ASSESSMENT OF INTEGRATION OF TUBERCULOSIS AND DIABETES MELLITUS IN HEALTH SERVICES IN ADDIS ABABA, ETHIOPIA

BY

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D E D I C A T I ON

This study is dedicated to my love life and wife, Tsion Adamu, and my daughter, Yodahie. I would also like to dedicate this study to my heroic parents; my father Tiroro Salato and my mother Kebenesh Abaychew who had the potential but couldn't pursue their academic career to the expected extent but tried their best to fill the gap through teaching me and my brothers in modern schools.

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Signature: **Date**: AUGUST, 2023

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A B S T R AC T

The Co-morbidity of tuberculosis (TB) and diabetes mellitus (DM) is a major global public health challenge. Both diseases disproportionately affect low - and middle-income countries. While integrated care approaches offer synergistic benefits, TB and DM services often remain fragmented in many health systems. The purpose of this study was to assess the factors affecting the integration of health services for patients with TB and DM, and to develop an integration framework to improve the management of TB in patients with DM, and DM in TB patients.

The study population was adult patients with pulmonary TB who tested positive for type 2 diabetes (T2DM) and were attending DOTS clinics in the 52 selected public health facilities in Addis Ababa. Cluster sampling with stratified simple random sampling was used to select hospitals and health centres. Simple random sampling technique was used to select patients with comorbid TB and diabetes for the quantitative study. Purposive sampling was used to select key informants for in-depth interviews. The study began with an explanatory quantitative phase, which included a survey of 357 patients with comorbid TB and diabetes and 23 key informant interviews with experts and practitioners working in clinical facilities and TB and diabetes programmes in public health facilities and the health bureau in Addis Ababa. Quantitative data were collected using structured questionnaires developed from the Sustainable intEgrated chronic care modeLs for multi-morbidity: delivery, Financing and performancE (SELFIE) multi-morbidity framework. Both quantitative and qualitative data were collected between March 2021 and June 2022. Quantitative data were analysed using SPSS version 28, while thematic analyses of qualitative data were conducted using Atlas.ti8 software.

The study involved 357 respondents, a response rate of 96.5%, and in-depth interviews with 23 key informants. The results of the study found that integration of TB-DM

services in health facilities is minimal, with only a quarter of facilities providing integrated care. Several factors contribute to this, including inadequate counselling on medication use, limited awareness of TB risks among DM patients, and the lack of organised TB-DM services and integration strategies. Screening practices and training of health workers are also inadequate. Leadership and governance play a crucial role in promoting integration, with supportive leadership and the availability of guidelines being key factors. In addition, the lack of a reimbursement mechanism and equitable cost of services are barriers to comprehensive care. Limited access to technology and medical products, such as electronic health record systems and diagnostic tools, affects the integration of services. Furthermore, the lack of personalised patient data and tailored registration and reporting tools hampers the provision of integaeted care and the collection of data on TB-DM co-morbidity. These findings emphasised the need for interventions to address these factors and improve the integration of TB-DM services, ultimately improving patient outcomes.

The results of this study emphases the urgent need to address the limited integration of TB-DM services in health facilities. This gap has significant implications, as it hinders the provision of integrated care to a significant number of TB-DM patients. Inadequate integration puts patients at risk of suboptimal treatment outcomes, increased disease burden and higher long-term health care costs. To effectively address these challenges, it is essential to prioritise and improve the integration of TB and diabetes services. This can be achieved by improving continuity of care, establishing multidisciplinary teams, implementing clear guidelines, involving patients in decision-making, improving access to technology and adopting innovative health care approaches. Further research is needed to refine these recommendations and assess their impact on population health.

KEY CONCEPTS

Tuberculosis, Diabetes mellitus, Co-morbidity, Non-communicable diseases, Integrated health services, prevalence rates, Public health, Low and middle income countries, Global burden, Health systems

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ABBREVIATIONS AND LIST OF ACRONYMS

AARHB	Addis Ababa Regional Health Bureau
AbHC	Abebe Biqela Health Centre
AbiHC	Abinete Health Centre
AboHC	Abore Health Centre
ADA	American Diabetes Association
AIDS	Acquired Immune Deficiency Syndrome
AFCSH	Armed Forces Comprehensive Specialised Hospital
AGHC	Addisu Gebeye Health centre
AHC	Akaki Health Centre
AmHC	Amorew Health Centre
ArHC	Arada Health Centre
ArScHD	Arada Sub city Health Department
AkmScHD	Addis Keteme Sub city Health Department
AkkScHD	Akaki Kality Sub city Health Department
SARA	Survice Availability and Readiness Assessment
AOR	Adjusted Odds Ratio
BMI	Body Mass Index
BPR	Business Process Reengineering
BScHD	Bole Sub city Health Department
BHC	Bulbula Health Centre
B17HC	Bole 17 Health Centre
B17/12HC	Bole 17/12 Health Centre
CAS	Complex Adaptive Systems
CCM	Chronic Care Model
CD	Compact Disc
CEOC	Comprehensive Emergency Obstetric Care
CI	Confidence Interval
CHC	Churchill Health Centre
CRDs	Chronic Respiratory Diseases
CVDs	Cardiovascular Diseases
COPD	Chronic Obstructive pulmonary Disease
DhHC	Dageme Hedase Health Centre

DHIS2	District Health Information System 2
DM	Diabetes Mellitus
DOTS	Directly Observed Treatment Short Course
DL	Decilitre
DR-TB	Drug Resistance Tuberculosis
DST	Drug Sensitivity Test
D1HC	District-1 Health Centre
D2HC	District-2 Health Centre
D3HC	Distric-3 Health Centre
D4HC	Distric-4 Health Centre
D6HC	Distric-6 Health Centre
D8HC	Distric-8 Health Centre
D9HC	Distric-9 Health Centre
D10HC	Distric-10 Health Centre
D11HC	Distric-11 Health Centre
D12HC	Distric-12 Health Centre
D13HC	Distric-13 Health Centre
EDA	Ethiopian Diabetic Association
EFMHACA	Ethiopian Food Medicine and Health Administration Control Authority
EHC	Entoto Health Centre
EPHI	Ethiopian Public Health institute
EMR	Electronic Medical Record
ESA	Ethiopian Standard Agency
EPSA	Ethiopian Pharmaceutical Supply Agency
EPSS	Ethiopian Pharmaceuticals Supply Service
FDREMoH	Federal Democratic Republic of Ethiopia Ministry of Health
FMOH	Federal Ministry of Health
FPH	Federal Police Hospital
GHC	Goro Health Centre
GuScHD	Gulelle Sub city Health Department
HBC	High Burden Country
HbA1C	Glycated Hemoglobin
HC	Health Centre
HMIS	Health Management Information System

HIT	Health Information Technician
HIS	Health Information System
HP	Health Post
HIV	Human Immunodeficiency Virus
HSTP II	Health Sector Transformational Plan II
HSTP IV	Health Sector Transformational Plan IV
ICAP	International Centre for AIDS Care and Treatment Program
ICT	Information and Communication Technology
IDF	International Diabetes Federation
IDI	In-Depth Interview
IQR	Interquartile Range
JHC	Janemeda Health Centre
KbHC	Kebene Health Centre
KHC	Kirkose Health Centre
KlHC	Kolfe Health Centre
KoHC	Kotebe Health Centre
KkScHD	Kolfe Keranyo Sub city Health Department
KScHD	Kirkose Sub city Health Department
KII	Key Informant Interview
KNCV	Koninklijke Nederlandse Chemische Vereniging
LHC	Lideta Health Centre
LMHC	Lomimeda Health Centre
LMICs	Low Middle Income Countries
LPA	Line Probe Assay
LScHD	Lideta Sub city Health Department
LTBI	Latent Tuberculosis Infection
MCH	Millennium Health Centre
MDR-TB	Multi-Drug resistant Tuberculosis
MLHC	Mikileland Health Centre
MrsBHC	Mrs Beleteshachew Health Centre
M-II H	Menelik-II Hospital
NCDs	Non-Communicable Diseases
NCDCP	Non-Communicable Disease Control Program
NGO	Non-Governmental Organization

NSLScHD	Nefas Silk lafto Sub city Health Department
NTP	National Tuberculosis control Programme
PCCC	Person-Centred Coordinated Care
PEPFAR	President's Emergency Plan for AIDS Relief
PHCU	Primary Health Care Unit
PLWD	People Living With Diabetes
PTB	Pulmonary Tuberculosis
RDDMH	Ras Desta Demtew Memorial Hospital
RHB	Regional Health Bureau
RHZE	Rifampicin, Isoniazid, Pyrazinamide and Ethambutol
REC	Research Ethics Committee
NTP	National Tuberculosis Program
SELFIE	Sustainable intEgrated chronic care modeLs for multi-morbidity delivery, Financing and performancE
SMHC	Shero Meda Health Centre
SHC	Selam Health Centre
TB	Tuberculosis
TBH	Terunesh Beijing Hospital
ThHC	Teklehayemanot Health Centre
TB/HIV	Tuberculosis-Human Immune Virus co-infections
T2DM	Type 2 Diabetes Dellitus
SDGs	Sustainable Development Goals
STIs	Sexual Transmitted Infections
The Union	International Union Against Tuberculosis And Lung Diseases
UHC	Universal Health Coverage
UNISA	University of South Africa
USAID	United States Agency for International Development
WHO	World Health Organization
YHC	Yeka Health Centre
YScHD	Yeka Sub city Health Department
Y12HC	Yekatit-12 Hospital College
ZMH	Zewditu Memorial Hospital

CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The introduction provides an overview of the relevant content of the first chapter. Background of the research study, statement of the research problem, purpose of the study, research objectives and questions, significance of the study and definition of the key terms are described in this part of the study.

1.2 BACKGROUND OF THE RESEARCH PROBLEM

The burden of tuberculosis (TB) and diabetes mellitus (DM) represents a significant global public health challenge, particularly in low- and middle-income countries (LMICs). In 2021, it was estimated that there would be 10.6 million new cases of TB worldwide, resulting in over 1.4 million deaths. This corresponds to a rate of 134 cases per 100,000 population (WHO 2022a). The distribution of the TB burden is uneven, with the highest prevalence observed in countries in the South-East Asia region (45%), followed by Africa (23%) and the Western Pacific region (18%) (WHO 2022a). These regions bear a significant burden of the disease, emphasising the need for targeted interventions and allocation of health resources.

Simultaneously, the prevalence of non-communicable diseases (NCDCs), including diabetes mellitus, is on the rise in both LMICs and high-income countries (HICs). Globally, there are approximately 530 million adults aged 20-74 living with diabetes, with over three-quarters of them residing in LMICs. In 2021, diabetes will be responsible for 6.7 million deaths (IDF 2021:32-39). Particularly in Africa, the prevalence of diabetes is remarkable, with 1 in 22 adults living with the condition in 2021. Importantly, in Africa, 1 in 2 people have undiagnosed diabetes (IDF 2021:40).

The link between TB and diabetes is significant, as diabetes can increase the risk of developing active TB and worsen TB treatment outcomes. In fact, more than 0.37 million TB cases will be attributed to diabetes in 2021(WHO 2022a). This double burden of TB and DM further compounds the public health challenges faced by health systems and requires integrated approaches to effectively address both diseases.

DM is a chronic metabolic disorder that occurs when the body cannot produce enough insulin or cannot effectively use the insulin it produces (IDF 2019:12).

It is one of the most common non-communicable diseases worldwide, with a substantial increase in low- and-middle income countries affecting both the poor and the rich (IDF 2019:34-60). DM increases the risk of TB across all population segments (Al-Rifai, Pearson, Critchley & Abu-Raddad 2017: e0187967; Hayashi & Chandramohan 2018:1058-1070; Alebel, Wondemagegn, Tesema, Kibret, Wagnew, Petrucka, Arora, Ayele, Alemayehu & Eshetie 2019:254).

T2DM is the most common form, accounting for over 90% of all diabetes cases globally (IDF 2019:14). There has been a dramatic increase in the prevalence of diabete worldwide. For example, in 2016, the number of people living with diabetes was 424.9 million (8.8%) (IDF 2017:41), and this number rose to 463 million (9.3%) in 2019 (International Diabetes Federation 2019:34). The global raise in T2DM is recognized as an emerging risk and a challenge to TB control (Martinez & Kornfeld 2014:617-626).

Co-morbidity refers to the simultaneous occurrence of two or more diseases, often complex and chronic, in the same patient, either concurrently or sequentially (Capobianco & Lio' 2013:515-521; Fisher, Griffith, Gruneir, Panjwani, Gandhi, Sheng, Gafni, Chris, Markle-Reid & Ploeg 2016:113-123). According to a systematic review, the prevalence of DM among TB patients ranged from 1.9% to 45%, while the prevalence of TB among DM patients ranged 0.38% to 14% (Workneh, Bjune & Yimer 2017: e0175925).

Studies conducted in different parts of the world have reported that 12% to 44% of TB cases were associated with DM (Ogbera, Kapur, Chinenye, Fasanmade, Uloko & Odeyemi 2014:475-479; Wang et al 2014:45-49). Furthermore, bidirectional association between TB and DM have been revealed (Workneh, Bjune & Yimer 2016:e0147621, 2017:e0175925), with a diabetes prevalence of 19.9% among pulmonary tuberculosis patients (Wu, Guo, Huang, Cai, Zhang, Pan, Yuan & Shen 2016: 237-241).

Ethiopia is reported to have a high incidence of tuberculosis, with 211 new cases per 1000 people (WHO 2020:32). In addition, the International Diabetes Federation (2019:64) estimates that there are 1.7 million people aged 20-79 living with DM in Ethiopia. Furthermore, studies conducted in health facilities across the country have shown a significant prevalence of co-morbidity between TB and DM (Gedfew, Ayana, Abate, Bewket, Haile, Edmealem & Andualem 2020:869-878; Getachew, Mekonnen, Alemu & Yusuf 2013:862-872).

Therefore, integrating TB and DM services is crucial for the prevention, diagnosis and treatment of both diseases. It has also been recognised as an important strategy for improving the quality of care and outcomes for patients affected by both TB and DM. Integrated health services aim to achieve several goals, including improving population health, enhancing patients' care experience, and reducing per capita healthcare cost (Mckeown 2023:4; Miranda, Oliveira, Nicola, Baptista & Albuquerque 2023:7299; Litchfield, Kingston, Narga, Turner 2022:777-785; Stokes, Shah, Goldzahl, Kristensen & Sutton 2021:125-132).

Moreover, the integration of health services for TB and diabetes patients aims to increase satisfaction with services, improve the perceived quality of care, and facilitate access to services (Baxter, Johnson, Chambers, Sutton, Goyder & Booth 2018:1-13).

1.3 STATEMENT OF THE RESEARCH PROBLEM

The co-morbidity of TB and DM is indeed recognised as a significant public health problem. Several studies have emphasised the importance of addressing this co-morbidity, particularly due to its increasing prevalence in LMICs. These studies investigated various aspects of TB-DM co-morbidity, including its epidemiology, impact and management (Maharjan, Chalise & Thapa 2018:110-117; Critchley, Restrepo, Ronacher, Kapur, Bremer, Schlesinger, Basaraba, Kornfeld & Crevel 2017:165-173). They have also identified the challenges health system face in effectively managing this co-morbidity (Workneh et al 2016a:e0147621), and proposed strategies and interventions to address this public health problem (Noubiap, Nansseu, Nyaga, Nkeck, Endomba, Kaze, Agbor & Bigna 2019:e448-e460). In addition, this study has provided valuable insights into the wider public health implications of TB-DM co-morbidity (Zheng, Hu & Gao 2017:1264702).

The life time risk of developing active tuberculosis disease in a healthy person is 10%, however, the risk is higher for people with weak immune systems like in persons with diabetes mellitus is more than 30%, and according to WHO (2020:160), globally in 2019, around 0.65 million cases of tuberculosis are attributed to diabetes. The co-morbidity between tuberculosis and diabetes mellitus has been extensively studied (Martinez & Kornfeld 2014:617-626; Wang, Zhang, Ji, You, Bai, Dai & Wang, Zhang, Ji, You, Bai, Dai & Wang 2014:45-49; Sane Schepisi, Navarra, Altet Gomez, Dudnyk, Dyrhol-Riise, Esteban, Giorgetti, Gualano, Guglielmetti, Heyckendorf, Kaluzhenina, Lange, Lange, Manika, Miah, Nanovic, Pontali, Prego, Solovic,Tiberi, Palmieri & Girardi

2019:ofy337). This co-morbidity is supported by the fact that patients with DM have dysfunctional cell-mediated immunity and innate immunity, which are necessary to counter the progression from infection to clinical diseases (García-Elorriaga & Rey-Pineda 2014:144). DM not only increases susceptibility to Mycobacterium tuberculosis infection but also it folds four times the risk of active TB disease development among the TB infected individuals (Al-Rifai et al 2017:e0187967).

Tuberculosis and DM mutually influence each other's clinical manifestations and outcomes. Studies have found that people living with diabetes (PLWD) are at increased risk of developing latent TB infection (Foe-Essomba, Kenmoe, Tchatchouang, Ebogo-Belobo, Mbaga, Kengne-Nde', Mahamat, Kame-Ngasse, Noure, Mikangue, Feudjio, Taya-Fokou, Touangnou-Chamda, Nayang-Mundo, Nyebe, Magoundjou-Pekam, Ye'ngue', Djukouo, Emoh, Tazokong, Bouo-Ngandji, Lontchi-Yimagou, Kaiyuen, Donfack, Njouon, Mbanya, Mbacham, Eyangoh 2021:e0261246) and active TB disease (Antonio-Arques, Franch-Nadal, Moreno-Martinez, Real, Orcau, Mauricio, Mata-Cases, Julve, Mendez, Treserra, Puente, Millet, Del Val Garcia, Vlacho & Cayla 2022:789952). Furthermore, people PLWD have been found to present with complicated TB clinical presentations (Behzadmehr & Rezaie-Keikhaie 2022:56-63; Cheng, Wang & Gong 2022:1-12), experience unsuccessful TB treatment outcomes (Adane, Howe, Wassie & Magee 2023:100368; Ahmad, Yaacob, Jaeb, Hussin & Wan Mohammad 2020:1485-1493), treatment failure (Gautam et al 2021b:2113), and faced increased mortality, relapse and recurrence of TB infection (Cáceres, Calderon & Ugarte-Gil 2022b:20499361221095831).

One study has shown that proper diabetes management and control, regardless of TB status, can reduces TB incidence and mortality rates by 4.5%-16.5% and 6.5%-22.2%, respectively, and avert TB cases by 2.9%-10.8% (Awad, Critchley & Abu-Raddad 2020:100381). Meanwhile, another study has demonstrated that TB-induced inflammation and metabolic changes in the host lead to the development of insulin resistance and type 2 diabetes (Bisht, Dahiya, Ghosh & Mukhopadhyay 2023:1134036). Additinally, TB has been found to worsens glycaemic control and quality of life in people with diabetes (Siddiqui, Khayyam & Sharma 2016).

In Ethiopia, the total estimated incidence of TB in 2021 was 119 per 100,000, over 143,000 number of cases reported, and the total estimated death rate was 16 per 100,000, with over 19,000 deaths (WHO 2022a).

Diabetes mellitus is one of the non-communicable diseases posing a challenge to Ethiopia's current health system. According to IDF 2021 report, a total of 1.4 million people aged of 20-79 are living with diabetes in Ethiopia (IDF 2021:57). Additionally, over 3,900 (2.72%) of TB cases in 2021 were attributed to diabetes mellitus (WHO 2022a). A systematic review and meta-analysis conducted in Ethiopia found that the co-occurrence of TB and diabetes mellitus was 12.77% (Alemu et al 2021:82-91). Another facility-based study showed that 15.8% of active TB patients in Addis Ababa had diabetes mellitus (Damtew et al 2014a:389-396).

Integrated responses to TB-DM co-morbidity have been called for, but existing models have mainly focused on service architecture (Dare & Woldehanna 2017; Harries, Kumar, Satyanarayana, Lin, Zachariah, Lönnroth, Kapurh 2016:173-179; Kapur, Harries, Lönnroth, Wilson & Sulistyowati 2016:8-10). Recognising the need to address the burden of TB-DM co-morbidity, the World Health Organization (WHO) and the International Union Against Tuberculosis and Lung Diseases (The Union) launched a collaborative framework in 2011.This framework provides key recommendations, including policy strategies for routine implementation of bidirectional screening for TB and DM, establishing mechanisms for collaboration between TB and DM control programmes, and managing quality-assured services (WHO and The Union 2011). Technical guidelines for TB-DM management have also been developed by The Union and the World Diabetes Foundation (WDF) to support integrated care for patients with TB and diabetes mellitus (Lin, Harries, Kumar, Critchley, Crevel, Owiti, Dlodlo & Dejgaard 2019).

However, there are several challenges to achieving integrated care for TB-DM co-morbidity, including lack of commitment, limited resources, poorly functioning information technology (IT), coordination issues, conflicting objectives, and internal conflicts within teams (Almossawi, Matji, Pillay, Singh, Mvusi, Mbambo, Olkkonen & Kok 2019:329; Kozlowska, Lumb, Tan & Rea 2018:64-80; Workneh, Bjune & Yimer 2016b:1-11). Studies conducted in South Africa and Ethiopia have identified overburdened health workers, poor health information systems, unavailability of systems for continuity of diabetes care, inadequate knowledge and skills of health workers, lack of diagnostic and treatment supplies, financial constraints faced by patients, poor data management and insufficient attention to diabetes care as barriers to TB-DM service integration (Almossawi et al 2019:329; Kozlowska et al 2018:64-80; Workneh, Bjune & Yimer 2016b:1-11).

Therefore, the aim of this study was to analyse the factors affecting the integration of services for patients with TB and diabetes mellitus, explore the challenges and opportunities within the health system for integrating these services, and describe the experiences of practitioners and experts on the current integration of services in public health facilities in Addis Ababa, Ethiopia. Additionally, the study aimed at developing an integration framework specifically for patients with tuberculosis and diabetes mellitus in Addis Ababa, Ethiopia. By achieving these objectives, the study could contribute to the improvement of integrated care for people with both TB and diabetes, ultimately enhancing overall healthcare for these co-morbid conditions.

