwe (Magodoro et al., 2016). Given these varying durations of what defines a long duration of HIV infection, there could be a need for additional research to ascertain how long HIV infection begins to pose a risk to the development of Type 2 Diabetes (Noubissi et al., 2018)

United States Preventative Taskforce, (2019) notes that the effectiveness of ART in the managing of HIV infection has contributed to the longevity of PLWH. Although the use of ART has decreased mortality, the adverse effects of ART have predisposed PLWH to the development of Type 2 Diabetes. The concept of adverse effects of ART emerged as the second theme to emerge from the scoping review of literature. The issue of adverse effects of ART and the associated development of Type 2 Diabetes was described drawn from different times; Samad et al. (2016), Guaraldi et al. (2018) and Høgh et al. (2022). The consistency of the finding that Type 2 Diabetes was associated with adverse effects of ART (especially older generation ART) was reported using different study designs. Guaraldi et al. (2018) applied a match control design, while, Samad et al. (2016) used secondary data analysis and the study by Høgh et al. (2022) used a non-intervention cohort design. Noteworthy, the risk posed by older generation ART to the development of Type 2 Diabetes among older PLWH was described only from studies from Europe and North America. Two studies Samad et al., (2016) and Høgh et al. (2022) list the particular use of Stavudine; in older

generation ART with the associated development of Type 2 Diabetes. The period when older generation ART predisposed to Type 2 Diabetes was explicitly outlined by Samad et al. (2016) who noted that ART use between 1997 and 2004 was associated with Type 2 Diabetes development in their Canadian study. Reflecting on this finding (the use of older generation ART predisposes to Type 2 Diabetes) and the observation that studies were from Europe and North America, noteworthy the study by Ford et al. (2011) outlines that the inequitable distribution of health resources at a global scale resulted in ART not being available at the same times between developed countries and developing countries like Zimbabwe. Ford et al. (2011) note that triple combination therapy ART only became available in developed countries after 2001, when India began manufacturing ARVs at a cost lower than one United States Dollar ($1) supplying 80% of all ART used in developing countries at the time. Given the observation that studies describing adverse effects of older generation ART were from developed countries and the historical background of inequity in ART distribution there is need for further studies in Africa to ascertain causality of older generation ART on development of Type 2 Diabetes.

The risk posed by a high BMI in the development of Type 2 Diabetes among older PLWH was described in studies from Europe (Duncan et al., 2018); (Guaraldi et al., 2018) and Africa (Chimbetete et al., 2017). Furthermore, different study designs used in the studies confirmed the risk of a high BMI as a risk to the development of Type 2 Diabetes. Two of the studies used a cross-sectional study design, Chimbetete et al. (2017); Duncan et al. (2018) and one study Guaraldi et al. (2018) used a match control study design. The outcome of a high BMI being a risk to the development of Type 2 Diabetes is consistent with findings by Masenga et al. (2020) who found that a high BMI is a risk for the development of Type 2 Diabetes even in the general population. However, among older PLWH Kumar and Samaras (2018) add that use of ART results in the redistribution of body fat and weight gain resulting in Type 2 Diabetes. Although it was concluded that a high BMI in older PLWH is associated with the development of Type 2 Diabetes in older PLWH, Samad et al. (2016) found that Type 2 Diabetes does occur among PLWH who have a normal BMI. This assertion by Samad et al. (2016) is clinically significant as it may be indicative of the influence of other risk factors such as the long duration of HIV infection in the development of Type 2 Diabetes among older PLWH.

The presence of hypertension among older PLWH also predicted the development of Type 2 Diabetes. Studies by Duncan et al. (2018) from the United Kingdom, Guaraldi et al. (2018) in Italy and Chiwandire et al. (2021) from South Africa described hypertension as a predictor of Type Diabetes among older PLWH. Noteworthy, varying study designs illustrated the risk posed by the presence of hypertension in the development of Type 2 Diabetes. The study by Chiwandire et al. (2021) used a secondary data analysis method. The association of developing Type 2 Diabetes and the presence of hypertension from the South African study is significant as it implies, that the lack of control of hypertension in PLWH could result in multimorbidity of Type 2 Diabetes, Hypertension and HIV infection.

The lack of knowledge of modifiable risk factors was also associated with the development of Type 2 Diabetes among older PLWH. Two studies from Africa Kagaruki et al. (2018); Biraguma et al. (2019) described the risk posed by a lack of knowledge on modifiable risk factors for the development of Type 2 Diabetes. In these two studies, Kagaruki et al. (2018); Biraguma et al. (2019) used cross-sectional study designs. The lack of presentation from other contexts except for Africa by this theme illustrates a need for additional studies outside the African context. Despite this lack of representation from other contexts, the Canadian study by Samad et al, (2017) recommended health education on modifiable risk factors as a measure to reduce Type 2 Diabetes among older PLWH. This recommendation by Samad et al. (2017) could affirm the findings by Biraguma et al. (2019); Kagaruki et al. (2018) of a lack of knowledge on modifiable risk factors for the development of Type 2 Diabetes.

The studies reviewed described different risks concurrently leading to the development of Type 2 Diabetes, for example, Samad et al. (2016), found that a long duration of ART is associated with Type 2 Diabetes which also implies a long duration of HIV infection. Likewise, Høgh et al. (2022) discuss the adverse effects of older-generation thymidine analogues simultaneously with the long duration of HIV infection as a predisposing factor to the development of Type 2 Diabetes among older PLWH. Such co-occurrence of several risk factors to the development of Type 2 Diabetes is not unique to older PLWH and is also described by the study by Masenga et al. (2020) highlighting the risk factors associated with the developing Type 2 Diabetes in the general population are multiple and occur concurrently. This implies the need for

healthcare workers to holistically assess multiple risks in one patient to identify older PLWH at risk of Type 2 Diabetes.

4.5 Summary of Chapter 4

Chapter 4 was the scoping review of literature which identified the excess risks of developing Type 2 Diabetes among older PLWH. The chapter outlined the six steps used for the scoping review of literature. These steps included identifying the research question, identifying studies, selecting studies, data extraction and lastly data collation, summarising and presenting findings. Chapter 4 also presented the results, from these results, 15 studies were reviewed from 2012 to 2022. These studies used different study designs which included cross-sectional study designs, match-control study designs, longitudinal study designs and secondary data analysis.

The risks identified through the scoping review of the literature found five main risks which were; long duration of HIV and or a long duration of HIV with a low CD4 cell nadir; use of older generation ART and or adverse effects of ART among older PLWH, high BMI among older PLWH, lack of knowledge among older PLWH and presence of Hypertension.

The discussion from the scoping review of literature noted that the definition of long duration of HIV infection varied from different literature sources reviewed for instance Magodoro et al. (2016) in their study defined a long duration as more than 7 years whilst in Italy Guaraldi et al. (2018) described that long duration of HIV infection was 25 years. Furthermore, it was also discussed that the risk posed by use of older generation ART was concluded from studies in developed countries who accessed ART before developing countries, similar conclusions were not made from studies in African countries. This difference in time to exposure to older generation ART warrants further studies especially in developing countries. The next chapter is Chapter 5 presents the findings of the study.

CHAPTER 5

FINDINGS AND DISCUSSION

Chapter 3 described the methodology used to conduct the study and Chapter 4 presented the scoping review of literature conducted which addressed the first research objective of describing the excess risks associated with Type 2 Diabetes among older PLWH. This chapter builds on the qualitative study design presented in Chapter 3 by outlining the findings from the exploratory descriptive study and further discussing these findings.

Two data collection phases were used. The first phase data collection was from older PLWH and the second phase data were collected from nurses providing care to older PLWH. This section presents findings from the analysis of both phases of the data collection.

5.1. Findings from the older PLWH

Data collection for phase 1 of the exploratory descriptive study was conducted among older PLWH. This section presents findings from the older PLWH

5.1.1 Demographic variables of the older PLWH

A total of 23 participants from five clinics in Harare Urban District provided the data for phase 1 of the exploratory descriptive study. Six participants were from Mufakose Polyclinic, six were from Budiriro polyclinic, four were from Kambuzuma Polyclinic, four were from Glenview Polyclinic and three were from Glenview Satellite clinic. The participants pseudonyms also denoted the location of the clinics they were from. Such that; Muf denoted Mufakose Polyclinic, GV denoted Glenview Polyclinic, GV Sat denoted Glenview Satellite Clinic, Kam denoted Kambuzuma and Bud denoted Budiriro Polyclinic. All participants were black Africans.

The ages of the participants ranged from 51 to 78 years with a mean age of 62 years. The modal age of the participants was 53 years. Most participants (52%) were female while 48% were male. Regarding marital status, most participants (52%) were married, 30% were widowed, 13% stated they were divorced and one participant (4%) was cohabiting. Most of the participants (87%) identified their religion as Christian, one participant (4%) stated they practised a traditional African belief system and two participants (9%) stated that they did not identify with any particular religion. All participants highlighted that they started ART the year they tested positive for HIV, as

such the duration of HIV infection was similar to the duration of ART. This duration of ART/HIV infection ranged from 4 years to 23 years with a mean duration of 11.3 years and a modal duration of 6 years. Most participants (70%) reported that they did not have any other chronic illness, while 26% noted they had hypertension and one participant (4%) revealed they had hypertension and arthritis. The participants also stated their occupations, with the majority (30%) stating they were retired, 9% of the participants did not specify any occupation, another 9% stated they were farmers and 17% of the older PLWH noted they were self-employed. Other occupations listed by each of the older PLWH were burial society coordinator (4%), homemaker (4%), buying and selling wares (4%), driver (4%), IT officer (4%), piece jobs in farming (4%), clothing vendor (4%) and office orderly (4%). Table 5.1 below shows the sample demographic variables of older PLWH.

Participant Pseudonym	Age	Gender	Marital status	Religion	Occupation	Duration HIV/ ART	Other chronic illness
Participant 1 GV	53	Male	Widowed	Christian	Self-employed	4	Hypertension
Participant 2 GV	62	Male	Married	African beliefs	Non-specified	12	Nil
Participant 3 GV	53	Male	Married	Christian	IT officer	16	Nil
Participant 4 Muf	56	Male	Divorced	Christian	Piece jobs in farming	9	Nil
Participant 5 Muf	52	Female	Cohabiting	Christian	Buying and selling	6	Nil
Participant 6 Muf	66	Female	Married	Christian	Farmer	6	Nil
Participant 7 Muf	64	Male	Married	Christian	Non specified	12	Nil
Participant 8 Muf	78	Female	Widowed	Christian	Retired	23	Hypertension & arthritis
Participant 9 Muf	54	Female	Married	Christian	Self-employed	12	Hypertension
Participant 10 GV Sat	72	Male	Married	Non specified	Retired	17	Nil
Participant 11 GV Sat	63	Male	Married	Christian	Burial society coordinator	14	Nil
Participant 12 GV Sat	51	Male	Married	Christian	Self-employed	9	Nil
Participant 13 GV Sat	53	Female	Widowed	Christian	Self-employed	6	Nil
Participant 14 Bud	67	Female	Widowed	Christian	Clothing vendor	11	Nil
Participant 15 Bud	64	Female	Widowed	Christian	Retired	19	Nil

Participant 16 Bud	69	Male	Married	Christian	Retired	11	Hypertension
Participant 17 Bud	72	Male	Married	Christian	Retired & farming	21	Nil
Participant 18 Bud	69	Female	Married	Christian	Retired	15	Hypertension
Participant 19 Bud	70	Male	Divorced	Christian	Retired	12	Nil
Participant 20 Kam	56	Female	Divorced	Christian	Office orderly	4	Hypertension
Participant 21 Kam	67	Female	Widowed	Christian	Farmer	7	Nil
Participant 22 Kam	54	Female	Married	Christian	Homemaker	6	Nil
Participant 23 Kam	61	Male	Widowed	Non specified	Driver	8	Nil

Table 5.1: Sample demographics, older PLWH

From the table it can be seen that the sample of older PLWH engaged in various occupations. In addition, the sample also shows that older PLWH had lived with HIV infection for more than seven years which was identified as a risk for the development of Type 2 Diabetes. In addition, the sample also included older PLWH who had hypertension as a co-morbidity which was also described as a predictor of Type 2 Diabetes among older PLWH.

5.1.2 Emerging themes older PLWH

The interviews with older PLWH sought to describe self-care practices for older PLWH for the reduction of Type 2 Diabetes and challenges that older PLWH experienced in implementing the self-care practices.

The questions pertaining to self-care practices included "what physical activity self-care practices do you practise for reduction of Type 2 Diabetes? What diet self-care practises do you practice to reduce Type 2 Diabetes? What are the socio-cultural and environmental enablers to implementing physical activity and what socio-cultural and environmental factors enable consumption of a healthy diet. From the analysed data, two main themes emerged, these included aspects relating to physical activity and aspects relating to healthy eating.

Theme 1: Older PLWH described different aspects relating to physical activity in relation to their health

Participants described various ways they maintained physical activity as part of their lifestyles. These activities included their economic activities, domestic chores, routine

walking, performance of exercise routines and performance of various physical activities The participants also described routine exercise regimes that they engaged in which helped them remain physically fit.

Subtheme 1.1: Work facilitates physical activity.

The first theme to emerge was that work facilitates physical activity and this work included economic activities and domestic chores. Whilst they performed different forms of work older PLWH would also walk.

Category 1.1.1: Economic activities facilitate physical activity

This category of subtheme 1.1 emerged from descriptions provided by Participant 4 Muf, Participant 5 Muf, Participant 11 GV Sat, Participant 18 Bud and Participant 21 Kam. The description of how economic activities facilitate physical activity was elicited in response to the question, "describe your physical activity routine as a self-care practice to reduce Type 2 Diabetes?" The participants described how their economic activities helped them exercise. In their descriptions, participants noted that their work involved a lot of physical activity in the form of farming activities or walking. Participant 5 Muf, also described how her occupation involved buying and selling her wares which involved a lot of travel and this traveling and selling of wares was physically demanding she expressed that this constituted exercise for her. The quotes from Participant 4 Muf, Participant 11 GV Sat and Participant 21 Kam to support this theme are shown below:

> *"I work manually for 8-9 hours a day, I do piece jobs which are manual, so we have to meet work targets, to get the money, we get into the field in the morning and leave at 5 pm"* **Participant 4 Muf**

> *"Normally I exercise through the work I do with my hands; I work in the garden. I ride my bicycle to and from Warren Park, so naturally that is my exercise that is my means of transport which helps me stay strong, I do it daily as I can be called to any burial society in Warren Park, to Kuwadzana I will be on my bicycle, I do not use a taxi"* **Participant 11 GV Sat**

> *"I exercise through my farming work, we plough the fields, dig, and plant and till the land and we harvest and carry the harvest physically to our home we then have time to rest, that is how I exercise through my work, I grow beans and sell them"* **Participant 21 Kam**

The category of economic activities facilitating physical activity was described by participants who worked in different occupations like Participant 11 GV Sat who coordinated burial society activities. Participant 5 Muf noted she bought and sold wares as their occupation. Participant 4 worked piece jobs that involved working in the fields and Participant 21 Kam was a farmer. This finding of economic activities facilitating physical activity is congruent with studies conducted by Havyarimana et al. (2021) in Burundi and Vancampfort et al. (2018) in a systematic review of literature in Sub-Saharan Africa who found that older PLWH are physically active due to economic productivity.

Category 1.1.2: Domestic chores facilitate physical activity

Three participants also described how the domestic chores provided an opportunity to be physically active. These participants were Participant 8 Muf, Participant 22 Kam and Participant 15 Bud. Participants shared their experiences of the domestic work they did like cleaning, cooking and laundry, or gardening which they considered as physically involving. This category of subtheme 1.1 also emerged from the question "describe your physical activity regime which helps maintain physical fitness?". The quotes from Participant 8 Muf. Participant 15 Bud and Participant 22 Kam are shown below:

> *"I work in my house, I have no helper, I clean my dishes, I still can work with my upper body, I am only disabled waist downwards, I tend to my garden, I sweep outside I use two walking canes as I sweep my house, I do laundry"* **Participant 8 Muf**

> *"I look after the family here, it is quite exerting at my age, the young children have to be assisted to get ready for school, and I cook for them to make sure they have clean clothes because their mother works far in Marondera… At my age that I can no longer run like a young person"* **Participant 15 Bud**

> *"I maintain my garden and the yard around my house that is the physical activity I do, but it is not regular"* **Participant 22 Kam**

The participants who shared experiences of how domestic work in the house was physical activity were all females. Two of these participants Participant 8 Muf and Participant 15 Bud stated they are retired, while Participant 22 Kam highlighted that she was a homemaker. This finding also confirms findings of the study conducted in Canada by Vader et al. (2021) who found that domestic chores are viewed as a form

of physical activity. Similar findings were also described in the study in Uganda by Wright et al. (2021) who found that women mostly engaged in domestic chores as a form of physical activity.

Category 1.1.3: Routine walking facilitates physical activity

Four of the participants also described how they intentionally and regularly walked as part of their lifestyle. These participants were Participant 2 GV, Participant 3 GV, Participant 16 Bud and Participant 20 Kam. Participants 3 GV and Participant 20 Kam described walking as part of their lifestyle influenced by their work. Participant 3 GV in particular noted that their work involved constant sitting during the week and took the opportunity during weekends to walk long distances as a means of being physically active. Participant 3 GV further explained that when it was the farming season, they worked on their small farm during the weekend as a means of keeping physically fit. Participant 20 Kam, highlighted they walked a long-distance part of the journey to work as a way of maintaining physical activity. Participant 2 GV also noted they walked around their house twice a day as part of their physical activity routine. The quotes below show the responses of the participants in response to the question describe your routine for exercise as a means of reducing Type 2 Diabetes.

> *"At my age I don't jog. I try as much as I can to walk. I leave the car, and walk 5km to and 5km from. I walk mostly weekends to do my soccer betting.* **Participant 3 GV**

> *"I go to work that's how I exercise. I walk part of my journey to work, from town to Avondale. I come back I use a car. It is quite a distance to Lomagundi street, that is my exercise"* **Participant 20 Kam**

The two participants who described walking as a means of maintaining a physical activity pattern due to economic activities-related matters were both in their 50s-Participant 3 GV was 53 years and Participant 20 Kam was 56 years. Although both noted they walked long distances, Participant 3 GV noted the sedentary lifestyle in their occupation of an IT officer motivated the walking while Participant 20 Kam noted the need to get to work and to be physically fit as a motivator for walking the long distance. Physical activity that includes walking among older PLWH has also been confirmed in other contexts. Chetty et al. (2022) notes older PLWH engaged in walking in South Africa and Kitilya et al. (2021) also found that older PLWH walked as a form of physical activity in Tanzania.

Subtheme 1.2: Physical activity includes an exercise routine

Participants shared their experiences of how they followed structured exercise routines. In their descriptions, participants noted they exercised around the home as well as outside the home in daily or weekly routines. Participants who described the structured exercise routines were all male and these included Participant 1 GV, who followed a structured weekly exercise routine of running, Participant 2 GV shared his experience of walking around his house twice a day and doing push-ups every afternoon on a daily routine. Participant 12 GV Sat noted that his work involved sitting and once every week he would play and exercise with a social soccer team. The quotes from Participant 1 GV, Participant 12 GV Sat and Participant 2 GV are shown below:

> *"I feel the need to exercise the body, so I run 30 to 40 minutes twice every week"* **Participant 1 GV**
>
> *"When I finish my breakfast in the morning, I walk around my house, and a few hours later I exercise in the house by doing push-ups and before I sleep, I exercise by walking around the house again"* **Participant 2 GV**
>
> *"With all the sitting during the week, I have to do some exercising, so I play social soccer. It is not serious; I play with my friends from Budiriro and we have been doing it for some time once every week. We get there we warm up with different exercises before we play"* **Participant 12 GV Sat**

Noteworthy, Participant 2 GV shared their experience of walking as part of their physical activity pattern and described how they also included push-ups in their physical activity routine daily. Two of the participants described weekly routine physical activity patterns -Participant 1 GV and Participant 12 GV Sat described weekly routines of physical activity of running and playing soccer respectively. These two participants who described the weekly routines were both in their 50s'. The two participants who described daily exercise routines were in their 60s (Participant 2 GV and Participant 16 Bud) and these routines also included walking. Older PLWH's engagement in exercise routines confirms findings by Chetty et al. (2022) who found that older PLWH had exercise routines that involved aerobic exercise involving strength as well as exercise that involves groups similar to the description by Participant 12 GV.

Subtheme 1.3: Performance of varied physical activities

The third subtheme was that older PLWH performed various activities as a means of reducing Type 2 Diabetes. This theme emerged from the shared experiences of Participant 3 GV who noted that they walked during the weekend as a means of maintaining physical activity, in addition to walking, Participant 3 GV shared that during the rainy season, they were also involved in farming as a means of maintaining adequate physical activity. Similarly, Participant 2 GV stated that their physical activity routine involved doing push-ups as well as walking. Participant 20 Kam also noted that they walked part of the distance to work and when they are at work, their work partially included other physical activities that fostered physical activity. Participant 11 GV Sat also noted that the physical activities they were involved in were varied and these included working in the garden as well as cycling for a long distance. The quotes to support the shared experiences of the participants are shown below:

> *"like this time when it is harvest time I make sure that every weekend I go to these small farms we have and I work in the fields, tilling the land, I work from about 5 am till 9 am then I feel this time I am tired, it is also part of the exercise"* **Participant 3 GV**

> *"I walk part of my journey to work, from town to Avondale…. and at work, my work involves a balance of physical activity and sitting which is also an opportunity for me to exercise"* **Participant 20 Kam**

In summation, older PLWH in Harare Urban District performed a variety of physical activities to remain physically fit. These varied physical activity regimes were part of their economic activity routines or were structured exercise patterns. This finding also confirms the finding by Kitilya et al. (2023) in Mwanza, Tanzania who found that although walking was common, older PLWH who performed other activities such as domestic chores and economic activities.

The first theme described various aspects of physical activity performed by older PLWH. These included various physical activities, work in form of domestic chores, economic activities, walking and exercise. Orem's self- care model notes that for such self-care physical activities to happen there should be motivation, the activities must be done continuously and resources must be available for them to perform the physical activities. In this regard, domestic chores, economic activities, walking and exercise were done continuously. Performance of the physical activities by the older PLWH also

demonstrated the universal self-care requisite of maintaining a balance between activity and rest. For example, Participant 12 GV Sat described how they would play social soccer during weekends to maintain the balance of sitting during the week.

Theme 2: Older PLWH described their eating habits in relation to their health

Regarding healthy eating, older PLWH described how they ate indigenous foodstuffs, whole grains and restricted sugar, salt and fatty foods to maintain a healthy eating pattern. Participants also described how the ease of access especially to fruits and vegetables fostered healthy eating patterns and how their families supported them financially and with the selection of food.

Subtheme 2.1: Consumption of indigenous grains, fruit and vegetables

The diet of older PLWH included; indigenous unrefined grains, vegetables and fruit. Participants who described their diet as consisting of indigenous foods were Participant 13 GV Sat, Participant 23 Kam, Participant 6 Muf and Participant 17 Bud. In their responses to the question "describe your dietary pattern concerning the reduction of Type 2 Diabetes?" participants listed that their diet consisted of Southern African porridge (*sadza*) (Collins English Dictionary, 2023) made from unrefined grains of finger millet, maize, millet, or sorghum. Participants described they ate indigenous vegetables like okra, pumpkin leaves (*muboora*), black jack (*mutsine*) and amaranth leaves (*bonongwe*). The quotes from Participant 13 GV Sat and Participant 23 Kam supporting the emergence of theme 3 are shown below:

> *"I eat Southern African Porridge made from ground sorghum (rapoko), or finger millet (mhunga) I also eat a lot indigenous vegetables like pumpkin leaves and amaranth leaves which are healthy for me"* **Participant 13 GV Sat**

> *"I eat traditional vegetables a lot like pumpkin leaves, I supplement them with peanut butter, I also take some tea every day and usually eat bananas, mangoes and apples"* **Participant 23 Kam**

From this discussion, it was concluded that participants included indigenous whole grains, indigenous vegetables and fruit in their diets. The consumption of locally available food confirms recommendations made by Duncan et al. (2020) who notes the culturally acceptable diets among older PLWH enhance adherence to a healthy diet.

Category 2.1.1: Influence of rural background on eating habits

Some of the participants who noted they ate indigenous food as part of their diet explained that their choice of eating indigenous wholegrains, vegetables and fruit emanated from their rural background. These participants were Participant 6 Muf and Participant 17 Bud. Participant 17 Bud described their preference for indigenous fruit like Uapaca kirkiana (*mazhanje*) to apples and bananas as part of their diet, while Participant 6 Muf described how they ate Southern African Porridge made from different types of indigenous grains like sorghum or finger millet. The participants noted this rural background influenced the choice of indigenous foods because it is what they grew up eating. This subtheme was elicited from participants describing their daily dietary pattern. Excerpts from responses of Participant 6 Muf and Participant 17 Bud to support this subtheme are shown below:

> *"I don't normally select the milled grain I use, I grew up in rural areas we ate all types of Southern African Porridge, so I eat all types of southern African Porridge. I eat southern African Porridge made from sorghum, finger millet. I grew up in Gutu in Masvingo Province where, the finger millet southern African porridge was the most common one which is what I eat most of the time now. In terms of vegetables I eat amaranth leaves, black jack and okra we eat what we grew up eating"* **Participant 6 Muf**

> *"If it is southern African porridge, I make sure the maize meal is unrefined. I also eat natural indigenous fruit like Uapaca kirkiana because I grew up in the rural areas. I eat bananas and apples less than five times a year, I also eat a lot mangoes. When it comes to vegetables, during this planting season I eat indigenous vegetables like pumpkin leaves and amaranth leaves, I even drink the water from cooking them. I also eat a lot of okra I spend the whole week eating okra as part of my meal.* **Participant 17 Bud**

From these quotes, it was concluded that the influence of previous rurality influenced the preference for indigenous fruits, whole grains and indigenous vegetables described by Participants 17 Bud and Participant 6 Muf. Notably, the participants who described the influence of previous rurality on their preference for indigenous foods stated they were involved in farming activities. The finding of an influence of a rural background influencing food choices contrasts with the study findings from rural Zambia by Masa et al. (2018) who found that rural influence was mostly aligned to a lack of dietary diversity with consumption of mostly carbohydrates. In this study, the

diversity was illustrated by consumption of southern African porridge made from various grains.

Subtheme 2.2: Diet is mostly carbohydrates, with varied but lesser portions of vegetables and fruit with restricted use of oils, salt and sugar.