1.4 AIM, OBJECTIVES AND RESEARCH QUESTIONS

1.4.1 Aim

The aim of the study was to assess factors affecting integration of health services for people with tuberculosis and diabetes, and to develop the integration framework that will help to improve the detection and management of (i) tuberculosis in patients with diabetes, and (ii) diabetes in tuberculosis patients.

1.4.2 Objectives

Quantitative Objective

i. To analyse factors affecting integration of health services for patients with tuberculosis and diabetes in Addis Ababa, Ethiopia.

Qualitative Objectives

i. To explore the health system challenges and opportunities for the integration of health services for patients with tuberculosis and diabetes in Addis Ababa, Ethiopia.
ii. To describe the experiences of experts and practitioners on the current integration status of tuberculosis and diabetes health services for people with tuberculosis and diabetes in Addis Ababa, Ethiopia.

Mixed Objective

i. To develop health services integration framework for patients with tuberculosis and diabetes mellitus.

1.4.3 Research questions

Research questions are specific queries the researcher wants to answer at the end of the study by addressing the research problem (Polit & Beck 2017:117). In this study, the researcher wanted to answer the following research questions:

i. What are the factors affecting integration of health services for patients with TB and DM in Addis Ababa, Ethiopia?
ii. What are the health system opportunities and challenges for the integration of health services for patients with TB-DM in Addis Ababa, Ethiopia?
iii. How do health experts and practitioners working in TB and DM experience the integration of health services in Addis Ababa, Ethiopia?
iv. How can we integrate health services for patients with TB and DM?

1.5 SIGNIFICANCE OF THE STUDY

Both tuberculosis and diabetes present significant global challenges in public health. Tuberculosis remains a leading cause of morbidity and mortality, particularly in low-and middle-income countries (WHO 2022a). Simultaneously, the prevalence of diabetes is rapidly increasing worldwide, contributing to a substantial burden of chronic disease (IDF 2021:32-33). Recognising and addressing the coexistence of these two conditions is crucial for effective public health planning and allocation of resources.

The relationship between tuberculosis and diabetes is complex and bidirectional (Alemu, Bitew, Diriba & Gumi 2021:82-91). Diabetes increases the risk of tuberculosis infection, progression, and poor treatment outcomes (Adane, Howe, Wassie & Magee 2023:100368; Antonio-Arques, Franch-Nadal, Moreno-Martine, Real, Orcau, Mauricio, Mata-Cases, Julye, Mendez, Treserra, Puente, Millet, Del Val Garcia & Cavla 2022:789952). Conversely, tuberculosis can worsen glycaemic control and lead to poor diabetes management (Bisht, Dahiya, Ghosh & Mukhopadhyay 2023:1134036). Integrating services for both diseases enable a comprehensive approach that considers the interaction between TB and diabetes, ultimately resulting in improved health outcomes for affected individuals (Dávila, Castellanos & García 2015b:19-21).

The overlapping symptoms and diagnostic challenges associated with TB and diabetes necessitate timely and accurate diagnosis (Wu, Liu, Ma, Liu & Chen 2022a:1657-1666).

The integration of services can facilitate the development of diagnostic strategies that address the specific needs of individuals with both conditions (Bao, Hafner, Lin, Lin & Magee 2018:1111-1112). This approach can lead to early detection, appropriate treatment initiation and improved disease management (WHO 2022b; WHO and The Union 2011).

Integrated health services can improve treatment optimisation for people with TB and diabetes (Yeremenchuk 2021:10-10; Awad, Critchley & Abu-Raddad 2020a:100381). Coordinated care ensures that treatment plans consider potential interactions between TB and diabetes medications, reducing the risk of adverse effects and improving adherence (Ayeni, Oyetunde & Aina 2021:285-292). Moreover, integrated care can provide comprehensive support, including lifestyle interventions and patient education, to effectively manage both conditions (WHO 2022b).

Furthermore, the integration TB and diabetes services can improve the overall efficiency of health systems. By streamlining care, reducing fragmentation, and promoting collaboration among healthcare providers, resources can be used more effectively (Bulstra, Hontelez, Otto, Stepanova, Lamontagne, Yakusik, El-Sadr, Apollo, Rabkin, Atun, Barnighausen, Ayela, Benzaken, Caswell, Dukashe, Delima, Friedman, Ghys, Godfrey-Faussett, Gorgens, Guarinieri, Hader, Izazola-Licea, Kassymova, Kelley, Kim, Kruk, Low-Beer, Mafiala, Manzanero, Mesbah, Munar, Odugleh-Kolev, Pereira, Radix, Saavedra, Sladden, Stover, Toro & Torres-Bueda 2021:e1003836). This results in improved patient outcomes, reduced health care costs, and better optimal allocation of limited resources (WHO 2022b,a; Bandurska, Damps-Konstenska, Popowski, Jedrzejczyk, Janowiak, Swietnicka, Zarzeczna-Baran & Jassem 2017:2850-2862).

Therefore, the significance of this study on the integration of tuberculosis and diabetes into health services in public health facilities in Addis Ababa lies in its potential to address the factors affecting the integration of TB and diabetes services. It aims to explore the challenges and opportunities within the health system and to describe the experiences of practitioners and experts on the current status of integration. Ultimately, the study aims to develop an integration framework for people with TB and diabetes. In doing so, it has the potential to contribute to improved health outcomes and better management of these two co-morbid conditions.

1.6 DEFINITION OF KEY CONCEPTS

1.6.1 Diabetes mellitus

Diabetes mellitus (DM), more commonly known as diabetes, is a serious, chronic metabolic disorder that occurs when blood glucose levels are elevated because the body does not produce insulin, does not produce enough, or does not use the insulin it does produce effectively (IDF 2021:12).

1.6.2 Type-1 diabetes mellitus

Type-1 diabetes is a metabolic disorder caused by an autoimmune process in which the body's immune system attacks the insulin-producing beta cells of the pancreas; as a result, the body produces very little or no insulin (IDF 2021:13).

1.6.3 Type-2 diabetes mellitus

Type-2 diabetes, also known as adult-onset or non-insulin-dependent diabetes, is a condition that results from the body's ineffective use of insulin. It is the most common type of diabetes, accounting for 95% of cases, and is largely the result of excess body weight and physical inactivity (IDF 2021:14).

1.6.4 Integration

Integration is the process by which professionals and organisations come together (Amelung, Stein, Suter, Goodwin, Nolte & Balicer 2021:1-13) to minimise fragmentation of services and includes methods for the funding, administrative, organisation, service delivery and clinical levels designed to create linkages, alignment and collaboration within the health system (Curry & Ham 2010:3). For this the level of integration (Sharma, Srey & Jain 2020:15) is categorized as follows:

1.6.4.1. Level 1: Minimal integration- TB and DM/NCD service providers work in separate facilities have separate systems and rarely communicate about cases.

1.6.4.2. Level 2: Basic integration at distance- Providers have separate systems in separate sites, but communicate regularly about shared patients, mostly by telephone and email/messages. Providers see each other as resources.

1.6.4.3. Level 3: Basic integration onsite- TB and DM/NCD health professionals have separate systems but share facilities. Proximity supports at least occasional face-to-face meetings and communication is improved and more regular.

1.6.4.4. Level 4: Close integration in a partly integrated system- TB and DM/NCD service providers share the same sites and have some systems, such as scheduling or charting is common. There are regular face-to-face interactions, coordinated treatment plans and a basic understanding of each other's roles

1.6.4.5. Level 5: Close integration in a fully integrated system- TB and DM/NCD health professionals share the same sites, vision, and systems. All providers are part of the same team and have developed a deep understanding of each other's roles and areas of expertise.

1.6.5 Integrated tuberculosis-diabetes mellitus service

Healthcare facilities that detect and manage both tuberculosis in patients with diabetes mellitus and diabetes mellitus in patients with tuberculosis (WHO and The Union 2011).

1.6.6 Informal health provider

Informal health care providers refer to a range of practitioners who provide services for which they do not have formal medical training or that are outside of the boundaries of their licence and who operate with tenuous legitimacy in relation to the formal health system (Sieverding & Beyeler 2016:1-12).

1.6.7 Tuberculosis

Tuberculosis (TB), an infectious disease caused by the bacillus Mycobacterium tuberculosis, is the most common infectious cause of death and one of the most prevalent diseases worldwide (WHO 2018:20).

1.6.8 Pulmonary tuberculosis

Pulmonary tuberculosis (PTB) is any bacteriologically confirmed or clinically diagnosed case of TB involving the lung parenchyma or the tracheobronchial tree. A patient with both pulmonary and extra-pulmonary TB should be classified as a case of PTB (FDREMoH 2017:47).

1.6.9 First line anti-TB

According to the national guideline for tuberculosis, drug-resistant tuberculosis(DR-TB) and leprosy in Ethiopia, first-line anti-tuberculosis treatment refers to rifampicin(R), isoniazid (H), pyrazinamide (Z) and ethambutol (E), usually abbreviated as RHZE (FDREMoH 2017:51).

1.6.10 Second line anti-TB

According to the national guideline for tuberculosis, drug-resistant tuberculosis (DR-TB) and leprosy in Ethiopia, second-line anti-tuberculosis treatment regimen includes Kanamycin (KM), Moxifloxacillin (Mfx), Prothionamid (Pto), Clofazimine (Cfz), Pyrazinamide (Z) and Ethambutol (E); usually abbreviated as Km-Mfx-Pto-Cfz-Z-H^{H}-E (FDREMoH 2017:51).

1.6.11 Screening

Screening is the act of detecting an unrecognised disease in an apparently healthy or asymptomatic population by tests, examinations or other procedures that can be rapidly and easily applied to the target population (WHO Regional Office for Europe 2020:3-4).

1.6.12 Health post

A health facility at the primary health care level that provides mainly basic promotive, preventive and limited curative services (ESA 2012:7).

1.6.13 Guidelines

Guidelines are evidence-based recommendations developed by experts in their field to help healthcare providers to make sound clinical decisions, including confirming a diagnosis, determining appropriate treatment options, monitoring patient's progress and adjusting the treatment plan, educating patients and their families about the disease condition and treatment options, defining standards of care, and ensure high quality and consistency of care for patients (American Diabetes Association 2022:S1; Dhaliwal, Madden, Cahill, Jeejeebhoy, Kutsogiannis, Musccedere, McClave & Heyland 2010:625-643).

1.7 RESEARCH METHODOLOGY AND DESIGN

This study employed the explanatory sequential mixed methods design, which involves a two-stage approach. Firstly, the researcher conducted quantitative research, analysed the findings and then elaborated on them using qualitative research. This design is referred to as explanatory because it aims to provide a deeper understanding of the initial quantitative findings through the use of qualitative data (Creswell, 2014b:304).

Quantitative research is a systematic approach that involves the collection of measurable data from participants, analysis using statistical methods, and conducting research in an unbiased manner (Creswell 2018:53). In this study, the quantitative component was used to analyse the factors affecting service integration for patients with tuberculosis and/or diabetes mellitus. To achieve this, a cross-sectional survey design was chosen as the preferred method. This design allows data to be collected at one point in time to provide a numerical overview of trends or events within a population. By drawing inferences from the results of the sample, the researcher can make broader conclusions about the population as a whole (Creswell 2014:200). The primary objective of the cross-sectional survey was to analyse the factors affecting the integration of health services for patients with TB and/or diabetes in the public health facilities in Addis Ababa, Ethiopia.

Qualitative research is a methodological approach that aims to understand and interpret the subjective meaning that individuals or groups attribute to a social or human problem (Ravitch & Carl 2016:36). This type of research involves an iterative process of inquiry, with questions and procedures emerging as the study progresses. Data is typically collected in the natural environment of the participants, and analysis focuses on identifying recurring patterns and themes that emerge from the data in an inductive manner. The researcher's interpretation plays a crucial role in understanding the meaning behind the data (Creswell 2018:43).

Qualitative research is valuable in gaining insights into organisations, facilitating understanding and promoting improvement, especially in complex organisational change (Florea & Amuza 2014:378-384). Phenomenological research, a type of qualitative inquiry rooted in philosophy and psychology, aims to describe the lived experiences of individuals in relation to a particular phenomenon, as described by the participants themselves. This approach is typically conducted through interviews and is underpinned by strong philosophical principles (Creswell 2014a:14). In the context of this study, the qualitative component was used to explore the challenges and opportunities for health systems to integrate services for TB and diabetes, and to describe the experiences of the practitioners and experts in integrating services for patients with TB and diabetes. The researcher used an interview guide based on the SELFIE framework. Through qualitative research, the study provided a platform for the integration of health services for people with TB and diabetes mellitus in Addis Ababa, Ethiopia.

The researcher integrated the two data sources by linking the quantitative findings with the qualitative data collection. In this study, the quantitative findings were used to guide the subsequent qualitative phase, to determine the sampling procedures, and to determine the types of qualitative questions to be asked of participants in the second phase. The interpretation of the results within the explanatory sequential design involved using the qualitative findings. This approach added depth and insight to the quantitative findings. Consequently, the researcher presented the general qualitative findings and then engaged in a discussion that explained how the qualitative findings extended or clarified the quantitative findings. This was because the qualitative research narrowed the focus of the quantitative research.

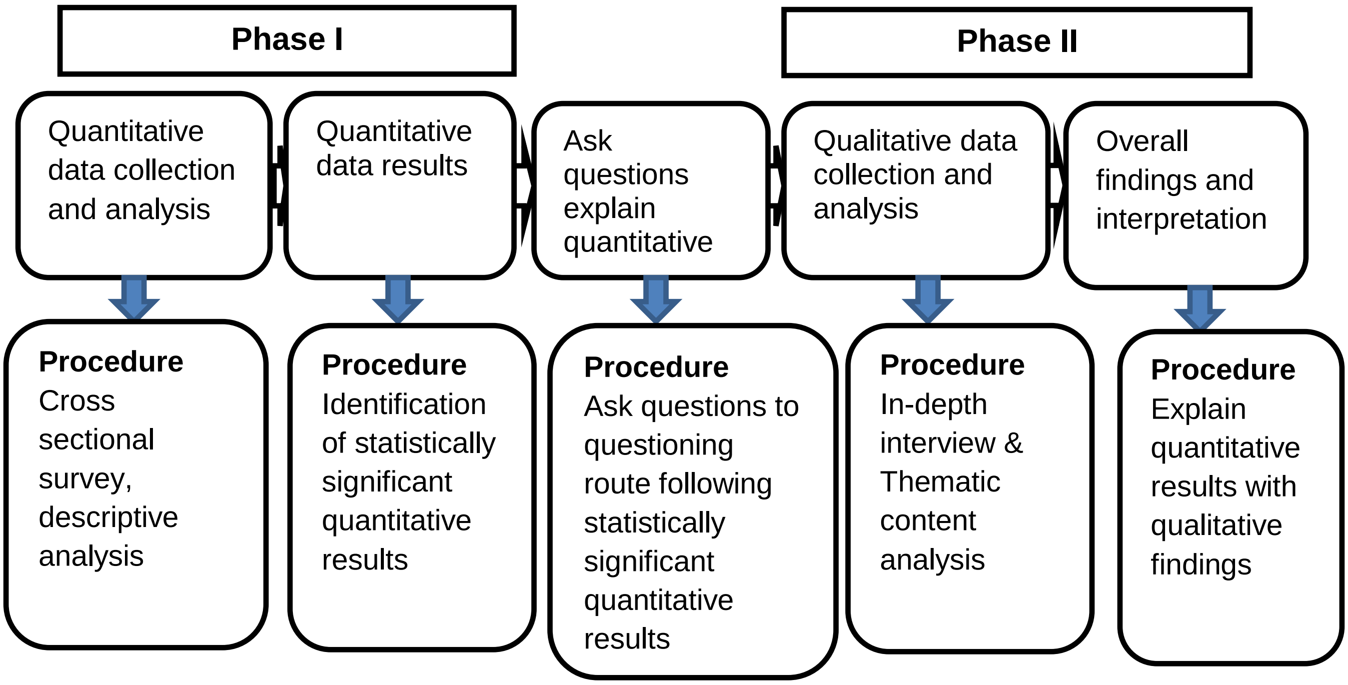


Figure 1: Explanatory sequential design to be conducted in two phases (Creswell 2018:350).

1.8 SCOPE OF THE STUDY

The scope of the study was limited to the assessing the integration of pulmonary tuberculosis and type-2 diabetes in non-pregnant adult patients. The study samples were drawn from public hospitals and health centres.

1.9 LAYOUT OF THE STUDY

The thesis comprised seven chapters.

Chapter 1: Provides the overview to the research and includes the background supported by the pertinent literature, statement of problem, significance of the study, purpose, and structure of the thesis.

Chapter 2: Provides an overview of the theoretical framework used in this study

Chapter 3: Review of relevant literature to describe the association and co-morbidity prevalence of tuberculosis and diabetes mellitus; determine challenges and opportunities, and to describe the experiences of health workers about tuberculosis and diabetes health service integration.

Chapter 4: In this chapter, the researcher has described the methodology of the study, covering the research design, approaches followed, population and sampling techniques and procedures was reported on the application of the research method in the study. It includes the measures applied to ensure validity of data collection, integrity of data management and maintaining ethical principles.

Chapter 5: The findings of the quantitative phase of the research and discussion are presented. The main objective of the quantitative phase was to analyse factors affecting the integration of health services for tuberculosis and diabetes mellitus.

Chapter 6: This chapter presents the findings and discussion for the qualitative phase. The aim of the qualitative study was to explore the current status of integration of TB and diabetes health services, and the challenges and opportunities for the health system to integrate TB and diabetes services within the existing health system.

Chapter 7: In this chapter the researcher provides the outline strategy for the development of the integration framework for patients with tuberculosis and diabetes mellitus based on the research findings and recommendation to apply the integration in the Ethiopian context.

Chapter 8: This chapter presents the conclusions and recommendations.

1.10 SUMMARY OF THE CHAPTER ONE

In conclusion, Chapter 1 provided a comprehensive overview of the study of TB and DM co-morbidity. It set the stage by introducing the background, research problem and purpose of the study. The chapter emphasised the global prevalence and impact of TB and DM, highlighting the association between the two diseases and their mutual influence on clinical manifestations and outcomes.

Furthermore, the chapter highlighted the co-morbidity situation in Ethiopia, a country with a high TB burden and a significant number of people living with DM.

The existing literature and facility-based studies in Ethiopia highlight the need to address TB-DM co-morbidity as a significant public health issue.

The chapter concluded by emphasising the importance of integrated response to this co-morbidity and identifies challenges to achieving integrated care. It also outlines the specific aims of the study, which include analysing factors affecting integration of services, exploring challenges and opportunities within the health system and describing practitioners' experiences. Overall, Chapter 1 lays the groundwork for further exploration of the complex relationship between TB and DM and the need for comprehensive and integrated approaches to address this co-morbidity.

CHAPTER TWO

FRAMEWORK FOR THE STUDY

Information about the research paradigm, theoretical framework, the SELFIE framework and the ecological system model is described in this chapter.

2.1 RESEARCH PARADIGM

A research paradigm is a framework that guides research practices and methods and includes a set of shared assumptions, values, beliefs, and methods that researchers use to study a particular topic or phenomenon; it also influences how researchers formulate research questions, collect and analyse data, and interpret research findings (Creswell 2018:46). There are several research paradigms, for example, post-positivism, constructivism, transformative and pragmatism are the four known research paradigms (Creswell 2014:35). Each paradigm has a unique set of assumptions and methods that guide research practice, and understanding each is important for researchers as it helps them to select appropriate research methods and interpret findings.

Post-positivism is a deterministic philosophy in which researchers use quantitative methods to test hypotheses; constructivism emphasises the use of qualitative methods to understand subjective experiences; transformative research paradigms often use qualitative methods to explore the subjective experiences of individuals and communities and to understand the social, political, and cultural context in which social phenomena occur; and pragmatism research paradigm emphasises the use of both quantitative and qualitative methods with the belief that knowledge is provisional and contextual and that research should be guided by its practical application in solving real-world problems (Creswell 2018b: 44-48).

The pragmatic paradigm in research values practical problem solving, empirical evidence and scientific methods, while recognising the importance of context and pluralism. Pragmatists aim to be responsive to the needs of individuals and communities by promoting positive change through research findings. They also value flexibility and openness to change, providing a useful framework for relevant, practical and responsive research (Creswell 2018:51).

Therefore, in the current study, the researcher used the pragmatic paradigm to uncover the health system challenges and opportunities for integrating TB and diabetes services in public health facilities in Addis Ababa, Ethiopia.

2.2 THEORETICAL FRAMEWORK

A theoretical framework is a group of principles, ideas, and assumptions that underpin research and provide a foundation for analysing and interpreting data. It includes a set of related theories, models, or hypotheses that explain or predict a phenomenon. Theoretical frameworks play a crucial role in research as they guide the selection of research questions, design, data collection, and analysis, and help to determine the significance of research findings (Peterson, Anderson, Bourne, Charns, Gorin, Hynes, McDonald, Singer & Yano 2019:90-98; Grant & Osanloo 2016:7). Moreover, a theoretical framework helps researchers to situate and contextualise formal theories in their studies as a guide, and it serves as a focus for the research. It is related to the research problem under study and, therefore, guides the research choice of research design and data analysis plan (Ravitch & Carl, 2016:104).

Furthermore, theoretical framework assists the researcher in selecting an appropriate research approach, analytical procedures, and tools for their research inquiry. It also enhances the significance and generalisability of research findings (Akintoye & Lancashire 2015). In general, theoretical frameworks provide an important foundation for research, helping researchers to develop clear research questions, define variables, and guide the process of data collection and analysis (Peterson et al 2019: 90-98).

There are several theoretical frameworks that have been used in research on the integration of health services for people with co-morbidity or multi-morbidity. One of these is the Chronic Care Model (CCM), which is widely used and emphasises a patient-centred approach to healthcare for people with chronic conditions, including multi-morbidity. The CCM focuses on the integration of health services across different levels of care to improve patient outcomes, including the health system organisation, community resources and policies, self-management support, delivery system design, decision support and clinical information systems (Dunn & Conard 2018:295-296). Another framework is the Integrated Care Model (ICM), which emphasises the coordination and integration of healthcare services to provide patient-centred care for people with multi-morbidity (Bandurska, Damps-Konstanska, Popowski, Jedrzejczyk, Jankwaik, Swietnicka, Zarzeczna & Jassem 2017:2850-2862).

The Person-Centred Coordinated Care (PCCC) Model also highlights the importance of patient-centred care and coordination among healthcare providers for people with multi-morbidity (Phelan, Rohde, Casey, Fealy, Felle, O'kelly, Llody & Carroll 2021:1-13). Finally, the Complex Adaptive Systems (CAS) Model recognises the complex and dynamic nature of health systems and highlights the need for flexible, adaptive approaches to integrating health service for people with multi-morbidity (Wilson, McLachlan, Dube, Potter & Jayamaha 2023:168-186).

CCM was developed in the 1990s to improve care for people with chronic conditions such as heart disease, hypertension, diabetes, and pulmonary diseases and was designed to identify key components and strategies that could effectively address these conditions (Dunn & Conard 2018:295-296). CCM is widely used in the care of people with multi-morbidity and complex health problems to meet their needs (Boehmer, Dabrh, Gionfriddo, Erwin & Montori 2018:e0190852). A systematic review and meta-analysis by Goh, Siah, Tam, Tai and Young (2022:1-23) and Boehmer et al (2018:e0190852) demonstrated that the implementation of the CCM resulted in improved primary care for patients with multi-morbidities.

In addition, the CCM relies on multiple factors, including the health system organisation, proactive care, self-management support, interdisciplinary teamwork, and the use of information systems to ensure comprehensive management of chronic conditions and improved patient outcomes (Dunn & Conard 2018:295-296). The Sustainable intEgrated chronic care modeLs for multi-morbidity: delivery, FInancing, and PerformancE (SELFIE) is an example of a chronic care model that provides comprehensive guidance for developing and implementing integrated care models for patients with chronic conditions, including those with multi-morbidity and co-morbidity (Leijten, Struckmann, van Ginneken, Czypionka, Kraus, Reiss, Tsiachristas, Boland, de Bont, Bal, Busse & Mölken 2018:12-22). The SELFIE framework provides a robust and programmatic approach to developing integrated care models specifically tailored for patients with co-morbidity and multi-morbidity. It is also a valuable tool for policy makers, health care providers and researchers seeking to improve care and outcomes for this specific populations (Leijten et al 2018a:12-22).

The SELFIE framework extends upon the CCM by providing additional guidance on the financing and performance dimensions of integrated care models. It acknowledges the significance of establishing sustainable financing models to support the delivery of integrated care. Additionally, it highlights the importance of ongoing evaluation to assess the effectiveness and efficiency of these care models (Leijten et al 2018a:12-22). The SELFIE framework surpasses the CCM by providing comprehensive guidance on the financing and performance aspects of integrated care. Therefore, in the present study, we adopted the SELFIE framework to assess the factors affecting the integration of services for patients with TB and diabetes. In addition, we aimed to describe the experiences of practitioners and experts regarding the current state of integration of TB and diabetes services, and to explore the challenges and opportunities within the health system of public health facilitates in Addis Ababa, Ethiopia.

2.3 THE SELFIE FRAMEWORK

The SELFIE framework was developed to respond to the growing demand for integrated care models that effectively address the complex needs of people with multi-morbidity, which refers to the co-existence of two or more chronic conditions. The prevalence of multi-morbidity is increasing due to factors such as the ageing population, improved survival rates for chronic diseases, and the increasing prevalence of risk factors such as obesity and physical inactivity, which can lead to conditions like diabetes, hypertension, cardiovascular diseases and others (Leijten et al 2018:12-22).

In this study, the researcher adopted the SELFIE framework (Leijten et al 2018:12-22), which was specifically developed to address the integrated care needs of people with multi-morbidity. This framework places people with multi-morbidity and their environment at the centre and categorises concepts of integrated care for multi-morbidity into micro, meso and macro levels. It further classifies these concepts according to the six WHO health system building blocks: service delivery, leadership & governance, workforce, financing, access to technologies & medical products and information & research (WHO 2007a:14).

The SELFIE framework provides a comprehensive outlook on individuals with co-morbidities and their environment, covering various aspects including service delivery, leadership and governance, workforce, financing, access to technologies and medical products, as well as information and research (Leijten et al 2018:12-22). The framework is structured in a way that initially introduces the core, followed by a description of each component. This description progresses in a clockwise direction from the top, highlighting the micro, meso, and macro levels of the framework. Figure 2 illustrates this structure, with each constituent depicted and explained at the corresponding level.

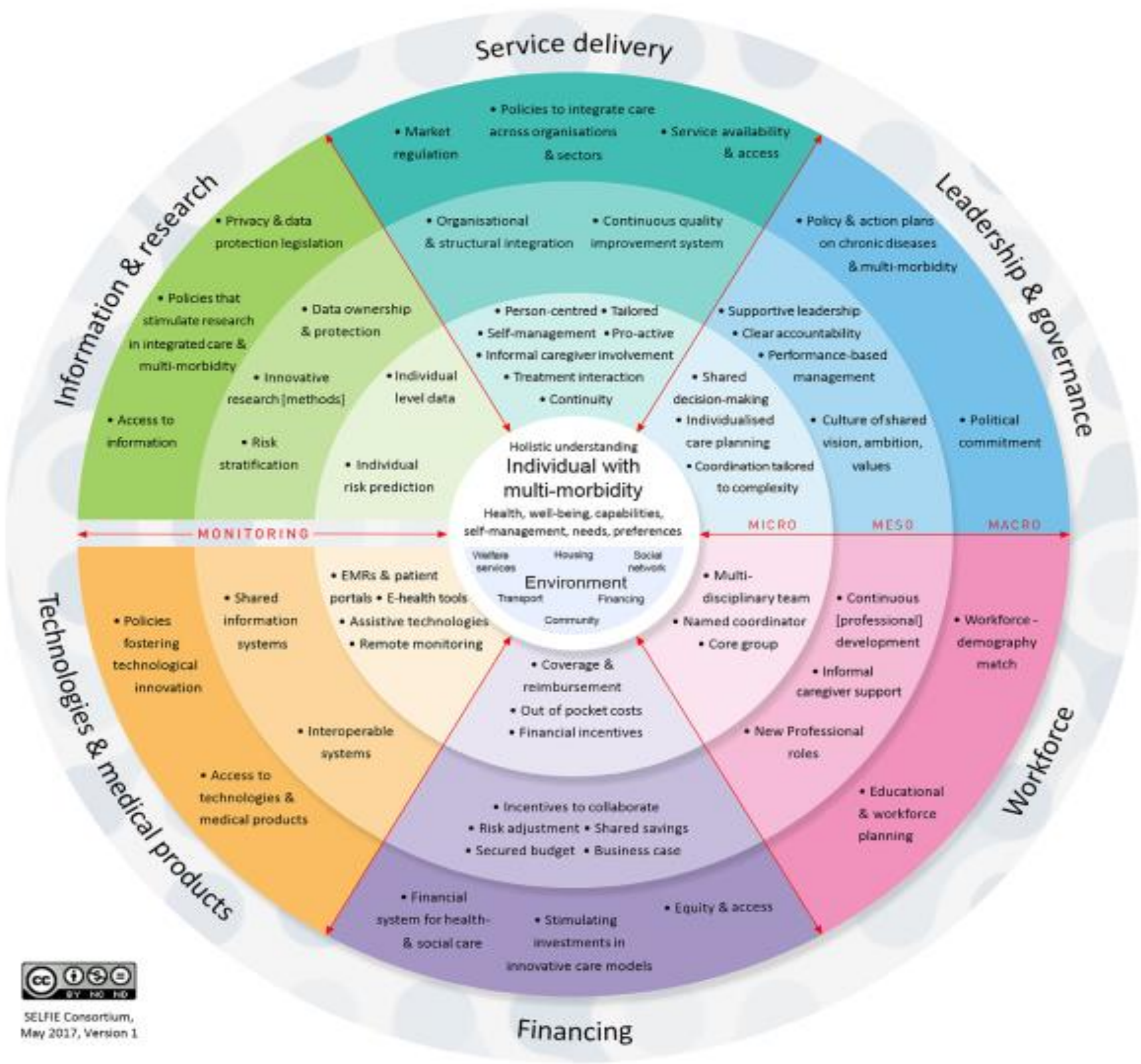


Figure 2: The SELFIE framework for integrated care for multi-morbidity (Leijten et al., 2018:12-22).

The SELFIE framework comprises three main elements: delivery, financing and performance. The delivery component pertains to the organisation and provision of care including the integration of different health care providers and services. The financing component considers the financial models and incentives that facilitate the implementation of integrated care. The performance component focuses on the evaluation and monitoring of care models, including the measurement of patient's outcomes, quality of care and cost-effectiveness. The SELFIE framework places strong emphasis on patient-centred care and active involvement of patients in the design and evaluation of integrated care models. Furthermore, the framework recognises the importance of addressing the social determinants of health and promoting health equity (Leijten et al 2018:12-22).

Integration can take different forms at macro, meso and micro levels. The macro-level (system level) is a broad, all-encompassing level that is often used interchangeably with policy when referring to the setting for institutional arrangements' architecture and direction; and aimed to provide integrated care at a high level of service to the population they serve. The ministry of health and other government agencies, state or republican centres, independent institutions, medical schools, and large national research institutes are a few examples of macro-level actors (Raus, Mortier & Eeckloo 2020:1-9; WHO 2016a:6; Tello & Barbazza 2015:14).

At meso-level (organizational level), systems focus on the integrated care needs of a particular population or group with similar diseases or conditions. By interpreting and operationalising aims and objectives for use by a particular segment of the population, the meso level of service delivery explains how policy manifests itself in practice. Depending on a number of variables, such as the institutional structure of regional and district administrations, sub-national entities and other institutions, the spectrum of organisations at this level can vary significantly from context to context (Raus et al 2020:1-9; WHO 2016a:6; Tello & Barbazza 2015:14).

The micro level (clinical level), which is the most practical level of service delivery, primarily refers to those procedures for the provision of clinical and non-clinical services. These procedures frequently involve members of the health workforce, managers, administrators, and clinical providers, as well as patients, families, and other caregivers. The role of integrated system, at micro level, is to improve the coordination of care for individual patients and other caregivers (Raus et al 2020:1-9; WHO 2016a:6; Tello & Barbazza 2015:14).

Combining these levels with the processes of health service delivery- service selection, care design, provider organisation, and service management and performance improvement captures the complexity between them, as well as the different numbers and profiles of actors influencing each. For example, the selection of services and the design of care rely on macro, system-level actions as part of the overall management and standardisation of services. As Table 1 shows (Tello & Barbazza 2015:15), each level has a different role and responsibility for these processes.

Other processes, such as service management and performance improvement, rely more on the meso and micro levels to carry out crucial tasks that are closer to the actual delivery of services.

Table 1: Actors of health delivery system by integration level

Macro: System-level	Meso: Organisational-level	Micro: Clinical-level
Ministry of health	Regional health authorities	Health professionals
Units within ministry of health	Local health authorities/trusts	Health managers
Prime ministry of office	Health boards	Patients
Ministry of finance	Law enforcement agencies	Family members and care givers
State or republican centres	Health related NGOs	Non-governmental health providers
Medical schools, training institute and health policy schools	Business associations	Hospital boards
Bilateral agencies	Accreditation agencies	Primary care centres/units
Think tanks	Auditing agencies	Clinical leaders
Research universities	Unions of health workers	Quality teams
Procurement agencies	Associations of health professionals	Community and social workers
Health insurance funds		
Media and communication outlets		
Institute of public health		
Statistic offices		

2.4 THE CONCEPT OF INTEGRATION AND INTEGRATED CARE

2.4.1 Definition and characteristics of integration

2.4.1.1 Definition of Integration

It is impossible to address the meaning of integrated care without first examining the roots and core concepts of integration. The word integrated comes from the Latin verb integer, meaning to complete and it is used to express the bringing together or merging of elements or components that were formerly separate. Comprehensiveness overlaps with integrating. Comprehensiveness means full understanding of a situation, similar to the original meaning of the Greek verb to diagnose, in other words, there is a desire to have an understanding of the relationship between the elements that are part of the whole (Kodner & Spreeuwenberg 2002:1-6).

The concept of integration can be defined in different ways, depending on the discipline. As a result, integration does not have a universal and single definition, but is generally understood as a framework. Integration is a dynamic, multidimensional (González-Ortiz, Calciolari, Goodwin & Stein 2018:1-12) and nested concept (Kodner 2009:5-16) that means different things to different people from different perspectives with many roots and branches.

2.4.1.2 Characteristics of integration

Since the term integration has no single and universally accepted definition, its detailed characteristics is described in the following ways.

2.4.1.2.1 Foci of integration

Integration efforts focus on: (1) general population to promote health, prevent diseases, address social determinants of health and improve health equity (Farmanova, Baker & Cohen 2019:1-25) regardless of the health status, (2) vulnerable clients sub group (Tavassoli, Barreto, Berbon, Mathieu, Kerimel, Lafont, Takeda, Carrie, Piau, Jouffrey, Andrieu, Nourhashemi, Beard, Eugenia, Martin & Vellas 2022:e394-e404; Tian, Zhang, Wang, Cheng & Meng 2022:e061011; Han, He, Lyu, Yu, Bian & Lee 2020:11-17), and (3) patients with comorbidities (WHO 2022a; Salifu & Hlongwana 2021a:1-6; Nicholson, Makovski, Griffith, Raina, Stranges & Akker 2018:142-146; Petersen, Fairall, Bhana, Kathree, Selohilwe, Brooke-Summer, Faris, Breuer, Sibanyoni, Lund & Patel 2016:s29-s39).

2.4.1.2.2 *Types of integration*

There are six types of integration: (1) functional integration (the degree to which back-office and support functions are coordinated across all entities), (2) organisational integration (refers to relationship between healthcare organisations), (3) professional integration (refers to provider relationships within and between organisations), (4) service or clinical integration (refers to the coordination of services and the integration of care in a single process across time, place and discipline), (5) normative integration (shared mission, work values and organisational and/or professional culture), and (6) systematic integration (which involves the alignment of policies and incentives at the organisational level) (Raus, Mortier & Eeckloo 2020:1-9; González-Ortiz, Calciolari, Goodwin & Stein 2018:1-12).

Table 2: Types of health service integration

Types of integration	**Descriptions**
Systemic	• Coordinate and align policies, rules, regulatory frameworks at different organisational levels; and this type of integration called an integrated delivery system.
Normative	• Shared values, culture and vision across organisations, professions and individuals. • Developing shared goals, identifying and addressing communication gaps, building relationships and trust, and enabling collaboration.
Organisational	• Coordinating formal or informal structures, contractual or collaborative arrangements, governance systems and relationships across organisations (e.g. pooled budgets, umbrella organisations) • Occurs through mergers/collectives, virtual networks, or purchaser brokered contracts.
Administrative/Functional	• Align non-clinical support and back-office functions (like financial systems /budget, shared accountability mechanisms, human resources (HR), strategic planning, management, quality improvement,

	information technology system including compatible electronic medical records. • Requires flexibility to link financial, management and information system around service delivery. • Requires common policies and practices, but does not necessarily mean standardisation.
Clinical	• Integrated care delivery through coordinated information and services as a single or coherent process for consumers within and/or across professions. • Requires the development of expanded clinical roles, guidelines, protocols and inter-professional education.
Service	• Different clinical services are integrated at an organisational level, for example through teams or multidisciplinary professionals.

Adapted from (Raus, Mortier & Eeckloo 2020:1-9; González-Ortiz, Calciolari, Goodwin & Stein 2018:1-12).

2.4.1.2.3 Levels of integration

The level of integration is closely related to the above dimension (type of integration). Integration can also take place at the following five different levels: (1) financial, (2) administrative, (3) organisational, (4) service delivery and (5) clinical (Raus, Mortier, & Eeckloo 2020:1-19; González-Ortiz et al 2018:1-12; World Health Organization 2016a) 2016a:5).

2.4.1.2.4 Breadth of integration

Integration can also be described as a horizontal or vertical (Goodwin 2016:1-4; World Health Organization 2016a:5): (1) Horizontal integration is where similar organisations/units involve the provision of integrated care between health services, social services and other care providers, usually based on the development of multidisciplinary teams and/or care networks that support a specific client group (e.g. older people with complex needs) at the same level together (e.g. two hospitals); and (2) vertical integration also involves the provision of integrated care across primary, community, hospital and tertiary care services, and is manifested in protocol-driven care pathways for people with specific conditions (such as COPD and diabetes) and/or care transitions between hospitals and intermediate and community care providers.

2.4.1.2.5 Degree of integration

The degree of integration is also referred to as the intensity of integration. This means that there is a continuum that ranges from informal links to more managed co-ordination of care and to fully integrated teams or organisations (Goodwin 2016:1-4; World Health Organization 2016a:6).

Table 3: Degree of integration health services

Integration level	Description
Individual	• Agencies deliver individual services with little or no communication; and there is no shared vision, values, or funding.
Linkage/Co-location	• Agencies promote continuity of care by facilitating communication and referrals between services. • Staff aware of roles and responsibilities of other agencies, refer clients where appropriate. • Agencies engage with the community and respond to needs independently. • Services can co-locate with joint planning but retain their own vision, funding and governance.
Coordination/ Collaboration	• Agencies identify fragmentation and discontinuity and formalise processes and structures to address them. • Agencies work within current systems, but share information, support transitions, and define structures and responsibilities to coordinate care across services. • Open communication between agencies and engagement with the community to respond collectively. • There is a shared vision, culture, and funding.
Full integration	• Agencies pool resources across systems, developing a new organisation with a comprehensive service tailored to specific populations or groups. • Sharing resources (i.e. medical records) rather than sharing

	information across systems. • Partnership approach to achieve shared outcomes in response to the community, possibly through multi- or interdisciplinary teams.

Adapted from (Government of Western Australia 2020: 6; Goodwin 2016: 1-6; World Health Organization 2016a: 6).

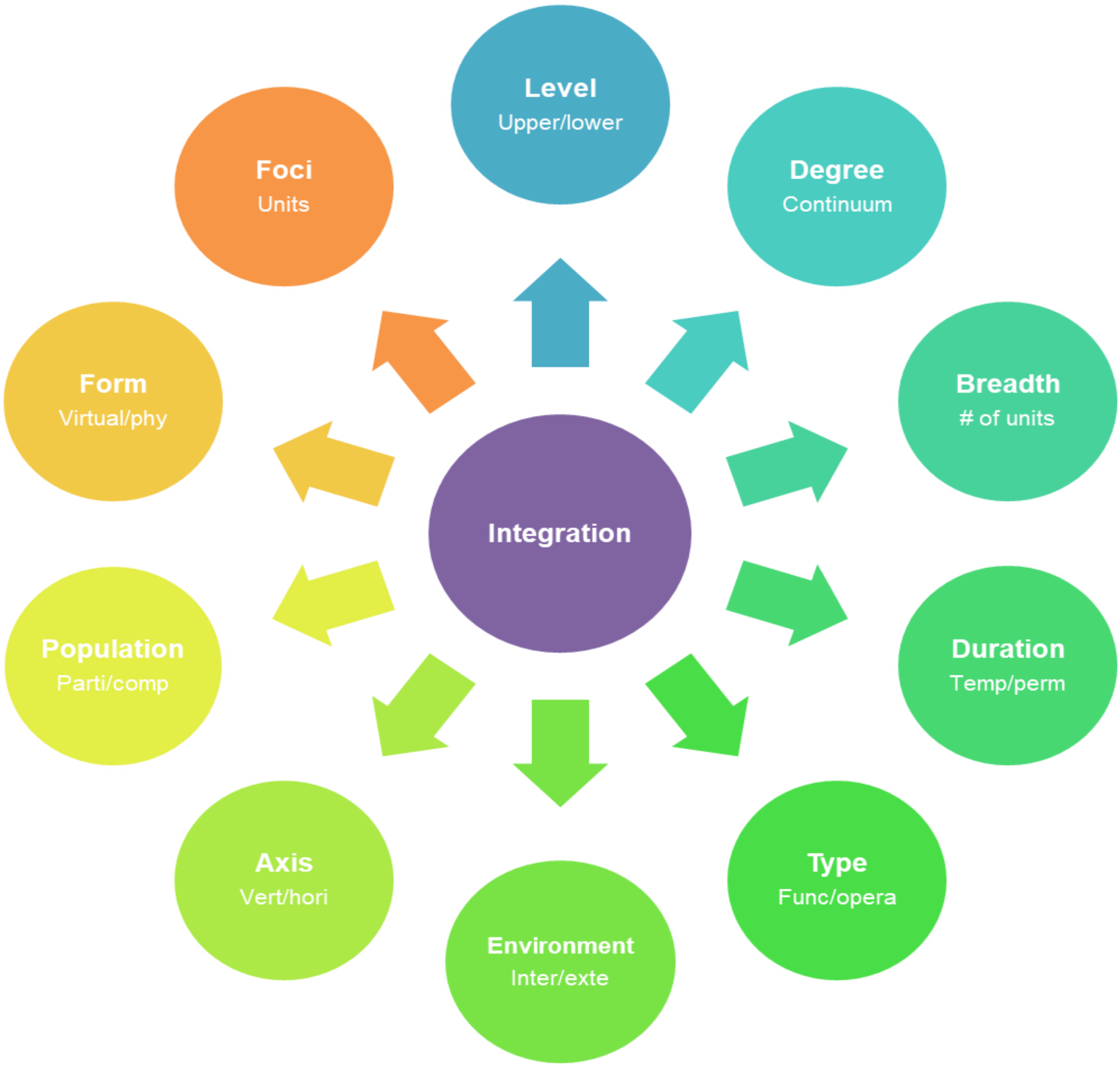


Figure 3: The conceptual framework of integration compact

2.5 SUMMARY OF CHAPTER TWO

Chapter 2 is a foundational chapter that plays a crucial role in establishing the research paradigm and theoretical framework for the study. The chosen research paradigm is the pragmatic paradigm, which focuses on practical problem solving and responding to the needs of individuals and communities. This paradigm will guide the research approach throughout the study.