Participants described their diet consisted of mostly carbohydrates, varied lesser portions of vegetables, fruit and proteins with restricted oils, salt and sugar. This subtheme was elicited from responses from Participant 17 Bud, Participant 12 GV Sat, Participant 8 Muf and Participant 1 GV. Participant 17 Bud shared that their diet included indigenous foods further revealed that their diet was mostly carbohydrates in the form of southern African porridge with varying proportions of vegetables and proteins. Participant 12 GV Sat described how their daily meal plan includes a larger proportion of starch in the form of southern African porridge, rice, and pasta from breakfast then lunch till dinner with 20% vegetable intake through the meals. Participant 17 Bud and Participant 1 GV quantified this larger proportion of starch by revealing that carbohydrates made up 50% of the diet intake. Participant 17 Bud and Participant 8 Muf also noted that they took tea with very little sugar. The issue of restricted oils was described by Participant 8 Muf and Participant 17 Bud. Participant 1 GV also noted they had been taught about restricted salt intake and took very little salt with their food. This response was elicited after probing participants to describe the nutrient proportions of their diets. The excerpts of the participants' responses are shown below:

> *"I eat a normal diet, southern African Porridge with meat and fruit from time to time, about 10% of the diet is fruit and 50% is southern African porridge and vegetables. I restrict my salt intake because we have been taught about controlling our blood pressure. I use a little sugar because it is my preference"* **Participant 1 GV**

> *"We as elderly people start our day with tea, and I never took my tea with a lot of sugar ever since I was a young child. I also don't eat a lot of oil but I eat lots of southern African porridge and vegetables with about 10% of my diet being protein"* **Participant 8 Muf.**

> *"In the morning I have porridge then at lunch time I have macaroni or rice and I have southern African porridge for dinner, and I always include vegetables in my meals …about 20% is vegetables"* **Participant 12 GV Sat**

> *"I would give 50% to southern African porridge, protein is 20%, vegetables is 30%; but sometimes vegetables are 20% and protein is 30%. I do not use a lot of oil in my food and with sugar it is just a few granules, just so people can say I have used the sugar."* ***Participant 17 Bud***

From these statements, it was concluded that participant's diets included a higher proportion of carbohydrates, and also included fruits and vegetables in a smaller proportion in varying quantities. The diets of the older PLWH also included restricted use of sugar and oils due to preference. Notably Participant 1 GV, who had indicated that they are hypertensive restricted their salt intake in compliance with the health education received. The finding of a higher carbohydrate content in diets also confirms findings by Masa et al. (2018) in rural Zambia who found that older PLWH consumed a larger proportion of carbohydrates in relation to protein, fruit and vegetables.

Subtheme 2.3: Ease of access to food

The ease of access to food through markets and gardens fosters healthy eating emerged as a subtheme of healthy eating. This issue of accessibility of food was discussed by participants across all five clinics, who included Participant 1 GV, Participant 10 GV Sat, Participant 18 Bud, Participant 8 Muf, Participant 21 Kam and Participant 22 Kam. The participants described how the easy access to markets, supermarkets and gardens supported them in adhering to a healthy eating pattern. In their descriptions, the participants noted they easily accessed bananas, apples tomatoes, and vegetables from the vendors in the markets. Participant 10 GV Sat further shared that fruit vendors move from door to door selling fruit which made it easy to access fruit and vegetables. Furthermore, the participants explained that growing their vegetables in their gardens also helped with the maintenance of a healthy eating pattern. Participant 8 Muf, Participant 21 Kam and Participant 22 Kam also highlighted their gardens which made easy access to food was also their means of exercise. The quotes from the participants to support this theme are shown below:

> *"The fruits and vegetables are easily accessible in the local market, we get all the fruits like bananas, apples, tomatoes and vegetables"* ***Participant 1 GV***

> *"The food is quite nearby from the supermarket, …I also eat a lot of vegetables which in grow in my garden"* ***Participant 8 Muf***

> *"Where I stay a lot of vendors sell vegetables in push carts, some knock on the door to sell to us, so this access makes it easy for us"* **Participant 10 GV Sat**

> *"We do get a lot of fruit and vegetables mostly from the market especially bananas"* **Participant 18 Bud**

From these participants' responses, it was concluded that the accessibility to food from the markets, supermarkets and gardens helped the older PLWH maintain a balanced dietary pattern. Noteworthy, Participant 1 GV who had stated that 10% of their diet consisted of fruit acknowledged the ease of access to fruits and vegetables at the local market. Similarly, Participant 8 Muf also stated that they ate lots of southern African porridge and vegetables and noted that they grew their vegetables in the garden. Participant 8 Muf also stated they were disabled and did not have full use of their legs and noted that the nearby supermarket enabled accessibility to food. The finding of ease of access to food markets and gardens as an enabler of healthy eating confirms findings by Henry et al. (2019) who found that proximity to food markets was an enabler of healthy eating. Orem's self-care model also notes that the self-care agency is influenced by the availability of resources (Lambermon et al., 2020). As such the finding of ease of access to fruit and vegetables shows the influence of availability of resources for older PLWH to care for themselves.

Subtheme 2.4: Family support enables healthy eating pattern

The last subtheme emerging from the participants' shared experiences on healthy eating habits was family support enables. This discussion was elicited when participants described the enablers of healthy eating. Participant 3 GV shared how their partners helped them select healthy foodstuffs from a large common market in Harare, while Participant 6 Muf and Participant 8 Muf shared that their children provided the financial resources which enable them to buy food and maintain a healthy eating pattern. Participant 8 Muf also stated that she eases the financial burden on her children by making the money she is given last longer. Excerpts supporting the theme of family support fostering self-care and healthy eating habits from Participant 3 GV and Participant 6 Muf are shown below:

> *"Every weekend I go with my wife to Mbare market (common market) and she picks out the potatoes, tomatoes, onions and fruit"* **Participant 3 GV**

"With my work in farming, I can get the food, however, my children also support me financially which helps me supplement the food I get"
Participant 6 Muf

From these descriptions, it was concluded that family members assisted the older PLWH financially to buy food and maintain a healthy eating pattern and with selection of food stuffs to foster healthy eating habits. The finding of family support fostering healthy eating confirms study findings by Henry et al. (2019) who found that older PLWH who had family support were more likely to have healthy eating habits.

The older PLWH described their eating habits in relation to health and highlighted that their diets consist of whole locally available grains. The older PLWH also noted their diets were mostly carbohydrates with lesser proportions of protein, fruit and vegetables. The food choices for older PLWH living with HIV were influenced by their rural background. The influence of a rural background relates to Orem's self-care agency concept which notes that people's self-care practices are influenced by the socio-cultural background (Lambermon et al., 2020). In this regard, the self-care agency which is an acquired ability is demonstrated by older PLWH acquiring their abilities to care for themselves by the previous rurality.

Summary of findings older PLWH descriptions of healthy eating and physical activity

The table below summarises the themes, subthemes and categories of physical activity and healthy eating among older PLWH

Theme	Subtheme	Category
Older PLWH described different aspects relating to physical activity in relation to their health	Work facilitates physical activity	Economic activities
		Domestic chores
		Routine walking facilitates physical activity
	Physical activity self-care includes following an exercise routine	
	Performance of varied physical activities	
Older PLWH described their eating habits in relation to their health	Consumption of indigenous grains, fruit and vegetables	Influence of rural background on eating habits
	Diet is mostly carbohydrates, with varied but lesser portions of vegetables and fruit with restricted use of oils, salt and sugar.	
	Ease of access to food	

	Family support enables healthy eating pattern	

Table 5.2 Summary of themes older PLWH self-care in relation to health.

From the table above two themes, subthemes and categories of subthemes emerged from analysed data which described the older PLWH self-care practices in relation to health.

Older PLWH described challenges they experience in performing physical activity and eating healthy

Older PLWH described the challenges they experienced in practising self-care measures to reduce Type 2 Diabetes. These challenges pertained to exercise and also following a healthy eating pattern. The themes were elicited in response to questions; What challenges do you experience in performing physical activity? What challenges do you experience in adhering to a healthy diet?   Two main themes emerged. One theme outlined challenges in engaging in physical activity and one main theme was aligned to challenges experienced in adhering to a healthy diet.

Theme 1: Older PLWH described challenges they experienced in performing physical activity

In response to the question, "what challenges do you face in performing self-care activities to reduce Type 2 Diabetes? The older PLWH described the various challenges they experienced in performing physical activities. These challenges included pain, fatigue, and depressive like symptoms.

Subtheme 1.1: Pain

Four participants described the issue of pain as a challenge in performing physical activity, these participants were Participant 1 GV, Participant 4 Muf, Participant 11 GV Sat and Participant 21 Kam. In their response Participant 1   GV stated that they felt joint pain which affected their exercise routine of running twice every week. Participant 2 GV also described general body pain which affected physical activity and noted that they felt pain in their joints and muscles. Participant 11 GV Sat and Participant 21 Kam described the issue of general body pain as a major challenge in performing physical activities. The excerpts from the interviews with Participant 1 GV and Participant 2 GV supporting the emergence of the subtheme "pain" are shown below:

> *"I feel a lot of joint pain which makes it difficult to exercise"* **Participant 1 GV**

> *"I don't have any problems with weak muscles, the problem is pain all over the boy, I experience pain even in my joints in the knees that affects my exercise"* **Participant 2 GV**

The participants who shared their experiences of pain affecting physical activity were engaged in different forms of exercise. Participant 1 GV stated they ran twice weekly for 30 to 40 minutes, Participant 4 Muf stated they worked piece jobs in the fields for 8-9 hours and their work was their form of physical activity, Participant 11 GV Sat was a burial society coordinator who cycled long distances and Participant 21 was a farmer whose work in farming was their means of engaging in physical activity. From the descriptions of pain in the joints and general body pain, it was concluded that pain is a challenge in maintaining a physical activity pattern in older PLWH. The finding of pain affecting physical activity also corroborates the findings in studies conducted by Addis et al. (2020) who found that pain was prevalent in 25-90% of PLWH. The joint pain described by Participant 1 GV also confirms pain description by Reynolds et al. (2022) who found that most common pain sites among PLWH included joints.

Category 1.1.1: Previous vigorous physical activity is associated with pain

A category of the first subtheme to emerge from the theme of pain was previous vigorous physical activity causes pain which affects continued physical activity. Participant 21 Kam who stated that farming activities as their means of exercise noted how vigorous physical activity causes pain which affects her continued physical activity to the extent of not being able to get out of bed. Similarly, Participant 4 Muf also noted that their form of exercise was the farming work they did of working in the fields for 8-9 hours through piece jobs described the issue of pain being caused by too much physical work.

> *"The challenge I experience is pain, I think it is because of overworking, the body will be in pain, but it does not stop me from sleeping, it just slows my work. The pace will not be the same as every day"* **Participant 4 Muf**

> *"The problem is pain which is present, there are days when I feel a lot of pain, because of this work of tilling and ploughing is work for cattle and tractors, so as a person this is bound to cause pain. There are*

days I genuinely fail to get out of bed because of the pain and I seek medication for the pain which really helps" **Participant 21 Kam**

From the participants' descriptions it was concluded that extreme physical activity caused pain and this pain affected their continued physical activity in the case of Participant 21 Kam they would not be able to get out of bed while Participant 4 Muf slowed down on how they continued to work. Noteworthy both participants who described the issue of previous vigorous activity causing pain were involved in farming. Previous studies that have analysed pain associations among older PLWH have noted associations of pain with chronic inflammation that characterises aging (Addis et al., 2020). Another study whose findings also closely relate to the issue of pain from previous vigorous exercise is the Chinese study by Lu et al. (2021) who found that pain in older PLWH is associated with post trauma.

Subtheme 1.2: Fatigue

The second subtheme to emerge was fatigue. This subtheme emerged in response to the question describe challenges you face in adhering to your physical activity routine. The subtheme of fatigue was described by participants, Participant 1 GV, Participant 8 Muf and Participant 20 Kam. Participant 1 GV had stated that joint pain also affects their physical activity, and went further to state that, constant fatigue was a hindrance to physical activity. Participant 1 GV also stated their form of exercise was running for 30 minutes to 40 minutes twice a week which they did routinely. Participant 8 Muf expressed that fatigue affected their physical routine which involved domestic work and gardening and revealed that this fatigue emanated from ageing. Another participant who explained the issue of fatigue was Participant 20 Kam, who attributed the source of the fatigue to being hypertensive. Participant 20 Kam had previously stated that their exercise routine was walking part of the journey to work. Noteworthy, the three participants who described the issue of fatigue were hypertensive and this represented half of older PLWH who were hypertensive from the sample. Excerpts from their responses are shown below:

> *"I exercise but the problem is the body is always tired, so I cannot do it as much"* **Participant 1 GV**

> *"As an elderly person, sometimes the body is fatigued and I am unable to work but I can get out of bed"* **Participant 8 Muf**

> *"I am hypertensive and I feel fatigued that is when I am not able to care for myself or even exercise"* **Participant 20 Kam**

From the participants' responses, it was concluded that fatigue among older PLWH affects physical activity routines. The fatigue was described by hypertensive participants. Fatigue affecting older PLWH is also described in the study conducted by Goswami et al. (2015), who notes that fatigue is a challenge among older PLWH in performing physical activities. Langseth et al. (2022) also note that such fatigue can be chronic, which resonates with the description by Participant 1 GV, who said they were always tired.

Subtheme 1.3: Depressive-like symptoms appeared to affect physical activity routines".

The third subtheme that emerged was depressive-like symptoms appeared to affect physical activity, this issue was described by Participant 22 Kam and Participant 9 Muf. Participant 22 Kam who had also previously indicated that their form of physical activity was working in and around the house or garden was a homemaker who did not exercise regularly and noted that she was never diagnosed with depression however there were times she was just not happy. Participant 9 Muf described how they worried about money and during these times they felt sad. Excerpts from the participants' shared experiences are shown below:

> *"I stress about money, sometimes which is a problem this takes my time because I will be thinking a lot and I'm sad at such times"* **Participant 9 Muf**

> *"I feel that there are times I am not happy, but I have never been told that I have depression at the clinic"* **Participant 22 Kam**

From the participants' responses, it was noted that depressive-like symptoms affected the physical activity patterns of older PLWH. The issue of depressive symptoms affecting physical activity confirms findings in China which note that depression affected older PLWH self-efficacy in performing physical activity (Zou et al., 2022). Although Zou et al. (2022) note that older PLWH are affected by depression to perform physical activity, the older PLWH in the study asserted that they had not been diagnosed with depression which reflects on the underdiagnosis of depression among older PLWH described by van Coppenhagen and Duvenage (2019).

The older PLWH described the challenges they experienced in performing physical activity. These challenges included pain, fatigue and depressive-like symptoms, Noteworthy, Orem's self-care deficit model describes how self-care deficit can be partial or complete, which delineates where nursing interventions are required. In this regard although the older PLWH described how they had never received health-care services for the pain, fatigue and depressive like symptoms, even though it affected their physical activities. Furthermore, the effect of the challenges on the older PLWH physical activities illustrates the effect of health status on the self-care agency described by Orem's self-care model.

Theme 2: Older PLWH described challenges to their eating habits in relation to their health

Regarding the challenges in healthy eating. All participants stated that the high cost of food affected their food preferences and healthy eating patterns. The high cost of food affecting preferences was described by Participant 9 Muf, who stated that they resort to eating beans and dried Tanganyika sardines (*Kapenta*) due to the high cost of food which is not their preferred choice. Participant 9 Muf who had described how she stressed about money and this was also a source of sadness which affected their physical activity pattern shared that the high cost of food affected healthy eating habits. Participant 14 described how the high cost of food affected their food preferences. Participant 6 Muf who had stated their occupation as a farmer similarly stated that the high cost of food affected a healthy eating pattern. The quotes supporting this theme from, Participant 6 Muf, Participant 9 Muf, Participant 14 Bud and Participant 16 Bud are shown below:

> *"The challenge is the cost of food, it is expensive, but we persist we can't go hungry"* **Participant 6 Muf**

> *"The problem is the high cost of food, it is expensive, you end up buying the beans and the dried Tanganyika sardines because those we afford because you can buy them for one US dollar"* **Participant 9 Muf**

> *"The problem is the money to buy food, I may not buy what I want"* **Participant 14 Bud**

> *"I mostly eat vegetables and Southern African porridge, I do not get fruit like apples because of the high cost"* **Participant 16 Bud**

From these quotes above, it was evident that the high cost of food affected food preferences for older PLWH to adhere to a healthy eating pattern for reduction of Type 2 Diabetes. The high cost of food is also described in several studies in various contexts. In Canada Bekele et al. (2020) highlight the issue of high cost of food among older PLWH. Similarly, another developed country the UK, Duncan et al. (2020) recommends that older PLWH should be assisted with tailor made nutritious food to mitigate high cost of food. In Africa, the study by Wright et al. (2021) also found that older PLWH had homogenous diets due to high cost of food.

Orem's self- care model describes the self-care agency which is affected by the availability of resources. Similarly, the availability of financial resources to buy healthy food affects the self-care agency's capabilities in reducing risks of Type 2 Diabetes.

Summary of themes: challenges affecting older PLWH self-care practices in reducing Type 2 Diabetes

The table 5.3 below summarises the main themes related to challenges in reducing Type 2 Diabetes among older PLWH.

Theme	Subtheme	Category
older PLWH described challenges they experienced in performing physical activity	Subtheme 1.1: Pain	Previous vigorous physical activity causes pain which affects continued physical activity
	Subtheme 1.2: Fatigue	
	Theme 1.3: Depressive like symptoms appear to affects physical activity routines	
Older PLWH described challenges to their eating habits in relation to their health	Subtheme 2.1: High cost of food	

Table 5:3: Summary of challenges experienced by older PLWH in reducing Type 2 Diabetes

From the table above it was summated that older PLWH in Harare Urban District experienced challenges of fatigue, pain, sadness and high cost of food to adhere to self-care practices for the reduction of Type 2 Diabetes.

5.2 Findings from the nurses providing health care to older PLWH
Data collected from nurses providing health care to older PLWH in the five clinics was also analysed and results are presented below.

5.2.1 Demographic variables of nurses providing healthcare to older PLWH

A total of nine nurses participated in the study, drawn from all the five clinics sampled. Two participants were each from Glenview Polyclinic, Budiriro Polyclinic, Mufakose Polyclinic and Kambuzuma Polyclinic, while one participant was from Glenview Satellite Clinic. Pseudonyms were also assigned to the nurses denoting which clinic they were from, Muf denoted Mufakose Polyclinic, Kam denoted Kambuzuma Polyclinic, Bud referred to Budiriro Polyclinic, GV represented Glenview Polyclinic and GV Sat denoted GV Satellite clinic. The ages of the nurses ranged from 33 years to 54 years, with a mean age of 42.8 years and a modal age of 41 years. The years of experience in managing HIV ranged from 2 to 12 years with an average of 6 years' experience managing HIV and the modal years' experience was 4 years. Two (22%) of the participants were males while seven (78%) were females. The sample demographic variables are shown in table 5.4 below.

Pseudonym	Gender	Age	Years of experience managing HIV
Participant A GV	Female	49	5
Participant B GV	Female	41	6
Participant C GV Sat	Female	33	4
Participant D Bud	Female	38	3
Participant E Bud	Female	40	2
Participant F Muf	Male	41	12
Participant G Muf	Female	42	4
Participant H Kam	Female	54	11
Participant I Kam	Male	47	7

Table 5.4: Demographic variables of nurses caring for older PLWH

The table 4.9 above illustrates the gender, ages and years of experience in providing ART services among nurses providing care to older PLWH in Harare Urban District. From the table it can be concluded that the nurses had considerable experience in managing ART among PLWH as all of them indicated that they had more than 2 years providing ART services.

5.2.2 Emerging themes nurses

Three main themes emerged from their shared experiences of the nurses. The themes emerged from the questions; What screening measures do you implement to identify older PLWH at risk of Type 2 Diabetes? What health education do you provide to older PLWH to reduce Type 2 Diabetes? Describe how health education is provided to older PLWH? What are the enablers you have identified to reduce Type 2 Diabetes among

older PLWH? The themes were: nurses described aspects of the Type 2 Diabetes screening process; nurses described various aspects of providing health education regarding Type 2 Diabetes to older PLWH and interventions to reduce Type 2 Diabetes among older PLWH can be fostered with continuous training.

Theme 1: Nurses described aspects of the Type 2 Diabetes screening process.

The first theme to emerge was that nurses described aspects of the Type 2 Diabetes screening process. The nurses described the screening measures they implemented which included screening for risks of Type 2 Diabetes, screening for signs and symptoms of Type 2 Diabetes, use of a multidisciplinary team for screening and random blood glucose testing. This theme emerged in response to the question "describe screening interventions conducted for the reduction of Type 2 Diabetes".

Subtheme 1.1: Screening includes risk assessment.

The subtheme emerged from the shared experiences of Participant C GV Sat, Participant A GV, Participant D Bud, Participant H Kam and Participant F Muf. Participant C GV Sat described how they conduct a risk assessment of individual patients which includes; those older PLWH who have a family history of Type 2 Diabetes. Similarly, Participant D Bud noted that they assess for obesity among those older PLWH who are then further screened for Type 2 Diabetes. Participant H Kam also noted that all patients including older PLWH are weighed and nurses identify those at risk who are gaining excessive weight. The excerpts from the nurses' shared experiences are shown below:

> *"Here at the facility, we also do a risk assessment whereby we assess those at high risk of developing Diabetes, it is those with a family history of Diabetes"* **Participant C GV Sat**

> *"We do not test everyone for Diabetes, we screen them first those that are at risk, we see those that are at risk who are obese"* **Participant D Bud**

> *"Here in the OI clinic, we weigh our patients, those that are gaining excessive weight are the ones we target for testing, some we end up referring them for further management"* **Participant H Kam**

From quotes of nurses providing care to older PLWH it was concluded that an assessment of risks among older PLWH is done as an intervention to reduce Type 2 Diabetes and the commonly identified risks among older PLWH included, obesity and

family history of Diabetes among older PLWH. The practice of screening for risks of Type 2 Diabetes among older PLWH is not unique to the Harare Urban Context and similar practice is described in the study conducted by Galaviz et al. (2021) who assessed risks of Type 2 Diabetes among PLWH using the FINDRISC tool in the USA.

Subtheme 1.2: Screening includes an assessment for signs and symptoms of Type 2 Diabetes

Another subtheme to emerge from theme 1 screening includes an assessment for signs and symptoms of Type 2 Diabetes among older PLWH. This theme was elicited from experiences shared by Participant D Bud, Participant G Muf and Participant A GV. The participants shared that they screen for signs and symptoms of Type 2 Diabetes during the routine review visits. The responses of the participants were also elicited in response to the question "describe the screening interventions done to reduce Type 2 Diabetes among older PLWH." Participant D Bud elaborated on these signs and symptoms by explaining that screening is mostly done for those presenting at the clinic with pre-Diabetes symptoms while Participant G Muf similar to Participant A GV shared that they provide screening for older PLWH who present with symptoms of Diabetes. The responses from the participants are shown below:

> *"We screen especially those who report that they have symptoms of Diabetes"* **Participant A GV**

> *"You find that some of them are in the pre-Diabetes stage, where we know if we manage them, we can prevent the onset of Diabetes, they have the symptoms so those we have to target for screening"* **Participant D Bud**

> *"We screen patients for Type 2 Diabetes who present with signs and symptoms of Diabetes"* **Participant G Muf**

From these quotes by the nurses providing care to older PLWH it was concluded that screening for Type 2 Diabetes also included screening for those presenting with signs and symptoms of Diabetes as interventions could also reduce the onset of Diabetes for older PLWH who are pre-diabetic. Similar practice of screening for signs and symptoms of Type 2 Diabetes have also been reported in the Zambian study by Baumgartner et al. (2022) who assessed the effectiveness of this screening practice in identifying PLWH at risk of Type 2 Diabetes. Gonah et al. (2020) also report a similar

practice of screening for signs and symptoms of Type 2 Diabetes among PLWH in Gweru, Zimbabwe.

Subtheme 1.3: Random blood glucose testing

The third subtheme to emerge was that random blood glucose testing was done on patients at risk or those presenting with signs and symptoms of diabetes. This subtheme also emerged in response to the question, "what are the screening interventions you implement as a means of preventing Type 2 Diabetes among older PLWH? Participant E Bud shared that they test older PLWH who present with signs and symptoms of Type 2 Diabetes because of the scarcity of testing resources such as glucose test strips and therefore would only reserve these resources for older PLWH in dire need. Similarly, Participant C GV Sat also shared that only those identified as being at risk would have random blood glucose testing done. Participant F Muf shared that their selective testing of older PLWH is influenced by the presence of symptoms due to the scarcity of glucose test strips. The quotes to support this subtheme are shown below:

> *"We screen the stable patients when they come after six months for the review visit, we do the glucometer checks, those that have a family history of Diabetes or are at risk of Diabetes are the ones that we do the glucometer checks"* **Participant C GV Sat**

> *"We do not test everyone, the resources would not permit us to do so, we only test those that present with symptoms of Type 2 Diabetes, so we have to test those at risk because of the resources sometimes there are no strips sometimes the battery is not working"* **Participant E Bud**

> *"We screen only those with signs and symptoms of Diabetes, that is when we do the glucometer checks, there is a challenge of consumables, currently there are no strips."* **Participant F Muf**

From the participants' discussions, it was noted that random blood glucose testing using a glucometer is done on older PLWH that are at risk of Type 2 Diabetes or those who present with signs and symptoms of Type 2 Diabetes. This selective testing of older PLWH was influenced by the scarcity of resources like glucometer test strips. These findings also confirm the findings by Gonah et al. (2020) in Zimbabwe who found that a scarcity of resources resulted in random blood glucose testing being done only when patients present with signs and symptoms of Type 2 Diabetes.

Subtheme 1.4: Screening for Type 2 Diabetes is supported by a multi-disciplinary team

The fourth subtheme emerging from the participants' responses is that screening for Type 2 Diabetes is supported by other disciplines in healthcare such as laboratory services and medicine. This theme emanated from experiences shared by Participant D Bud and Participant H Kam. The theme was elicited from discussing how participants screen for Type 2 Diabetes. Participant D Bud explained that there are times when older PLWH present with fluctuating readings of random blood sugar tests and further confirmatory tests have to be done through the laboratory or are referred to a doctor to manage them. Similarly, Participant H Kam shared that the tests done at the facility were not confirmatory and older PLWH are referred for further testing. The responses from the participants are shown below:

> *"For example, they come today and we record a high glucometer reading, then tomorrow we check them it is low, the next day it is high, it is fluctuating, those are the ones we target for referral to the lab, or when the doctor comes, they can see them"* **Participant D Bud**

> *"Here at the clinic, those which we identify, the ones that gain excessive weight we refer them to the lab for further testing, because you can see that they are at risk.* **Participant H Kam**

From the participants' responses, it was concluded that the screening for Type 2 Diabetes involved a multidisciplinary approach to confirm a diagnosis of Type 2 Diabetes. The support of Type 2 Diabetes screening by a multidisciplinary team is described as an ideal scenario in the study to assess success of a clinic only for older people conducted Pereira et al. (2022). In their conclusion, Pereira et al. (2022) attributed effective screening practices for Type 2 Diabetes in the UK to a multidisciplinary team.