The chapter then introduces several theoretical frameworks relevant to the integration of health services for people with co-morbidity or multi-morbidity. These frameworks include the Chronic Care Model (CCM), the Integrated Care Model (ICM), the Person-Centred Coordinated Care (PCCC) model and the Complex Adaptive Systems (CAS) model. However, particular emphasis is placed on the SELFIE framework, which is recognised as a comprehensive model that effectively addresses the complex needs of people with multi-morbidity. The SELFIE framework organises integrated care approaches into micro, meso and macro levels, and aligns them with the six building blocks of the World Health Organization's health system. This framework provides valuable insights into the delivery, financing and performance aspects of integrated care.

In conclusion, Chapter 2 provides the conceptual foundation for the study. It establishes the pragmatic paradigm as the guiding approach and introduces various theoretical frameworks, with particular emphasis on the SELFIE framework. This chapter sets the stage for further exploration and investigation of the integration of TB and diabetes mellitus services within public health facilities in Addis Ababa, Ethiopia.

CHAPTER THREE

LITERATURE REVIEW

3.1 INTRODUCTION

A literature review is a thorough and critical evaluation of a written document that involves a systematic examination and analysis of existing knowledge on a specific topic (Harris, 2020:153; Machi & McEvoy, 2016:28). It's also referred to as a process of contextualising one's own research within a broader framework of information and ideas (Ravitch & Riggan 2017:49-52), which involves showing how the current empirical work addresses unanswered questions or fills gaps in the existing literature. It involves a review of scholarly sources relevant to the research problem or theory, with the aim of providing a coherent and methodological exploration of the topic (Pan, 2017:14).

A literature review is an important tool for researchers to present and summarise existing knowledge and information on a particular topic. It demonstrates the researcher's familiarity with relevant research in the field, establishes a theoretical framework and methodology for the current study, and shows how the research fits into the wider body of knowledge. The review also helps to refine research questions, identify gaps of limitations in the existing literature, and generate new research questions to address these gaps (Creswell 2018b:66). It recognises the importance of replication studies, identifies relevant theoretical frameworks, critically evaluates previous studies, assists in planning research methodology and improves research methods by identifying inconsistencies and contradictions in previous findings (Ravitch & Riggan 2017:49-53; Machi & McEvoy 2016:26-27). It also places the current study in a broader context, provides new interpretations or fills gaps in the existing literature, and offers insights into future research directions (Ravitch & Riggan 2017:50). Moreover, the literature review facilitates an understanding of key concepts, data sources and measurement techniques used by other researchers, encouraging the exploration of alternative research projects and consideration of the implications of one's own work in relation to the existing literature (Machi & McEvoy 2016:25-27).

Based on the distinct purposes and approach, literature review can be classified into argumentative reviews, integrative reviews, historical reviews, methodological reviews and systematic reviews.

An argumentative review is an approach to academic writing that involves the critical analysis and evaluation of specific previously published literature on a particular topic (Özdemir 2018:112). The primary aim of this type of review is to contribute to academic discourses by presenting a particular perspective supported by evidence from the literature. This type of review involves identifying a research question or a specific issue within the field and exploring different viewpoints, theories, methodologies and findings. It also involves synthesising the information and identifying gaps or limitation in existing research (Özdemir 2018:122; Wentzel 2017:1-2).

An integrative review is a review method that synthesises evidences from various sources to provide a comprehensive understanding of a particular topic. In contrast to argumentative reviews that focus on critiquing individual studies, integrative reviews delve deeper by identifying patterns, commonalities, and relationships across different findings (Oermann & Knafl 2021:65-68; Torraco 2016:404-428).

Historical reviews examine the development and changes of a topic throughout its history. It explores the historical context, key milestones, and influential theories or studies that have shaped the current understanding of the topic (Hong & Pluye 2018:261-276). The purpose of a historical review is to place research in its historical context, to present knowledge of recent developments, and to identify potential avenues for future research (Gómez-Carrasco, Rodríguez-Medina, López-Facal & Monteagudo-Fernández 2022:497-511; Hong & Pluye 2018:261-276).

Methodological reviews involve evaluation and critique the research methods used in previous studies within a specific field. In addition to examining the research findings, these reviews look at how the research was conducted, providing insights into different levels of understanding such as theory, content areas, research approaches, and data collection and analysis techniques. This comprehensive approach allows researchers to access a wide range of knowledge, including conceptual aspects and practical guidance for fieldwork (Aguinis, Ramani & Alabduljader 2023:46-76; Snyder 2019:333-339).

Moreover, this type of review covers several areas, including considerations of ontology and epistemology, integration of quantitative and qualitative methods, sampling strategies, interviewing techniques, data collection and analysis procedures, and ethical considerations. By exploring these dimensions, methodological reviews support researchers in identifying and addressing ethical issues that may arise during the study (Mbuagbaw, Lawson, Puljak, Allison & Thabane 2020:1-12; Snyder 2019:46-76).

Systematic reviews employ a meticulous and organised method to identify, select, and appraise pertinent studies for a specific research question (Jahan, Naveed, Zeshan & Tahir 2016:4-9). They follow predefined criteria and methods to ensure transparency, replicability, and minimise bias. This type of review provides a comprehensive summary of the existing evidence on a clearly defined research question (Munn et al 2018:1-7).

The current study utilised argumentative reviews, integrative reviews, methodological reviews and systematic reviews techniques to examine articles and books. The researcher conducted a literature search using public health databases such as PubMed, Medline, and CINAHL, Google scholar, SAGE Research Methods and Cochrane library with the citation from the mid-1998s to date. The search utilised specific keywords including tuberculosis, diabetes, integration, integrated care, tuberculosis and diabetes, co-morbidity/multi-morbidity, author names, phrases related to the topic, and full research titles. Furthermore, the literature review included both national and international resources.

3.2 THE CONCEPT OF INTEGRATED CARE

The term integrated care is widely used and accepted in different healthcare systems around the world. Goddard and Mason (2016:1-3) described the concept of integrated care as a global buzzword in healthcare, which is widely seen as a potential solution to the major challenges facing the current healthcare system across the world. However, the concept is not new, as the fragmentation of health services is linked to the design and delivery of the current health services (Amelung et al 2021:15; Dawda 2019:e000001; Goodwin 2016:1-4). For health system policy makers, programmers and experts, the activity of integrated care is very apparent in all developed countries, as evidenced by the exponential growth of intellectual attention to the topic in the last two decades (Dawda 2019:e000001).

For Kodner and Spreeuwenberg (2002:1-6), integrated care is defined as 'the set of coherent methods at the financial, administrative, organisational, service delivery and clinical levels that are designed to create linkages, alignment and collaboration within and between the health and care sectors'. According to Leijten et al (2018a:12-22), also integrated care also refers to coordinated, proactive, person-centred, multidisciplinary care delivered by well-communicating and collaborating providers within the health system.

Although there is probably no common understanding of integrated care due to its polymorphous nature, integrated care is used as a synonym for terms such as collaborative care, coordinated care and seamless care (WHO 2016a:4). As a result, the term ‘integrated care’ is used as an umbrella term for different concepts and organisational structures. Indeed, the views and expectations of different stakeholders in the health system are likely to shape the perspectives that construct the concept. Healthcare professionals, providers, policy-makers, regulators, evaluators, communities, service users and managers are the stakeholders shaping the integrated care perspective (Lê, Morgan, Bestall, Featherstone, Veale & Ensor 2016:406-419; WHO 2016a:3).

Due to the diversity of perspectives and concepts, different researchers may come up with different definitions. However, for the purposes of this study we used the health system based definition, WHO definition, which is defined as the provision of a continuum of health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation and palliative care services that are coordinated across different levels and sites of care within the health sector, based on the needs of clients' throughout the life course (WHO 2015c:4).

3.2.1 Purpose of integrated health services

Health service integration refers to provision a package of health interventions, either preventive or curative, for a particular population group; and integrated health services is the management and delivery of health services such that people receive a continuum of promotive, preventive, curative and rehabilitative services, through the different levels and sites of care within the health system, according to their needs throughout the life course (WHO 2015:5-11).

Integration of health services has been recognised as a useful approach to building a more efficient, patient-centred health system, leading to better health outcomes. In 2007, the WHO Director General (WHO 2007a) stated:

> “*We need a comprehensive, integrated approach to service delivery. We need to fight fragmentation*.”

Nowadays, the ageing population and the growing burden of long-term chronic diseases and co-morbidities means that current health systems are struggling to successfully meet the rising demand for care (Leijten et al. 2018a:12-22; WHO 2018b:3).

Health service integration is a system to address fragmentation, duplication and gaps (WHO 2019:11) in health services that is not limited to methods of funding, administration and organisation, but also creates connectivity, alignment and collaboration within the health system (Amelung, Stein, Suter, Goodwin, Nolte & Balicer 2021: 1-13; Curry & Ham 2010: 3).

Not only the collective results of various socio-demographic and economic but also environmental and rising care expectations have led the health services to focus on proactive rather than reactive, comprehensive and continuous rather than episodic and disease specific care, built on sustainable patient-provider relationships rather than incidental and provider-led care (WHO 2018b:3).

3.3 ASSOCIATION BETWEEN TUBERCULOSIS AND DIABETES MELLITUS

Previous studies have reported an association between pulmonary tuberculosis and type 2 diabetes mellitus (Patwary et al 2018:129-136; Dewi, Putra, Sawitri & Duarsa 2017:24-29). Patients with diabetes mellitus have a two to four times higher risk of active tuberculosis compared to non-diabetics (Al-Rifai, Pearson, Critchley & Abu-Raddad 2017:e0187967; Risna Dewi et al 2017:24-29). Type 2 diabetes is recognised as a relevant and independent risk factor for the development of active tuberculosis (WHO 2021:26; Gedfew et al 2020:869-878; Gadallah, Abdelmoniem, Fawzy, Mokhtar & Mohsen 2019:343-348).

Diabetes affects both innate and adaptive immunity, which are crucial for the defence mechanism against pulmonary tuberculosis (Kumar Nathella & Babu 2017:13-24; Martinez & Kornfeld 2014:617-626). A decrease in anti-inflamatory effects has also been observed in patients with type 2 diabetes (Lachmandas et al 2016; Prada-Medina et al 2017:1-16). However, one study reported that type 2 diabetes was not a significant factor in increasing molecular clustering in individuals with pulmonary tuberculosis (Mburu, Kingwara, Esther & Andrew 2018:21-26). Furthermore, hyperglycaemia, a hallmark of diabetes, plays an important role in increasing susceptibility to tuberculosis in individuals with diabetes (Ruslami et al 2021:108701). The risk of developing pulmonary tuberculosis is 20 times higher in people with diabetes than in those without diabetes (Patwary et al 2018:129-136).

In addition, diabetes has a detrimental effect on treatment outcomes in patients with pulmonary TB. It is associated with treatment failure (Pinto & Carvalho 2019:219-243;

Mukhtar & Butt 2018: e0207148), relapse (Mukhtar & Butt 2018:e0207148), drug resistance (Pinto & Carvalho 2019:219-243; Yadav, Singh, Singh & Rani 2017:290-294), multidrug resistance (Perez-Navarro et al 2017:83-91), delayed smear conversion (Perez-Navarro et al 2017:83-91), increased mortality (Mukhtar & Butt 2018:e0207148; Nguyen, Pascopella & Barry 2018:1269-1276) and delayed clinical presentation (Mahishale et al 2017:5303-5312). These associations and effects between type 2 diabetes and pulmonary TB have negative consequences for TB control programmes and the quality of life of people with diabetes (Ruslami et al 2021:108701; Harries et al 2016:173-179).

3.4 CO-MORBIDITY PREVALENCE OF TUBERCULOSIS AND DIABETES MELLITUS

The co-morbidity prevalence of TB and DM varies worldwide. Several studies have examined this relationship and reported different prevalence rates in different regions.

Worldwide, about 0.68 million TB cases were attributed to DM in 2020 (WHO 2021:26). The global prevalence of diabetes among TB patients ranges from 1.9% to 45%, while the prevalence of TB among diabetic patients ranges from 0.38% to 14% (Workneh, Bjune, Yimer 2017:e0175925). The highest prevalence of diabetes among TB patients was reported in countries in Asia, North America and Oceania, while the prevalence of TB among diabetic patients was relatively higher in countries in the Asian and African continents.

Specific studies have reported different prevalence rates of co-morbidity. For example, a systematic review from low -and middle- income countries reported 19% (Heo et al 2015:1098-1101), while a study from Ethiopia found a co-morbidity prevalence of diabetes among TB patients of 12.77% and TB among diabetes patients of 4.14% (Alemu, Bitew, Diriba & Gumi 2021:82-91).

Several studies have also looked at the prevalence of diabetes in people with TB or TB in people with diabetes in specific regions. For example, a systematic review and meta-analysis on 2.3 million people found a global prevalence of diabetes in active tuberculosis of 15.3% (Noubiap et al 2019:e448-e460). Studies from China (Du, Wang, Long, Zhao & Abdullah 2021:1553-1559), Sub-Saharan Africa (Alebel et al 2019:1-10) and Southeast Asia (Gautam et al. 2021:1-12) reported prevalence rates of diabetes in TB patients of 7.8%, 9.0% and 21%, respectively.

The prevalence of type 2 diabetes among TB patients in various low-and middle-income countries (LMICs) ranged from 1.8% to 45%, while the prevalence of TB among type 2 diabetes patients ranged from 0.1% to 6.0% (McMurry et al 2019:e3066). Studies from Asia countries reported a prevalence of diabetes among patients with pulmonary TB ranging from 5% to more than 50% (Zheng, Hu & Gao 2017: 1264702).

Specific regional studies have also reported prevalence rates of co-morbidity. For example, a retrospective study from Denmark showed a prevalence of diabetes in TB patients of 5% (Huber et al 2022:1-9). A study from a municipality in northeastern Brazil showed an increasing trend in the prevalence of TB and DM co-morbidity, from 3.23% in 2014 to 19.5% in 2018 (Sousa et al 2021: e20201238). Another study from Brazil reported a 14.3% to 18.2% prevalence of TB-diabetes co-morbidity, with higher prevalence in older age groups (Evangelista, Maia, Toledo, Abreu & Barreira 2020: 130-136).

Several studies have investigated the prevalence of diabetes in patients with TB or TB in patients with diabetes in specific populations. For example, a cross-sectional community based study in India a 31% prevalence of diabetes among patients with pulmonary TB (Kumar, Rajesh & Kiran 2021:223-232). A study from the Mexican state of Tamaulipas reported a 25.2% prevalence of diabetes among TB patients, with a significant proportion being newly diagnosed and younger (Abdelbary, Garcia-Viveros, Ramirez-Oropesa, Rahbar & Restrepo 2016: S124-S134).

Various screening tests have been used to determine the prevalence of TB and diabetes co-morbidity. For example, a study in Western Australia used HbA1c screening in patients with active tuberculosis and found a high prevalence of diabetes in older patients with a family history of diabetes (Lu et al 2019:630-633). A bidirectional prevalence of TB and diabetes was reported in another study (Yorke et al 2017). A cross-sectional study from Tanzania showed a 9.2% prevalence of diabetes among TB patients (Mabula et al 2021:69-74).

In Ethiopia, the prevalence of tuberculosis cases attributed to diabetes mellitus was over 5,300 in 2019 (WHO 2020:161). Cross-sectional facility-based studies of TB patients in Ethiopia have reported prevalence rates of diabetes ranging from 5.1% to 15.8%, with a significant proportion of patients being newly diagnosed (Jerene et al 2022:100306; Gezahegn, Ibrahim & Mulat 2020:3879-3886; Damtew et al 2014a:389-296; Abebe, Getachew, Kebede & Alemu 2014:862-872).

3.4.1 Risk factors for tuberculosis-diabetes mellitus co-morbidity

Various risk factors for the co-morbidity of tuberculosis and diabetes mellitus, and vice versa, have been reported worldwide. For example, factors such as gender, older age (Alemu et al 2021:82-91; Workneh et al 2017:e0175925), urban residence, tabacco smoking, sedentary lifestyle, poor glycaemic control and family history of diabetes are among the identified risk factors for their co-morbidity (Alemu et al 2021:82-91; Workneh et al 2017: e0175925).

According to Mburu et al (2018:9-13), factors as TB treatment regimen, employment status, alcohol consumption, smoking and age are associated with the co-occurrence of diabetes among TB patients. Poor glycaemic control (Hayashi & Chandramohan 2018:1058-1070) is not only associated with the co-occurrence of pulmonary TB in adult-onset diabetics, but is also strongly associated with an increased risk of advanced and more severe forms of TB disease, such as lung cavitation, positive sputum smear, and slower smear conversion (Mahishale et al 2017:144-151).

Weight loss, lower BMI, drug addiction, uncontrolled diabetes, higher HbA1c, increased insulin requirement, anaemia, higher ESR, higher platelet count, and lower serum protein and albumin are determinants of pulmonary TB occurrence among diabetic patients, as reported by Khalil & Ramadan (2016:817-823). The co-occurrence of diabetes in patients with pulmonary TB is associated with male gender, high socioeconomic class, residential status, tobacco consumption, type of smoking, duration of smoking, housing conditions, physical activity and duration of physical activity (Kumar et al 2021: 223-232), and uncontrolled diabetes (Ahmed, Omer, Osman & Ahmed-Abakur 2017: 97).

A community based cross sectional study in Bangladesh reported that older age, higher BMI, higher education (secondary level and above), being married, less active labour force participation, and family history of diabetes were associated with a higher prevalence of diabetes in tuberculosis patients (Sarker et al 2016: e0165396).

In Ethiopia, factors such as age over 50 years and being female were significantly associated with co-morbidity of diabetes mellitus and tuberculosis (Gezahegn et al. 2020: 3879-3886).

Poor glycaemic control (Chen et al 2021:1-14), smoking, lower body mass index, education, socio-economic status and longer duration of diabetes were associated with the occurrence of pulmonary tuberculosis in diabetic patients (Alisjahbana et al 2021:634-643; Yoo et al 2021:e2126099).

A retrospective cohort study found that older age, smear positive pulmonary tuberculosis, and underlying conditions such as hypertension/heart disease, renal disease and chronic obstructive pulmonary disease were associated with incident diabetes in tuberculosis patients (Omar et al 2021:267-273). Adults from poor families, lower BMI, lower literacy and unemployment were reported be at higher risk of TB-DM co-morbidity (Sil et al 2020:758-772).

In Cameroon, BMI, HIV infection, marital status and age over 40 years were associated with the co-occurrence of type 2 diabetes among pulmonary TB patients (Sousa et al. 2021:e20201238; Fonkeng et al 2017:1-13).

A study from Ethiopia reported that a short duration of diabetes mellitus was associated with the occurrence of pulmonary tuberculosis. In addition, older age, HIV infection and family history of diabetes were associated with the co-morbidity of TB and diabetes mellitus (Andualem & Malede 2021:141-145; Mabula et al 2021:69-74).

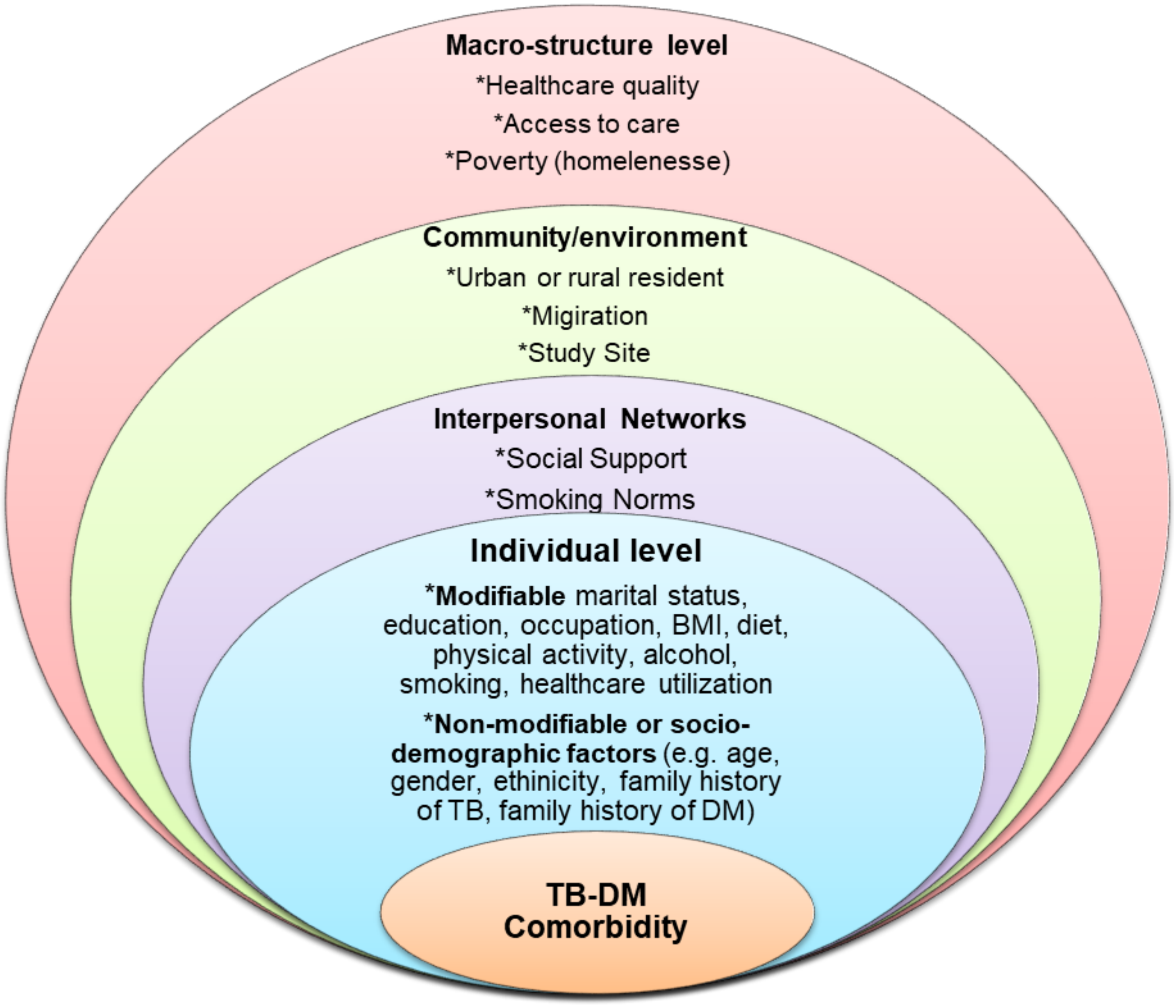


Figure 4: An ecological system model of the tuberculosis-diabetes mellitus co-morbidity

3.5 INTEGRATION OF HEALTH SERVICES FOR TUBERCULOSIS AND DIABETES

Integrating health services for TB and DM is essential to address the burden of these diseases and improve health services. The World Health Organization (WHO) and the United Nations High-Level Meeting on Non-communicable Diseases have emphasised the need to strengthen and integrate health systems. Non-communicable diseases often coexist with communicable diseases, increasing the risk and impact of each. This provides a rationale for implementing joint prevention, screening and management strategies within the health system (Prabhakaran et al 2018:1224-1236; WHO 2007a:26).