The first theme concluded that nurses described various aspects regarding Type 2 Diabetes screening. The screening included risk assessment, screening for signs and symptoms, the use of a multidisciplinary team and random blood glucose testing. These various aspects of screening illustrate the nursing system which subsumes the professional-technological subsystem. The professional technological subsystem according to Orem (2001) includes aspects such as diagnosing monitoring and

managing cases. Such activities of diagnosing illumine the nursing aspects of screening like risk assessment, random blood glucose testing described by the nurses.

Theme 2: Nurses described various aspects of providing health education regarding Type 2 Diabetes to older PLWH

Data collected from the nurses also described the various aspects of health education regarding Type 2 Diabetes by the nurses. The subthemes that supported the second themes were; health education informs older PLWH of healthy eating and encourages physical activity, group health education focusses on all NCDs including Type 2 Diabetes and health education is poorly received.

Subtheme 2.1: Health education informs older PLWH of healthy eating and encourages physical activity

The first subtheme to emerge was that health education informs older PLWH about healthy eating and encourages physical activity. The theme originated in response to the question "describe the health education you provide to older PLWH concerning the reduction of Type 2 Diabetes? Participant H Kam detailed how they encouraged older PLWH to eat natural foods that are not processed, this included Southern African Porridge made from unrefined maize as well as Southern African Porridge made from other grains such as finger millet, and sorghum. Participant H Kam further detailed that health education on physical activity is provided with consideration that older PLWH are involved in small jobs like farming and the nurses providing care to older PLWH encourage such economic activities-related physical activity in addition to walking. Participant B GV similar to Participant H Kam described how they focussed on individual older PWLH and encouraged them to eat unprocessed foods. Participant B GV shared that in providing dietary education, some information on healthy eating they had been providing in the management of HIV to the older PLWH was used as information for reduction of Type 2 Diabetes. This information included eating traditional whole grains. Participant G Muf described that health education provided to older PLWH included the consumption of unprocessed and unrefined foods which formed part of the healthy eating plan for PLWH and prevention of all NCDs. The quotes from the shared experiences are shown below:

"…the health education we provide to older PLWH is not specific to preventing Type 2 Diabetes, it is the health education we have been providing them on healthy eating, which encouraged PLWH to eat a balanced diet including locally available foods like Southern African Porridge made from other grains like sorghum. The exercising we also encourage it as well as is also part of the education which applies to PLWH" **Participant B GV.**

"We encourage them to eat unprocessed foods if they are eating Southern African porridge, it should be from unrefined maize, and also to eat Southern African Porridge made from other grains which are not maize like finger millet and to eat other whole grains like round nuts, the natural foods including wild fruits and seasonal fruits, whatever is available they should eat it and also traditional foods… We also encourage them to walk, we support them to be physically active, because most of them they have small jobs they do in the home either in the fields or at their workplaces" **Participant H Kam**

From these responses, it was concluded that older PLWH were educated to adhere to a healthy eating pattern that included locally available indigenous foodstuff as part of living positively with HIV and such information was considered also relevant in the prevention of NCDs such as Type 2 Diabetes. The exercise was also part of the health education to encourage the older PLWH to walk and be active in the work they do. The finding that health education focusses on physical activity and healthy eating is congruent with findings by Stonbraker and Larson (2016) in the Dominican Republic who found that health education on lifestyle management from healthcare workers was acceptable to older PLWH.

Subtheme 2.2: Group health education sessions focus on all NCDs including Type 2 Diabetes

Another subtheme to emerge was that group health education focussed on all NCDs including Type 2 Diabetes. This subtheme emanated from probing how health education was provided to older PLWH. Participant I Kam shared that because of the pressure of work, group education was mostly done and this education was done in the mornings and included the prevention and management of all NCDs. Participant C GV Sat shared that group education provided to older PLWH included how they can prevent other chronic illnesses such as hypertension. The quotes from the Participants are shown below:

> *"We provide health education concerning all other NCDs we don't concentrate on one chronic illness like Diabetes, Tuberculosis Hypertension and so forth, everyone is included in these sessions"* **Participant C GV Sat**

> *"We normally provide group education here at the clinic because of the pressure of work, we see many clients per day"* **Participant I Kam**

From the shared experiences of Participant, I Kam and Participant C GV Sat it was concluded that health education on the reduction of Type 2 Diabetes was also provided in groups and included education on the reduction of other illnesses like hypertension and Tuberculosis. The provision of health education in groups contradicts preferences of health education described by older PLWH in the Dominican Republic who noted that such group health education sessions were associated with stigma surrounding HIV (Stonbraker & Larson, 2016). In addition, Duncan et al. (2018) recommended the provision of individualised health education to older PLWH to enable tailoring of health education needs to individual needs.

Subtheme 2.3: Individual health education is provided to identified older PLWH at risk of Type 2 Diabetes

Another subtheme that supported the theme of health education was that individualised health education about healthy eating and physical activity is provided to patients identified as at risk of Type 2 Diabetes. The subtheme was elicited from experiences shared by Participant 1 Kam and Participant D Bud. Participant I Kam explained that individualised health education was provided to older PLWH who required monitoring as they would be at risk of developing Type 2 Diabetes. Participant I Kam also shared that group health education sessions were provided and the individual sessions were only provided for those at risk and this was done less frequently. Similarly, Participant D shared that individualised health education is provided to older PLWH who were at risk of developing Type 2 Diabetes. The excerpts from these shared experiences of Participant D Bud and Participant I Kam are shown below:

> *"Sometimes you find the people walking about every day, and they just come with a diabetic foot so the key for us is to provide health education, to those we have identified as having a risk"* **Participant D Bud**

> *"…however here and there we offer individual client education to assist in the monitoring, it is only those we have identified that they are at risk, health education is mostly done in groups"* **Participant I Kam**

From the responses, it was concluded that health education for individual older PLWH is targeted at those identified to be at risk of developing Type 2 Diabetes. This individualised health education on reduction of Type 2 Diabetes was described by nurses who also noted that group health education sessions are conducted, and individualised health education complimented the group health education sessions. This finding of individualised health education is described in the study by Duncan et al. (2018); Samad et al. (2017) as the ideal to meet individual needs. Similarly, Stonbraker and Larson (2016) note that older PLWH preferred individualised health education.

Subtheme 2.4: Type 2 Diabetes health education is poorly received

The fourth subtheme to support the main theme, health education was that health education for the reduction of Type 2 Diabetes is poorly received. Participant E Bud shared that older PLWH especially the obese are educated on the need to reduce weight through diet and exercise, however with subsequent visits, little change is observed in weight reduction. Participant B GV also noted the issue of poor management of weight among older PLWH and expressed that even among the nurses and general population health education regarding weight reduction through diet and exercise was still a challenge. The quotes below illustrate their shared experiences on challenges in providing health education to older PLWH.

> *"Even us as individuals or as nurses sometimes the risks of being obese are not easy to manage, we find the same with the PLWH, we do explain the risks of being obese but they remain the same, so it means the message is not being heard"* **Participant B GV**

> *"We teach them the signs and symptoms of Diabetes as well; we also educate them on healthy eating and exercise. Some people understand, but with Diabetes there are challenges, some people understand, but with Diabetes, there seems to be a problem because we talk of the risks of being overweight but to them, it is not easy information to understand because you find that they keep maintaining that weight"* **Participant E Bud**

From these shared experiences by the nurses providing care to older PLWH, it was concluded that although health education was provided regarding weight loss among older PLWH, weight reduction measures of physical activity and diet did not seem to be implemented effectively. The issue of health education being poorly received is described in the study by Matchanova et al. (2021) who found that poor healthy literacy among older PLWH resulted in lower self-care efficacy in managing HIV as well as other chronic illnesses. Maduka et al. (2020) also found that older PLWH who were health literate engaged in self-care practices like healthy eating and physical activity.

The nurses' description of various aspects of providing health education for reducing Type 2 Diabetes illustrated social contractual subsystem of the nursing system. The social contractual subsystem delineates the role of the nurse and the role of the patient in the therapeutic relationship. In this regard, the nurses provided health education on physical activity and healthy eating which the older PLWH were supposed to perform in a collaborative manner. However, the study found that such health education was poorly received which was undesirable for outcomes of the social contractual subsystem.

Theme 3: Interventions to reduce Type 2 Diabetes among older PLWH can be fostered with continuous training and information sharing

The last theme that emerged was in response to the question of what enablers can foster effective implementation of interventions by nurses to reduce Type 2 Diabetes among older PLWH? Four participants described the issue of training being beneficial to nurses providing care to older PLWH. Participant C GV Sat described that they would benefit from training on new developments in the management of older PLWH as nursing interventions are dynamic. Similarly, Participant F Muf, shared that they realise how the changes in the population of PLWH have also brought on the need for additional training to better equip nurses with the changes. Participant I Kam narrated how she had been working in HIV services for the past 25 years, and had seen how interventions, for prevention, care and treatment of HIV have evolved. Such interventions had always been supported by information sharing to align service providers with new developments. The excerpts from the nurses providing care to older PLWH supporting this theme are shown below:

"It would be beneficial to receive training on the management of Diabetes among older PLWH as you know nursing is dynamic and we need to keep abreast with new information, perhaps we are just using old models that are no longer relevant" **Participant C GV Sat.**

"To become confident in preventing Type 2 Diabetes among older PLWH it would be helpful to receive some training on endocrinology, and how the endocrine system is affected by HIV. We last discussed endocrinology topics in nursing school and at that time things were different regarding the HIV population. **Participant F Muf.**

"I have been working with in HIV services for over 25 years now, first at BTS, then at OI clinic at Harare Hospital here at Kambuzuma clinic I have been working for 4 years, as nurses, the sharing of information has always been helpful to make sure that we better placed to manage HIV or rather to prevent NCDs among PLWH. **Participant I Kam**

From these experiences shared by nurses providing care to older PLWH, it was concluded that training nurses or facilitating information sharing on the reduction of Type 2 Diabetes among PLWH would improve skills for implementation of interventions for the reduction of Type 2 Diabetes among older PLWH. The need for training is also described in the study conducted by Baumgartner et al. (2022) who found that ineffective screening of older PLWH for Type 2 Diabetes was a result of a lack of knowledge among healthcare workers especially pertaining to HIV and ART specific risks of Type 2 Diabetes among older PLWH.

The nurses also described how interventions for the reduction of Type 2 Diabetes could be fostered with continuous training and information sharing. The nurses by providing this description illustrate conditioning factors affecting the nursing agency. According to Orem (2001) conditioning factors affecting the nursing agency include level of education, experience and family support. The desire for additional training shows how the nurses' power and capability to reduce Type 2 Diabetes were affected by education level.

The table 5.5 below summarises the themes from nurses providing care to older PLWH.

Theme	Subtheme
Theme 1: Nurses described aspects of the Type 2 Diabetes screening process	Subtheme 1.1: Screening includes assessment of risks
	Subtheme 1.2: Screening includes an assessment for signs and symptoms of Type 2 Diabetes among older PLWH
	Subtheme 1.3: random blood glucose testing

	Subtheme 1.4: screening for Type 2 Diabetes is supported by a multi-disciplinary approach
Theme 2: Nurses described various aspects of providing health education for reducing Type 2 Diabetes	Subtheme 2.1: Health education informs older PLWH of healthy eating and encourages physical activity
	Subtheme 2.2: Group health education focuses on all NCDs including Type 2 Diabetes
	Subtheme 2.3: individualised health education is provided to older PLWH at risk of Type 2 Diabetes
	Subtheme 2.4: Diabetes health education is poorly received
Theme 3: Interventions to reduce Type 2 Diabetes among older PLWH can be fostered with continuous training	

Table 5:5: Summary of findings nursing interventions for reduction of Type 2 Diabetes among older PLWH

The table 5.5 above shows that nurses providing care to older PLWH in Harare Urban District provided screening, health education to reduce Type 2 Diabetes among older PLWH. These interventions from the nurses' shared experiences could be enhanced through continuous training.

Theme 1: Interventions for the reduction of Type 2 Diabetes are determined by outcomes of a risk assessment

Nurses also described that interventions for the reduction of Type 2 Diabetes among older PLWH are determined from a risk assessment of PLWH. Such risks identified by Participant D Bud, Participant E Bud and Participant I Bud included excessive weight gain. In Budiriro Polyclinic, Participant E Bud noted that they provide health education to older PLWH on weight reduction. Participant E Bud shared this experience in the context of how older PLWH poorly receive health education on Type 2 Diabetes. Participant D Bud also explained that they screen for Type 2 Diabetes among older PLWH who present with obesity. Similarly, Participant B GV described the issue of being overweight among older PLWH in the context of poor understanding of health education, whilst acknowledging the provision of health education to older PLWH who present with the excess risk of obesity. Participant I Kam explained that they weigh older PLWH on each clinic visit and those who gain excessive weight are referred for additional testing. This description by Participant I Kam was provided in explaining how screening for Type 2 Diabetes is done among older PLWH. The quotes that support this theme are shown below:

"…risks of being obese are not easy to manage, we find the same with the PLWH, we do explain the risks of being obese but they remain the same" **Participant B GV**

"We screen them first those that are at risk, we see those that are at risk who are obese" **Participant D Bud**

"With Diabetes, there seems to be a problem because we talk of the risks of being overweight but to them, it is not easy information to understand." **Participant E Bud**

"…we weigh our patients, those that are gaining excessive weight are the ones we target for testing." **Participant H Kam**

From the participants' shared experiences, it was concluded that interventions that included health education and screening by nurses were done as a means to reduce Type 2 Diabetes among older PLWH who presented with the excess risk of obesity, or excessive weight gain. Noteworthy, the decision to provide interventions based on excess risks such as obesity and excess weight gain is also described by the study conducted in the USA by Turrini et al. (2020). The authors Turrini et al. (2020) found that inadequate screening could occur as a result of an underestimation of all risks older PLWH may present with.

5.3 Summary of findings

The sample of older PLWH was composed of 23 participants, whose ages ranged from 52 years to 78 years. The majority of the participants were female (52%). 62% of the older PLWH participants were married. Most of the participants (87%) stated their religion as Christian. All participants highlighted that they commenced ART the same year they tested positive for HIV and this duration of ART use and HIV infection ranged from 4 years to 23 years. The most common comorbidity among older PLWH was hypertension with 26% revealing they were hypertensive. Most participants (30%) were retired

The older PLWH described their self-care practices in the reduction of Type 2 Diabetes. These self-care practices are related to physical activity and maintenance of healthy eating patterns. Concerning exercise, their economic activities facilitated physical activities and such work included farming activities or domestic work in the house and the gardens. Some older PLWH engaged in structured exercise patterns

such as social soccer and jogging. In addition, older PLWH described how they walked long distances as part of physical activity and how their physical activities were varied.

The dietary patterns of older PLWH were described by the participants who noted that they ate indigenous whole grains such as finger millet as well as indigenous vegetables like pumpkin leaves. Notably, this choice of indigenous foods was in some cases influenced by previous rurality, which emerged as a category of a subtheme. The older PLWH participants described how they restricted the use of sugar in their diet out of preference and also restricted the use of oils and salt. The participants further stated their diets were mostly carbohydrates with variations in proportions of proteins, vegetables and fruit. This maintenance of a healthy eating pattern for older PLWH was fostered by a family who assisted in food selection and provided financial support.

Challenges in maintaining a physical activity routine were described by the older PLWH and these challenges included pain, which at times was caused by previous vigorous activity. This pain slowed the pace of working for older PLWH. The older PLWH noted that fatigue affected their exercise regimes and this was discussed by older PLWH who had stated hypertension as a comorbidity. Some of the older PLWH stated that depressive like symptoms appeared to affect their physical patterns activity and this sometimes emanated from worry about money. With regards to healthy eating the participants noted that the high cost of food affected their food preferences in maintaining a healthy eating pattern.

Data were also collected from 9 nurses in five clinics, whose ages ranged from 33 to 54 years. The participants were all experienced in working in an ART clinic and this experience ranged from 2 years to 12 years. Two of the nurses providing care to older PLWH were male while the rest (7) were female.

Concerning nursing interventions for the reduction of Type 2 Diabetes, three main themes emerged. The first theme was nurses described various aspects of screening for Type 2 Diabetes, and this screening was conducted for older PLWH at risk such as those who were overweight and those with a family history of Type 2 Diabetes. The screening for Type 2 Diabetes also included an assessment of signs and symptoms of Type 2 Diabetes and included a random glucose test for some older PLWH. The random blood glucose testing was done for older PLWH who presented with signs and

symptoms or those at risk as a scarcity of resources limited that testing for all older PLWH. Screening for Type 2 Diabetes was also supported by a multidisciplinary team which included doctors and laboratory services.

The second theme to emerge was that nurses described various aspects of providing health education for Type 2 Diabetes. The health education provided was in groups where the reduction of other risks of NCDs was discussed. Individualised health education was also provided to older PLWH especially those with higher risk of Type 2 Diabetes such as the obese. The health education provided for the reduction of Type 2 Diabetes was poorly received as the nurses noted that issues such as weight reduction were not adhered to. The third theme to emerge was that continuous training and information sharing among nurses can foster the implementation of interventions for the reduction of Type 2 Diabetes among older PLWH.

Nurses providing care to older PLWH also shared their experience that interventions for reducing Type 2 Diabetes through health education and screening are determined by the excess risk of obesity presented by older PLWH.

5.4 Triangulation of findings of older PLWH and nurses

Findings from the older PLWH and the nurses providing care were also triangulated as a means of ensuring validity of findings. The findings triangulated were those pertaining to health education for the nurses and aspects of physical activity and healthy eating. The table below shows the triangulated findings.

Main Themes	Subthemes and categories	Older PLWH	Nurses providing care to older PLWH
Health education	Physical activity includes walking, domestic chores, performance of various activities, exercise and economic activities	Yes	Yes
	Diet includes consumption of locally available whole grains vegetables fruit with restricted oils, salt and sugar	Yes	Yes
	Diet includes a greater proportion of carbohydrates	Yes	No

Table 5.6: Triangulation of findings from nurses and older PLWH

5.5 Discussion

The study aimed to develop nurses' guidelines for the reduction of Type 2 Diabetes among older PLWH. To develop the guidelines, interviews were conducted with nurses and older PLWH on measures to reduce Type 2 Diabetes. The discussion below describes these findings in relation to previous studies conducted.

5.5.1 Findings from the older PLWH

Older PLWH described physical activity patterns and healthy eating practices they adhered to as a means of reducing Type 2 Diabetes.

5.5.1.1 Older PLWH described various aspects relating to physical activity in relation to their health.

The older PLWH described how economic activities facilitate physical activity. The participants shared their experiences that the work they engaged in for economic purposes or domestic work in and around the house facilitated physical activity. This work was performed by the older PLWH for economic purposes. These findings of economic activities fostering physical activity among older PLWH are in contrast to other findings conducted in Africa. In Burundi by Havyarimana, et al. (2021) concluded that economic activities among younger PLWH facilitated physical activity while older PLWH were less active as they were not physically active. Like Havyarimana et al. (2021) the findings of the systematic review in Sub-Saharan Africa by Vancampfort et al. (2018) concluded that having an occupation facilitated physical activity, as such older PLWH were less likely to be physically active as they were not economically productive. Although the findings of this study contrast with the findings by Havyarimana et al. (2021); Vancampfort et al. (2018), the assertion that work does facilitate physical activity drawn from all three studies could imply that older PLWH in Harare Urban District continue to be economically active which facilitates exercise beyond the ages of 50 years.

Farming was described by the participants as physically involving work for economic purposes. Participant 21 Kam and Participant 4 Muf, described the intense work they did through farming activities and the duration they did the work respectively. In particular, Participant 21 Kam described how, farming activities ensured physical fitness by outlining that she tilled the land, and carried the beans she grew manually. Such a description illustrates the involvement of walking, hand and muscle

strengthening exercises. Correspondingly, farming is listed by Chetty et al. (2022) in South Africa as an economic activity among older PLWH which facilitated physical activity. The authors, Chetty et al. (2022) describe farming as a means of physical activity from a study conducted in a different context from this study – a semi-rural community, whilst this study was conducted in an urban context. The reporting of farming activities as a contribution to physical activity among older PLWH in this urban context (Harare Urban District) is also characteristic of sprawling urban agriculture activities described as economic activity by Chirisa and Mabeza (2019). The different contexts with which farming activities are conducted by older PLWH could illustrate the ubiquity of farming as a physical activity among older PLWH in both urban and semi-rural areas. As such, this contribution of farming to physical fitness among older PLWH could warrant further investigation to tailor-make fitness regimes for older PLWH involved in farming whose work also contributed to a variety of physical activities.

In addition, to working for economic purposes, the study also found that older PLWH are engaged in domestic work which facilitates physical activity. This theme emerged with participants such as Participant 8 Muf who was retired and not involved in any economic activity elaborated on the domestic activities they were engaged in that fostered exercise such as cleaning, cooking and sweeping. Participant 15 added that they looked after their grandchildren and this involved physical activity as they also had to wash, cook and clean. This theme emerged from females who spent most of their time in the home environment. The findings of this study also affirmed the findings of qualitative studies conducted by Kitilya et al. (2023) in Mwanza Tanzania as well as Vader et al. (2017) also in a qualitative study in Canada. Similarly, these findings also compare with findings by Safa et al. (2022) who conducted a scoping review of literature and noted that women living with HIV self-reported that domestic chores were their means of exercise. Kitilya et al. (2023) also highlight that the perception of domestic chores being a form of exercise is influenced by cultural norms. This difference in cultural values towards domestic work being a form of exercise is illustrated by the difference in findings of this study, from findings by Chetty et al. (2022). The authors Chetty et al. (2022) although acknowledging that activities of daily living inclusive of such domestic chores revealed that older PLWH regarded domestic chores as a barrier to performing physical activities as they consumed too much time

for them to join and follow an exercise program. In this regard, the finding that domestic chores are a form of exercise among older PLWH is important to acknowledge when providing health education on physical activity as older PLWH regard such exercise as a means of maintaining fitness.

The study also found that walking routinely among older PLWH was done as a means of remaining physically active. Participants noted they walked varying distances such as Participant 3 GV who walked 10km weekly, while Participant 20 Kam described how they walked part of the journey to work. These findings also affirm the findings conducted in an urban context in the USA by Voigt et al. (2022) who found that older PLWH accepted walking as a means of physical activity. Also in Tanzania, Kitilya et al. (2023) reported similar findings and concluded that walking was done intentionally as a means of physical activity among PLWH. Despite this similarity of walking as a means of physical activity, Voigt et al. (2022) further revealed that older women living with HIV were less likely to walk as a means of physical activity, this study, in contrast, found that walking was routinely done by both older men and women living with HIV.

The study also found that following an exercise routine facilitated physical activity among older PLWH. The participants described how they engaged in structured routine exercises that included different activities such as walking daily twice daily around their house shared by Participant 2 GV, playing soccer weekly described by Participant 12 GV Sat and running as part of their self-care practices in the reduction of Type 2 Diabetes stated by Participant 1 GV. Intervention studies describing the reduction of Type 2 Diabetes include structured exercise regimes for older PLWH, including the study conducted by Duncan et al. (2020) in the UK, who used a structured exercise regime of 10 000 steps a day for older PLWH combined with a dietary plan. Similarly, Willig et al. (2020) note that for physical activity to be effective there is a need for habitual implementation of physical activities. Despite the advantages posed by structured exercise routines, few studies outline the practices of routine exercise among older PLWH. In the observational study conducted by Wright et al. (2021) in Uganda the authors do acknowledge that physical activity routines are performed by older PLWH. However, Wright et al. (2021) conclude that routine physical activity was most likely done by men who conduct such activities intentionally in comparison with women who are most likely driven to exercise by the need to accomplish domestic

chores. As such the findings of this study also acknowledge that older PLWH do follow structured physical activity routines which include a variety of exercises.

Participants in the study outlined various physical activities they engaged in which included; exercising as part of their economic activities, exercising as part of the domestic work they did, physical activity included walking and routinely following a structured physical exercise routine. The various physical activities performed by older PLWH are also reported by Wright et al. (2021) in a study in Uganda who notes that older PLWH engaged in a variety of physical activities. This engagement in varied physical activities found in this study is also described by the study conducted in Canada by Buckinx et al. (2022) who found that the engagement in various activities improved walking distance, leg muscle strength and hand grip among older PLWH with a duration of more than 20 years HIV infection. These findings, by Buckinx et al. (2022), are significant to this study as a long duration of HIV infection was also reported as one of the excess risks predisposing older PLWH to Type 2 Diabetes. As such health education for older PLWH to engage in varied physical activities is crucial because this knowledge mitigates excess risks posed by long duration of HIV infection. However, despite the importance and benefits of varied physical activities, Wright et al. (2021) note that these varied physical activities performed by older PLWH did not meet the minimum requirements and in comparison, to other population groups, older PLWH were less physically active. This insight by Wright et al. (2021) that despite older PWLH engaging in a variety of physical activities is important in providing individualised health education on exercise to older PLWH should take into consideration the frequency and intensity of the varied physical activities to meet minimum requirements.

Participants in sharing their experiences of self-care practices on physical activity routine described different routines, different frequencies and varied intensities with which the older PLWH maintained a physical activity pattern. These variations of different activities could indicate different lifestyle preferences of exercise routines which should be considered when providing health education on physical activity. Furthermore, the different routines and frequencies with which these routines are done could also indicate a lack of knowledge on the frequency and intensity of physical activity required to reduce Type 2 Diabetes. Kitilya et al. (2023) argue that health education on physical activity is provided among older PLWH however, the information

provided qualifies as a "reminder" to be physically active hence the poor implementation of physical activity. Stonbraker et al. (2019) qualify the assertion by Kitilya et al. (2023) and note that information provided to older PLWH is complex without adequate guidelines for topics that healthcare workers need to provide.