The health system comprises the people, institutions and resources that provide health services to meet the needs of the population. Its purpose is to provide health services, inputs, management and financing (WHO 2016). Integrated health systems aim to strengthen people-centred health care by promoting the comprehensive delivery of quality services across the lifespan, tailored to the multidimensional needs of individuals and populations. This is achieved through coordinated multidisciplinary teams working across settings and levels of care (WHO 2016:4). Integrated systems provide seamless, accessible and affordable services that are easy to use and lead to better overall health outcomes for patients (Al-Saddique 2018:19; Enthoven 2016:115).

Following the launch of the Collaborative Framework for the Care and Control of Tuberculosis and Diabetes Mellitus by WHO and The Union in 2011(WHO and The Union 2011), some countries have started to implement bi-directional screening and co-management services for patients with TB and diabetes (Jiang et al 2022:689; Nyirenda, Wagner, Ngwira & Lange 2022:1-2; Lin, Harries, Kumar, Critchley, Crevel, Owiti, Dlodlo & Dejgaard 2019:37-46). Integrating health services for communicable and non-communicable diseases offers immense benefits, including disease prevention, diagnosis, improved treatment and management, infection control, and better monitoring and reporting of cases (Jiang et al 2022:689; Nyirenda et al 2022:1-12; Harries et al 2018:1117-1126).

Overall, integrating services for TB and non-communicable diseases improves health care delivery across conditions and levels of care and addresses the combined burden of disease, particularly in low-and middle-income countries (Foo et al 2022: e1003899). The Ministry of Health and Family Welfare in India has implemented an integrated approach for TB-DM patients, including bidirectional screening interventions and linkage cases for appropriate management and reporting at different levels of care (Ministry of Health and Family Welfare Government of India 2017:11-14). Feasibility studies have demonstrated the effectiveness of integrating health services for TB and diabetes in Ethiopia (Jerenea et al 2017:100-104). These integrated services have led to increased case detection rates for both diseases, improved therapeutic success of TB treatment in people with diabetes, and increased detection of diabetes among TB patients (Gadallah, Amin, Fawzy, Mokhtar & Mohsen 2018:e0218052; Jerenea et al 2017:100-104; Dávila, Castellanos & García 2015b:19-21).

Several studies have assessed the performance of integrated TB-DM services, showing that the majority of health care providers in Central Java, Indonesia and Tanzania are ready and implementing these services (Chamba et al 2022:100242; Adespin, Julianti, Utami, Wulandari & Nugraheni 2020:336).

3.5.1 Challenges and opportunities for TB-DM service integration

Integrating tuberculosis and diabetes mellitus health services is a complex process that requires coordination, skilled staff and organisational structures in both high-and low income countries. Several challenges hinder the implementation of integrated health systems in low-income countries. Mounier-Jack, Mayhew and Mays (2017:6-12) identified key challenges such as lack of incentives for well-funded programmes to integrated with poorer programmes, limited bargaining power for underfunded programmes, inadequate capacity and support for staff, fragmented health management information systems, and poor coordinated care across sectors.

Despite these challenges, integrated care holds great promise improving health care and patient outcomes. However, there are currently no formal guidelines for implementing integrated care that can be applied across different health systems. Successful implementation requires addressing a complex interplay of factors at multiple levels of influence (Stadnick et al 2019:1-12).

Studies evaluating the implementation of integrated health services for TB-DM have identified various challenges. For example, in Western Nigeria Peter and Aighobahi (2019:1-15) found that lack of awareness of TB-DM co-morbidity, lack of integration policies, and inadequate expertise and guidelines for TB-DM services were the main health system challenges. Similarly, in Ethiopia, challenges included inadequate knowledge and skills of health workers, frequent stock-outs of diabetes supplies, patients' inability to pay for diabetes services, poor diabetes data management, and limited attention to diabetes care (Workneh, Bjune & Yimer 2016b:135).

Barriers to integrated care also include cost-effectiveness, financing mechanisms to sustain integrated care, poor supply of medical products, lack of guidelines, and low baseline health system readiness at the organisational and facility levels (Mwagomba et al 2018:21-32; Goddard & Mason 2016:1-3; Abera, Tesfaye, Belachew & Hanlon et al 2014:e88437). Other barriers include low prioritisation of integrated care services, weak management and planning capacity, weak orientation towards integrated care, high staff turnover, weak intersectoral coordination, infrastructure constraints and lack of dedicated budget for integrated health services (Marais and Petersen 2015:14).

The readiness of health workers in terms of knowledge and skills and the availability of materials to support TB-DM integration are also barriers to implementation (Chamba et al 2022:100242; Adespin et al 2020). However, despite resource constraints, Tanzania has demonstrated readiness for integrated TB-DM management in more than half of its health facilities (Chamba et al 2022:100242). Collaboration between the National TB control Programme, as well as increased support for communicable diseases, are important factors for successful TB-DM integration (Salifu & Hlongwana 2021:1-6).

In South Africa, limited availability and capacity of health workers, lack of an effective information system, and poor perfrmance in screening for TB-DM co-morbidities were identified as challenges to integrating TB-DM services in primary health units (Almossawi et al 2019:329).

Enabling strategies for integrated care in low-income countries include leadership, supportive organisational culture, use of trained and incentivised health workers, patient-centred care, task shifting, and integration of prevention and treatment programmes (Mounier-Jack, Mayhew & Mays 2017:6-12). Enablers for health service integration include shared purpose and vision, shared professional values, strong leadership, joint working, trust, involvement of staff at all levels, clarity of roles and responsibilities, ability to share data, absence of legal barriers, incentives for collaboration, adequate funding, and trained engaged workforce (Goddard and Mason 2017:1-3).

Opportunities for health service integration include the existence of overarching health policy documents that recognise the need for integration, coordinated action by policymakers, researchers and implementers, task-shifting and the involvement of non-governmental organisations (Mwagomba et al 2018:21-32; Marais & Petersen 2015:14). In Ethiopia, a well-established TB control programmes and high levels of interest and readiness among health workers, programme managers and leaders are enabling factors for the integration of TB-DM services (Workneh et al 2016b:135).

3.5.2 Experiences of experts and practitioners on TB-DM service integration

Experiences of experts and practitioners on TB and DM service integration vary across different countries. The concepts and principles of health service integration are not new to health workers (Abera et al 2014:113; Hanlon et al 2014:e88437; Martin et al 2016:76-81). Health workers in developed countries have more experience in integrated health services (Martin et al 2016:76-81), while the level of experience depends on the perceived health problems in each country (Hanlon et al 2014:e88437; Chaitkin et al 2019:1-26).

A study has shown that countries around the world are implementing the WHO TB-DM collaborative framework, which includes bi-directional screening of TB patients for diabetes and vice versa, to address the management and control of TB-DM comorbidities (Salifu, Hlongwa & Hlongwana 2021:e047342).

Frontline health workers in Northern Ghana implementing the TB-DM collaborative framework prioritised TB/HIV co-infection over TB-DM co-morbidity. They had limited knowledge and awareness of TB-DM co-morbidity and lacked awareness of the collaborative framework. Their workload in TB and DM clinics was high and they faced challenges such as multiple roles, inadequate training and lack of space (Salifu et al 2021:e047342). Another study reported good performance by health officers in integrating TB-DM services, with demonstrated knowledge and skills (Adespin et al 2020).

The experience of Yogyakarta City, Indonesia, in implementing collaborative care and control of Tb-DM revealed health system-related barriers, including working practices, diagnostic procedures, health financing, referral systems and human resource issue. Health workers had a varying levels of knowledge and awareness of TB-DM co-morbidity, with some having misconceptions and inadequate training. Implementation of bi-directional screening was inconsistent, and multisectoral roles were needed (Arini, Sugiyo & Permana 2022:1-22).

Studies have shown inadequate knowledge among health workers (Ogbera et al 2013:704) and insufficient knowledge among physicians about the prevalence and risk factors for acquiring TB, DM and the combination of the two diseases in the Philippines (Baja et al 2014:9). A situational analysis and cross sectional study conducted in western Nigeria revealed a lack of awareness of TB-DM co-morbidity and integration among health workers (Peter & Aighobahi 2019:1-15).

Sensitisation and training of health workers at all levels, from national programme officers to state, district and sub-district levels, are critical components of TB-DM integrated services. Information, education, and communication strategies are also essential for integrating health services for patients with dual TB-DM (Ministry of Health and Family Welfare Government of India 2017; 11-25).

3.6 SUMMARY OF CHAPTER THREE

In conclusion, Chapter 3 serves as a comprehensive introduction to the literature review and its importance in research. By conducting a literature review, researchers can gain a thorough understanding of existing knowledge, establish a theoretical framework, and identify gaps or limitation in the literature. The chapter discusses different types of literature reviews, highlighting their different purposes and approaches.

Furthermore, the chapter highlights the concept of integrated care as a potential solution to the challenges facing healthcare systems worldwide. Integrated care focuses on creating collaboration and alignment within and between the health and care sectors. By providing comprehensive and continuous health services based on individual needs, integrated care aims to improve coordination, efficiency and patients outcomes. The World Health Organization's definition of integrated care emphasises the importance of a continuum of services across the life course.

Overall, Chapter 3 lays the foundation for the current study by establishing the importance of literature reviews in research and introducing the concepts of integrated care. It highlights the need for integrated approaches to health care to address fragmentation, improve patient-centred care and meet the changing needs of populations, particularly in the comorbidities/multi-morbidities and an ageing population. By understanding the existing literature and embracing the principles of integrated care, researchers and health professionals can contribute to advancing knowledge and improving health care. The next section focuses on the research methodology of the current study.

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 STUDY SETTING AND PERIOD

According to Majid (2018:1-7), the study setting refers to an area where the phenomenon of interest actually lives, which can be a home, a health facility, a community or a place chosen by the participants. This study was conducted in Addis Ababa, the capital of Ethiopia and the largest city in the country with a total population of over 3.85 million (Central Statistic Agency 2013).

Administratively, the city is divided into ten sub-cities (Figure 3), and 114 districts. According to the Ethiopian Ministry of Health Policy and Planning Directorate (FDREMoH 2015:72-73), there were 113 registered health facilities (15 hospitals and 98 health centres) in the government sector in Addis Ababa. These included four hospitals that provided specialised services such as mental health, fistula, trauma and maternal and child health, and six health centres that did not provide tuberculosis and diabetes services were not included.

Private health facilities were not included in this study for two reasons: firstly, the structure of the private sector health system in Addis Ababa is not well developed, i.e. public-private partnership is not well established, and secondly, there is a fundamental difference in the infrastructure and services provided in public and private facilities. Therefore, the setting of this study was eleven (11) public general hospitals and ninety-two (92) public health centres in Addis Ababa; and the study was conducted from March 2021 to September 2022.

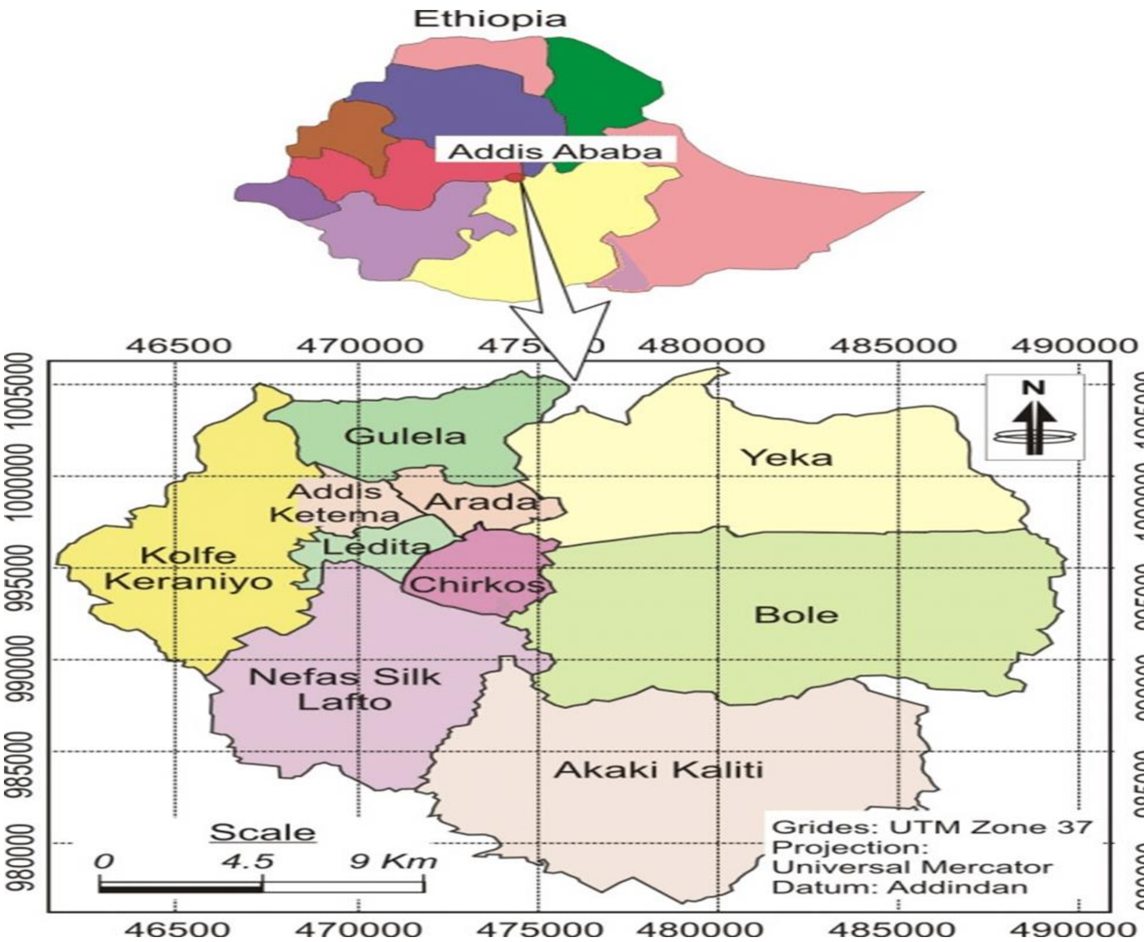


Figure 5: Map of Addis Ababa showing the 10 sub-cities (Berhanu & Raghuvanshi, Tarun Kumar Suryabhagavan 2017:13-25).

4.1.1 The health system of the Ethiopia

The health system of the Federal Democratic Republic of Ethiopia is guided by a 20-year Health Sector Development Strategy, which is implemented through a series of five year Health Sector Development Programmes (HSDPs). Currently, the country is implementing the fourth health sector development programmes (HSDP IV) (FDREMoH 2016).

The HSDP IV has introduced a three-tier health service delivery system (Figure 6). The primary level consists of Primary Health Care Unit (PHCU) (health posts and health centres) and primary hospitals; the secondary level services are provided by general hospitals; and the tertiary level services are provided by specialised hospitals (FDREMoH 2016).

A Comprehensive Specialised Hospital is a tertiary level health care facility that provides not only curative and rehabilitative services, but also promotive and preventive services, including medical laboratory, imaging and pharmacy services, with a minimum capacity of 110 beds for a population of approximately 3.5-5 million (FDREMoH 2021a; ESA 2012).

A general hospital is a health care facility at the secondary level of the health care system that provides not only general curative and rehabilitative services, but also promotive and preventive services, including diagnostic facilities (such as laboratory and imaging) and therapeutic interventions (such as pharmacy and other standard related services), with a minimum capacity of 50 beds for a population of approximately 1-1.5 million (FDREMoH 2021a; ESA 2012b)

A primary hospital is a health facility at the primary health care level that provides promotive, preventive, curative and rehabilitative services with a minimum capacity of 35 beds and that provides at least 24-hour emergency services, general medical services, treatment of basic acute and chronic medical problems, basic emergency surgical interventions and comprehensive emergency obstetric care (CEOC), including laboratory, imaging and pharmacy services and other related services for an estimated population of 60,000-100,000 (FDREMoH 2021a; ESA 2012).

A health centre is a health facility at the primary level of the health system that provides promotive, preventive, curative and rehabilitative outpatient care, including basic laboratory and pharmacy services, with a capacity of 10 beds for emergency and maternity services for approximately 15,000-25,000 people in rural areas and 40,000 people in urban areas (FDREMoH 2021a; ESA 2012c).

A health post is a health facility at the primary health care level that provides primarily basic promotive and preventive services to approximately 3,000-5,000 people in rural areas with limited curative services as indicated in this standard (FDREMoH 2021a; ESA 2012a).

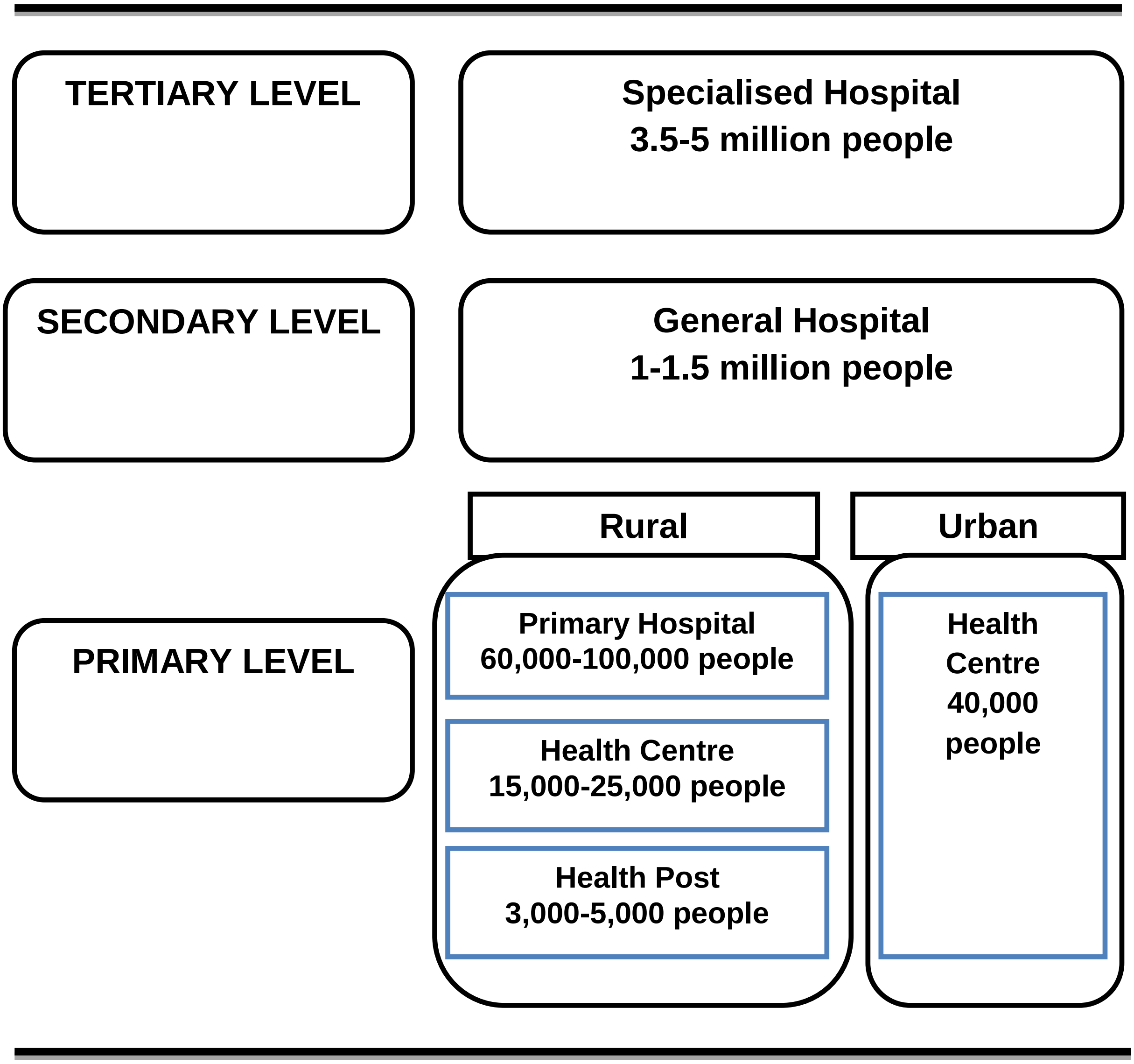


Figure 6: Levels of Ethiopian healthcare system

4.1.2 Tuberculosis and diabetes programme in Ethiopia

Ethiopia has endorsed the End TB strategy, which aims to eliminate the TB epidemic by 2030. According to the National TB and Leprosy Strategy, the success rate of TB treatment in 2019/20 was 95%, while the cure rate was 80%. In 2018, the Service Availability and Readiness Assessment (SARA) found that 50% of country's health facilities performed TB diagnosis using smear microscopy, and 12% used chest X-rays. As of 2019, there were 59 specialised clinics for the treatment of drug-resistant TB and more than 700 follow-up facilities (FDREMoH 2021b). SARA data also show that 43% of health facilities in Addis Ababa provide TB services (EPHI 2018).