5.5.1.2 older PLWH described eating habits in relation to health

Older PLWH also described how they practiced healthy eating habits. The participants described how their diet consists of indigenous whole grains, vegetables and fruit. The inclusion of whole grains which are locally sourced is described as an effective means for the reduction of Type 2 Diabetes among older PLWH in the study conducted by Duncan et al. (2020). Participants listed indigenous whole grains that were used to make Southern African Porridge; which were inclusive of finger millet and sorghum. In line with outcomes from Duncan et al. (2020) study outcomes, participants such as Participant 8 Muf and Participant 3 GV described how grains such as maize were eaten whole by using maize meal that was not refined. The results of this study are contrary to findings in the quantitative study conducted in Poland by Duda et al. (2020) who found that only a quarter of the older PLWH ate whole grains in a day. Duda et al. (2020) note that the most preferred sources of carbohydrate among older PLWH were pasta and bread. The difference in study findings of this study and findings from the study conducted by Duda et al. (2020) in Poland could also be indicative of the influences of culture on food preferences. This issue of cultural influences on food preferences is described by the study conducted by Duncan et al. (2020) as this choice in consumption of whole grains can also be attributed to the influence of culture on food preferences.

In line with this influence of culture on food preferences, this study also found that the choice to eat indigenous whole grains, fruit and vegetables was influenced by a previous rural background. Duncan et al. (2020) from their intervention study recommended that when structuring dietary patterns to reduce Type 2 Diabetes, there should be cultural sensitivity to recommended diets. In this regard, these findings of the influence of the rural background of older PLWH should be considered when structuring dietary patterns to reduce Type 2 Diabetes among older PLWH

The study findings also noted that older PLWH diets in Harare Urban District diet was mostly carbohydrates with varied but lesser portions of vegetables and fruit with

restricted use of oils, salt and sugar. The participants shared that their diets consisted of at least 50% carbohydrates and portions of fruit and vegetables varied from 20% to 30%, with consumption of lesser fruit than vegetables. However, the higher proportions of carbohydrates described by older PLWH is incompatible with recommendations made by the Queensland Government (2021) of a Mediterranean diet found to be effective in the reduction of Type 2 Diabetes which prescribes at least 25% intake of whole grains as a source of starch. Although the diet of mostly carbohydrate is not desirable for the reduction of Type 2 Diabetes, similar findings have been reported in Africa by the study conducted by Wright et al. (2021) who found that diet was mostly homogenous consisting of mainly "matoke" a type of banana and sweet potato. Wright et al. (2021) noted that the consumption of a high portion of carbohydrate was influenced by eating what is available rather than eating for nutritional benefit. Similar findings have also been reported in the study conducted in rural Zambia by Masa et al. (2018) who noted that diets of older PLWH were mostly carbohydrates based on the staple food in Zambia. In addition, contrary to findings of this study, of participants consuming varying proportions of vegetables fruit, Masa, Chowa and Nyirenda found that a higher proportion of vegetables was consumed in comparison to protein.

Furthermore, the findings of at least 20-30% of intake being fruit and vegetables diverge from recommendations by the Queensland Government (2021) which recommends at least 50% intake of fruit and vegetables. The findings of this study also show contrast with findings from the South African study, which found that older PLWH consumed a greater portion of fruit than vegetables with at least 3 servings of fruit daily and one serving of vegetables daily (Oduro & Kissah-Korsah, 2021).

Although older PLWH described varying intakes of fruit and vegetables which were in proportions lesser than prescribed by the Queensland Government (2021) to reduce Type 2 Diabetes one of the themes that emerged was that this intake of fruit and vegetables was supported by the ease of access through markets and gardens. Participant 8 Muf described how their garden ensured vegetables were available. Similarly, the programme of a community garden conducted in the USA, described by Palar et al. (2019) enabled the availability of vegetables in gardens and provided health education and increased consumption of vegetables and fruit. Palar et al. (2019) also found that access to food gardens was a source of physical activity.

Gardening as part of domestic chores which enabled physical activity was also described by the older PLWH again drawing a parallel conclusion to the findings by Palar et al. (2019) who found that gardening facilitated physical activity.

The findings of the proximity of gardens and markets as a means of enabling the intake of fruit and vegetables similarly complement, the conclusion by Henry et al. (2019). Significantly, with this ease of access to vegetables and fruits through markets and gardens older PLWH in Harare Urban district shared that vegetable and fruit intake varied and starch was their higher proportion of nutrient intake. This could mean a lack of nutrition information on adequate proportions of intake of fruit and vegetables which Henry et al. (2019); Palar et al. (2019) recommends when gardening activities are done. Alternatively, this lesser intake of fruit and vegetables could be due to food preferences to the higher proportions of carbohydrates which Henry et al. (2019) also note that healthy eating is also influenced by food preferences.

The study found that older PLWH restricted the intake of sugar, salt and use of oils in their diets as a means of fostering healthy eating and out of preference for less sugar in their diets. Noteworthy, this restriction in the consumption of sugar by the older PLWH in the Harare Urban District is in line with the recommendations stipulated by Objective 13 of the National Health Strategy for Zimbabwe 2016-2020, which outlines the restrictions on sugary beverages. The findings of the study also substantiate the observation made by Duncan et al. (2020) in the UK from the STOP Diabetes diet and physical activity intervention study to reduce Type 2 Diabetes who found that the restriction of sugar to less than 25g per day was the easiest to achieve among older PLWH, which was attained by 61% of participants. Although the present study findings compare with the observation made by Duncan et al. (2020) in the present study the participants self-reported that they restricted their consumption of sugar such that no quantification was made of how much this "restriction" was. As such this limits the comparison with the findings by Duncan et al. (2020). Duda et al. (2019) in their study in Poland however report contrasting findings, by concluding that among PLWH, the consumption of sweetened hot beverages such as tea was popular among respondents with concluded that 48.9% of respondents reported consuming water and a sweetened hot beverage several times a week.

The study found that older PLWH healthy eating patterns were supported by family. This support from family included support provided through the selection of healthy food as well as the financial support provided to buy healthy food. The findings of this study are similar to the conclusion drawn by Henry et al. (2019) who found that having social support facilitated a healthy eating plan. Oduro and Kissah-Korsah (2021) in their study describe how financial support described by the participants in this study facilitated a healthy eating pattern. However, the authors Oduro and Kissah-Korsah (2021) in their findings describe participants who self-reported that they were financially stable and followed a healthy eating plan in comparison to participants who received a government grant in South Africa.

5.5.2. Older PLWH described challenges they experience in performing physical activity and healthy eating

Older PLWH in Harare urban District described the challenges they experienced concerning physical activity and healthy eating.

5.5.2.1 Older PLWH described challenges experienced in performing physical activity

The first challenge described by the older PLWH was that pain affected physical activity among older PLWH. The participants noted they experienced general body pain and this pain was located in the joints which affected physical activity routines. The descriptions provided by the participants are similar to the description of pain outlined by Addis et al. (2020) who note that among PLWH, pain affects more than one anatomical position and is described as widespread pain. Addis et al. (2020) also found that among older PLWH pain was also located in the joints, back, head and legs, substantiating the descriptions of joint pain described by participants in the study. Other studies that have also confirmed the presence of pain as a challenge to performing physical activities include studies conducted by Vancampfort, et al. (2018) and Karris et al. (2020) also found that pain in older PLWH affects physical activity routines. The study by Karris et al., (2020) also found that pain in older PLWH was associated with multimorbidity, this assertion by Karris et al. (2020). Consistent with this finding by Karris et al (2020) one of the participants (Participant 1 GV) in this study who shared their challenge of pain also stated hypertension as a

comorbidity. Addis et al. (2020) explained that pain in older PLWH was caused by chronic inflammation, HIV-associated neuropathy and ART-induced neuropathy. Addis et al. (2020) also elaborate that ART-induced neuropathy was associated with the use of NRTI and PI. The issue of chronic inflammation causing pain in older PLWH especially those with hypertension illustrates the bidirectional effect of chronic inflammation; in the forward direction, as described by Masenga et al. (2020) chronic inflammation provides the common pathway to the development of both Type 2 Diabetes and Hypertension. In the opposing direction, chronic inflammation causes pain which inhibits the ability to engage in the physical activity described by participants in the study, negating efforts to reduce the occurrence of Type 2 Diabetes and Hypertension. These findings illustrate the importance of managing pain in older PLWH, to enable physical activity and reduce its confounding effect on the development of Type 2 Diabetes

Associated with pain, was that previous vigorous activity is associated with pain which affects continued physical activity. Participants who described the issue of excessive work the previous day causing pain used their farming work which was their economic livelihood as a means of physical activity. This assertion is supported by Vancampfort et al. (2018) who observe that PLWH including older PLWH relies on physically demanding jobs, in the informal sector with little social and financial security to earn a living that requires extreme physical fitness. Implications of the chronic pain affecting farming activities are also described by the Ugandan study conducted by Reynolds et al. (2022) who revealed that chronic pain affected the ability of older PLWH to conduct farming activities such as digging, weeding, looking after cattle, harvesting, splitting firewood and gardening.

Participants also shared their experiences of how fatigue affects physical activity routines, which affects self-care practices to reduce Type 2 Diabetes. The participants in their descriptions associated fatigue with ageing and the participants who noted the issue of fatigue were all hypertensive. These findings compare with the Norwegian study conducted by Langseth et al. (2022) who also found fatigue prevalent among older PLWH and associated multimorbidity among older PLWH. Similar conclusions were also drawn about fatigue as a concern in physical activity patterns among older PLWH from the study conducted by Goswami et al. (2015) in

the USA who also report that fatigue is associated with chronic pain and multimorbidity. These findings also correspond with findings conducted from other African countries; including the study conducted in Ethiopia by Gebreyesus et al. (2020) who also note that fatigue is prevalent among older PWLH and is associated with multimorbidity. Similarly, the study in Zambia and the UK by Van de Van et al (2019) was a common occurrence among older PLWH which affected physical activity.

From the current study findings, older PLWH who reported fatigue as a challenge in performing physical activity reported hypertension as a comorbidity. One of the previous studies that associated fatigue with multimorbidity included the study by Siegler et al. (2021) who list other multimorbidity- cerebrovascular diseases, gait disorders, urinary incontinence and peripheral neuropathy. Siegler et al. (2021) list of multimorbid conditions is not inclusive of hypertension which was a self-reported comorbidity among older PLWH in this study who described the issue of fatigue. This study's findings deviation, from the conclusion drawn by Siegler et al. (2021) could warrant further investigation on the correlates between the presence of hypertension and fatigue among older PLWH.

Another challenge described by the older PLWH which affected their physical activity routines were depressive like symptoms. Participants noted that although the general feeling of sadness affected their physical activity patterns, none of the participants reported that they had been diagnosed with depression. This overwhelming feeling of sadness which poses a challenge to implement physical activity routines could imply the under-diagnosis of depression among PWLH described by van Coppenhagen and Duvenage (2019). In the South African study by van Coppenhagen and Duvenage (2019), the authors note that diagnosis of depression among PLWH is a challenge because the symptoms of HIV infection itself such as fatigue, mirror the symptoms of depression which contribute to the difficulty in diagnosing depression among older PLWH. Moreover, the authors' van Coppenhagen and Duvenage (2019) reveal that diagnosis of depression is difficult as the DSM1V or DSM V do not include specific criteria for diagnosing depression among PLWH. In Zimbabwe, the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe concede that PLWH are at a higher risk of Type 2 Diabetes, and recommend the use of the depression screening tool

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for PLWH (MoHCC, 2016). Notably, unhappiness described by participants in this study is one of 14 parameters assessed using the depression screening tool recommended by the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (MoHCC, 2016). Other parameters include; lack of sleep, lack of concentration and gastrointestinal disturbances; and a score below 7 may qualify for a depression diagnosis.

Given the difficulty in recognising depression among PLWH described by van Coppenhagen and Duvenage (2019) and the recognition that unhappiness is a parameter to assess depression by the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe. The findings from this study that sadness affected their physical activity routines, there is the implication that the challenge of sadness may not fit available tools for mental health screening for depression such as the DSM-1V and DSM-V described by van Coppenhagen and Duvenage (2019) and the depression screening tool by the MoHCC (2016). As such the effects of sadness on functional capabilities of older PLWH require additional research to develop appropriate tools for their screening and mitigate effects on self-care.

5.5.2.2 Older PLWH described challenges of healthy eating

The older PLWH also noted one main theme that affected their self-care practice in adhering to a healthy eating plan which was the high cost of food. The participants described how the high cost of food affected their food preferences, which resulted in them eating what was available. The negative impact of the high cost of food on older PLWH is described in global and African literature as well. These findings are similar to the study conducted by Bekele et al. (2018) who found that low-income families of older PLWH in Canada are negatively affected by the high cost of food. Moreover, studies in the USA by O' Donnell (2019) and Henry et al. (2019) make similar conclusions on the high cost of food as a barrier to healthy eating plans. In Africa, Wright et al. (2021) in Uganda found that older PLWH eat homogenous diets due to the high cost of food. Similarly in South Africa, Oduro and Kissah-Korsah (2021) concluded that older PLWH who were financially stable could afford to maintain healthier eating plans.

Notably, Bekele et al. (2018) further assert that the high cost of food for older PLWH is also associated with depression and living in large urban areas. Notably, the issue of depression and the high cost of food resonates with this study's description by Participant 9 Muf who noted that they felt sadness as they constantly worried about not having enough money. This sadness described by Participant 9 was described in relation to challenges experienced by older PLWH.

Also, concerning the high cost of food, findings from the study by O'Donnell et al., (2019) conducted in the USA found that the cost of travel in urban areas to access food resulted in increased costs associated with the maintenance of a healthy eating pattern. This finding is also consistent with the finding by Henry et al. (2019) who conducted their study in an urban area also from the USA and who noted that proximity to grocery stores affects food costs and adherence to a healthy eating plan among older PLWH. Findings from this study contrast with these findings by O'Donnell et al. (2019) and Henry et al. (2019) as participants shared their experiences that food was readily available and accessible to them from markets, gardens and supermarkets near them. This difference in findings could infer the difference in the characteristics of urban contexts in the USA and Zimbabwe and their effects on enabling accessibility to food for older PLWH. As such recommendations made to mitigate the high costs of food among older PLWH should consider the different characteristics of the urban areas.

The theory of Self-care

Orem's self-care model and Orem's self-care deficit model formed the theoretical framework for the study. Orem's self-care model highlights that self-care practices must be learnt and must be done continuously throughout life (Smith & Parker, 2015).

The theory of self-care identifies that the self-care requisites include the (i) universal, (ii) developmental and (iii) health deviation self-care requisites (Smith & Parker, 2015). Didisen et al. (2017) explain that universal self-care requisites are critical because they uphold the unity of the physical and functional of people (Didisen et al., 2017). The universal self-care requisites include the maintenance of a balance between solitude and social interaction. Aligned to the universal self-care requisite of maintaining a balance between solitude and rest the study found that the older

PLWH in Harare Urban district maintained social relations which family members like children and spouses who supported their healthy eating patterns. Orem's theory of self-care notes that universal self-care includes, maintaining a balance between activity and rest; the study found that older PLWH in Harare Urban District were not sedentary and performed domestic chores such as cleaning, cooking and gardening as part of their physical activity routines thus maintaining the balance of physical activity and rest.

The developmental self-care needs defined in Orem's Theory of self-care are maturity-related factors that include preventative self-care practices (Didisen et al., 2017). Smith and Parker (2015) note that there are three types of developmental self-care requisites and these include; firstly, the general developmental needs, secondly requisites met by people in a positive mental state and involve the setting of goals and taking responsibility and thirdly developmental needs related to loss. Findings from this study were aligned to the second developmental need which specifies the need to take responsibility for one's health to reduce Type 2 Diabetes. From the study findings, these preventative self-care practices are being applied to the maintenance of a healthy eating pattern and performing physical activities. The older PLWH shared that the developmental self-care practices related to maintaining a healthy diet included; to maintain a healthy diet included eating a diet that consisted of whole grains, indigenous vegetables and fruit; having a diet composed of mostly carbohydrates with restricted, oils and sugar. The developmental physical activity self-care practices described by older PLWH to reduce Type 2 Diabetes were; walking as part of a physical activity routine and following a structured exercise pattern as part of the Type 2 Diabetes reduction pattern.

The self-care agency is conditioned by the peripheral concepts related to age, availability of resources, developmental state and socio-cultural background (Lambermon et al., 2020). From the study findings, the challenges experienced by the older PLWH conditioned the "*power*" and "*capabilities*" of the self-care agency to reduce Type 2 Diabetes. From the study findings, the capabilities of older PLWH to adhere to a healthy diet were affected by the high cost of food in Harare Urban District. On the other hand, capabilities of the older PLWH were supported by a family who provided the support to adhere to a healthy diet. The figure 5.2 below shows study results in relation to the concepts of Orem's self-care model.
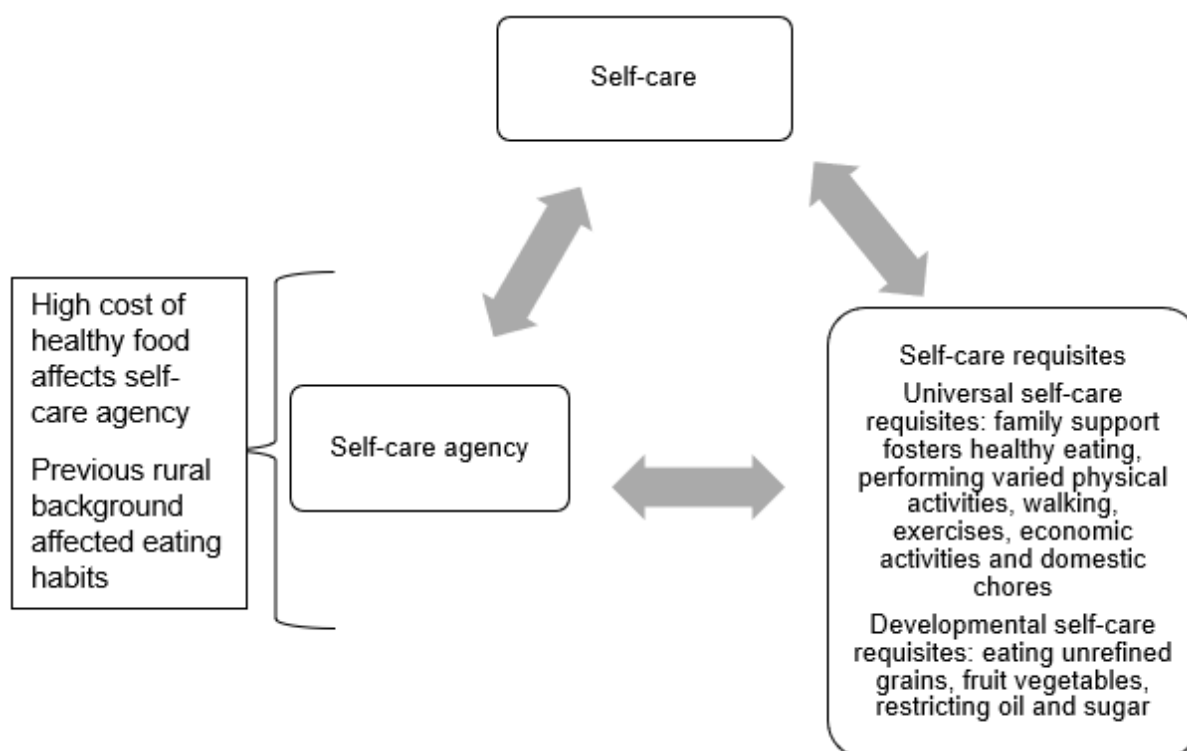
Figure 5:1. Orem's self-care model

The self-care deficit theory outlines two presumptions; firstly, for people to care for themselves they should have the values to do so and secondly nursing occurs when people are socially dependent (Smith & Parker, 2015).

From the study findings, pain, fatigue, depressive-like symptoms and previous vigorous activity negatively affected older PLWH self-care agency capabilities to engage in physical activity. Therefore, the presence of pain, fatigue, sadness and previous vigorous activity created social dependency through an inability to perform physical activity which warranted nursing care. Petiprin (2023) explains that this care is provided through teaching, guiding, acting for or creating an environment which is conducive for the self-care agency. In this regard a conducive environment could be provided by screening for depression evidenced by the sadness described by older PLWH; as stipulated in the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (2016). Teaching as a nursing intervention described in Orem's self-care deficit theory would also create a conducive environment for minimising fatigue and previous vigorous exercise. This teaching would provide education that physical activities ought to be done with gradual

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increment as stipulated in the WHO Guidelines for Physical Activity and Sedentary Behaviour (2020c). Nursing interventions to reduce pain which impacted physical activity also serve to create a conducive environment for physical activity.

5.5.3 Discussion of findings from nurses providing care to older PLWH

The second phase of the study sought to describe nursing interventions for the reduction of Type 2 Diabetes among older PLWH. Data were collected from nurses from five clinics in Harare Urban District. Three main themes emerged which described the nursing interventions to reduce Type 2 Diabetes among older PLWH. These themes were; nurses described various aspects of Type 2 Diabetes screening, nurses described various aspects of providing health education regarding Type 2 Diabetes to PLWH and interventions to reduce Type 2 Diabetes among PLWH can be fostered with continuous training.

5.5.3.1 Nurses described various aspects of Type 2 Diabetes screening

Regarding screening one of the aspects that emerged was that screening includes an assessment of risks of Type 2 Diabetes among older PLWH. The issue of screening for risks is recommended from the study conducted in the UK by Duncan et al. (2018). The authors note that such screening for risks should include HIV-specific risk factors. In their description of screening for risks, the nurses noted risks such as weight gain, and a family history of Type 2 Diabetes would warrant additional screening. Similarly, screening for such risks as a family history of Type 2 Diabetes is described by Galaviz et al. (2021) who note that the FINDRISC questionnaire includes questions on family history of Diabetes. In their study, in the USA Galaviz et al. (2021) added the HOMA-IR test to further screen for Type 2 Diabetes and found that the FINDRISC and addition of the HOMA-IR test were inadequate in identifying all Type 2 Diabetes cases in PLWH. The authors like Duncan et al. (2018) recommended the addition of HIV risk factors.

The nurses providing care to older PLWH in Harare urban District also shared their experiences that screening included an assessment of signs and symptoms of Type 2 Diabetes. Gonah et al. (2020) in their study also in Zimbabwe, outside of Harare in Gweru affirm these findings. The authors, Gonah et al. (2020), reveal that screening for signs and symptoms of Type 2 Diabetes in primary healthcare settings was standard practice and also applied to the general population. The screening for signs

and symptoms of Type 2 Diabetes was not only described in the Zimbabwean context. The study in Zambia by Baumgartner et al. (2022) also included a checklist to assess signs and symptoms of Type 2 Diabetes among older PWLH. From their conclusion the Baumgartner et al. (2022) found that screening for Type 2 Diabetes among older PLWH using a checklist drawn from signs and symptoms of Type 2 Diabetes could not identify all possible cases of Type 2 Diabetes among PLWH.

Nurses providing care to older PLWH in Harare also shared their experiences that screening included random blood glucose testing which is done for older PLWH at risk or presenting with signs and symptoms of Type 2 Diabetes. The effectiveness of performing a random blood sugar test for older PLWH presenting with signs and symptoms of Type 2 Diabetes was assessed in the study conducted in Zambia by Baumgartner et al. (2022), whose intervention required that presentation of one sign or symptom of Type 2 Diabetes should be followed through with a random blood sugar test. In their study, Baumgartner et al. (2022), concluded that when such as two-point screening procedure is used it was not effective in identifying all cases of Type 2 Diabetes. A second two-step screening procedure different from the Zambian study by Baumgartner et al. (2022), which also aligns with the theme (screening included random blood glucose testing which is done for older PLWH at risk) from this study is explained in the Peruvian study, by Bernabe-Ortiz et al. (2018). Bernabe-Ortiz et al. (2018) explain that the first step is an identification of people at risk of Type 2 Diabetes and then secondly, a follow-up confirmatory test inclusive of a random blood sugar test or other confirmatory tests like the OGTT can be useful in identifying Type 2 Diabetes. In the UK, healthcare worker performance of a random blood sugar test or a HbA1c test for older PLWH was also assessed, and results comparable to this study's findings were reported. In the UK study, Ekong et al. (2020) found that not all healthcare workers performed a random blood sugar test or an HbA1c test, with 79.9% of healthcare workers reporting that such tests were performed on older PLWH.

The study also found that screening for Type 2 Diabetes was supported by a multi-disciplinary team. In their descriptions, Participant D Bud and Participant H Kam shared that they were supported by laboratory services and medical personnel. This finding supports the conclusion drawn by Pereira et al. (2022) from a ten-year longitudinal study in the UK commends the use of a multidisciplinary team in the

screening of Type 2 Diabetes among older PLWH. In conclusion, the authors Pereira et al. (2022) found that the use of a multidisciplinary team is partly attributed to decreased polypharmacy and multimorbidity among PLWH. Noteworthy, is the similarity in conclusions drawn using two different study designs, a longitudinal study design by Pereira et al. (2022) and the use of a cross-sectional exploratory descriptive study design from this study. These similar conclusions using the different study designs could imply an affirmation of effectiveness in multidisciplinary teams which are common practice in health services and not unique to older PLWH or nursing care (Frieden et al., 2020). Furthermore, Frieden et al. (2020) note that in developed countries healthcare systems which are well resourced, the use of multi-disciplinary teams is standard practice for the prevention of all NCDs among PLWH.

5.5.3.2 Nurse described various aspects of providing health education regarding Type 2 Diabetes to PLWH

The second theme that emerged was that nurses described various aspects of providing health education regarding Type 2 Diabetes to PLWH. The health education informs older PLWH about healthy eating and encouraging physical activity to reduce Type 2 Diabetes among older PLWH. The participants noted that they provide health education on what to eat to prevent Type 2 Diabetes and also encourage older PLWH to engage in physical activity. Findings by Stonbraker et al. (2019) in the Dominican Republic compare with findings from this study. From their findings, Stonbraker et al. (2019) found that healthcare workers provided nutrition information on healthy eating to older PLWH. The issue of encouraging physical activity for older PLWH is also described in the study conducted in Tanzania by Kitilya et al. (2023) who revealed that healthcare workers "*reminded*" older PLWH to perform physical activities. Noteworthy, the researchers of this paper opine that there is a paucity of literature describing the current health education provided to older PLWH on the reduction of Type 2 Diabetes. In both comparable studies to this study, (Stonbraker et al., 2019); In addition, Stonbraker et al. (2019) and Kitilya et al. (2023) state that their studies were limited by data collection from a single facility and results cannot be generalised. Similarly, this study found comparable findings to Stonbraker et al. (2019); Kitilya et al. (2023) used a qualitative approach, from which findings cannot be generalised. Therefore, the researchers of this paper's opinion of the paucity of literature could imply a knowledge gap warranting additional research.

The study also found that group health education sessions focus on all NCDs including Type 2 Diabetes. The nurses providing care to older PLWH also shared their experiences that they provided health education in groups of older PLWH where all NCDs including Type 2 Diabetes could be provided. In addition, the study also found that individual health education was provided to older PLWH on Type 2 Diabetes who are at risk of developing Type 2 Diabetes. These findings compare with the findings from the integrative review of literature conducted by Stonbraker and Larson (2016) who found that for health education to be effective both individual and group health education sessions should be provided.

The study also found that Type 2 Diabetes health education is poorly received. Participants deduced that health education to reduce Type 2 Diabetes among older PLWH was poorly received as older PLWH failed to implement lifestyle changes to reduce Type 2 Diabetes which was mostly seen by the failure to reduce weight. Matchanova et al. (2021) explain this finding from their study by noting that health literacy is also illustrated by the ability to make decisions regarding one's health based on the health education provided. In their study in the USA, Matchanova et al. (2021) found that low levels of health literacy were associated with poor health-related decision-making. Fazeli et al. (2020) in their study in the USA found that low health literacy levels among older PLWH were associated with the presence of low socio-economic status as well as the presence of depressive symptoms. Synchronous with these findings by Fazeli et al. (2020), depressive symptoms were reported in this study in the first phase of data collection from older PLWH, the older PLWH participants shared their experiences that sadness affected their self-care routines in engaging in physical activity. Moreover, the study was conducted in a low socio-economic setting (Mufakose, Glenview, Budiriro, and Kambuzuma) of Harare Urban District (City of Harare, 2018). The findings of poor reception of health education among older PLWH in a low socio-economic context where older PLWH also report sadness as an impediment to physical activity may clinically signify the need for an additional assessment on the sadness reported and its effects on complying to health education and physical activity among older PLWH.

5.5.3.3 Interventions to reduce Type 2 Diabetes can be fostered by training

The last theme that emerged from the nurses providing care to older PLWH was that interventions to reduce Type 2 Diabetes among older PLWH can be fostered with continuous training and information sharing. This finding also aligns with the finding described in the USA by Turrini et al. (2020) who note that healthcare workers underestimate the effects of ART and HIV infection on older PLWH and require additional training. Similarly in Zambia, Baumgartner et al. (2022) found that healthcare workers reported inadequate knowledge among healthcare workers on the need to screen for Type 2 Diabetes. The study findings are also similar to findings reported by Gonah et al. (2020) in their study also in Zimbabwe who found that healthcare workers needed to be trained in endocrinology to improve their knowledge in assessing and providing health education to older PLWH in reducing Type 2 Diabetes. This finding of a need for additional training and information sharing among healthcare workers is clinically pertinent in improving both screening practices and providing health education

5.5.4 Nursing interventions are influenced by excess risks

The study found that interventions for the reduction of Type 2 Diabetes are determined by the risks presented by older PLWH. From their descriptions, the nurses providing care to older PLWH shared that these risks presented included obesity and a family history of Type 2 Diabetes in older PLWH. Noteworthy, from the first research objective excess risks associated with HIV infection and ART use in older PLWH included long duration of HIV infection and or a long duration of HIV infection with a low CD4 cell nadir, a high BMI in older PLWH, the presence of hypertension, use of older generation ART and or adverse effects of ART in older PLWH and the lack of knowledge on modifiable risk factors among older PLWH. WHO (2020b) outlines the risks of Type 2 Diabetes in the general population including the risks described by the nurses providing care to older PLWH (family history of Diabetes and obesity). Other HIV or ART-specific risks such as a long duration of HIV and the presence of hypertension were not described by the nurses providing care to older PLWH. The underestimation of risks of Type 2 Diabetes by the nurses providing care to older PLWH is not unique to the Harare Urban district and was also described in the study conducted in North America by Turrini et al.

(2020). In their study, Turrini et al. (2020) found that older PLWH are not adequately screened for Type 2 Diabetes. Galaviz et al. (2021) explain that this underestimation of risks for Type 2 Diabetes among older PLWH by healthcare workers could also be due to the lack of inclusion of HIV-specific parameters in the current Type 2 Diabetes screening tools. Similarly, in Zimbabwe, Friedan et al. (2020) reveal that the underestimation of risks of Type 2 Diabetes among older PLWH is due to the lack of guidelines for screening NCDs specific to PLWH.

The Nursing Systems Theory

The theoretical framework guiding the second phase of data collection was Orem's Nursing Systems theory. The Nursing Systems Theory describes three nursing systems, the wholly compensatory, partially compensatory and the supportive educative nursing system (Smith & Parker, 2015). The supportive educative theory acknowledges that patients can carry out their self-care activities on their own and the nursing role provides education, support and enables the creation of an environment that supports the patients (Didisen et al., 2017). The study found that nurses providing care to older PLWH in Harare Urban District interventions to reduce Type 2 Diabetes were determined by the outcomes of a risk assessment. The nursing interventions to reduce Type 2 Diabetes being determined by outcomes of a risk assessment is synchronous with Orem's Nursing systems theory which notes that nursing requires both intellectual and practical functions to determine the self-care requisites or potential self-care requisites (Didisen et al., 2017). This study found that such intellectual and practical skills were assessing risks such as weight gain and or obesity to identify the self-care requisites of older PLWH.

The study also found that nursing interventions that were practical and intellectual in alignment with the Nursing systems theory included screening for Type 2 Diabetes, such screening included conducting random blood sugar testing for some older PLWH with signs and symptoms of Type 2 Diabetes and involving a multidisciplinary team in screening for Type 2 Diabetes. These screening interventions illustrate the wholly compensatory nursing system described by Orem's nursing systems theory The findings that nurses' providing care to older PLWH provided health education on healthy eating to older PLWH, this health education was provided in groups on all NCDs as well as focussed health education to those older PLWH who were at risk

of Type 2 Diabetes. This provision of health education on healthy eating illustrates Orem's supportive educative nursing system described by Smith and Parker (2015). Furthermore, Didisen et al. (2017) explain that through the supportive educative nursing system, nurses should support patients to provide care for themselves. Such support included the encouragement for older PLWH to perform physical activities.

5.6 Conclusion to Chapter 5

Chapter 5 detailed the findings of the study. The study found that the total sample for older PLWH was 23. Their ages ranged from 52 years to 78 years. The majority (52%) of the older PLWH participants were married. The older PLWH had lived with HIV for a mean duration of 11.3 years. Two main themes; (1) older PLWH described their physical activities and (2) older PLWH described by healthy eating habits emerged from the study. The physical activities described by the older PLWH were; economic activities, domestic work, walking, exercise routines and performance of varied physical activities were the physical activities carried out by older PLWH. Regarding diet older PLWH stated that their diets consist of indigenous whole grains; indigenous fruit and vegetables and the rural background influences the choice of eating indigenous food. Diet is mostly composed of carbohydrates, with little oil and sugar; accessibility to food through markets and gardens helps with healthy eating and family support fosters healthy eating patterns.

Older PLWH also described challenges in reducing Type 2 Diabetes. The study found that the presence of pain affects physical activity; extreme physical activity is associated with pain affected physical activity. The study also found that fatigue affects the ability to engage in physical activity and depressive like symptoms affect physical activity. Older PLWH also noted that the high cost of food affects healthy eating patterns.

Chapter 5 also presented data collected from nurses providing care to older PLWH. A total of 9 nurses constituted the sample. Their ages ranged from 33 years to 54 years, with a mean age of 42.8 years. The mean years of experience in managing ART among the nurses was 6 years.

Three main themes emerged from data analysed from the interviews with nurses. The first theme was nurses described aspects of Type 2 Diabetes screening, (2) nurses described various aspects of providing health education for reducing Type 2 Diabetes

and health education was poorly received by older PLWH and (3) interventions to reduce Type 2 Diabetes could be fostered with training and information sharing. The main theme of screening was supported by subthemes that included; screening for risks of Type 2 Diabetes, screening for symptoms of Type 2 Diabetes, random glucose testing. The main theme of health education was supported by subthemes of; health education is provided for all NCDs in groups, individual health education to reduce Type 2 Diabetes is provided for older PLWH presenting with risks of Type 2 Diabetes, health education for the reduction of Type 2 Diabetes is poorly received. The study also found that risks presented by older PLWH determined nursing interventions and such risks included weight gain and obesity.

The findings of the study were also discussed in relation to findings from literature reviewed. From the older PLWH the study also found that domestic chores were described by participants as a means of engaging in physical activity. These findings were described mostly by women and similar conclusions were made from the study in Tanzania by Kitilya et al. (2023). Kitilya et al. (2023) however note that this perception differs contextually. Illustrating this difference of domestic chores as a means of physical activity, Chetty et al. (2022) from their South African study found that older PLWH regarded domestic chores as a hindrance to following an exercise routine. The study also found that older PLWH ate southern African porridge made from indigenous whole grains which were unrefined. The consumption of indigenous whole grains was influenced by their rural upbringing. This finding was also described in context of Harare Urban District as findings differed from the study conducted by Duda et al. (2020) in Poland who found that their participants consumed mostly "over milled" carbohydrate sources such as pasta. Duda et al. (2020) also notes that the choice of eating over-milled whole grains is influenced by culture.

The study also described challenges older PLWH faced in reducing Type 2 Diabetes. One of the challenges described was the issue of depressive like symptoms hindering physical activity among older PLWH. Participants in this study also reported that they had never been diagnosed with depression. From this it was acknowledged that sadness was a symptom of depression from the Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (MOHCC, 2016) and depression was a common mental health illness among PLWH from the description by van Coppenhagen and Duvenage (2019). The authors van Coppenhagen and Duvenage

(2019) also note that current tools for measuring depression could not sufficiently identify all PLWH with depression which explain the findings from this study.

The findings also discussed the findings from the nurses providing care to older PLWH. These findings noted that nurses' practices to reduce Type 2 Diabetes among older PLWH included screening, and health education to encourage physical activity. Similar findings were drawn from the study conducted by Kitilya et al. (2023) in Tanzania who noted that health education provided included nutrition education with only a "reminder" to perform physical activities. The study findings of screening and providing health education also aligned that the supportive educative nursing system was described by Orem's Nursing Systems Theory. The next chapter is Chapter 6 which develops guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

CHAPTER 6

DEVELOPMENT OF GUIDELINES

The previous Chapter 5 outlined and discussed findings from the exploratory descriptive study. This chapter triangulates three- data sources of qualitative findings of the exploratory descriptive research design and an integrative literature review. To triangulate the qualitative data, the chapter will start with an integrative literature review then the triangulation of the data sources,

6.1 Integrative literature review

Integrative literature reviews are the broadest form of systematic review in comparison to other forms of systematic reviews such as scoping reviews, and meta-analyses (Sefcik, 2020). Whittemore and Knafl (2005) explain that integrative reviews are particularly useful in providing knowledge for developing practices and policies in nursing. The authors, Whittemore and Knafl (2005) developed a five-step framework for conducting integrative literature reviews. The first step is problem identification, the second step is literature search, the third step is data evaluation, the fourth step is data analysis and the last step is data presentation. As such this integrative review for developing guidelines for reduction of Type 2 Diabetes will follow the five-step Whittemore and Knafl (2005) framework for conducting integrative reviews.

6.1.1 Problem Identification

Guidelines are general statements of recommendations (Olayemi et al., 2017). As such, to develop guidelines, existing recommendations for the reduction of Type 2 Diabetes among older PLWH are identified to address the challenge of Type 2 Diabetes among older PLWH.

Several authors Samad et al. (2016); Duncan et al. (2018), and Guaraldi et al. (2019) who describe the excess risks associated with the development of Type 2 Diabetes among older PLWH have provided recommendations for reducing Type 2 Diabetes among older PLWH. However, these recommendations remain disintegrated and it is not clear whether these recommendations are similar across the different populations

and contexts. In this regard, the integration of the different recommendations is pertinent.

Concepts that characterise recommendations for the reduction of Type 2 Diabetes among older PLWH in the literature reviewed (Chapter 2; section 2.3 include screening; health education for physical activity and diet; pharmacological interventions. Some concepts are defined from the perspective of healthcare workers such as health education, screening and pharmacological interventions, while other concepts like diet and physical activity are described from the perspectives of both healthcare workers and older PLWH. The recommendations made regarding these concepts vary in the depth of articulation as well as the populations with which they are described. For example, a healthy diet for the reduction of Type 2 Diabetes among older PLWH is described from a healthcare workers' perspective in the UK study as a modified Mediterranean diet (Duncan et al., 2020). On the other hand, the study in Poland, by Duda et al. (2020) describe some similar elements like the consumption of fruit, vegetables and whole grains of healthy diet using data collected from older PLWH. As such the integration of characteristics of a healthy diet described from different perspectives provides a deeper understanding of diet concerning the reduction of Type 2 Diabetes.

Variations are also noted concerning screening as a recommendation for the reduction of Type 2 Diabetes. There is consensus that older PLWH should be screened for Type 2 Diabetes in ART clinics (Duncan et al., 2018); (Bernabe-Ortiz et al., 2018); (Baumgartner et al., 2022). These recommendations for screening for Type 2 Diabetes, descriptions range in depth from assertions such as screening "*should be done as part of integrated care*"; in an Ethiopian study describing comorbidities among adults living with HIV, by Getahun et al. (2020). On the other end of the continuum, thick descriptions of screening measures with tools to assist healthcare workers screen for Type 2 Diabetes are described by Baumgartner et al. (2022); Galaviz et al. (2021) (Chapter 2; section 2.3) while Bernabe-Ortiz et al. (2018) describe a two-step screening process. As such an integrative literature review serves to consolidate information of recommendations for healthcare worker interventions to reduce Type 2 Diabetes among older PLWH.

Aim: The integrative literature review objective is to describe recommendations for the reduction of Type 2 Diabetes among older PLWH

6.1.2 Literature Search

A literature search was conducted from the 22nd of May 2023 to the 17th of June 2023 using three databases, PubMed, CINAHL and Cochrane Library which were published in English from 2013 to 2023. The search terms used were; reduction, Type 2 Diabetes, and People living with HIV. To search grey literature, three targeted websites were used, WHO, The IDF and the MoHCC Zimbabwe. The inclusion and exclusion criteria for the database search are shown below:

Inclusion criteria

Articles in English

Articles outlining interventions or recommendations for the reduction of Type 2 Diabetes among older PLWH

Articles including ageing, older age, and age more than 50 years as a variable to make recommendations or outline interventions for the reduction of Type 2 Diabetes among older PLWH.

Exclusion criteria

Articles not written in English

Articles not specifying "older age" "ageing" or age above "50 years" of PLWH

6.1.3 Data evaluation

The final selection of studies included reports and original research studies. The original research studies used different methods to recommend measures for the reduction of Type 2 Diabetes among older PLWH, these included mixed methods studies, quantitative studies and qualitative studies. To evaluate the overall quality of each study selected, for the data analysis, the CASP checklists were used. Responses to the parameters being assessed were limited to "yes", "no", "can't tell" or a narrative

to an open- ended question. Table 6.1 below shows the outcome of the data evaluation of the studies used.

Studies	CASP Checklist used	Number of "Yes" responses	Number of "No" responses	Number of "Can't tell" responses	Response to the open- ended question	Total number of items checked
Sarfo et al. (2021)	CASP Cohort Study	13	1	0	0	14
Lazar, Kersanske and Braunstein (2019)	CASP Cohort Study	13	0	1	0	14
Malindisa et al. (2023)	CASP Cohort Study	12	0	2	0	14
Farahat et al. (2020)	CASP Cohort Study	11	2	1	0	14
Duncan et al. (2020)	CASP Cohort Study	13	0	1	0	14
da Cunha et al. (2020)	CASP Cohort Study	13	0	1	0	14
Nanditha et al. (2020)	CASP Cohort Study	13	0	1	0	14
Nimitphong et al. (2022)	CASP randomised control trial checklist	8	4	1	0	13
Peters et al. (2013)	CASP Systematic review	7	0	1	2	10

Table 6:1 Data evaluation

The Table 6.1 above shows studies selected for the integrative review of literature were of good quality as most responses indicated "Yes" for key features of the study design used.

6.1.4 Data Analysis

The data analysis identified study characteristics which included; study design, year of publication, country or geographical area of origin, objectives of the studies/guidelines, study populations, sample sizes and outcomes/recommendations concerning the reduction of Type 2 Diabetes among older PLWH. Data analysis in integrative reviews includes ordering, coding and categorising data with the aim of

synthesising the meaning of data retrieved (Whittemore & Knafl, 2005). Whittemore and Knafl (2005) further state that data analysis in integrative reviews requires constant comparison of data sources to generate themes and meaning of data retrieved.

6.1.5 Findings

A total of 1168 articles were screened using titles and abstracts only. 955 articles were retrieved from CINAHL; 198 from PubMed and 15 articles were screened from the Cochrane Library. Two guidelines were selected from the WHO website and the MoHCC Zimbabwe website. The decision flow chart is shown in Figure 6.1 below
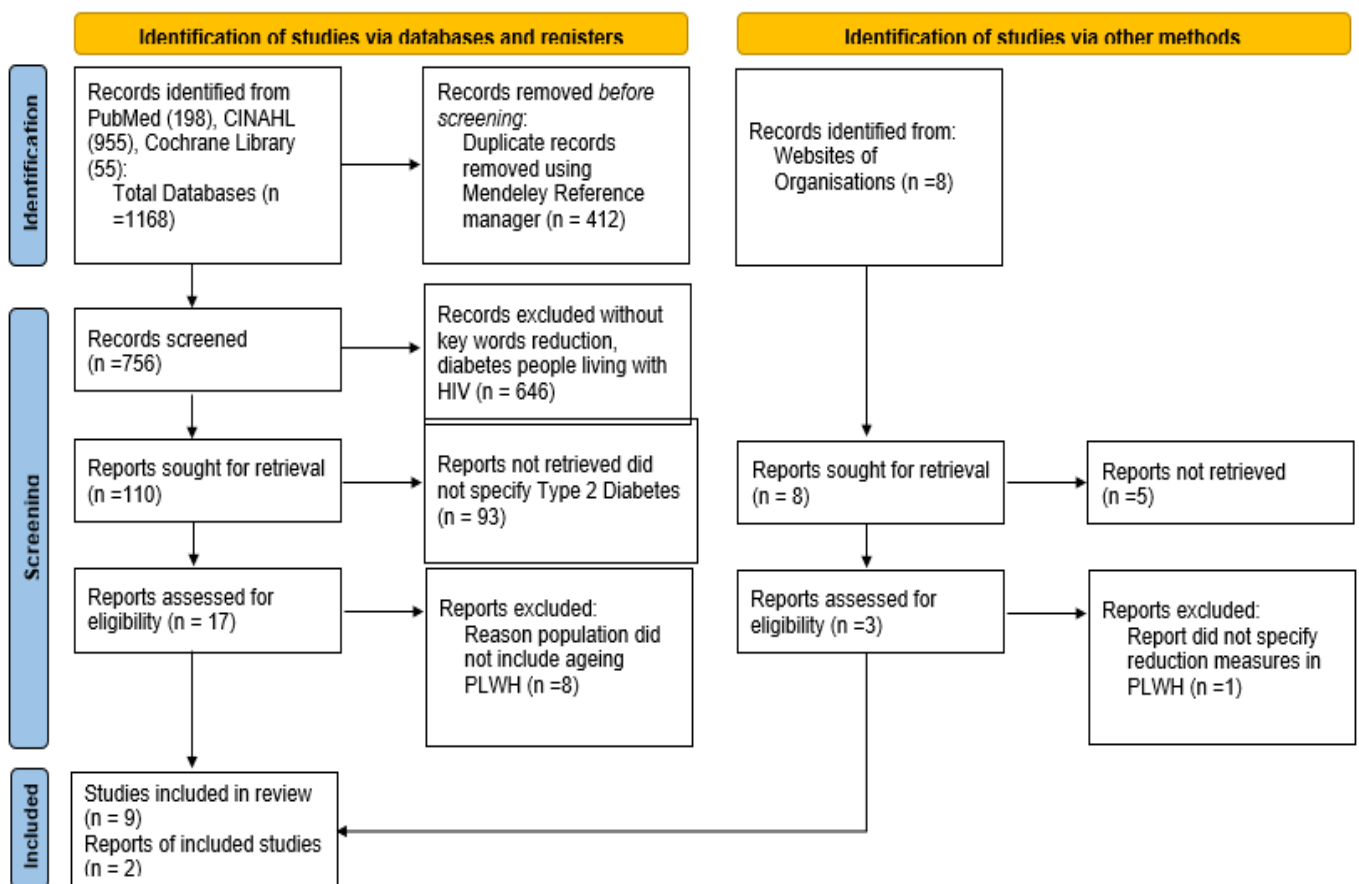

Figure 6:1. The PRISMA Flow chart for the integrative review of literature. Adapted from Page et al. (2020)

6.1.5.1 Study Characteristics

The integrative review described findings from a total of eleven articles. Two articles selected were guidelines developed by the WHO and the MoHCC Zimbabwe. The selected studies included 4 cross-sectional studies, one each of a systematic review, mixed method study, longitudinal chart review and, randomised control trial. Concerning the geographical origins of the studies, most (2) studies were from the UK, one each study was from the USA, Ghana, Tanzania, Saudi Arabia, Brazil, Canada and Thailand. The majority (4) of studies were from 2020, one each study was from 2013, 2019, 2021, 2022 and 2023. The table 6.2 below shows the characteristics of the studies selected for the integrative review.

Authors; Year of; Country of Origin	Study design	Population and Sample Size	Objectives
Sarfo et al. (2021); Ghana	Cross-sectional comparative analytical design	Adults more than 30 years from Kumasi recruited at Komfo Anokye Teaching Hospital, a tertiary hospital three samples of 258 on cART, 244 not on ART and 242 HIV negative	To describe prevalence of pre-diabetes and diabetes among PLWH at a tertiary facility
Lazar et al. (2019); USA	Cross-sectional survey	Most respondents older than 50 years recruited from New York City medical monitoring group. Sample size of 397	To determine testing frequencies of STI's diabetes, TB and diabetes
Malindisa et al. (2023); Tanzania	Cross-sectional study	Sample size 572 PLWH mean age 43 years recruited from Mwanza district	To describe the association between dietary patterns and development of Type 2 Diabetes and prediabetes among PLWH and HIV negative people.
Farahat et al. (2020); Saudi Arabia	Retrospective chart review	Sample size was 130 PLWH with a mean age of 50.1 years recruited from King Abdulaziz Medical City-Jeddah	To evaluate the prevalence and risks associated with development of comorbidities among PLWH
Duncan et al. (2020); UK	Mixed methods exploratory study	Participants aged more than 18 years with a mean age of 54 years from three clinics in London sample size of 23 PLWH.	To assess effectiveness and acceptability of individualised diet and physical activity intervention among PLWH

da Cunha et al. (2020) Brazil	Cross-sectional descriptive quantitative survey	Participants were recruited from an infectious diseases' clinic at the Walter Cantídio University Hospital. Sample size 125	To assess the prevalence of diabetes among PLWH and describe the risks associated with diabetes
Nanditha et al. (2020) Canada	Population-based longitudinal cohort study	Clinical records from 8031 PLWH and 32 124 HIV negative people recruited from British Columbia from 2000 to 2012	To compare age of diagnosis of chronic conditions and prevalence of comorbidities between PLWH and those not infected with HIV
Nimitphong et al. (2022), Thailand	randomised clinical trial	Adults with a mean age of 49.6 years, total sample size 74 with 37 in each group. Respondents recruited from an infectious diseases' clinic of a teaching hospital	To assess the efficacy of metformin to reduce Type 2 Diabetes
Peters et al. (2013) UK	Systematic review	Not Applicable	To describe the need for improved screening for comorbidities among PLWH
WHO guidelines on physical activity and sedentary life (2020) Switzerland	Consensus and systematic review of evidence	Guidelines target all populations from 5 years to 65 years and older	Not applicable
Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (2016) Zimbabwe	Expert consensus from the National Medicines and Therapeutics Policy Advisory Committee and reviews from WHO guidelines and consensus workshop	Guidelines are targeted at all age groups	Not applicable

Table 6.2. Characteristics of articles from the integrative review of literature

The table 6.2 above shows that the selected articles were studies that described one objective of conducting the study. The table further illustrates that the studies mostly used cross-sectional study designs.

6.1.5.2 Recommendations for the reduction of Type 2 Diabetes among older PLWH.

From the data analysed, recommendations and outcomes of interventions for the reduction of Type 2 Diabetes among older PLWH included screening for Type 2 Diabetes, providing health education and pharmacological interventions.

Screening

Screening for Type 2 Diabetes among older PLWH was described in the studies to identify older PLWH at risk of developing Type 2 Diabetes. Sarfo et al. (2021) in a cross-sectional comparative study design with three cohorts of 258 PLWH on cART, 244 not on ART and 242 people who were HIV negative in Ghana using a recommended routine screening for PLWH. In their findings, Sarfo et al. (2021) note that diabetes was prevalent in PLWH with a mean age of 50.6 years. Furthermore, Sarfo et al. (2021) observed that routine screening for NCDs was not done for PLWH and some PLWH were diagnosed with Type 2 Diabetes through the study screening. Peters et al. (2013) in a systematic review from the UK defines "*routine*" by citing the European AIDS Clinical Society which recommends screening for Type 2 Diabetes at HIV diagnosis, ART initiation, then thereafter biannually or annually. Farahat et al. (2020) in a retrospective medical records analysis spanning 18 years in Saudi Arabia concur with Peters et al. (2013) and Sarfo et al. (2021) by recommending screening for Type 2 Diabetes. Farahat et al. (2020) who conducted the study with a similar objective to Sarfo et al. (2021) of describing the prevalence of Type 2 Diabetes among PLWH partially attribute the high prevalence of co-morbidities among older PLWH to a lack of screening and consequent lack of interventions to reduce the occurrence of preventable co-morbidities.

Screening includes an assessment of HIV-specific risks of Type 2 Diabetes

Lazar et al. (2019) in a cohort study in the USA that assessed screening frequency for HIV co-morbid conditions with a majority of PLWH aged more than 50 years recommended that screening should be based on risks associated with comorbidities. The authors Lazar et al. (2019) found that screening and testing for Type 2 Diabetes were highest due to healthcare providers being concerned about risks to Type 2 Diabetes which are posed by long-term ART resulting in at least two-thirds of PLWH

being tested for Type 2 Diabetes. In their findings in a cross-sectional survey in Brazil with 125 PLWH, Da Cunha et al. (2020) also reiterates the recommendation of screening for HIV and ART-specific risks of Type 2 Diabetes among older PLWH. HIV-specific risks such as adverse effects of ART should be screened by assessing the type of ART taken by older PLWH with consideration that second-line ART use of Stavudine predisposes to Type 2 Diabetes (da Cunha et al., 2020).   The systematic review by Peters et al. (2013) further describes the need for a risk assessment of HIV-related risks for Type 2 Diabetes among older PLWH. Peters et al. (2013) like da Cunha et al. (2020) recommend assessment of ART-related Type 2 Diabetes risks among older PLWH taking Stavudine and Zidovudine routinely annually. Furthermore, risks for Type 2 Diabetes among older PLWH should be assessed at HIV diagnosis and ART initiation (Peters et al., 2013).