The Second National Strategic Plan of the Federal Democratic Republic of Ethiopia for 2020, which is aligned with the Global Action Plan on non-communicable diseases 2013-2020 and the Sustainable Development Goals (SDGs) 2030, identifies diabetes mellitus as one of the four major non-communicable diseases prevalent in Ethiopia. The aim of the policy is to reduce the burden of NCDs, promote healthy lifestyles, reduce risk factors and implement integrated, evidence-based, innovative and cost-effective clinical intervention (FDREMoH 2020). According to the 2018 SARA data, 36% of health facilities in the country provide diabetes diagnosis and treatment services, while 82% of health facilities in Addis Ababa provide diabetes services. The necessary commodities for diabetes diagnosis and treatment, such as glucose strip, urine dipstick and injectable insulin, were available in 54% of health facilities (EPHI 2018).

The World Health Organization (WHO) and the International Union Against Tuberculosis and Lung Disease (The Union) have called the integration of services to address the double burden of TB and DM co-morbidity. The primary goals of this collaboration are to prevent both diseases and to conduct bi-directional screening to facilitate early detection and treatment, as well as follow-up care. Ultimately, the aim is to improve outcomes for patients with TB and DM (WHO and The Union 2011). However, most African countries, including Ethiopia, lack an organised system for the provision of integrated services, which have been shown to improve the follow-up, management and early detection of both diseases. Currently, services for dibetes and TB are provided separately (Workneh et al 2016b:1-11).

4.2 RESEARCH PARADIGM

A research paradigm is a set of fundamental assumptions and beliefs about how the world is perceived, which then serves as a framework of thought that guides the behaviour; and it represents the abstract beliefs and principles that shape how a researcher sees the world and how the researcher interprets and acts within that world (Crewell 2018:46). There are four well-known research paradigms: post-positivism, constructivism, transformative and pragmatism. They are all essentially philosophical in nature and include the following common elements: axiology, ontology, epistemology, methodology and rhetoric (Creswell 2014:35).

The pragmatic paradigm was used in the current study. This is a paradigm that advocates the use of mixed methods as a pragmatic way of understanding human behaviour.

The pragmatic paradigm applies to mixed methods research in that researchers draw freely from both quantitative and qualitative assumptions when conducting their research (Creswell 2018:51).

In the pragmatic paradigm, individual researchers have the freedom to choose the methods, techniques and procedures of research that best suit their needs and purposes. Pragmatists do not see the world as an absolute unit. Similarly, mixed methods researchers look at many approaches to collecting and analysing data, rather than committing to one method (e.g. quantitative or qualitative). Pragmatic researchers look at what and how to research based on the intended outcomes, where they want to go with it. Mixed methods researchers need to establish a purpose for their mixing, a rationale for why quantitative and qualitative data need to be mixed in the first place. For mixed methods researchers, pragmatism opens the door to multiple methods, different worldviews and assumptions, and different forms of data collection and analysis (Creswell 2018:51).

This study used a mixed methods approach, mixed designs, different data collection techniques and different analysis techniques for the quantitative and qualitative components. The quantitative findings were complemented by the qualitative findings. Therefore, the pragmatic paradigm, which is appropriate for mixed methods research, was used in the current study.

4.3 STUDY APPROACH

A research approach is a plan or procedure for research that spans the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation (Creswell 2018:42). According to Creswell (2014:32), research approaches are quantitative research approach, which is an approach to test objective theories by examining the relationship between variables; qualitative research approach, which is an approach to explore and understand the meaning that individuals or groups attribute to a social or human problem; and mixed methods research, which is an approach to inquiry that involves collecting both quantitative and qualitative data, integrating the two forms of data, and using different designs that may include philosophical assumptions and theoretical frameworks.

4.3.1 Quantitative research

Quantitative research is an approach that involves collecting quantifiable data from the participants, analysing these figures using statistics, and conducting research in an objective manner (Creswell 2018:53). A characteristic of quantitative research, as described by Polit and Beck (2017:248), is that it usually involves comparisons, either within or between subjects, which are usually specified in the hypothesis.

The quantitative aspect of this study was used to analyse the factors affecting integration of health services for patients with TB and diabetes (phase I). Therefore, a cross-sectional survey design is one of the popular designs in a quantitative research that provides a numerical description of trends or events of a population by studying a sample of that population; and from the sample results, the researcher draws inferences about the population (Creswell 2014:200). The aim of this cross-sectional survey is to analyse the factors affecting the integration of health services for patients with tuberculosis and diabetes mellitus in Addis Ababa, Ethiopia.

4.3.2 Qualitative research

Qualitative research is an approach to exploring and understanding the meaning that individuals or groups attribute to a social or human problem (Ravitch & Carl 2016:36). The research process involves emergent questions and procedures, data typically collected in participant settings, data analysis that builds inductively from details to general themes, and the researcher's interpretation of the meaning of the data (Creswell 2018:43).

According to Florea and Amuza (2014:378-384), a qualitative study helps to understand and improve an organisation. It also makes it possible to understand a complicated organisational change. Phenomenological research is a type of qualitative research design. It is a research design from philosophy and psychology in which the researcher describes the lived experiences of individuals about a phenomenon, as described by the participants. This design has a strong philosophical underpinning and typically involves the use of interviews (Creswell 2014:14). The decision to use this type of design is based on its flexibility; it allows more freedom during the interview to explore the professional part of the experiences (Miles,Huberman & Saldana 2014:27).

The qualitative aspect of this study was used to explore the lived experiences of experts and practitioners working in tuberculosis and diabetes mellitus through the use of interview guide questions developed form the SELFE framework. Therefore, the qualitative aspect of this study provided an opportunity to explore the experiences of experts and clinicians on the status of TB and diabetes service integration and the challenges and opportunities of the health system to integrate TB and diabetes health services within the existing health system in Addis Ababa, Ethiopia.

4.3.3 Mixed method approach

Mixed methods is an approach in which a researcher collects and analyses data, synthesises findings, and draws inferences using both qualitative and quantitative approaches and methods in a single study (Polit & Beck 2017:811; Creswell 2018:40). The underlying assumption of a mixed methods approach is that the combination of qualitative and quantitative approaches provides a more complete understanding of the research problem than either approach alone (Creswell 2018:44).

In this study, both quantitative and qualitative methods were used as mixed methods to assess the integration of health services for tuberculosis and diabetes mellitus patients, and to develop the integration framework that that will help to improve the detection and management of (i) tuberculosis in patients with diabetes, and (ii) diabetes in tuberculosis patients in Addis Ababa, Ethiopia. The advantages of using mixed methods are as follows:

- Complementarity: it provides the opportunity to present the study in both words and numbers to address the research problem.
- Practicality: it is practical to use the methodological tools best suited to address pressing research questions, rather than having one’s hands tied by rigid adherence to a single approach. Mixed methods often allow researchers to ask questions that cannot be answered with a single approach.
- Incrementally: The use of mixed methods helps to develop a feedback loop. The results generated in the quantitative phase are validated qualitatively.
- Enhanced validity: using both methods increase the validity of the study. It also helps to interpret data from different perspectives.
- Collaboration: mixed methods help to enable collaboration between quantitative and qualitative methods to answer the same question (Polit & Beck 2017:812).

4.4 STUDY DESIGN

4.4.1 Explanatory sequential mixed method

The explanatory sequential mixed methods design was used in this study. This is a research design in which the researcher first conducts quantitative research, analyses the results, and then builds on the results to explain them in more detail with qualitative research. It is considered explanatory because the initial findings from the quantitative data are further explained with the qualitative data. It is considered sequential because the initial quantitative phase is followed by the qualitative phase (Creswell 2014:304).

The study involved a two-phase data collection approach in which the researcher collected quantitative data in the first phase, which is the dominant approach best suited to address overall study goals, analysed the results and then used the findings to plan (or build on to) the second, qualitative phase (Figure 5).

The quantitative findings typically inform the types of participants to be purposefully selected for the qualitative phase and the types of questions to be asked of participants. The overall intention of this design is that the qualitative data will help to explain in the initial quantitative findings in more detail, so it is important to link the quantitative data collection. A typical procedure might be to collect survey data in the first phase, analyse the data, and then follow up with qualitative interviews to help explain confusing, contradictory, or unusual survey responses.

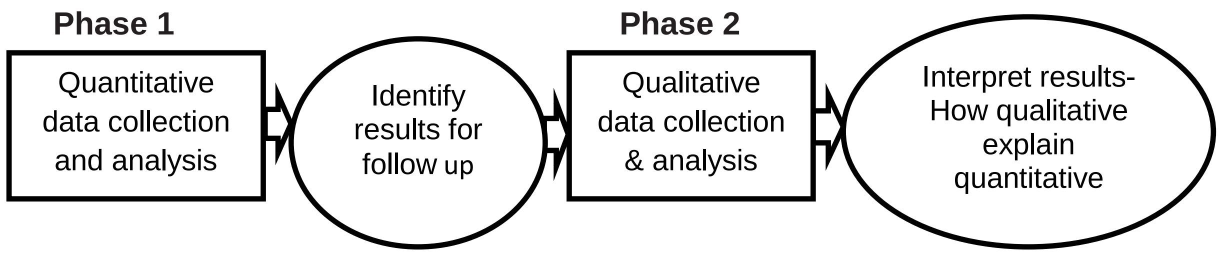


Figure 7: Explanatory sequential design to be conducted in two phases (Creswell 2018:300).

4.4.2 Research Methods for Phase-I

A research method is a technique used to collect, process and analyse data related to the research questions. This section describes the collection, analysis and interpretation of quantitative data in Phase I.

4.4.2.1 Purpose of phase I

The purpose of the phase-I study was to analyse the factors affecting the integration of health services for patients comorbid with tuberculosis and diabetes mellitus.

4.4.2.2 Objective of phase I

The objectives of phase-I were to analyse the factors affecting integration of health services for TB-DM patients in Addis Ababa, Ethiopia.

4.4.2.3 Setting

Majid (2018:1-7) defines the setting as the actual environment in which the phenomenon under study takes place. This setting can include different places such as homes, health facilities, communities, or place chosen by the participants themselves. In the specific case of this study, the setting was the public health facilities within the Addis Ababa city administration. This included a total of 6 hospitals and 46 health centres.

4.4.2.4 Population

The population refers to a group of individuals who share similar characteristics, while the source population refers specifically to the population of interest from which the researcher aims to draw conclusions (Polit & Beck 2017:365). In this study, the source population consisted of health facilities providing TB and diabetes mellitus services, as well as governmental and non-governmental organisations supporting TB and/or DM programmes in Addis Ababa. The target population, on the other hand, consisted of TB-DM co-morbid patients attending DOTS clinics in Addis Ababa. The study population focused on adult patients with pulmonary TB who had tested positive for type-2 diabetes mellitus when attending public health facilities in Addis Ababa.

According to data from the Addis Ababa City Administration Health Bureau (AACAHB), a total of 2,563 cases of pulmonary TB were registered across all public health facilities by the end of 2019. Damtew, Ali and Meressa (2014:389-396) reported a prevalence of 15.8% for diabetes among pulmonary tuberculosis patients in Addis Ababa city. This means that out of the total number of pulmonary tuberculosis cases (2,563) in Addis Ababa, 15.8%, or 405 individuals, had diabetes. These 405 people formed the study population for this particular study.

4.4.2.5 Sample size determination and sample procedure

A sample is a group of representative elements of a defined population about which a researcher seeks information, and sampling is the process of selecting representative elements from that population to enable inference about the population (Polit & Beck 2017:367).

In this study, a three-stage cluster sampling design was used to select a sample. Cluster sampling is a type of design that involves the sampling of a broad group (Polit & Beck 2017:376). In this study, there were two clusters of public health facilities, namely hospitals and health centres. In *stage 1*, there were 11 hospitals and 92 health centres providing general services to the population of Addis Ababa. From the total sample frame of sites, 50% were proportionally selected as sample sites (6 hospitals and 46 health centres) to participate in the study (Polit & Beck 2017:377).

In *stage 2,* a total of 2,563 pulmonary TB cases were reported in the six hospitals and 46 health centres in 2019, of which 15.8% (Damtew, Ali & Meressa, 2014b:389-396) had diabetes; this number of cases was considered as the (baseline) source population for this study. Based on this result, the researcher calculated the number of participants to be selected from each health facility.

In the third *stage*, the sample size was determined by using a single population proportion formula with a 95% confidence interval, a 5% margin of error, and a prevalence of diabetes among TB patients in Ethiopia of 32.4% (Noubiap et al 2019:e448-e460); finally, a 10% non-response rate was considered.

$$\boxed{\frac{Z\alpha/_2 \times P\ (1\text{-}P)}{d^2}}$$

Where

$Z\alpha/_2$= the value from standard normal distribution table for *Z*

P= the prevalence of tuberculosis patients tested and positive for type-2 diabetes mellitus

1-P=tuberculosis patients tested negative for type-2 diabetes mellitus

d= the margin of error

$$\frac{(1.96)^2 \times 0.324 \times 0.676}{(0.05)^2}$$

= 336 after considering 10% non-response rate of 34.
Total sample size is 370.

Thus, a total of 370 pulmonary TB patients who tested positive for type-2 diabetes mellitus were selected to participate in the study.

4.4.2.5.1 Sampling procedures

Table 1: Selection of a sample using a 3 stage cluster sampling design

11 hospitals and 92 health centres providing general services for the people of Addis Ababa

Stage 1: 50% of health services proportionately sampled

Six (6) hospitals

46 health centres

Stage 2: Identify a population of PTB with adult onset Diabetes

405 PTB cases with type 2 diabetes in 2019

Stage 3: Select a total sample of 370 adult TB patients who tested positive for Diabetes

370 adult TB patients who have tested positive for type 2 diabetes patients will be selected randomly

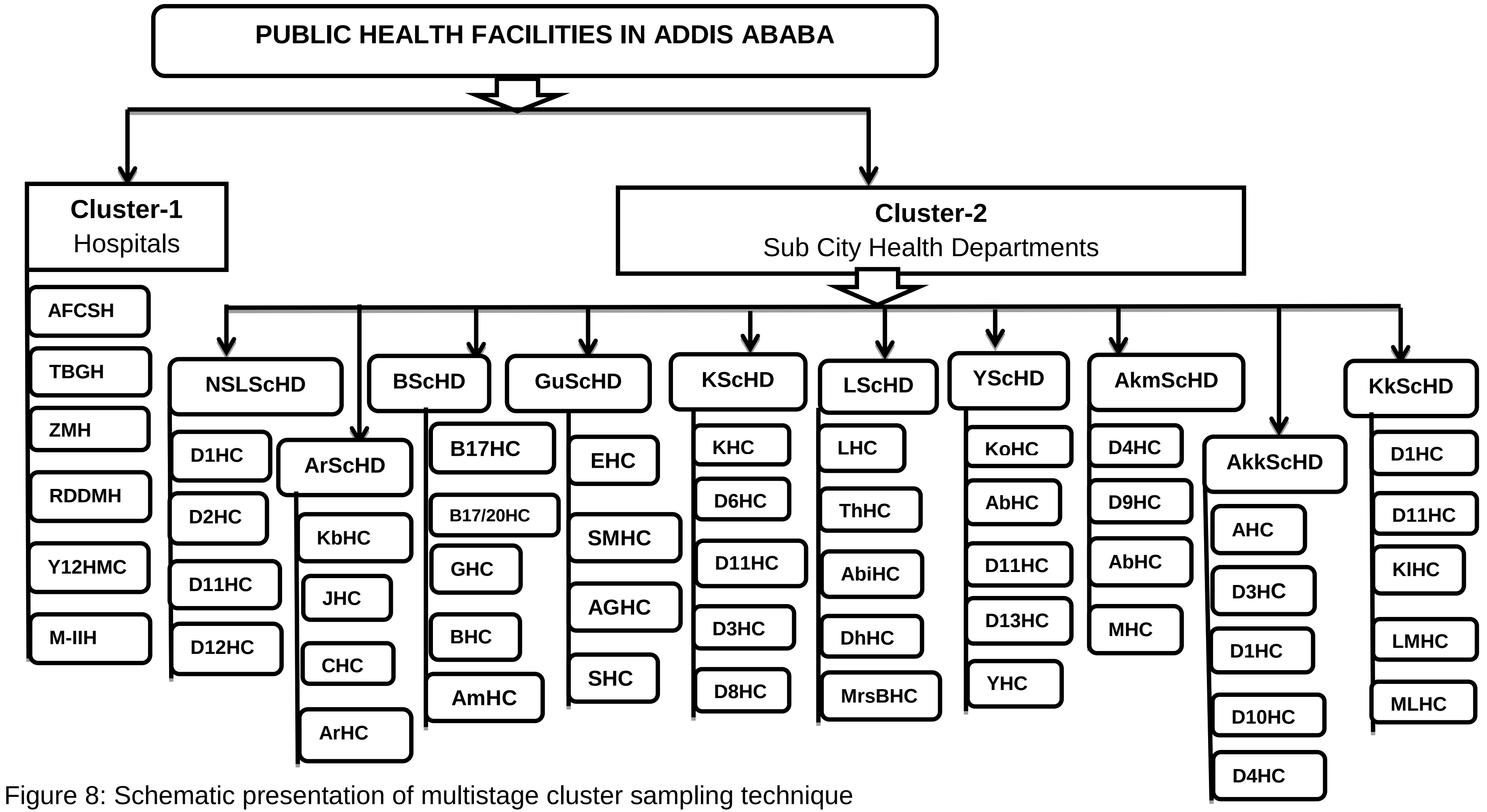


Figure 8: Schematic presentation of multistage cluster sampling technique

4.4.3 Inclusion and exclusion criteria

4.4.3.1 Inclusion criteria

All adult pulmonary TB patients with known type 2 diabetes status, available during the data collection period, from the selected health facilities (TB DOTS clinics) were included in the study.

4.4.3.2 Exclusion criteria

- Pulmonary TB-DM patients who refused to give consent
- Pulmonary TB-DM patients under the age of 18 years
- Critically ill pulmonary TB-DM patients
- Type 1 (childhood onset) DM patients
- Extra pulmonary TB-DM
- Pulmonary TB-DM patients with clinical signs and symptoms of COVID-19

4.4.4 Data collection using the SELFIE Integration Framework

The survey questionnaire, which served as data collection tools for TB-DM comorbid patients and health facility managers, were developed based on the SELFIE framework for integrated care of multi-morbidities. This framework covers key components of the health system, including health service delivery, workforce, leadership and governance, financing, access to medical products and technologies, and information and research.

To ensure accuracy and avoid misinterpretation, the SELFIE integration framework questionnaires were translated into the local language, Amharic, and then re-translated back into English for consistency. During the data collection process, the data collectors warmly welcomed and greeted the participants. They presented a consent form obtained from the Addis Ababa Regional Health Bureau and provided information about the research and its objectives. The written consent form was read to eligible participants and their informed consent was obtained before proceeding.

Data were collected from March 2021 to June 2021 using a structured questionnaire administered by the interviewers. Once the data collection was completed, the data collectors thanked the participants for their willingness to participate and for their time they had dedicated to the study.

4.4.5 Plan for Data Analysis

All generated data were thoroughly reviewed, checked for completeness and prepared for computerised data entry by assigning codes. Epi-Info version 7.1 software was used for the analysis process. In addition, the data were subjected to further checks and cleaning procedures, including running frequencies, sorting and listing variables, to ensure consistency. The Statistical Package for Social Sciences (SPSS) version 28 was used for these tasks.

Prior to undertaking the statistical analysis, the researcher consulted the statistician for guidance on various aspects. This included determining the types of data to be entered into the software, identifying outcome variables, dealing with missing variables and understanding how these variables would be controlled during the analysis. The expected statistical methods and techniques, in particular logistic regression analysis, were also discussed.

Descriptive analyses, such as frequencies, percentages, means, medians and modes, were performed for all variables. The results of these analyses were presented in the form of frequency distribution tables and graphs. Chi-square (X^2) cross-tabulation and logistic regression analysis were used to determine factors affecting the integration of health service. Logistic regression analysis was used specifically to examine the predictor of the outcome variable. The goodness of fit of the model was assessed using the test, with a p-value greater than 0.05 indicating a good fit. The researcher sought guidance from the statistician during this process. The strength of association was measured using odds ratio. Finally, the level of statistical significance was considered if the p-value was less than 0.05.

4.4.6 Ensuring rigour

4.4.6.1 Validity

Validity refers to the extent to which of inferences or conclusions drawn from data accurately reflect the actual empirical relationship, or correlation between a putative cause and its effect or outcome (Polit & Beck 2017:318). To ensure the statistical validity of the conclusion, the researcher took several measures. Firstly, a sufficiently large sample size was used, which helps to minimise the risk of low statistical power and allows for more reliable and robust findings.

In addition, the researcher maximised the precision of the measurement tools used in the study, thereby increasing the accuracy and reliability of the data collected. Moreover, the inclusion and exclusion criteria were clearly defined and described, ensuring that the participants selected were truly representative of the target population being studied. These steps were taken to enhance the validity of the study's findings and increase confidence in the conclusion drawn.