Screening for Type 2 Diabetes among PLWH should commence at an earlier age than the general population

Acknowledgment of the excess risks of Type 2 Diabetes faced by older PLWH is made by Nanditha et al. (2021). Nanditha et al. (2021) recommend that screening for Type 2 Diabetes among PLWH should be commenced at earlier ages than the general population from a longitudinal study of medical records spanning from 2000 to 2012 in British Columbia in Canada. The issue of early screening PLWH at an earlier age is also described in the Ghanaian study by Sarfo et al. (2021) who found that PLWH had prediabetes symptoms as early as 44.9 years with overt Type 2 Diabetes by age 50.6 years.   Similarly, Peters et al. (2013) in the systematic review of literature cite the British HIV Association which recommends screening for Type 2 Diabetes for PLWH from 40 years. Peters et al. (2013) explain that even though PLWH are screened from the age of 40 years, this screening should be risk profile dependent in consideration of the scarcity of resources.

Screening should include Type 2 Diabetes routine confirmatory testing

In their recommendations, Sarfo et al. (2021) note that the routine screening for Type 2 Diabetes should include a laboratory diagnostic test. In discussing the issue of confirmatory laboratory testing for Type 2 Diabetes, Sarfo et al. (2021) used two laboratory tests to measure incident Type 2 Diabetes among PLWH and found a lower

(7.0%) incidence of Type 2 Diabetes among PLWH when using the HbA1C test in comparison to 13.5% using a fasting blood glucose test. Peters et al. (2013) also reiterate the need for routine confirmatory laboratory testing for Type 2 Diabetes among older PLWH by noting that these can include an HbA1C test and an oral glucose tolerance test among other WHO recommended tests.

Screening for self-care practices and challenges of physical activity and diet

Duncan et al. (2020) in a mixed methods intervention study from the UK explain that older PWLH face several challenges for self-care in the reduction of Type 2 Diabetes. Their findings from the UK note that such barriers include stigma associated with weight reduction. In light of these self-challenges, Duncan et al. (2020) recommend that healthcare workers assess and manage challenges experienced by older PLWH in the reduction of Type 2 Diabetes. The recommendation to assess older PLWH' abilities to self-manage is reiterated by Farahat et al. (2020) in the study in Saudi Arabia, who elaborate that older PLWH do manage their lifestyles to maintain health and this self-management should be assessed to inform clinical decision-making.

Health education

From findings of the study conducted by Duncan et al. (2020), it was also recommended that individualised health education for the reduction of Type 2 Diabetes among older PLWH be provided. Individualised health education encompassed monthly advice on achieving set goals for weight reduction using face-to-face means and telephonically (Duncan et al., 2020). Reiterating the need for health education, Farahat et al. (2020) recommended individualised counselling for lifestyle modification to reduce the risks of Type 2 Diabetes. The recommendation for health education among PLWH to modify lifestyles emanates from their findings of Type 2 Diabetes being the most prevalent co-morbidity among older PLWH in Saudi Arabia (Farahat et al., 2020). Peters et al. (2013) also recommend the provision of individualised health education using different forms of communication such as online and telephonic means. The authors Peters et al. (2013) further posit the importance of creating online

knowledge-sharing groups to facilitate individualised health education among older PLWH.

Health education to promote adherence to a healthy diet

In a Tanzanian cross-sectional study with 572 respondents that assessed dietary patterns and factors associated with Type 2 Diabetes, the lack of a vegetable-rich diet among older PLWH was positively correlated to the development of Type 2 Diabetes (Malindisa et al., 2023). In addition, low socio-economic status was associated with a vegetable poor diet (Malindisa et al., 2023). Older men living with HIV are also more likely to consume a carbohydrate-rich diet and a vegetable poor diet increasing their predisposition to Type 2 Diabetes (Malindisa et al., 2023). From these findings, Malindisa et al. (2023) recommended health education fostering a vegetable-rich diet among older PLWH especially older men living with HIV, to reduce Type 2 Diabetes. In the UK, Duncan et al. (2020) using a sample size of 23 participants in the mixed method study substantiated findings by Malindisa et al. (2023) and give a similar recommendation. Using an individualised diet among older PLWH consisting of seven or more servings of fruit and vegetables, restriction of carbohydrate to less than 600kcal daily, restriction of sugar to less than 25mg daily, restricting saturated fat intake to less than 10% of daily energy intake and consuming 50% whole grains of carbohydrate intake, Duncan et al. (2020) demonstrated reduction Type 2 Diabetes indicators among older PLWH.

Health education to promote physical activity

The WHO Guidelines on physical activity and sedentary behaviour (2020c) explain that all forms of physical activity should be accounted for and this includes domestic chores, work for economic purposes and sporting or leisure activities like walking. The WHO (2020c) further recommends that older people with chronic illnesses like HIV should engage in 150 to 300 minutes of moderate aerobic physical activity or 75 to 150 minutes of vigorous aerobic physical activity two to three times weekly or a combination of both. For additional benefits from physical activity, the WHO (2020c) recommends muscle-strengthening exercises two days a week. Duncan et al. (2020) in their study in the UK also illustrated the effectiveness of physical activity in the reduction of Type 2 diabetes by using an intervention that included walking 10 000

steps daily with gradual increments of 1000 steps daily was effective in the reduction of Type 2 Diabetes among older PLWH. In addition, Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (2016) also recommend physical activity among PLWH to reduce the incidence of Type 2 Diabetes.

Pharmacological interventions

Pharmacological intervention as a means of reducing diabetes among older PLWH is described in the randomised clinical trial conducted by Nimitphong et al. (2020) in Thailand. The authors Nimitphong et al. (2020) used two matched groups of 37 participants each to assess the efficacy of metformin and found that the metformin group had improved HOMA-IR and HBA1c from 6 months onwards in comparison to the control group not taking metformin. Although reporting these benefits of metformin, Nimitphong et al. (2020) highlight that their study was limited by the small sample size of 74 participants and short intervention duration of 1 year. Peters et al. (2013) in the systematic review also discuss the use of metformin for the reduction of Type 2 Diabetes among older PLWH and explain that metformin is recommended when lifestyle adjustment interventions are not effective in the reduction of risks for Type 2 Diabetes.

Interventions for the reduction of Type 2 Diabetes are supported by a multidisciplinary team

Studies describing the various recommendations for the reduction of Type 2 Diabetes among older PLWH also recommend a multidisciplinary approach to implement the interventions. Sarfo et al. (2021) from the study in Ghana recommend the use of a multidisciplinary team for effective screening of Type 2 Diabetes among older PLWH. Similarly, in the UK Duncan et al. (2020) also made use of a dietician to provide individualised dietary advice to older PLWH enrolled for the study. Furthermore, Lazar et al. (2019) in the USA emphasize the importance of laboratory testing services for confirmation when screening for Type 2 Diabetes. The authors Lazar et al. (2019) also highlights the need to integrate HIV services with other prevention and mitigation services in healthcare services delivery.

Summary of findings of the integrative review of literature

Table 6.3 below shows the articles used and the different recommendations made which were aligned to the reduction of Type 2 Diabetes among older PLWH.

Article	Outcomes aligned to recommendations for the reduction of Type 2 Diabetes among older PLWH
Sarfo et al. (2021)	Routine screening through laboratory diagnostic tests. A multidisciplinary approach should be used to reduce Type 2 Diabetes
Lazar et al. (2019)	Screening for diabetes was poor for PLWH who had less than 3 care visits annually. HIV services should be integrated with other health services. Screening should be done following a risk assessment
Malindisa et al. (2023)	Older PLWH were less likely to adhere to vegetable rich diets in comparison to younger PLWH and develop Type 2 Diabetes.
Farahat et al. (2020)	Type 2 Diabetes was the most common co-morbidity occurring in 15.4% of PLWH. Effective health education should be provided for lifestyle modification
Duncan et al. (2020)	A six-month intervention involving physical activity and healthy diet achieved reduction in insulin resistance and lowered body weight among PLWH. Individualised health education
da Cunha et al. (2020)	High prevalence of Type 2 Diabetes among older PLWH and the need for screening for Type 2 Diabetes based on risk
Nanditha et al. (2020)	Screening for diabetes among PLWH should be commenced at earlier ages than the general population
Nimitphong et al. (2022)	Metformin improved HbA1C among PLWH and improved HOMA IR among PLWH at 12 months follow up
Peters et al. (2013)	Metformin should be used for reduction of Type 2 Diabetes when lifestyle interventions fail. Screening should be from earlier ages than general population Screening to include HIV specific risks
Guidelines for Antiretroviral Therapy for the Prevention and Treatment of HIV in Zimbabwe (2016)	Modifiable risk factors should be managed and these include smoking, hypertension, obesity, unhealthy diet and physical inactivity. Presence of other NCDs should be assessed
WHO guidelines on physical activity and sedentary life (2020)	150 to 300 minutes moderate intensity physical activity weekly or 75 to 150 minutes vigorous intensity aerobic physical activity

Table 6:3. Summary of findings from the integrative review of literature

In conclusion, the Table 6.3 summarises the different themes that were integrated to develop guidelines for the reduction of Type 2 Diabetes among older PLWH.

6.2 Qualitative data sources triangulation

Triangulation is defined as the use of several sources of data or methods to develop a complete understanding or a qualitative research problem (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville, 2014). There four types of triangulations in qualitative

research; data source, methodology, investigator and theory triangulation (Carter et al. (2014). This study will utilise data source triangulation to develop guidelines for the reduction of Type 2 Diabetes among older PLWH. Stonbraker et al. (2019) explain that data sources triangulation is the combination of multiple sources of data to reveal diverse perspectives of information, ensure complete findings and confirms study findings. In addition, data source triangulation ensures data converges, combining the data ensures greater understanding and converging the data ensures trustworthiness of the data (Carter et al., 2014). As such to ensure strong recommendations that are credible, complete and trustworthy, this section triangulates the three qualitative data sources to develop guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

6.2.1 Screening

Findings from the integrative review of literature found that screening was an integral part in the identification of older PLWH. In turn, data analysed from the nurses providing care to older PLWH also highlighted the issue of screening as a means of reducing Type 2 Diabetes among older PLWH. Studies conducted by Lazar et al. (2019), da Cunha et al. (2020) and Peters et al. (2013) describe the need for screening for risks of developing Type 2 diabetes among older PLWH. The articles recommending screening for excess risks highlight some excess risks such as use of Stavudine in second line treatment (da Cunha et al. 2020); long term use of ART (Lazar et al., 2019). Similar conclusions of screening for risks of Type 2 Diabetes are drawn from the data collected from nurses in Harare Urban District. Participant C GV Sat in particular notes the issue of conducting an initial risk assessment as part of screening for Type 2 Diabetes. These risks described by the nurses providing care to older PLWH included family history of Diabetes, obesity and or weight gain. The concurrence of healthcare workers and studies conducted by other healthcare workers in the absence of negative implications for the recommendation that "risks" are screened justifies a strong recommendation for screening for risks in the general population and excess risks among older PLWH.

In addition, the data collected from nurses in Harare Urban District concluded that screening for Type 2 Diabetes among older PLWH is supported by a multidisciplinary

team. In their description of a multidisciplinary team, Participant H Kam and Participant D Bud shared that they receive support from laboratory services and medical personnel in screening for Type 2 Diabetes. The support from a multidisciplinary team is also supported by findings from the integrative review from studies by Sarfo et al. (2021); Lazar et al. (2019); Duncan et al. (2020). The authors Sarfo et al. (2021) broadly recommend the inclusion of a multidisciplinary team while Duncan et al. (2020) describes support from dieticians and Lazar et al. (2019) like the nurses in Harare Urban District describe support of laboratory services. Noteworthy the recommendation for the utilisation of a multidisciplinary team extends beyond screening measures only and includes the provision of other interventions such as health education as illustrated by Duncan et al. (2020). In view of the concurrence on the use of a multidisciplinary team, from data collected from nurses providing care to older PLWH and the integrative review of literature, the use of a multidisciplinary team is strongly recommended in the reduction of Type 2 Diabetes among older PLWH.

Furthermore, the description of laboratory services to screen for Type 2 Diabetes by Participant H Kam resonates with the recommendation from the integrative review of screening should include routine laboratory testing. The recommendation that screening should include confirmatory laboratory testing is described in the study conducted by Sarfo et al. (2019); Peters et al. (2013). However, there was a discrepancy regarding the issue of "routine testing" described in the literature and the absence of "routine" in the description from the nurses. Despite this lack of "routine" in testing, the nurses in Harare Urban District did however did test older PLWH through performance of random blood glucose testing from the descriptions of Participant E Bud, Participant F Muf and Participant C GV Sat who described how random blood glucose testing was done on older PLWH presenting with risks of Type 2 Diabetes, while Participant E Bud described how they would repeatedly perform the glucometer checks when hyperglycaemia was detected. In view of the agreement between the use of a multidisciplinary team inclusive of laboratory services, the nurses' measures of random glucose testing with recommendations from the literature to provide routine laboratory confirmatory services, the recommendation for routine laboratory confirmatory testing is strongly recommended as there are also no adversities described with the routine testing.

The integrative review of literature also elicited the recommendation to screen for self-care practices for reduction of Type 2 Diabetes among older PLWH. Duncan et al. (2020) describes the screening of challenges such as stigma associated with weight reduction among older PLWH. In addition, Farahat et al. (2020) recommend screening for actual practices of physical activity and adherence to a healthy as a means of fostering positive lifestyle behaviours for the reduction of Type 2 Diabetes among older PLWH. This finding from the integrative review of literature resonates with findings from data collected from older PLWH. The older PLWH in Harare Urban District, describe their self-care practices of eating indigenous whole grains, restricting salt, sugar and consumption of fruit and vegetables. Furthermore, older PLWH also described physical activities they performed and the challenges they encountered in performing these self-care practices which included; pain, fatigue, and high cost of food. Data collected from the nurses is also indicative of assessment of self-care practices to reduce Type 2 Diabetes, one of the themes emerging from the nurses' data was that health education is poorly received by older PLWH. In their shared experiences the nurses- Participant E Bud and Participant B GV note that they provide health education on weight reduction however some older PLWH continue to gain weight. This recognition of poor adherence to health education described by the nurses could imply identification of challenges such as poor health literacy to adhere to a healthy lifestyle. Based on the findings of the integrative review of literature, findings from the older PLWH and findings from the nurses the recommendation to screen for self-care practices and challenges associated with self-care among older PLWH is strongly recommended.

The integrative review of literature also concluded that screening for Type 2 Diabetes among older PLWH should be commenced at earlier ages than the general public. This finding was drawn from studies made by Nanditha et al. (2021); Peters et al. (2013). Peters et al. (2013) makes the recommendation and also explain that screening for Type 2 Diabetes at an earlier age is dependent on the availability of resources for screening. Nurses in Harare urban district also noted the scarcity of resources for screening for Type 2 Diabetes such as glucose test strips described by Participant F Muf and Participant E Bud. Furthermore, the screening of PLWH from a younger age in comparison to the general public was not described by the nurses in Harare Urban District as such the recommendation is taken conditionally.

Noteworthy, the nurses in Harare Urban district also describe the screening of older PLWH who present with signs and symptoms of Type 2 Diabetes and the screening. This conclusion was not supported by evidence from the integrative review of literature. As such, the study recommends against the intervention, based on the WHO (2014) guidance that recommendations should be evidence based.

6.2.2 Health Education

Findings from the integrative review also described individualised health education to reduce Type 2 Diabetes among older PLWH. A comparison of recommendations from studies conducted by Farahat et al. (2020) and Duncan et al. (2020) draw the conclusion on the need for individualised health education to reduce Type 2 Diabetes among older PLWH. Concurring with this finding, data from the nurses in Harare Urban District also note individualised health education. The nurses from Harare Urban District elaborated that individualised health education is provided to older PLWH at risk of developing Type 2 Diabetes. Likewise, a strong recommendation is made to provide individualised health education for the reduction of Type 2 Diabetes among older PLWH

The findings from data collected from nurses also revealed that health education focusses on healthy eating and encouragement of physical activity. Likewise, health education promoting healthy eating and physical activity are described from the integrative review by studies conducted by Duncan et al. (2020); Malindisa et al. (2023); (WHO 2020c). Duncan et al. (2020) intervention that was similar to the findings by the nurses in Harare Urban District was the encouragement to consume a balanced diet that also included Southern African porridge made from indigenous unrefined grains such as sorghum, which concurred with the descriptions of diets consumed by older PLWH. Malindisa et al. (2023) in their correlational study also found that consumption of a vegetable rich diet reduced risks of Type 2 Diabetes among older PLWH. In parallel, to the evidence described by Malindisa et al. (2023) older PLWH revealed they consumed lesser proportions of vegetables in relation to carbohydrates. The nurses in turn generally stated they encouraged older PLWH to consume locally available, seasonal fruit and vegetables. Concerning the consumption of oils, sugar and salt, older PLWH stated they restricted their intake. Similarly, from the integrative

review of literature, Duncan et al. (2020) found that restricted use of saturated fat, salt to less than 5mg daily and sugar to less than 25mg daily was effective in reducing Type 2 Diabetes. However, the nurses from Harare urban district did not detail restrictions in sugar, salt and oils as part of health education for the reduction of Type 2 Diabetes among older PLWH. Therefore, the consensus from the evidence provided by the older PLWH, nurses and the integrative review health education on diet restricting oils, sugar, salt which are vegetable rich and include unrefined whole indigenous grains is strongly recommended.

Further alignment, of the three data sources was the inclusion of domestic chores, economic activities described by the WHO (2020c) as acceptable forms of physical activity, which older PLWH also indicated they performed. Duncan et al. (2020) from the intervention study in the UK also describes the effectiveness of walking at least 10 000 steps daily in the reduction of Type 2 Diabetes. The walking described by Duncan et al. (2020) is in synchrony with findings from the older PLWH who described walking as a means of maintaining physical activity. From the nurses' findings, the issue of economic activities concurred with the description by Participant H Kam who noted that older PLWH were encouraged to do their small jobs like farming. The WHO (2020c) also stipulates the required time of 75 minutes to 150 minutes weekly or 150-300 minutes two to three times weekly moderate physical activity or a combination of both. Acknowledging that the WHO (2020c) presents a physical activity guideline for older PLWH which recognises economic activities, domestic chores done by the older PLWH, strong recommendation is made to follow the WHO (2020c) guideline for physical activity to reduce Type 2 Diabetes among older PLWH.

6.2.3 Pharmacological Interventions

In a randomised controlled clinical trial to assess the effectiveness of metformin in the reduction of Type 2 Diabetes among older PLWH, Nimitphong et al. (2022) found that metformin was effective in the reduction of Type 2 Diabetes among older PLWH. Peters et al. (2013) also agreed that Type 2 Diabetes among older PLWH could be reduced using metformin. However, the nurses in Harare urban district did not corroborate the use of metformin as a pharmacological intervention for the reduction of Type 2 Diabetes among older PLWH. Therefore, the recommendation to use

metformin as a pharmacological intervention is conditionally made as there is evidence

of adverse drug interaction with some ART agents described by Dyson et al. (2018).

Table 6.4 below summarises the triangulation of the data sources

Recommendation	Presence of recommendation in data source: Integrative review of literature	Presence of recommendation in Data source: Nurses providing care to older PLWH	Presence of recommendation in data source: Older PLWH Harare Urban District	Strength of recommendation
Screening should include assessment of excess risks and risks of Type 2 Diabetes	Yes	Yes	Not applicable	Strong
Screening should be done for self-care practices and challenges in self-care	Yes	Yes	Not applicable	Strong
Consider screening for Type 2 Diabetes at an earlier age than the general population	Yes	No	Not applicable	Conditional recommendation
Screening should include screening for signs and symptoms of Type 2 Diabetes	No	Yes	Not applicable	Recommended against
Screening should include a routine confirmatory laboratory test	Yes	Yes	Not applicable	Strong
Interventions to be supported by a multidisciplinary team	Yes	Yes	Not applicable	Strong
Provision of individualised health education	Yes	Yes	Not applicable	Strong
Health education on WHO physical activity guidelines	Yes	Yes	Yes	Strong
Health education to promote a vegetable-rich diet, restricted salt intake, restricted sugar intake,	Yes	Yes	Yes	Strong

restricted oil intake, and consumption of whole grains				
Consider the use of metformin for the reduction of Type 2 Diabetes when lifestyle interventions fail	Yes	No	Not applicable	Conditional recommendation

Table 6:4. Results of the qualitative data source triangulation

From the table 6.4 above, it is summated that seven are strong recommendations as they are supported by evidence from literature, whilst two recommendations are conditional recommendations as they are not supported by evidence from the nurses providing care to older PLWH or there is concern of risks for the implementation of the recommendation.

Noteworthy, the WHO (2014) highlights that strong recommendations are those that are supported by consensus evidence and include nomenclature such as "should" whilst conditional recommendations are denoted by words such as "consider". This study did not utilise policy makers for consensus of recommendations and enhanced the data of clinicians from systematic evidence (integrative literature review) as such adapting the WHO (2014) framework for recommendation strength shown below. The table 6.5 below is adapted from the WHO (2014) grading system for recommendations.

Audience	Strong recommendations	Conditional recommendation
Older PLWH (Patients)	Most individuals in this situation would want the recommended course of action	Most individuals in this situation would want the course of action by most would not want
Nurses providing care to older PLWH, integrative literature review (Clinicians)	Most individuals should receive the intervention and adherence to the intervention could be used as a quality criterion performance indicator	Different choices will be appropriate for individual patients who will require assistance in arriving at a management decision. Decision aides may be useful in helping individuals make decisions consistent with values and preferences.

Table 6.5: Adaptation of the WHO interpretation of strong and conditional recommendations.

Conclusion to Chapter 6

Chapter 6 developed guidelines for the reduction of Type 2 Diabetes among older PLWH. The chapter began with an integrative review of the literature which identified eleven sources of evidence of recommendations for the reduction of Type 2 Diabetes among older PLWH. The integrative review identified recommendations aligned to screening which included, screening for excess HIV risks, screening Type 2 Diabetes at younger ages for PLWH, screening for self-care practices, use of laboratory services for screening for Type 2 Diabetes, including a multidisciplinary team, excluding the HbA1c test in screening for Type 2 Diabetes. The integrative review of the literature also identified recommendations for health education including the provision of individualised health education, providing education on healthy eating and physical activity. The chapter further triangulated recommendations from the integrative review of the literature with findings discussed in Chapter 5 from nurses providing care to older PLWH and the older PLWH.

CHAPTER 7

GUIDELINES FOR THE REDUCTION OF TYPE 2 DIABETES AMONG OLDER PLWH IN HARARE URBAN DISTRICT

Guidelines for the reduction of Type 2 diabetes among older PLWH have been developed following the AGREE 11 instrument. The process for the development of the guidelines included triangulation of qualitative data from three sources. The first source was findings from an exploratory descriptive study with 9 registered nurses from Harare Urban District with an average six years' experience working in ART clinics. The second data source was also from the exploratory descriptive study with 23 older PLWH with a mean age of 63 years and an average duration on ART of 11.3 years The third data source was an integrative review of literature which included 11 articles selected from three databases, PubMed, CINAHL, Cochrane Library and a grey literature search using targeted websites. The integrative review method is detailed in Chapter 6. The intended users of the guidelines are the nurses in Harare Urban District providing care to older PLWH. These guidelines apply to older PLWH.

7.1 Purpose and scope of the guidelines

The guidelines for the reduction of Type 2 Diabetes among older PLWH serve to answer the research question- what are the guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District?

7.2 Guidelines for reduction of Type 2 Diabetes among older PLWH

This section presents the guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District. The guidelines are categorised into four categories of screening, health education for lifestyle modification, use of a multidisciplinary team and use of pharmacological interventions.

Guideline 1: Screening for Type 2 Diabetes

The first guideline describes the screening measures which include, screening for excess risks, screening from a younger age, screening to include a confirmatory test and screening to include an assessment of self-care practices and challenges experienced by older PLWH in implementing lifestyle challenges.

Guideline 1.1: Screening should include excess risks as well as risks in the general population

Older PLWH face the same risks in developing Type 2 Diabetes as the general population and face excess risks due to HIV-related factors and ART-related factors (da Cunha et al. 2020); (Lazar et al., 2019); (Duncan et al., 2020). Da Cunha et al. (2020) note that excess risks associated with the development of Type 2 Diabetes include a long duration of HIV infection, a long duration on ART, a high BMI or a high waist circumference. In addition, Duncan et al. (2020) list HIV-associated risks which include a lack of immunosuppression in older PLWH. The issue of a lack of immunosuppression among older PLWH is further discussed by Høgh et al. (2022) who elaborate that older PLWH who have a CD4 cell count of less than 200cells/mm³ coupled with a long duration of HIV are more likely to develop Type 2 Diabetes. Regarding ART specific risks, use of older generation ART such as Protease Inhibitors and Nucleoside Reverse Transcriptase Inhibitors are associated with the development of Type 2 Diabetes (Guaraldi et al., 2019). According to Samad et al. (2017) older generation ART refers to use of ART between 1997 and 2004. ART specific risks also include the weight gain on ART initiation especially with the use of Integrase Inhibitors (Duncan et al., 2020). This weight gain on ART initiation should be more than 3% of initial weight annually (Duncan et al., 2020).

Excess risks for the development of Type 2 Diabetes among older PLWH also include the lack of knowledge of modifiable risk factors (Mhlanga & Netangaheni, 2023). In addition, the presence of hypertension is also a predictor for the development of Type 2 Diabetes as they share the common pathway in their development (Masenga et al, 2020).

In light of these ART and HIV specific excess risks, it is essential for nurses to enhance screening by assessing risks in the general population and excess risks presented by HIV and ART use.

Guideline 1.2: Consider screening for Type 2 Diabetes at earlier ages than general population

PLWH develop Type 2 Diabetes at an earlier age than the general population (Sarfo et al., 2021); (Nanditha et al., 2021); (Peters et al., 2013). Prediabetes symptoms can start as early as 44.9 years (Sarfo et al., 2021). In the UK it is recommended that screening for Type 2 Diabetes commences at the age of 40 years, however, due to scarcity of resources early screening is not always feasible (Peters et al., 2013).

A similar recommendation for screening for Type 2 diabetes at an earlier age than the general population is made by Hussain et al. (2022). According to Hussain et al. (2022) Type 2 Diabetes among PLWH can be detected from as early as 42 years which may indicate that Type 2 Diabetes is independent of the risk posed by ageing among PLWH. Moreover, Samad et al. (2016) reiterates the need to screen for Type 2 Diabetes at earlier ages than the general population because of the risk posed by use of older generation ART among PLWH who commenced ART between 1997-2004. The use of older generation ART was associated with lipodystrophy and dysglycaemia associated with the development of Type 2 Diabetes (Samad et al., 2016). Furthermore, the risk posed by use of older generation ART, may occur not only in the absence of ageing but also in the absence of obesity another risk for Type 2 Diabetes (Samad et al., 2016). In view of the evidence of risks for developing Type 2 Diabetes at an earlier age, it is recommended that PLWH are screened from an earlier age than the general population.

Guideline 1.3: Screening should include an assessment of self-care practices and challenges faced by older PLWH

Older PLWH perform physical activities and adhere to healthy eating plans as means of reducing Type 2 Diabetes (Duncan et al., 2020); (Farahat et al., 2020). These self-care abilities in adhering to a healthy diet and performing physical activities should be assessed to enable health education and mitigation of challenges (Farahat et al., 2020).

The guideline for screening older PLWH for self-care practices of healthy eating and physical activity is founded on the older PLWH engaging in healthy lifestyles. The WHO (2020c) notes that all forms of physical activity contribute towards physical activity for the reduction of cardiometabolic risks. These physical activities that older PLWH perform include walking, domestic chores, economic activities, and exercise

(Chetty et al., 2022). Screening for such activities enables identification of gaps in intensity, duration and nature of physical activity.

Concerning the screening for healthy eating, older PLWH consume diets partly influenced by cultural preferences (Duncan et al., 2020). This influence of culture means diets should be particular for each individual despite the need to align with a healthy diet for reducing Type 2 Diabetes. For example, the study in Uganda by Wright et al. (2021) found that PLWH consumed a diet mostly of the staple food. While in South Africa Oduro and Kissah-Korsah (2021) found that older PLWH do consume a considerable amount of fruit and vegetables which is desirable for reducing Type 2 Diabetes. This recognition of various diets consumed by older PLWH and the different physical activity patterns they engage in warrants screening to determine adequacy of lifestyle habits in reducing Type 2 Diabetes

Moreover, while older PLWH engage in various physical activities and healthy eating habits, they face challenges in performing these activities. These challenges include depression which affects the self-efficacy of performing physical activity (Wadley et al., 2022). Furthermore, fatigue is also another challenge experienced by older PLWH, which impacts on the intensity and duration of physical activity (Wadley et al., 2022). Chronic HIV related pain is another challenge in implementing physical activity among older PLWH (Vancampfort et al., 2018). Concerning adherence to a healthy diet older PLWH are mostly affected by the high cost of food especially where there is no social support (Bekele et al., 2018). Screening for such challenges would enable their mitigation facilitating older PLWH's engagement in healthy lifestyles.

Guideline 1.4: Screening should include a routine annual confirmatory laboratory test which may include a fasting blood glucose test, an oral glucose tolerance test, 2-hour post-load venous plasma glucose, with the exclusion of the HbA1c test.

Screening for Type 2 Diabetes among older PLWH should routinely include a confirmatory laboratory test excluding the HbA1c test (Peters et al., 2013); (Sarfo et al., 2021). Sarfo et al. (2021) found that the HbA1c test failed to detect Type 2 Diabetes among older PLWH by almost half. Peters et al. (2013) also report the underestimation of Type 2 Diabetes among older PLWH using the HbA1c test. Routine testing for Type 2 Diabetes should be conducted annually (Peters et al., 2013).

The routine confirmatory testing for Type 2 Diabetes among older PLWH as a screening measure for Type 2 Diabetes should ideally be done after screening for risks (Galaviz et al., 2021). Such confirmatory testing can include the oral glucose tolerance test, fasting blood glucose test, or 2-hour post-load venous plasma glucose and should exclude the HbA1c test (Sakar & Brown, 2019). According to Sakar and Brown (2019), the HbA1C test underestimates hyperglycaemia among PLWH due to drug interactions with prophylactic drugs like trimethoprim-sulfamethoxazole. In addition, Daultery et al. (2021) compared prevalence of Type 2 Diabetes among PLWH using an oral glucose tolerance test and the HbA1C test and concluded that prevalence was higher among those tested using an oral glucose tolerance test in comparison to the HbA1C. In light of this, the routine screening of Type 2 Diabetes is recommended with exclusion of the HbA1C test.

Guideline 2: Interventions for the reduction of Type 2 Diabetes among older PLWH should be supported by a multidisciplinary team

The support of laboratory scientists/technicians, dieticians, medical personnel and physiotherapists ensures older PLWH have access to comprehensive screening and health education to ensure the reduction of Type 2 Diabetes (Duncan et al., 2020); (Lazar et al., 2019); (Sarfo et al., 2021).

The use of a multidisciplinary team is described by Duncan et al. (2020) who note that dieticians are critical in providing dietary advice for Type 2 Diabetes reduction among older PLWH. In their discussion, the authors Duncan et al. (2020) note the importance of dieticians in providing individualised health education on a regular basis which was also valued by older PLWH. Furthermore, Lazar et al. (2019); Sarfo et al. (2021) emphasize the importance of laboratory personnel in routine testing of Type 2 Diabetes among PLWH. This routine testing of Type 2 Diabetes also facilitates the integration of HIV services with other chronic illnesses enabling the screening of Type 2 Diabetes (Lazar et al., 2019). As such the inclusion of a multidisciplinary team ensures older PLWH receive comprehensive care that includes adequate screening and health education.

Guideline 3: Providing PLWH with health education regarding lifestyle changes to reduce the development of Type 2 Diabetes

Health education for reducing Type 2 Diabetes among PLWH should include lifestyle changes of physical activity, and diet and the health education ought to be provided to individual older PLWH using various methods routinely.

Guideline 3.1: Individualised health education should be routinely provided to older PLWH using different methods

Effective reduction of Type 2 Diabetes among older PLWH is facilitated by routine individualised health education (Duncan et al., 2020); (Farahat et al., 2020). Health education to reduce Type 2 Diabetes should be routinely provided and can be provided using different mediums of communication such as face-to-face, online and telephonic (Peters et al., 2013). Peters et al. (2013) asserts that use of different means of providing patient education fosters increased frequency and routine of providing individualised health education.

The study conducted in the Dominican Republic by Stonbraker et al. (2019) also reiterates the need for individualised routine health education. The need for individualised health education is founded on the need to uphold confidentiality due to stigma associated with HIV infection (Stonbraker et al., 2019). Furthermore, the different educational levels and cultural difference among older PLWH warrants the need for individualised health education (Stonbraker at al., 2019). Moreover Duncan et al. (2020) acknowledges the need for individualised health education for older PLWH with consideration for their different needs for physical activity and healthy eating plans.

Guideline 3.2: Health education for physical activity should conform to the WHO 2020 guidelines on physical activity and sedentary life for people living with chronic conditions including HIV which stipulate 75-150 minutes of intense physical activity, or 150-300 minutes of moderate-intensity physical activity or a combination of both two to three times a week.

Physical activity coupled with healthy eating habits is effective in the reduction of Type 2 Diabetes among older PLWH (Duncan et al., 2020). The Guidelines for Antiretroviral

Therapy for the Prevention and Treatment of HIV in Zimbabwe (2016) and the WHO (2020) guidelines on physical activity and sedentary life also encourage physical activity among PLWH as a means for the reduction of Type 2 Diabetes and other cardiovascular conditions.

Several studies confirm the benefits of physical activity on the reduction of Type 2 Diabetes among older PLWH Quiles et al. (2017); Willig et al. (2020); Duncan et al. (2020). According to Willig et al. (2020) Type 2 Diabetes risk is lowered by 26% with moderate intensity physical activity and by 53% with vigorous intensity physical activity. Noteworthy, The WHO (2020) acknowledges all forms of physical activities among older people living with chronic illnesses like HIV. Chetty et al. (2022) summarises these physical activities engaged by older PLWH by listing domestic chores, exercise, economic activities like farming and walking.

Guideline 3.2: Health education to promote a vegetable-rich diet of 7 or more servings of fruit and vegetables, restricted salt intake to less than 5g daily, restricted sugar intake to less than 25mg daily, restricted oil intake, consumption of whole grains of at least 50% carbohydrate intake

In an intervention study to assess the effectiveness of a diet restricting the use of salt, sugars and fat intake; increased vegetable intake, and consumption of whole grains, Duncan et al. (2020) concluded that a healthy diet combined with physical activity reduced the occurrence of Type 2 Diabetes. A similar study conducted by Malindisa et al. (2023) found that PLWH who consumed a vegetable-rich diet had lesser risks to the development of Type 2 Diabetes

The benefits of a healthy diet and like physical activity in reducing Type 2 Diabetes among older PLWH have been confirmed by studies conducted by Bendall et al. (2018); Bavaro et al. (2021). The study by Bendall et al. (2018) found that the Mediterranean diet reduced central obesity among older PLWH. The Mediterranean diet consists of mostly fruit and vegetables, with restricted use of saturated fat, salt and sugars. Sneij et al. (2019) found that such increased consumption of fruit and vegetables also reduced the BMI after 6 months.

Guideline 4: Consider the use of metformin for the reduction of Type 2 Diabetes when lifestyle interventions fail.

The use of metformin for the reduction of Type 2 Diabetes was found to be effective in achieving glycaemic control in a clinical trial conducted by Nimitphong et al. (2022). In their study Nimitphong et al. (2022) concluded that metformin lowered the body weight and BMI as well as reducing the HbA1C levels and HOMA-IR levels among older PLWH after a 6 months period. Peters et al. (2013) also recommend the use of metformin when lifestyle interventions fail. However, there have been reports of adverse drugs interactions with some ART agents and the use of metformin among PLWH as such there is need for caution when prescribing metformin for Type 2 Diabetes reduction (Dyson et al., 2019).

7.3 Review of guidelines
Guidelines for the reduction of Type 2 Diabetes have been reviewed by the research supervisor in College of Health Studies, University of South Africa.

7.3.1 Updating of guidelines
The guidelines for the reduction of Type 2 Diabetes among older PLWH will be updated through a systematic review of literature after two years in June 2025.

7.3.2 Applicability of the Guidelines
To ensure the guidelines are applicable, the section details facilitators and barriers to the implementation and the monitoring framework of the guidelines.

7.3.3.1 Facilitators and barriers to the implementation of the guidelines
Implementation of guidelines for the reduction of Type 2 Diabetes among older PLWH will be facilitated by three main factors. Firstly, the availability of a multidisciplinary team such as medical personnel, dieticians, pharmacists, physiotherapists, and laboratory services for testing of Type 2 Diabetes among older PLWH. Secondly, continued information sharing and training among nurses providing ART services for PLWH in Harare Urban District will facilitate the implementation of the guidelines. A study conducted by Baumgartner et al. (2020) recommended that continued information dissemination improves knowledge on endocrinology facilitating implementation of measures to reduce Type 2 Diabetes. The third facilitator for

implementing the guidelines is the cooperation of older PLWH in implementing physical activity and adhering to a healthy lifestyle.

The main barrier that has been identified in the implementation of the guidelines is a lack of resources especially for testing and monitoring. Gonah et al. (2020) note the general lack of testing equipment such as glucose test strips which affects the screening of Type 2 Diabetes in Harare Urban District

7.3.3.2 Monitoring criteria for the guidelines

To facilitate the ongoing use of guidelines for the reduction of Type 2 Diabetes among older PLWH, defined criteria for measurement of implementation of recommendations are outlined in Table 7.1 below:

Guideline category	Guideline	Monitoring criteria
Screening	Screening for risks and excess risks of Type 2 Diabetes among older PLWH	Older PLWH clinic records detailing responses by older PLWH to risks assessed by nurses
	Consider screening PLWH from a younger age than the general population	PLWH clinic record showing screening interventions (risks assessment outcomes, and testing
	Screening should include an assessment of self-care practices	Details in older PLWH patient records outlining the nature, frequency and duration of physical activity and dietary patterns to reduce Type 2 Diabetes, dietary pattern and challenges in implementing self-care practices
	Screening should include a routine annual laboratory confirmatory test for Type 2 Diabetes	Laboratory test results annually indicating Type 2 Diabetes test
Multidisciplinary team	Interventions for the reduction of Type 2 among older PLWH should be supported by a multidisciplinary team	Referral letters to other disciplines for Type 2 Diabetes reduction screening and health education
Health education	Individualised health education should be routinely provided to older PLWH using different methods	Older PLWH clinic notes indicating the topic discussed on the reduction of Type 2 Diabetes and the method of health education used

	Health education for lifestyle adjustment enabling physical activity to conform to the WHO 2020 guidelines. The health education to promote a vegetable-rich diet of 7 or more servings of fruit and vegetables, restricted salt intake to less than 5g daily, restricted sugar intake to less than 25mg daily, restricted oil intake, consumption of whole grains of at least 50% carbohydrate intake	• Older PLWH clinic records detailing the assessment of physical activity health education • Clinic records of older PLWH detailing topics of healthy nutrition discussed with older PLWH.
Pharmacological interventions	Consider the use of metformin for the reduction of Type 2 Diabetes when lifestyle interventions fail.	Record of prescribed metformin in older PLWH clinic records

Table 7:1. Guideline monitoring criteria

The table 7.1 above shows how nursing can monitor the implementation of the guidelines for the reduction of Type 2 Diabetes among older PLWH.

7.4. Dissemination of the guidelines

The guidelines will be available in the institutional repository at the University of South Africa and publication of a journal will also be done to improve dissemination of the guidelines. Checklists of the quality assessments of studies used to develop the guidelines have also been attached to this study (Appendix I, J and K).

7.4.1 Editorial Independence of the guidelines

This section describes the competing interests of stakeholders involved in the development of the guidelines and funding information that could influence the outcomes of the guideline development process.

7.4.1.1 Funding Information

No funding was received in developing guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

7.4.1.2 Competing Interests

No competing interests are declared in the preparation of guidelines for the reduction of Type 2 Diabetes among older PLWH.

7.5 Conclusion to Chapter 7

Chapter 7 presented 8 guidelines for the reduction of Type 2 Diabetes among older PLWH. The chapter begins with a brief summary of how they were developed. The process included the triangulation of data with evidence from the nurses and older PLWH enabled contextualisation of the guidelines to Harare Urban District, simultaneously ensuring originality of the study. The AGREE 11 checklist for guidelines was used as a quality control measure to ensure guidelines adhere to acceptable standards of guideline reporting. The eight guidelines were then presented which are categorised into screening, health education, use of a multidisciplinary team and pharmacological interventions. Furthermore Chapter 7 lists the facilitators and barriers to implementing the guidelines as well as a monitoring framework for guideline implementation. The chapter also describes the editorial independence of the guidelines. The next chapter is Chapter 8 which presents the conclusion, recommendations for future studies, limitations, and implications of the findings.

CHAPTER 8

CONCLUSION, RECOMMENDATIONS AND LIMITATIONS, STRENGTHS

The previous Chapter 7 presented the guidelines for the reduction of Type 2 Diabetes among older PLWH. The current, Chapter 8 presents the conclusions, recommendations, strengths and limitations of the study. The chapter begins with a summary of the whole study and then a summary of the study findings according to specific research questions. The chapter then provides recommendations for policymakers, nursing education and further research. Limitations of the study are then discussed. The chapter then summarises the strengths of the study. This chapter concludes with a summation of the overall research purpose of developing guidelines for the reduction of Type 2 Diabetes among older PLWH in Harare Urban District.

8.1 Summary of the study

Chapter 1 of the study introduced the study and described the importance of developing guidelines for the reduction of Type 2 Diabetes among older PLWH due to the increase in the number of older PLWH in Harare Urban District and globally. In addition, the global, African and Zimbabwean contexts within which an increase in the number of older PLWH are described is discussed in section 1.2. In the background of the study, the variations of prevalence and incidence of Type 2 Diabetes among older PLWH are described and it is noted that in Zimbabwe prevalence of Type 2 Diabetes among older PLWH is similar to the general population. Furthermore, the chapter outlines the study objectives, the significance to nursing of the study and the research gap that was filled by the study. Section 1.8.1 of the study defines key concepts used in the study which include; risks, reduction, prevention, guidelines, HIV, and Type 2 Diabetes. The chapter further orients the study and outlines the qualitative study approach that was employed and Orem's self-care deficit nursing model which was the theoretical framework. The last section, section 1.11 provides an outline of the chapters of the study.

Chapter 2 of the study discussed the literature reviewed following the research objectives. Section 2.1 details physical activity and diet self-care practices done by older PLWH to reduce Type 2 Diabetes. The section outlines the nature of physical activities conducted by older PLWH from a global and African perspective and walking

was found as a common activity in the different contexts. Adherence to a healthy diet is also described globally and locally and the literature reviewed noted how older PLWH consumed homogenous diets in Africa whilst in developed countries older PLWH consumed refined foods. Chapter 2 further describes various challenges encountered by older PLWH in the reduction of Type 2 Diabetes which included fatigue, pain, depression, frailty, lack of information and the high cost of healthy food. Section 2.3 then describes healthcare interventions in the reduction of Type 2 Diabetes which included screening, health education and pharmacological interventions. Section 2.4 further describes efforts that have been made in reducing Type 2 Diabetes in the UK, USA, Zambia and Zimbabwe. Chapter 2 outlines the guidelines, statutes and policies that influence the reduction of Type 2 Diabetes among older PLWH which include the WHO guidelines for physical activity and sedentary life (2020). The last section of Chapter 2 outlines Orem's self-care nursing deficit theory which forms the theoretical framework of the study. The section details concepts and the three models that form the model.

Chapter 3 described the methods used in the study. The application of the pragmatism worldview is explained as well as the qualitative approach applied in the study. The chapter elaborates on the research design used in relation to the six research objectives. The research design included a scoping review of literature for the objective, describe risks associated with the development of Type 2 Diabetes among older PLWH. An exploratory descriptive design with two data collection phases (1) for older PLWH to describe self-care practices for the reduction of Type 2 Diabetes and describe challenges experienced by older PLWH in reducing Type 2 Diabetes. The second phase of data collection was for nurses providing care to older PLWH to fulfil the objectives describe interventions for the reduction of Type 2 Diabetes among older PLWH and determine whether nursing interventions are influenced by excess risks presented by older PLWH. The triangulation of qualitative data sources fulfilled the objective develop guidelines for the reduction of Type 2 Diabetes among older PLWH.

Chapter 3, also describes the exploratory descriptive study design which outlined the low socio-economic setting of Mufakose, Budiriro, Glenview and Kambuzuma where the study took place and how purposive sampling was used to select the sample of both older PLWH and nurses whose sizes were determined by data saturation. The chapter also describes the semi-structured interview schedules used to collect data

which was analysed using Braun and Clark's 6 steps. Moreover, Chapter 3 details the ethical considerations which explains that permission to conduct the study was approved by the College of Human Sciences Research Ethics Committee (14056739_CREC_CHS_2022) and permission was granted by the City of Harare City Health Department. Informed consent was also obtained from all participants. The last section of Chapter 3, details the triangulation of qualitative data sources and Whittemore and Knafl's updated (2005) five-step approach method used to conduct an integrative literature review. Whittemore and Knafl's (2005) five-step approach included (1) identifying the problem, (2) selecting the studies, (3) defining the information to be selected, (4) evaluating the quality of selected studies and (5) interpreting and presenting the findings

Chapter 4 details the scoping review of literature. The chapter details the method used which was developed by Arksey and O'Malley's (2005) The framework for scoping review included (1) outlining the research question, (2) identifying studies, (3) selecting studies, (4) data extraction and (5) presenting findings. Findings from the scoping review of literature indicated that 15 studies were selected from Italy (3), Zimbabwe (2), South Africa (1), United Kingdom (1), Brazil (1), Denmark (1), Tanzania (1), Rwanda (1), Canada (1) and USA (1). Two of the studies were multi-country studies from Italy and Romania and Italy and the Asia Pacific region. Five themes emerged which outlined the risks of Type 2 Diabetes among older PLWH. From the scoping review of the literature, the main discussion focussed on the long duration of HIV infection predisposing to Type 2 Diabetes from as early as 2012 from the study conducted by Galli et al. in (2012). Section 4.2 also discussed that data pertaining to the lack of knowledge on modifiable risk factors was derived only from studies conducted in Africa.

Chapter 5 presented the findings from the exploratory study from both the older PLWH and nurses providing care to older PLWH. Phase One of the exploratory descriptive study collected data from 23 older PLWH whose ages ranged from 51 years to 78 years with a mean HIV duration of 11.3 years. Two themes emerged from the data collected from older PLWH regarding the self-care practices for the reduction of Type 2 Diabetes and these pertained to physical activity and healthy eating. The older PLWH also described challenges they experienced in reducing Type 2 Diabetes, two of these challenges related to physical activity and one challenge was aligned with

healthy eating. The chapter also described the findings from data analysed from interviews with nurses providing care to older PLWH. Nine nurses participated in the study who had a mean duration of experience of 6.3 years in an ART clinic. Three themes emerged that described interventions for the reduction of Type 2 Diabetes among older PLWH and one theme emerged that described whether nursing interventions were determined by excess risks presented by older PLWH. Chapter 5 also discussed the findings from the study. The discussion from the exploratory descriptive study design confirmed that the dietary habits of older PLWH were determined by socio-economic status like in other African countries like Tanzania and Zambia. Interventions described by the nurses also confirmed the need for a multidisciplinary team for the reduction of Type 2 Diabetes among older PLWH. In addition, the discussion also confirmed the issue of poor health literacy among older PLWH described by nurses with other studies conducted in the USA.

Chapter 6 described the development of the guidelines for the reduction of Type 2 Diabetes among older PLWH. The chapter presented the integrative review of literature which described recommendations for the reduction of Type 2 Diabetes among older PLWH. The chapter describes the selection of 11 studies which outlines interventions related to screening, health education and pharmacological interventions for the reduction of Type 2 Diabetes among older PLWH. Furthermore, Chapter 6 presents a triangulation of the three qualitative data sources to draw up guidelines for the reduction of Type 2 Diabetes among older PLWH.

Chapter 7 presents the guidelines for the reduction of Type 2 diabetes among older PLWH. The chapter begins by introducing the method used to develop the guidelines. Furthermore, the chapter outlines the four categories of the guidelines which included screening, health education for lifestyle modification, use of a multidisciplinary team and the use of metformin. Chapter 7 also outlines how the guidelines were reviewed and when they will be updated. The facilitators and barriers to implementing the guidelines have also been listed and a monitoring framework is outlined. The chapter further reveals that the guidelines will be disseminated through a journal article and the editorial independence of developing the guidelines is listed.

8.2 Summary of study findings according to research questions
The study sought to address the following research questions

- What are the excess risk factors associated with developing Type 2 Diabetes in older PLWH?

- What are the self-care practices older PLWH perform to reduce Type 2 Diabetes?

- What are the challenges in reducing Type 2 Diabetes among older PLWH?

- What are the nursing interventions implemented to reduce Type 2 Diabetes among older PLWH with excess risk?

- Are nursing interventions for reducing Type 2 Diabetes determined by excessive risks older PLWH have?

- What nursing guidelines can be used for the reduction of Type 2 Diabetes among older PLWH with excess risk for developing Type 2 Diabetes?

8.2.1 Excess risk factors associated with the development of Type 2 Diabetes among older PLWH

The scoping review of literature described five risks associated with the development of Type 2 Diabetes among older PLWH. The first risk was the long duration of HIV among older PLWH, with the subtheme of a long duration of HIV and a low CD4 cell nadir. The second risk associated with the development of Type 2 Diabetes among older PLWH is the use of older generation ART among older PLWH, the second theme was supported by the subtheme; adverse effects of ART among older PLWH. The third risk was a high BMI among older PLWH. The fourth risk is the presence of hypertension in older PLWH predicts Type 2 Diabetes and the fifth risk is a lack of knowledge on modifiable risk factors that predisposes to Type 2 Diabetes.

8.2.2 Self-care practices implemented by older PLWH in Harare Urban District to reduce the development of Type 2 Diabetes

Findings from phase 1 data collection of the exploratory descriptive study design revealed that older PLWH in Harare Urban District engaged in a variety of physical activities. These physical activities included walking, performing economic activities such as farming, performing domestic chores and following exercise routines. The older PLWH also consumed indigenous unrefined whole grains, vegetables and fruit as a means of reducing Type 2 Diabetes. Furthermore, older PLWH restricted their intake of sugar, oils and salt whilst their diet was mostly starch with varying but lesser

proportions of protein, fruit and vegetables. The healthy eating among older PLWH was facilitated by family support and proximity to markets and gardens while previous rural background influenced the choice to consume indigenous whole grains, fruit and vegetables.

8.2.3 Challenges in reducing Type 2 Diabetes among older PLWH

The challenges faced by older PLWH in reducing Type 2 Diabetes included the presence of pain, previous vigorous physical activity which caused pain, fatigue and sadness which affected physical activity. The high cost of food affected healthy eating for the reduction of Type 2 Diabetes among older PLWH.

8.2.4 Nursing interventions to reduce Type 2 Diabetes

Nursing interventions implemented for the reduction of Type 2 Diabetes among older PLWH include screening for risks among older PLWH, screening for signs and symptoms of Type 2 Diabetes, performing random blood glucose testing, involving a multidisciplinary team in screening for Type 2 Diabetes, providing individualised health education on physical activity and healthy eating to older PLWH at risk of Type 2 Diabetes as well as group health education on all NCDs. The health education provided to older PLWH was poorly received and interventions to reduce Type 2 Diabetes among older PLWH could be fostered by continuous training of nurses.

8.2.5 Determine if nursing interventions for reducing Type 2 Diabetes are influenced by excess risks.

The nursing interventions for the reduction of Type 2 Diabetes among older PLWH were influenced by risks presented by older PLWH such as weight gain.

8.2.6 Guidelines for the reduction of Type 2 Diabetes among older PLWH

Eight guidelines can be used for the reduction of Type 2 Diabetes among older PLWH. The first is screening should include an assessment of excess risks as well as risks in the general population. The second is that consideration can be made to screen PLWH from a younger age. The third is that older PLWH should be screened for self-care practices and challenges for reducing Type 2 Diabetes. The fourth is that screening

should include a routine, annual confirmatory laboratory test which may include a fasting blood glucose test, an oral glucose tolerance test, and 2-hour post-load venous plasma glucose, with the exclusion of the HbA1c test. The fifth is that nursing interventions should be supported by a multidisciplinary team. The sixth is that individualised health education should be routinely provided to older PLWH using different methods. The seventh guideline is that health education for lifestyle modification should conform to the WHO (2020) guidelines on physical activity and sedentary life for people living with chronic conditions. The seventh guideline extends to promote a vegetable-rich diet of seven or more servings of fruit and vegetables, restricted salt intake to less than five grams daily, restricted sugar intake to less than 25mg daily, restricted oil intake, consumption of whole grains of at least 50% carbohydrate intake. The eighth guideline is that use of metformin to reduce Type 2 Diabetes can be considered if lifestyle interventions for reducing Type 2 Diabetes fail.