4.4.6.1.1 Internal Validity

Internal validity refers to the extent to which an inference that the independent variable is truly responsible for the observed variation in the outcome, rather than being influenced by external factors or variables outside the research context (Polit & Beck 2017:328). To ensure internal validity, the researcher used a probability sampling technique, specifically stratified cluster sampling, to control for potential confounding variables. In addition, the research assistants underwent two days of intensive training to ensure consistency in their understanding of research instrument and data collection procedures. During data analysis, statistical validity was maintained by adjusting for all possible confounders in the logistic regression analysis. Quality assurance measures such as checking for outliers, consistency and duplicates were also carried out prior to data analysis to increase internal validity.

4.4.6.1.2 External Validity

External validity, on the other hand, refers to the extent to which the findings of a study can be generalised to other settings, populations, and over time (Polit & Beck 2017:336). To increase the generalisability of the findings, the researcher used appropriate sampling techniques to select a representative sample. In addition, study participants were selected from different study settings, including hospitals and health centres and staff skill mixes. This diverse selection of settings increases confidence in the generalisability of the findings to other similar settings and populations, thereby increasing external validity.

4.4.6.2 Reliability

Reliability refers to the degree of consistency in the results produced by a research measurement instrument (Creswell 2018:253). The researcher took several steps to increase the reliability of the instrument used in the study.

Firstly, the research assistants were comprehensively trained on various aspects including the study objectives, data collection methods, questionnaire content, interviewing techniques and most importantly, how to maintain the confidentiality and privacy of the study participants. This ensured that the research assistants were well informed about the study and that there was a strong common understanding.

Prior to the actual data collection, a pre-testing phase was carried out to assess the effectiveness of the questionnaire. This involved administering the questionnaire to a sample of participants to identify any potential problems or areas for improvement. In addition, the questionnaire was translated from English into the local language (Amharic) and then back into English to ensure consistency and accuracy of content across languages.

To maintain consistency and reliability, the same questionnaire was administered to all respondents. This approach ensured that the information collected was comparable and reliable across all study participants. By implementing these measures, the researcher aimed to enhance the reliability of the research instrument and increase confidence in the consistency of the study's findings.

4.5 RESEARCH METHODS FOR PHASE II

4.5.1 Purpose of phase II

The purpose of Phase II was to explore the experiences of experts and clinicians on the status of TB and diabetes service integration and the challenges and opportunities for the health system to integrate TB and diabetes health services within the existing health system, which supporting the development of a framework for integrating health services for patients with TB and diabetes mellitus in Addis Ababa, Ethiopia.

4.5.2 Objective of phase II

The aim of Phase II was to explore the experiences of experts and clinicians on the status of TB and diabetes service integration, and the challenges and opportunities for the health system to integrate TB and diabetes health services within the existing health system in Addis Ababa, Ethiopia.

4.5.3 Setting

The setting of study for phase II was public health facilities and health bureau in Addis Ababa City Administration.

4.5.4 Population

The source population of the Phase II study was experts and practitioners working in the public health facilities and health bureau around TB programme and clinical diabetes in Addis Ababa, who had been working in the area of TB programme and clinical facilities in the selected public health facilities and health bureau in Addis Ababa for at least two years.

4.5.5 Sampling and sample size

For this particular study, the researcher conducted interviews with four experts involved in the TB programme and nineteen practitioners working in the clinical diabetes and TB DOTS units at public health facilities in Addis Ababa. The selection of participants for the study was done using purposive sampling, which is a non-probability sampling technique that uses the researcher's knowledge of the population to make informed choices (Polit & Beck 2017:372).

In the qualitative phase of the study (phase II), the sample size was determined based on the concept of saturation, which occurs when no new themes or issues emerge in subsequent interviews, indicating that a sufficient level of understanding has been achieved (Creswell 2018:262-265). Saturation is reached when interviewing additional participants does not yield new perspectives or themes (Astroth & Chung 2018:381-385). Achieving data saturation is crucial for gaining a comprehensive understanding of the phenomenon under study, rather than a superficial understanding.

4.5.6 Inclusion and exclusion criteria

4.5.6.1 Inclusion criteria

Experts and practitioners who have been working in the diabetes and/or TB DOTS unit in Addis Ababa for at least 2 years were included in the study.

4.5.6.2 Exclusion criteria

- Participants who refuse to consent.

- All participants who are working in clinical diabetes and TB facilities in private health facilities.

4.5.7 Data collection using a KII guide

Data collection in this study was conducted using a key informant interview (KII) guide developed based on the key elements of the SELFIE framework for integrated multi-morbidity care. The KII guide focused on six elements of the framework: health service delivery, workforce, leadership/governance, financing, technology and medical products, and information and research. In addition, key informants were asked to rate the current level of integration of TB and diabetes services on a scale of 1 to 5, representing different levels of integration (Sharma, Srey & Jain 2020:15).

The researcher used a semi-structured in-depth interview guide developed from the SELFIE framework to collect data. Interviews were collected from with key informants, such as experts and practitioners, who had been working in diabetes and TB units in the public health facilities in Addis Ababa for at least two years. The interview took place between May 2022 and September 2022. Interviews were conducted in the local language, Amharic, to ensure better understanding of concepts. An audio recorder was used to record the participants' statements, and field notes were taken during the interviews.

The interview questions were open-ended, allowing the study participants to freely express their opinions, knowledge and experiences regarding the integration of TB and diabetes in health services, as well as the challenges and opportunities associated with the health system's integration efforts. Probing techniques were used to obtain more detailed information during the interviews. Participants' statements were recorded, transcribed and considered as primary data for further analysis and interpretation in the research.

4.5.8 Plan for data analysis

The audio-recorded in-depth interviews, conducted in Amharic, were transcribed into English, capturing the participants' words verbatim and producing a written account. The transcriptions were carefully read and reread to establish a coding scheme. The coding process involved categorising the data based on the factors such as gender, profession and type of facilities.

Qualitative data analysis software, specifically ATLAS.ti8, was used to aid the analysis. This software facilitated thematic analysis and organisation of the data.

Triangulation was used to ensure the reliability and validity of the findings. This involved combining both quantitative and qualitative data to provide a comprehensive understanding of the research topic. By integrating different data sources and approaches, the study aimed to strengthen the overall analysis and interpretation.

4.5.9 Ensuring rigor/Trustworthiness

According to Polit and Beck (2017:787-788), the trustworthiness of qualitative research is described as follows.

4.5.9.1 Credibility

According to Polit and Beck (2017:787-788), credibility is a crucial aspect of trustworthiness in qualitative research. It refers to confidence in the truth of the data and the interpretations derived from them. To establish credibility, researchers must strive to ensure that the findings accurately reflect the perspectives of the participants and the specific research context.

Qualitative research aims to explore people's perceptions, experiences, feelings and beliefs. It is therefore important to recognise that the participants themselves are the best judge of whether the research findings have accurately captured their opinions and feelings. To maintain credibility, the researcher in this study adheres to scientific methods and protocols throughout the research process, including data collection, analysis and report writing. By following the following rigorous research practices, the researcher aimed to increase the trustworthiness of the findings and ensure that they accurately represented the views of the participants.

4.5.9.2 Dependability

Dependability in qualitative research refers to the stability and reliability of data over time and across different conditions. In this study, the researcher took several steps to ensure the dependability of the process and findings. Firstly, the research process was carefully planned and conducted in a logical manner. The whole process was thoroughly documented, with a detailed step-by-step explanation of each stage. This documentation allows other researchers to replicate the study and potentially obtain similar results, thereby increasing the reliability of the research.

To increase the reliability of the data, all interviews were audio-recorded, transcribed and accompanied by field notes. The use of audio recordings preserves the original information, while transcriptions and field notes provide additional context and detail. This comprehensive documentation helps to ensure that the data can be accurately verified and analysed.

Triangulation was used in this study, both in terms of data and methodology. This involves using multiple data sources and research methods to corroborate findings. By integrating different perspectives and approaches, the researcher aimed to increase the reliability of the findings. Member checking, which involves sharing the findings with participants to validate the accuracy and interpretation of their contributions, was also carried out. This process allows participants to review and confirm the researcher's understanding of their perspectives, further enhancing the reliability of the findings.

To increase the reliability of the analysis, the transcripts were reviewed by an independent qualitative researcher. This external review helps to identify any potential biases or error in the interpretation of the data. By implementing these measures, the researcher sought to ensure the reliability of the research process and findings, thereby promoting the trustworthiness of the study.

4.5.9.3 Confirmability

Confirmability in qualitative research refers to objectivity, specifically the ability of several independent people to agree on the accuracy, relevance and meaning of the data. It focuses on establishing that the data faithfully represent the information shared by the participants and that the interpretations of the data are not influenced or fabricated by the researcher.

To ensure Confirmability, the researcher used several strategies in this study. Records such as field notes and interview transcripts were carefully maintained to provide a clear trail of the data collected from the participants. These records serve as evidence to support the authenticity and reliability of the data.

In addition, an independent reviewer was involved in the process. The tape recordings of the themes were reviewed by this independent party, adding an extra layer of objectivity and confirming that the interpretations of the data were not biased or influenced by the researcher's perspective. Moreover, the researcher drew on relevant literature to provide a conceptual framework for the study. This incorporation of existing knowledge helps to establish the researcher's background and enhances the reader's understanding of the research context.

By implementing these measures, the researcher aimed to ensure the Confirmability of the study. The use of records, the involvement of an independent reviewer and the integration of existing literature contribute to the transparency and objectivity of the research process and findings.

4.5.9.4 Transferability

Transferability refers to the extent to which the findings can be applied or generalised to other settings or groups beyond the specific research context. In this study, the researcher took several steps to enhance the transferability of the findings.

Extensive field notes were taken throughout the research process. These detailed records provide a comprehensive account of the study context, participants and data collection procedures. By thoroughly documenting the research process, other researchers can gain a clear understanding of how the study was conducted and potentially replicate it in different settings.

Data saturation, the point at which no new information or themes emerge from the data, was also checked. This ensures that the data collection process was robust and comprehensive, increasing the likelihood that the findings capture the breadth and depth of participants' perspectives.

Relevant literature was used to inform the research design and analysis. By integrating existing knowledge, the researcher ensured that the findings were placed in a broader context and aligned with established theories or concepts. This enhances the transferability of the findings by providing a basis for comparison and extrapolation.

The research design itself was structured to promote transferability. Adequate information was provided about the study purpose, objectives, sampling strategies, and data collection procedures and data analysis. This transparency allows others researchers to evaluate the study's methodology and determine its applicability to their own settings or populations. By employing these strategies, the researcher has enhanced the transferability of the findings and provided insights that may be relevant and applicable beyond the specific research context.

4.6 INTEGRATION OF QUANTITATIVE AND QUALITATIVE STRANDS

The integration of quantitative and qualitative strands in research allows for a comprehensive and nuanced understanding of the research topic. In this study the researcher used the strategy of integration known as linking, where the findings of the quantitative phase influenced the data collection and analysis of the qualitative phase (Creswell 2018:352).The researcher process consisted of two distinct phases: the quantitative phase and the qualitative phase. In the quantitative phase, data were collected and analysed separately. The results of the quantitative analysis provided a basis for the subsequent qualitative phase.

Following the analysis of the quantitative data, the researcher used these results to plan and design the qualitative phase. The qualitative phase aimed to provide a more detailed and in-depth exploration of the research topic, building on and explaining the quantitative findings.

This approach is consistent with an explanatory sequential design in which the quantitative phase is carried out first, the results analysed and then used to guide the qualitative phase (Creswell 2018:356). By adopting this design, the research aimed to enhance understanding by incorporating both numerical data and rich qualitative insights.

The integration of quantitative and qualitative strands in this study allowed for a more comprehensive exploration of the research topic. The quantitative data provided a broader overview, while the qualitative data delved deeper into the experiences, perceptions and contexts of the participants. By combining these two strands, the researcher aimed to gain a more holistic understanding of the research phenomenon.

4.7 ETHICAL CONSIDERATIONS

The ethical principles that were adhered to in this study cover the following:

4.7.1 Informed consent

Informed consent is a crucial ethical requirement in research, ensuring that participants are fully informed about the study, understand its purpose and procedures, and agrees to participate voluntarily and without coercion (Creswell 2014:134). In this study, the researcher took steps to obtain informed consent from participants.

Participants were provided with an information sheet that explained in detail the purpose and the nature of the study. This sheet accompanied the questionnaire and was used to inform participants about the study and its importance. By providing this information, participants were given the opportunity to make an informed decision about their participation.

Participants were explicitly informed that their participation in the study was voluntary. They were assured that they had the right to refuse to participate or to withdraw from the study at any time without explanation or negative consequences (Polit & Beck 2017:212). This emphasis on voluntary participation and the right to withdraw ensures that participants retain control over their involvement in the research.

In addition, it is mentioned that participants who were 18 years of age or older were eligible to give consent to participate in the study. This indicates that the study complied with legal and ethical requirements regarding age restrictions for research participation.

By obtaining informed consent, the researcher respected the autonomy and rights of the participants. It ensured decision about their participation in the study, and allowed the freedom to withdraw at any time.

4.7.2 Beneficence and non-maleficence

Beneficence involves promoting the welfare of the research participants and protecting them from harm, while non-maleficence emphasises the obligation not to cause harm to participants (Polit & Beck 2017:211). In this study, the researcher took several steps to uphold these ethical principles.

Firstly, the nature of the study, which involved face-to-face interviews about the service availability in the identified health facilities, did not involve any known or identifiable physical or psychological harm to the participants. This consideration minimised the potential risks associated with the research.

The researcher ensured that participants were provided with the necessary information about the study to enable them to make an informed decision about their participation. In addition, participants were given the opportunity to ask questions and voice any concerns during the information sessions. This approach helps to reduce anxiety and ensure that participants feel comfortable and well informed throughout the research process.

Respect for the principles of beneficence and non-maleficence was also demonstrated by maintaining confidentiality. Participants' personal information and responses were treated with the utmost confidentiality to protect their privacy and minimise the risk of psychological and social harm that could result from a breach of confidentiality.

In addition, ethical approval was obtained before the study was conducted. This means that the research design and procedures were evaluated by an ethics committee or review board to ensure that they met the necessary ethical standards and minimised harm to participants.

By adhering to these principles, the research prioritised the well-being and rights of participants, ensured that they were protected from harm, and maintained ethical standards throughout the study.

4.7.3 Justice

Polit and Beck (2017:214) state that participants in research should be treated in a fair and equal manner, unless there is a reasonable justification for treating them differently.

In this study, the researcher upheld the principle of justice by using eligibility criteria to select participants for the study. By setting specific criteria for the selection of participants, the researcher ensured that the sample represented the population of interest in a meaningful way. This approach helps to ensure that the findings are applicable and representative, thereby enhancing fairness and validity of the research.

In addition, the researcher demonstrated respect for diversity by considering factors such as age and gender when selecting participants. This recognition of diversity contributes to a fair and equitable representation within the research sample, allowing for a more complete understanding of the research topic.

By including eligibility criteria and considering factors of diversity, the researcher aimed to uphold the principle of equity in the study. This approach ensures that participants are treated fairly and equally, and that research strategies and procedures are designed to promote fairness and equity in the selection and representation of participants.

4.7.4 Confidentiality and anonymity

Confidentiality and anonymity are important principles in research that protect the privacy and identity of participants. Confidentiality refers to protecting participants' information by ensuring that it is not shared with others without their permission. Anonymity, on the other hand, ensures that participants cannot be identified based on their responses or the information they provide (Polit & Beck 2017:223-215).

In this study, measures were taken to ensure both confidentiality and anonymity. Participants were specifically instructed not to write their name on the questionnaire, thus maintaining their anonymity. In addition, the identity of the hospital or health centre where the study took place was protected and not disclosed to protect the confidentiality of the participants and institution.

The raw data collected during the study were handled with the utmost care. It was securely stored, locked, and protected from unauthorised access. These precautions were taken to maintain confidentiality and prevent any potential breaches of participant information.

In reporting the results, the researcher was careful not to identify or link participants to the information provided. This ensured that the data was presented in a way that maintained the anonymity of the participants.

By implementing these measures, the researcher upheld the ethical principles of confidentiality and anonymity, and protected the privacy and identity of the participants. This approach is crucial to maintaining trust and protecting the well-being of research participants.

4.7.5 Scientific integrity of the research

The final proposal and research instruments were submitted to the UNISA Research Ethics Committee (REC) for ethical approval. As this was a minimal risk study and participants were not asked to disclose any personal information, the potential risks were low.

In anticipation of minor social risks, precautions were taken to minimise them. Key informant interviews were electronically recorded and stored on a password protected computer to ensure that unauthorised persons could not access them. There were no anticipated psychological risks associated with participation in the study. Participants had the right to refuse to answer any question they felt uncomfortable with.

No direct benefits or incentives were offered to participants for their participation. Participation was completely voluntary and participants were free to withdraw from the study at any time without consequences.

Confidentiality was maintained throughout the study. Data collectors ensured privacy during data collection sessions, and no personal identifiers or names were recorded in any data collection documents. Authorised staff involved in translation, transcription, analysis and reporting had access to the information collected. Audio recordings of individual interviews were stored as electronic copies on a password protected compact disc (CD). The CD, along with printed transcriptions and field notes, was securely locked in a safe at the interviewer's home, with limited access granted to authorised personnel.

The data collected will be retained for a period of five years and then destroyed as appropriate. Face-to-face interviews, which were recorded electronically, were stored on a password protected computer to prevent unauthorised access. The KIIs and surveys were conducted in English and Amharic, and a private room was used for the KIIs to ensure the privacy of the participants. By following these measures, the researchers demonstrated their commitment to ethical considerations, including the protection of participants' confidentiality, privacy and data security.

4.8 SUMMARY OF CHAPTER FOUR

In conclusion, Chapter 4 provides valuable insights into the research design and methodology of the current study. By focusing on specific public hospitals and health centres in the city, the study aims to investigate the integration of health services for patients with TB and DM. The exclusion of private health facilities from the study is justified by the underdeveloped nature of the private health system in Addis Ababa.

The chapter also sheds light on the health system in Ethiopia, which is guided by a comprehensive health sector development strategy. Each level provides different services, with primary health care being provided through health posts, health centres, while general and specialised hospitals provide secondary and tertiary level services respectively.

Regarding the research paradigm, the study adopts a pragmatic approach, which allows for the use of mixed methods. The pragmatic paradigm recognises the freedom of the researcher to choose the methods that best suit the research objectives and includes both quantitative and qualitative approaches. By using a mixed methods approach, the study capitalises on the strengths of both quantitative and qualitative data collection and analysis techniques.

Overall, the research approach in the study included both quantitative and qualitative research methods. Quantitative research involves the collection and analysis of quantifiable data using statistical techniques to provide an objective understanding of the factors affecting health service integration. On the other hand, qualitative research aims to explore the lived experiences and perspectives of experts and practitioners through interviews, providing a deeper understanding of the health service integration in in the public health facilities in Addis Ababa for patients with TB and DM. The combination of these approaches enhances the comprehensiveness and richness of the study's findings.

CHAPTER FIVE

QUANTITATIVE FINDINGS AND DISCUSSION

5.1 INTRODUCTION

This chapter presents quantitative results, focusing on the perspective of both TB-DM patients and health facility managers. The chapter is divided into two main sections, each with seven subsections.

The first section provides an overview of service integration as perceived by TB-DM patients. This section looks at different aspects of service integration, examining the views and experiences of patients. It explores issues such as coordination of TB and DM services; accessibility of integrated care and other relevant factors.

The second major section shifts the focus to the perspective of health facility managers. This section explored how health facility managers perceive the integration of services for TB-DM patients. It assessed their views on the availability of integrated care based on the health system pillars.

By organising the chapter into these two sections, each with its own set of sub-sections, the researcher provided a comprehensive understanding of service integration from both patient and health facility manager perspectives. This quantitative analysis adds valuable contributes to the overall understanding of healthcare delivery in this context.

5.2 INTEGRATION OF HEALTH SERVICES FROM PATIENTS' PERSPECTIVES

5.2.1 Introduction

This section describes the status of health service integration as perceived by TB-DM co-morbidity patients. The section is divided into several parts to cover different aspects of the topic.

The first part provides an overview of the socio-demographic characteristics and average monthly income status of patients with comorbid TB-DM. This information helps to contextualise the TB-DM patients and understand potential socio-economic factors that may affect their perspectives on health service integration.

The second part focuses on the health service integration of TB-DM patients. It assesses different dimensions of service integration, considering factors such as the coordination of TB and DM services, the accessibility and availability of integrated care and overall integrated services they receive.

The section is then divided into five subsections: health workforce, leadership and governance, health financing, access to technology and medical products, information and research. Each subsection assesses how these specific factors relate to the integration of health services for TB-DM patients, and provides insights into the challenges and opportunities associated with each area.

The final section focuses on statistical testing. It aims to assess the association between selected independent variables and the outcome variable to service integration. Bivariate and logistic regression model are used to explore the relationships between these variables and service integration.

By structuring the section in this way, the researcher provided a comprehensive analysis of health service integration for TB-DM co-morbid patients. The inclusion of statistical tests adds a quantitative aspect to the findings, allowing for a deeper understanding of the relationships between different factors and service integration.

5.2.2 Research results

This section discusses the results of the study in terms of response rate and sample size.

5.2.2.1 Response rate and sample size

A total of 370 adult patients with co-morbid TB-DM were approached to participate in the study. Data were successfully collected from 357 respondents through face-to-face interviews using a structured questionnaire. The response rate was calculated to be 96.5%.

Of the thirteen individuals who were not interviewed, eleven refused to participate for personal reasons, while two had a hearing impairments that made it difficult to conduct the interviews effectively.

The achieved response rate 96.5% is consistent with the study's assumptions of a 10% non-response rate, indicating that the sample size obtained is representative of the target population. This high response rate enhances the reliability and validity of the research findings as it suggests a minimal risk of non-response bias.