8.3 Recommendations

Several recommendations for policymakers, nursing education and additional research were derived from the findings from the study.

8.3.1 Recommendations of health care policymakers

One of the key issues discussed in the findings from the older PLWH was that depressive like symptoms appear to affect the self-care practice of physical activity, despite older PLWH not being diagnosed with depression. Similarly, other studies confirmed an underdiagnosis of depression among PLWH. In light of this underdiagnosis of depression among older PLWH, it is recommended that tools that assess depression include specific parameters that consider unique influences of HIV and ageing to enable the identification of all cases of depression among older PLWH.

Data analysed from older PLWH also concluded that older PLWH experienced challenges in adhering to a healthy diet because of the high cost of healthy food. In light of this plight, the study recommends policymakers support the nutrition requirements of older PLWH this could be through government initiatives, forging partnerships with private and civil society organisations aimed at providing balanced nutrition for older PLWH.

The study also found that nurses providing care to older PLWH provided group health education for the reduction of all NCDs among older PLWH. Studies reviewed such as

the study conducted by Masenga et al. (2020) also note the association of Type 2 Diabetes with other chronic illnesses like Hypertension. In light of this, the study recommends the integration of ART services with other NCDs as a means of providing comprehensive care to older PLWH.

8.3.2 Recommendations for Nursing Education

Data collected from the nurses concluded the need for training and information sharing on endocrinology for older PLWH. As such it is recommended that nursing education should facilitate training and information sharing on reducing and managing Type 2 Diabetes among older PLWH as part of continuous professional development.

8.3.3 Recommendations for further research

The scoping review of literature found that a lack of knowledge on modifiable risk factors predisposed older PLWH to Type 2 Diabetes. This conclusion was made from studies conducted only in Africa- Biraguma et al. (2019); Kagaruki et al. (2018). The lack of representation from other continents like Europe, and Asia could illustrate a gap in population which warrants further studies in other geographical locations outside Africa.

The scoping review of literature concluded that the use of older-generation ART is associated with the development of Type 2 Diabetes among older PLWH. However, this conclusion was made from studies drawn from Europe and North America. In consideration of the assertion made by Ford, Calmy and Mills (2011) of the delayed usage of ART in developing countries especially in Africa the effects of the use of older-generation ART on African populations may have not been uniform across the world. As such there is a need for a time series analysis in African countries to describe the influence of older generation ART in predisposing to Type 2 Diabetes among older PLWH.

The study used a qualitative, exploratory descriptive study design to describe self-care practices for the reduction of Type 2 Diabetes among older PLWH. From this exploratory nature of the study, it is recommended that additional quantitative studies using bio-physiologic measurements should be conducted that accurately measure

the intensity and duration of physical activity among older PLWH. In addition, it is also recommended that further investigation on the correlates between the presence of hypertension and fatigue among older PLWH be conducted as the older PLWH who had hypertension also shared their experiences of fatigue.

From the triangulation of qualitative data sources eight guidelines for the reduction of Type 2 Diabetes among older PLWH are described. In addition to providing the guidelines for the reduction of Type 2 Diabetes among older PLWH a monitoring framework was provided to ensure implementation of the recommendations. To assess the effectiveness of these recommendations the study recommends an evaluation study after one year from implementation to assess the impact of recommendations in the reduction of Type 2 Diabetes and the process of implementation of the recommendations

8.4 Strengths of the study

The study findings are based on the following strengths of study designs used.

8.4.1 Strengths of the scoping review of literature

The scoping review of literature enabled the identification of studies describing risks of Type 2 Diabetes from various populations of older PLWH, which included studies from various contexts such as, Asia, Europe, North and South America and Africa providing a comprehensive insight that informed the study.

8.4.2 Strengths of the exploratory descriptive study design

The exploratory descriptive study collected data from both older PLWH and nurses providing care to older PLWH in Harare urban District. This collection of data from both nurses and older PLWH enabled insight into the self-care practices of physical activity and challenges faced by older PLWH in reducing Type 2 Diabetes. This insight provided older PLWH contributing to guidelines that affect them which foster cooperation in implementing the guidelines.

8.4.3 Strengths of the integrative review of literature and triangulation of qualitative data sources

The integrative review of literature included searching for grey literature enabling the inclusion of guidelines -The WHO guidelines on physical activity sedentary life and the MoHCC Zimbabwe ART guidelines providing adequate recommendations for physical activity and screening for challenges faced by older PLWH in reducing Type 2 Diabetes. Triangulation of the three qualitative data sources enabled rigour (credibility) of the guidelines developed.

8.5 Limitations of the study

Despite all efforts being made to ensure credible results were obtained from the study, the study had some limitations.

8.5.1 Limitations of the scoping review of literature.

The scoping review of literature used secondary sources to map risks of Type 2 Diabetes among older PLWH. A total of 15 articles were selected and these articles defined and measured Type 2 Diabetes differently. Høgh et al (2022) in their study in Denmark measured insulin resistance using the HOMA-IR score. Chimbetete et al. (2017) and Samad et al. (2017) defined Type 2 Diabetes as random blood sugar of more than 11.1 mmol/litre which was further confirmed with a fasting blood glucose test of more than 7mmil/litre. Duncan et al. (2018) used a fasting blood glucose test of more than 7mmol/litre. This lack of consistency in defining Type 2 Diabetes limits the outcomes of the scoping review of literature.

8.5.2 Limitations of the exploratory descriptive study design

The exploratory descriptive study design was also limited by the interview method of data collection method used which may lack objectivity and or fail to provide full details of experiences due to forgetfulness from both the older PLWH and the nurses.

Furthermore, older PLWH living with HIV were provided with health education during the course of the interviews on how to reduce Type 2 Diabetes which education may have also influenced their responses.

Another limitation of Phase Two of the exploratory descriptive study with the nurses providing care to older PLWH was the lack of inclusion of participants from other disciplines such as medical officers, dieticians and medical laboratory scientists/technicians who could have provided additional insight into the interventions for the reduction of Type 2 Diabetes among older PLWH.

8.5.3 Limitations of the integrative review of literature

The study included an integrative review of literature as a systematic literature review to provide evidence for the recommendations made for the reduction of Type 2 Diabetes among older PLWH. The CASP checklists were used as a means of checking the quality of selected studies. The CASP checklists use subjective means dependent on assessment from the researcher to grade the quality of each article selected. This implies that the quality of the selected studies may be subjective to the researcher. In addition, the integrative review of literature also used sources that defined Type 2 Diabetes differently like the scoping review of literature.

8.6 Conclusion

Zimbabwe is in Southern Africa where there is a high prevalence of HIV and an increasing population of older PLWH who develop chronic age-related NCDs like Type 2 Diabetes. The increase in urbanisation in Zimbabwe has also increased Type 2 Diabetes which could increase the disease burden in a region with high HIV prevalence. As such this development of guidelines for the reduction of Type 2 Diabetes among older PLWH mitigates the high disease burden from Type 2 Diabetes in a high HIV endemic area through focussed screening, health education and the use of pharmacological interventions where lifestyle adjustments fail.

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Appendix A: The Ethical Clearance

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COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

25 July 2022

Dear Ms Nongiwe Linette Mhlanga

| NHREC Registration # : |
| Rec-240816-052 |
| CREC Reference # : |
| 14056739_CREC_CHS_2022 |

Decision:
Ethics Approval from 25 July 2022 to
25 July 2027

Researcher(s): Name: Ms NL Mhlanga
Contact details: 14056739@mylife.unisa.ac.za
Supervisor(s): Name: TR Netangaheni
Contact details: netantr@unisa.ac.za

Title: Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

Degree Purpose: PhD

Thank you for the application for research ethics clearance by the Unisa College of Human Science Ethics Committee. Ethics approval is granted for five years.

The *medium risk application* was reviewed by College of Human Sciences Research Ethics Committee, in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the

confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.

7. No fieldwork activities may continue after the expiry date (25 July 2027). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **14056739_CREC_CHS_2022** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signature: *Khan*

Prof. KB Khan
CHS Research Ethics Committee Chairperson
Email: khankb@unisa.ac.za
Tel: (012) 429 8210

Signature: PP *A HM udusi*

Prof K. Masemola
Exécutive Dean: CHS
E-mail: masemk@unisa.ac.za
Tel: (012) 429 2298

Appendix B: Consent Form

CONSENT TO PARTICIPATE IN THIS STUDY

Research title: Guidelines for the reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District

Researcher: Nongiwe Linette Mhlanga

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.
I agree to the recording of the interview.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature…………………………………………..Date………………

Appendix C: Researcher acknowledgement

RESEARCHER ACKNOWLEDGEMENT

Research title: Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

Researcher: Nongiwe Linette Mhlanga

Hereby, I Nongiwe Linette Mhlanga ID number 67-1000562S53 in my personal capacity as a researcher, acknowledge that I am aware of and familiar with the stipulations and contents of the

- Unisa Research Policy
- Unisa Ethics Policy
- Unisa IP Policy

and that I shall conform to and abide by these policy requirements

Signature:

Date: 22 April 2022

Appendix D: Participant Information Sheet

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Research title: Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

Researcher: Nongiwe Linette Mhlanga

Ethics clearance reference number: 14056739_CREC_CHS_2022

Research permission reference number (if applicable):N/A

22 April 2022

Title: Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

Dear Prospective Participant

My name is Nongiwe Mhlanga and I am doing research with Dr Netangaheni, a senior lecturer in the Department of Nursing Science towards a PHD at the University of South Africa. We are inviting you to participate in a study entitled Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could develop guidelines for the reduction of type 2 Diabetes Mellitus among older people living with HIV. The benefits are that information will be generated that enables further research in reducing Type 2 DM among older PLWHA as well as provide guidance for practice in reducing Type 2 DM among older PLWHA

WHY AM I BEING INVITED TO PARTICIPATE?

a) You have been chosen to participate because you are an older person living with HIV and receive health care services from the City of Harare. This information has been given to me through the City of Harare Health services where you receive treatment.

b) You have been chosen to participate because you are an expert who provides health care services to older people living with HIV in Harare Urban District. This information has been given to me from the City of Harare Department of Health.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

Describe the participant's actual role in the study.

The study involves semi-structured interviews The expected duration of the interviews is forty to sixty minutes.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation.   If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The benefits of taking part in this study is that you will be able to gain health education particularly on the reduction of Type 2 Diabetes Mellitus. The study will also benefit the scientific community by providing information for further research on the reduction of Type 2 DM among older people living with HIV.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

The potential inconvenience that may be encountered is emotional distress during the interview.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know

about your involvement in this research *[this measure refers to confidentiality]* OR your name will not be recorded anywhere and no one will be able to connect you to the answers you give *[this measure refers to anonymity]*. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings *[this measure refers to confidentiality].*

Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a minimum period of five years in a locked cupboard in Harare at 4149 Rockview Park Phase 1C. For future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

Payment will not be given for participation in this study

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received written approval from the Research Ethics Review Committee at Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

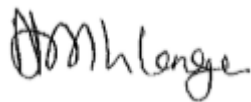**HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?**

If you would like to be informed of the final research findings, please contact Nongiwe Linette Mhlanga on 0772840945 and nongiwe@gmail.com . The findings are accessible for 5 years.

Should you have concerns about the way in which the research has been conducted, you may contact Dr Netangaheni on +27124299999 netantr@unisa.ac Contact the research ethics chairperson of the research ethics chairperson if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Nongiwe Linette Mhlanga

Appendix E: Interview Guide for nurses providing care to older PLWH

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SECTION A: Demographic variables

Age   Gender

Years of experience in providing ART

SECTION B: INTERVENTIONS FOR REDUCTION OF TYPE 2 DIABETES MELLITUS

1. What screening interventions do you provide to older PLWH to reduce Type 2 Diabetes

2. What is the nature of the health education you provide to older PLWH to reduce Type 2 Diabetes in relation to

   a. Diet

   b. Physical activity

3. What indications determine the implementation of measures to reduce Type 2 Diabetes among older PLWH?

End of interview

Thank you for your participation

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SEMI-STRUCTURED INTERVIEW GUIDE FOR OLDER PLWH

SECTION A: Demographic variables

Age,   Gender

Occupation   Religion

Marital Status   Duration of HIV infection and ART

SECTION B: Self-care Practices to reduce Type 2 Diabetes

1. What measures you have taken to reduce Type 2 DM with regards to:

    a. Adherence to a healthy diet

        i. What is your daily eating pattern

        ii. What are the proportions of starch, protein, fruit and vegetables on a daily basis

        iii. Describe your intake of oils, salt and sugar

    b. Exercise or physical activity on a weekly or daily basis

    2. What enablers have you identified in:
        a. Maintaining a physical activity pattern
        b. Adhering to a healthy diet

SECTION C: Challenges in Reducing Type 2 DM

    1. What challenges do you experience in performing physical activities?
    2. What challenges do you experience in adhering to a healthy eating pattern?
    3. What measures do you implement to address the challenges

        End of interview
Thank you for your participation

Appendix G: Request for permission to conduct study

<div align="center">

PERMISSION LETTER   UNISA | university of south africa

</div>

Research title: Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

<div align="center">

Researcher: Nongiwe Linette Mhlanga

</div>

Request for permission to conduct research at City of Harare -Health Services Department

Guidelines for the Reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

22 August 2022

Dr Prosper Chonzi
Rowan Martin Building
Samora Machel Avenue
Milton Park
Health Services Department
0242774141-3

Dear Dr Chonzi

I, Nongiwe Mhlanga am doing research with Dr Netangaheni a senior lecturer in the Department of Nursing Science towards a PHD at the University of South Africa. We are inviting you to participate in a study entitled Guidelines for the Guidelines of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

The aim of the study is to develop guidelines for the reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe

Your company has been selected because of the health services provided to older people living with HIV in the Harare Urban district polyclinics

The study will entail interviewing older people living with HIV and experts rendering care to older persons living with HIV
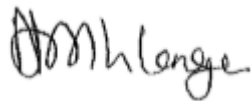
The benefits of this study are that the study will provide information on how to reduce Type 2 Diabetes Mellitus among older people living with HIV which will also contribute towards further research in management of older PLWHA

Potential risks are that they may experience emotional discomfort during the interview process.

Feedback procedure will entail the presentation of research findings to the City of Harare Health Department

Yours sincerely

Nongiwe Linette Mhlanga
Student

Appendix H: Permission to conduct study City of Harare: City Health Department

CITY OF HARARE

Director of Health Services

DR PROSPER CHONZI
MBChB, MPH, MBA

All correspondence to be addressed to the
DIRECTOR OF HEALTH SERVICES

DIRECTOR OF HEALTH SERVICES

Rowan Martin Building, Civic Centre,
Pennefather Avenue, Off Rotten Row,
Harare, Zimbabwe

P.O. Box 596
Telephone: +263 (242) 753326
753330/1/2
Fax: +263 (242) 752093

Ref:--

Your Ref:--

3/7

22 November 2022

Nongiwe Mhlanga
4149 Phase 1c
Rockview Park
Epworth
Harare

Dear Nongiwe Mhlanga

RE: Permission to Conduct Study in Harare City Health Clinics

I refer to the above subject matter.

Permission has been granted for you to conduct a study titled *"Guidelines for the Reduction Of Type 2 Diabetes Mellitus among Older People living with HIV in Harare Urban District, Zimbabwe"*. The aim of the study is to develop guidelines for the reduction of Type 2 Diabetes Mellitus among older people living with HIV in Harare Urban District, Zimbabwe.

For Further Assistance, kindly liaise with the Sisters In Charge at all the respective polyclinics. Please note that you will be expected to share your study findings with the Harare City Health Department through the Director's office

Yours Faithfully

DIRECTOR OF HEALTH SERVICES
Lc

CITY OF HARARE
CITY HEALTH DEPARTMENT
RECEPTION

2 8 NOV 2022

TEL: 024 275330/2

c.c : Sisters In Charge , City Health Clinics

Appendix I: The CASP Check list: Systematic review

Paper for appraisal and reference: Peters, B., Post, F., Wierzbicki, A. S., Phillips, A., Power, L., Das, S., Johnson, M., Moyle, G., Hughes, L., Wilkins, E., McCloskey, E., Compston, J., and Di Angelantonio, E. 2013. Screening for chronic comorbid diseases in people with HIV: the need for a strategic approach. *HIV medicine, 14 Suppl 1*, 1–11. https://doi.org/10.1111/j.1468-1293.2012.01055.x

Section A: Are the results of the review valid?			
1. Did the review address a clearly focused question?	Yes	X	HINT: An issue can be 'focused' In terms of • the population studied • the intervention given • the outcome considered
	Can't Tell		
	No		

Comments:
Screening for comorbid conditions in PLWH

2. Did the authors look for the right type of papers?	Yes	X	HINT: 'The best sort of studies' would • address the review's question • have an appropriate study design (usually RCTs for papers evaluating interventions)
	Can't Tell		
	No		

Comments:

Is it worth continuing?			
3. Do you think all the important, relevant studies were included?	Yes		HINT: Look for • which bibliographic databases were used • follow up from reference lists • personal contact with experts • unpublished as well as published studies • non-English language studies
		X	
	Can't Tell		
	No		

Comments:

4. Did the review's authors do enough to assess quality of the included studies?	Yes		HINT: The authors need to consider the rigour of the studies they have identified. Lack of rigour may affect the studies' results ("All that glisters is not gold" Merchant of Venice – Act II Scene 7)
	Can't Tell	X	
	No		

Comments:
No method of quality assurance outlined

5. If the results of the review have been combined, was it reasonable to do so?	Yes	X	HINT: Consider whether • results were similar from study to study • results of all the included studies are clearly displayed • results of different studies are similar • reasons for any variations in results are discussed
	Can't Tell		
	No		

Comments:

Section B: What are the results?

6. What are the overall results of the review? There is need to enhance current screening especially for other comorbid conditions which are not Diabetes	HINT: Consider • If you are clear about the review's 'bottom line' results • what these are (numerically if appropriate) • how were the results expressed (NNT, odds ratio etc.)

Comments:

7. How precise are the results?		HINT: Look at the confidence intervals, if given
Not applicable qualitative methods used		

Comments:

8. Can the results be applied to the local population?	Yes	X	HINT: Consider whether
	Can't Tell		• the patients covered by the review could be sufficiently different to your population to cause concern
	No		• your local setting is likely to differ much from that of the review

Comments:

9. Were all important outcomes considered?	Yes		HINT: Consider whether
		X	• there is other information you would like to have seen
	Can't Tell		
	No		

Comments:

10. Are the benefits worth the harms and costs?	Yes		HINT: Consider
		X	• even if this is not addressed by the review, what do **you** think?
	Can't Tell		
	No		

Appendix J: CASP Checklist: Cohort study

CASP
Critical Appraisal
Skills Programme

Paper for appraisal and reference: Sarfo et al. ....

Section A: Are the results of the study valid?

1. Did the study address a clearly focused issue?

Yes | X
Can't Tell |
No |

HINT: A question can be 'focused' in terms of
- the population studied
- the risk factors studied
- is it clear whether the study tried to detect a beneficial or harmful effect
- the outcomes considered

Comments:

2. Was the cohort recruited in an acceptable way?

Yes | X
Can't Tell |
No |

HINT: Look for selection bias which might compromise the generalisability of the findings:
- was the cohort representative of a defined population
- was there something special about the cohort
- was everybody included who should have been

Comments:

Is it worth continuing?

3. Was the exposure accurately measured to minimise bias?

Yes [X]

Can't Tell [ ]

No [ ]

HINT: Look for measurement or classification bias:
- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
- were all the subjects classified into exposure groups using the same procedure

Comments:

4. Was the outcome accurately measured to minimise bias?

Yes [X]

Can't Tell [ ]

No [ ]

HINT: Look for measurement or classification bias:
- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
- has a reliable system been established for detecting all the cases (for measuring disease occurrence)
- were the measurement methods similar in the different groups
- were the subjects and/or the outcome assessor blinded to exposure (does this matter)

Comments:

275

5. (a) Have the authors identified all important confounding factors?

Yes **X**

Can't Tell

No

Comments:

5. (b) Have they taken account of the confounding factors in the design and/or analysis?

Yes

Can't Tell

No **X**

Comments:
Confounding factors in design not described

6. (a) Was the follow up of subjects complete enough?

Yes **x**

Can't Tell

No

6. (b) Was the follow up of subjects long enough?

Yes **x**

Can't Tell

No

Comments:

Section B: What are the results?

7. What are the results of this study?

HINT: Consider
- what are the bottom line results
- have they reported the rate or the proportion between the exposed/unexposed, the ratio/rate difference
- how strong is the association between exposure and outcome (RR)
- what is the absolute risk reduction (ARR)

Comments: Prevalence and incidence of Type 2 Diabetes presented

8. How precise are the results?

HINT:
- look for the range of the confidence intervals, if given

Comments:
accurate 95% confidence interval

9. Do you believe the results?

Yes	X
Can't Tell	
No	

HINT: Consider
- big effect is hard to ignore
- can it be due to bias, chance or confounding
- are the design and methods of this study sufficiently flawed to make the results unreliable
- Bradford Hills criteria (e.g. time sequence, dose-response gradient, biological plausibility, consistency)

Comments:

Section C: Will the results help locally?

10. Can the results be applied to the local population?

Yes	X
Can't Tell	
No	

HINT: Consider whether
- a cohort study was the appropriate method to answer this question
- the subjects covered in this study could be sufficiently different from your population to cause concern
- your local setting is likely to differ much from that of the study
- you can quantify the local benefits and harms

Comments:

---

11. Do the results of this study fit with other available evidence?

Yes	X
Can't Tell	
No	

Comments:

12. What are the implications of this study for practice?

Yes	X
Can't Tell	
No	

HINT: Consider
- one observational study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making
- for certain questions, observational studies provide the only evidence
- recommendations from observational studies are always stronger when supported by other evidence

Comments:

Appendix K: CASP Checklist: Randomised controlled clinical trial

Study and citation: Nimitphong, H., Jiriyasin, S., Kasemasawachanon, P. and Sungkanuparph, S., 2022. Metformin for preventing progression from prediabetes to diabetes mellitus in people living with human immunodeficiency virus. *Cureus*, *14*(4)

Section A: Is the basic study design valid for a randomised controlled trial?

		Yes	No	Can't tell

1.	Did the study address a clearly focused research question?
	 CONSIDER:
	 • *Was the study designed to assess the outcomes of an intervention?*
	 • *Is the research question 'focused' in terms of:*
	   • *Population studied*
	   • *Intervention given*
	   • *Comparator chosen*
	   • *Outcomes measured?*
		☒	☐	☐

2.	Was the assignment of participants to interventions randomised? *CONSIDER:* • *How was randomisation carried out? Was the method appropriate?* • *Was randomisation sufficient to eliminate systematic bias?* • *Was the allocation sequence concealed from investigators and participants?*	☒	☐	☐
3.	Were all participants who entered the study accounted for at its conclusion? *CONSIDER:* • *Were losses to follow-up and exclusions after randomisation accounted for?* • *Were participants analysed in the study groups to which they were randomised (intention-to-treat analysis)?* • *Was the study stopped early? If so, what was the reason?*	☒	☐	☐

Section B: Was the study methodologically sound?

4.	• Were the participants 'blind' to intervention they were given? • Were the investigators 'blind' to the intervention they were giving to participants? • Were the people assessing/analysing outcome/s 'blinded'?	Yes ☐ ☐ ☐	No ☒ ☒ ☒	Can't tell ☐ ☐ ☐
5.	Were the study groups similar at the start of the randomised controlled trial? *CONSIDER:* • *Were the baseline characteristics of each study group (e.g. age, sex, socio-economic group) clearly set out?* • *Were there any differences between the study groups that could affect the outcome/s?*	Yes ☒	No ☐	Can't tell ☐
6.	Apart from the experimental intervention, did each study group receive the same level of care (that is, were they treated equally)? *CONSIDER:* • *Was there a clearly defined study protocol?* • *If any additional interventions were given (e.g. tests or treatments), were they similar between the study groups?* • *Were the follow-up intervals the same for each study group?*	Yes ☒	No ☐	Can't tell ☐

Section C: What are the results?

| 7. | Were the effects of intervention reported comprehensively?

 CONSIDER:
 • *Was a power calculation undertaken?*
 • *What outcomes were measured, and were they clearly specified?*
 • *How were the results expressed? For binary outcomes, were relative and absolute effects reported?*
 • *Were the results reported for each outcome in each study group at each follow-up interval?*
 • *Was there any missing or incomplete data?* | Yes ☒ | No ☐ | Can't tell ☐ |

	• Was there differential drop-out between the study groups that could affect the results? • Were potential sources of bias identified? • Which statistical tests were used? • Were p values reported?		
9.	Do the benefits of the experimental intervention outweigh the harms and costs? CONSIDER: • What was the size of the intervention or treatment effect? • Were harms or unintended effects reported for each study group? • Was a cost-effectiveness analysis undertaken? (Cost-effectiveness analysis allows a comparison to be made between different interventions used in the care of the same condition or problem.)	Yes ☐ No ☐ Can't tell ☒	

Section D: Will the results help locally?

10.	Can the results be applied to your local population/in your context? CONSIDER: • Are the study participants similar to the people in your care? • Would any differences between your population and the study participants alter the outcomes reported in the study? • Are the outcomes important to your population? • Are there any outcomes you would have wanted information on that have not been studied or reported? • Are there any limitations of the study that would affect your decision?	Yes ☒ No ☐ Can't tell ☐	
11.	Would the experimental intervention provide greater value to the people in your care than any of the existing interventions?	Yes ☐ No ☒ Can't tell ☐	

CONSIDER: • *What resources are needed to introduce this intervention taking into account time, finances, and skills development or training needs?* • *Are you able to disinvest resources in one or more existing interventions in order to be able to re-invest in the new intervention?*	

APPRAISAL SUMMARY: *Record key points from your critical appraisal in this box. What is your conclusion about the paper? Would you use it to change your practice or to recommend changes to care/interventions used by your organisation? Could you judiciously implement this intervention without delay?*

Appendix L: The Editor's certificate

LANGUAGE EDITING CERTIFICATE

This certifies that the document with the title listed below has been edited for proper English language, grammar, punctuation, spelling and overall style. It remains the student's responsibility to submit the edited version.

TITLE:

GUIDELINES FOR THE REDUCTION OF TYPE 2 DIABETES MELLITUS AMONG OLDER PEOPLE LIVING WITH HIV IN HARARE URBAN DISTRICT, ZIMBABWE

NAME:

NONGIWE LINETTE MHLANGA

SUPERVISOR:

DR TR NETANGAHENI

DATE ISSUED:

October 9, 2023

B Kruger

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