These findings demonstrate the researchers' successful efforts to engage a significant proportion of the target population and to collect data from robust sample size, ensuring that the study findings are more generalisable and reflect the perspectives of patients with comorbid TB-DM.

5.2.2.2 Socio-demographic characteristics of the respondents

5.2.2.2.1 Age distribution of the respondents

Important findings emerge as shown in Table 4. It can be seen that the age range of the participants varied from 23 to 87 years. The mean age of the respondents was calculated to be 49.87 years with a standard deviation of 14.046.

An analysis of the age distribution shows that the majority of participants, 29.7% (n=106), were in the 60^+ age group. The next largest group was the 40-49 age group with 25.5% (n=91) of the sample. Those aged 30-39 years accounted for 21.3 % (n=76) of respondents, while those aged 50-59 years accounted for 17.1% (n=61). The smallest age group was 18-29 years, with 6.4% (n=23) of respondents in this age group.

This analysis provides a comprehensive understanding of the age distribution of the respondents and highlights the age groups that are more prevalent within the TB-diabetes mellitus co-morbidity population. Overall, it can be concluded that the majority of patients with TB-diabetes co-morbidity, 93.56% (n=334) of the total sample, were aged 30 years or older.

Table 4: Age distribution of the respondents (n=357)

Age group	**Frequency**	**%**
18-29	23	6.4
30-39	76	21.3
40-49	91	25.5
50-59	61	17.1
≥ 60	106	29.7
	357	**100.0**

This finding is consistent with previous studies conducted in Sudan (Ahmed, Omer, Osman & Ahmed-Abakur 2017:97-101) and the Republic of Korea (Heo et al 2015:1098-1101) which reported similar age distributions among patients with TB-diabetes mellitus co-morbidity. In the Sudanese study, all patients with co-morbidity were older than 30 years, whereas in the Republic of Korea study, almost all patients (99.02%) were older than 30 years. Comparable findings were also observed in studies from Ethiopia (Gezahegn, Ibrahim & Mulat 2020:3879-3886) and China (Wu et al 2016:237-241), where a significant proportion of TB-diabetes co-morbidity cases were found in individuals over the age of 50 years (75% and 80%, respectively).

However, these findings contradict the results of a retrospective cohort study by Gedfew et al (2020:869-878) and a cross-sectional study by Getachew et al (2014:862-872) conducted in Ethiopia. These studies showed that a significant proportion of TB-diabetes co-morbidity cases (53.85% and 76.47%, respectively) were found in individuals less than 35 years of age. The difference in the results may be due to differences in the study participants. In the present study, the participants were individuals who had already been diagnosed with tuberculosis-diabetes mellitus co-morbidity, which could explain the observed differences.

These references show that the age distribution of TB-diabetes mellitus co-morbidity cases may vary between studies and populations. The results of this study contribute to the existing body of knowledge on the age distribution of comorbid conditions, with a particular focus on known patients with TB-diabetes mellitus co-morbidity.

5.2.2.2.2 Gender distribution of the respondents

The gender distribution of respondents shows that out of the total sample size of 357, 194 (54.3%) were male, while the remaining 163 (45.7%) were female (Figure 9). This indicates that there were more males living with the comorbid condition of TB-DM.

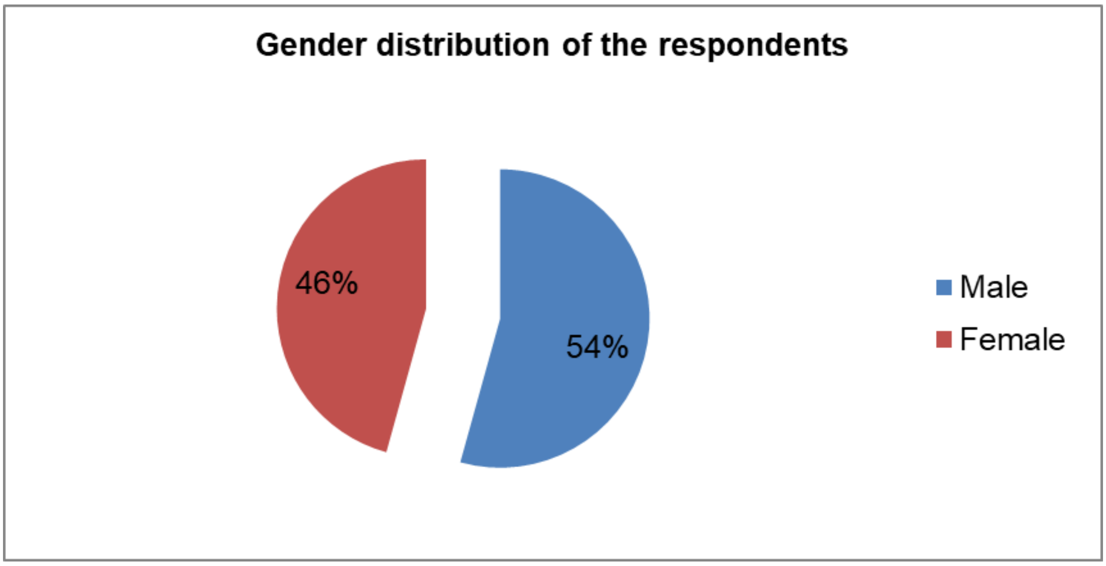


Figure 9: Gender distribution of the respondents (n=357)

This finding is consistent with studies conducted in Thailand (Buasroung, Petnak, Liwtanakitpipat & Kiertiburanakul 2022:374-379) and Mexico (Abdelbary et al 2016: S124-S134), which reported a higher proportion of male patients with TB-DM. In the Thailand study, 59.8% of comorbid patients were male; while in Mexico 56.9% of patients were male. Similarly, a study from the Republic of Korea (Heo et al 2015:1098-1101) found that 66.9% of tuberculosis-diabetes mellitus patients were male. Another study from China found that the majority (85.0%) of tuberculosis-diabetes patients were male (Wu et al 2016:237-241).

On the contrary, some studies have reported a higher prevalence of TB-DM co-morbidity in women. For instance, studies from Ethiopia (Gezahegn et al 2020:3879-3886) and Zambia (Fwoloshi et al 2018) reported a higher proportion of female patients with co-morbidity (75% and 83.3%, respectively). In addition, studies from India (Mansuri et al 2015:115-118) and Cameroon (Fonkeng et al 2017:1-13) reported prevalence rates of tuberculosis-diabetes mellitus in female populations (61.52% and 57.1% (respectively).

The differences in findings between studies could be attributed to various factors, such as differences in sample size, especially the proportion of males and females, differences in study design, health care utilisation patters, and geographical locations.

These references demonstrate that the gender distribution of TB-diabetes mellitus co-morbidity may vary between studies and populations. The results of this study contributed to existing knowledge on the gender distribution of co-morbidity conditions, with a particular focus on people living with TB-diabetes mellitus co-morbidity.

5.2.2.2.3 Residence of the respondents

The residence distribution of the respondents shows that the majority, 338 (94.7%), were from urban areas, while the remaining 19 (5.3%) were from rural areas (Figure 10). This suggests that a higher number of cases of TB-diabetes mellitus co-morbidity were found in urban areas compared to rural areas.

This finding is consistent with a study conducted in Ethiopia (Getachew et al 2014:862-872), which reported a co-morbidity prevalence of 64.70% in urban populations. Another prospective cohort study conducted in Chain (Cheng et al 2022:41-46) found that all cases (100%) of TB-diabetes mellitus co-morbidity were from urban areas.

However, this contrasts with studies conducted by Wu et al (2022:1-9) in Chain, Gedfew et al (2020:869-878) in Ethiopia and Gezahegn et al (2020:3879-3886) in Ethiopia, which reported higher proportion of TB-diabetes mellitus co-morbidity cases in rural areas. Wu et al found that 73.68% of cases were from rural parts of the Eastern Chain in Chain, while Gedfew et al and Gezahegn et al reported that 61.54% and 56.25% of cases, respectively, were from rural areas in Ethiopia.

The difference in findings may be due to differences in study settings. As the current study was conducted in Addis Ababa, the capital of Ethiopia, where the majority of participants were urban dwellers, the representation of respondents from rural areas was limited.

These results show that the residential distribution of Tb-diabetes mellitus co-morbidity cases may vary between studies and locations. The results of this study contribute to existing knowledge on the residence distribution of co-morbidity conditions, with a particular focus on people with TB-diabetes mellitus co-morbidity in urban settings.

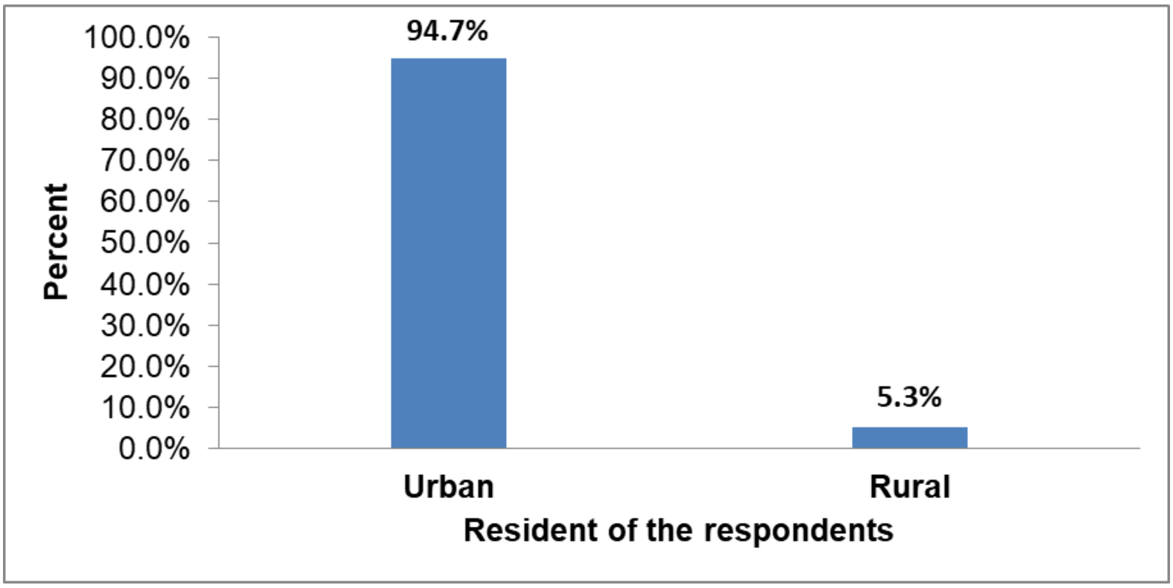


Figure 10: Distribution of respondents by urban-rural residence

5.2.2.2.4 Educational characteristics of the respondents

Regarding the educational status of the respondents, 140 (40.1%) had a diploma or higher, 97 (27.2%) had a secondary education, 73 (20.4%) had a primary education and 44 (12.3%) had no formal education (Figure 9).

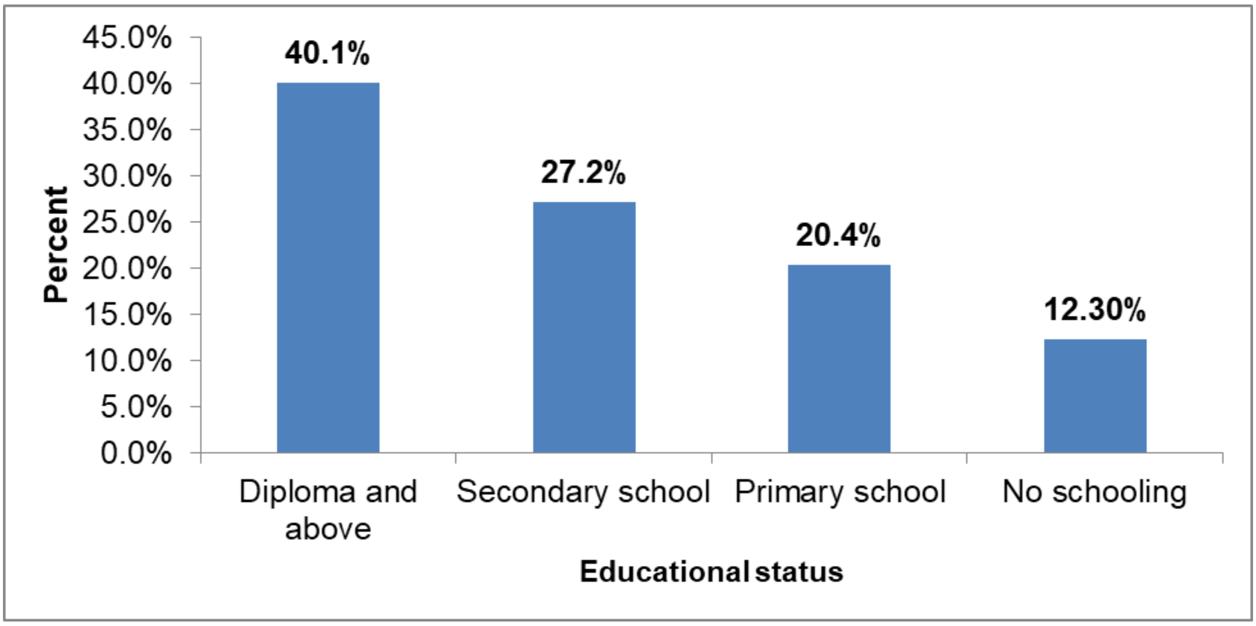


Figure 11: Educational status of the respondents

This study suggests that the burden of TB-DM co-morbidity condition is higher among those with an educational status of high school or above. This finding is consistent with studies conducted in Tanzania (Mabula et al 2021:69-74) and Bangladesh (Sarker et al 2016:e0165396), which reported a higher prevalence of TB-diabetes mellitus cases among respondents with an educational status of high school or above. In the Tanzania study, 92.8% of comorbid cases had educational status of high school and above while in the Bangladesh 41.63% were high school and above.

However, this contrasts with studies Wu et al (2022:1-9) and Cheng et al (2022: 41-46) from Chain, and a study Workneh et al (2016a: e0147621) from Ethiopia. Wu et al found that 86.84% of TB-diabetes mellitus co-morbidity cases were among respondents with an educational status of junior high school and below, while Chen et al reported that 80% of cases were from the same educational category in China. Similarly, the study by Workneh et al in Ethiopia found that 55.0% of cases were among respondents with an educational status of junior high school and below.

The possible explanation for this difference in the findings may be due to the differences in the educational status of the study participants. In this study, more than two-thirds (66.67%) of the study participants had a secondary school education or higher, which may have influenced the observed distribution of TB-diabetes mellitus co-morbidity cases.

5.2.2.2.5 Occupational Status of the respondents

The occupational characteristics of the respondents this study show that more than half (53.2%) were employed. The remaining respondents were retired (16.5%), housewives (13.7%) and the unemployed (16.5%) (Figure 12).

This study suggests that the co-morbidity of tuberculosis and diabetes mellitus is higher among the employed. This finding is consistent with studies conducted in China (Wu et al 2022:1-9), Bangladesh (Sarker et al 2016: e0165396) and Bali (Risna, Putra, Sagung & Dursa 2017:24-29). These studies reported a higher prevalence of TB-diabetes mellitus co-morbidity among employed people, with prevalence rate of 90.79%, 47.8% and 93.33% respectively.

However, this contrasts with cross sectional studies conducted by Abdelbary et al (2016:S124-S134) in Mexico and Mamun et al (2022:1-8) in Bangladesh. Abdelbary et al reported a tuberculosis-diabetes mellitus co-morbidity prevalence of 53% among unemployed respondents in Mexico, while Mamun et al found a prevalence rate of 82.5% among the unemployed in Bangladesh.

The difference in findings may be due to difference in the socio-demographic characteristics of the study participants. Factors such as income, access to healthcare, lifestyle and healthcare-seeking behaviour may differ between employed and unemployed individuals, which could influence the prevalence of TB-diabetes mellitus co-morbidity.

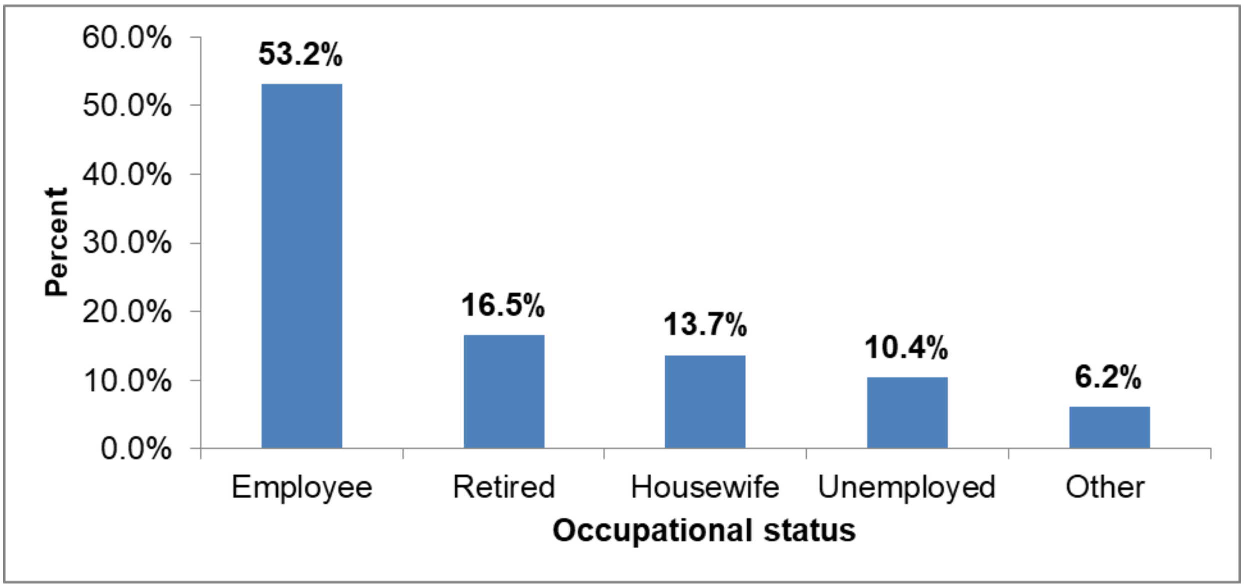


Figure 12: Occupational status of the respondents

5.2.2.2.6 Monthly Income of the respondents

The median monthly income of the respondents in this study was 5600.00 Ethiopian Birr with an interquartile range (IQR) of 6801. About 45% of the respondents had a median monthly income in the range of 5501-25000 Ethiopian Birr, while more than one fifth of the respondents had a monthly income below 2500 Ethiopian Birr (Figure 13).

This finding is consistent with studies conducted by Workneh et al (2016a: e0147621) in Ethiopia, Wu et al (2022:1-9) in Chain, and Yoo et al (2021:e2126099-e2126099) in Korea. These studies reported a higher prevalence of tuberculosis-diabetes mellitus among individuals with higher income levels, with prevalence rates of 52.3%, 65.79% and 61.4% in high-income individuals, respectively.

However, this contrasts with studies by Mamun et al (2022: 1-8) in Bangladesh and Anyanwu et al (2022: e059260) in Nigeria. Mamun et al found a prevalence rate of 92.1% among low-income patients in Bangladesh, while Anyanwu et al reported a prevalence rate of 46.87% among low-income individuals in Nigeria.

The difference in findings could be attributed to difference in socio-demographic characteristics, limited access to health services, poor quality of life and nutritional problems among different income groups. Low-income individuals may face challenges in accessing healthcare, which may affect the diagnosis and management of tuberculosis and diabetes mellitus. These findings highlight the relationship between income level and tuberculosis-diabetes mellitus co-morbidity, indicating the potential influence of socio-economic factors on the prevalence of the disease.

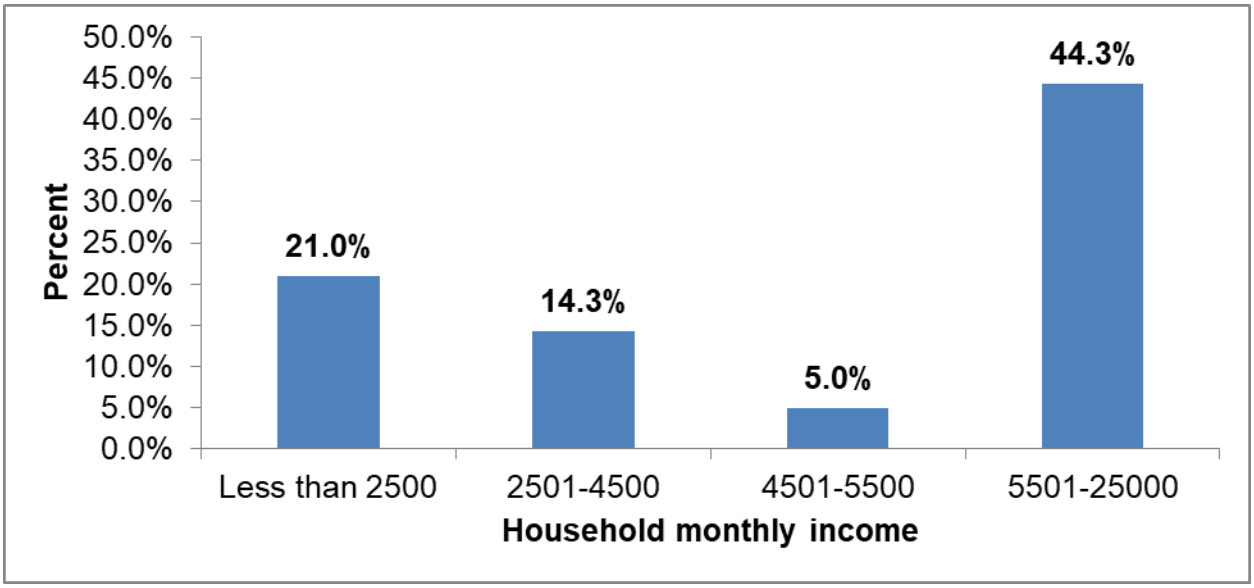


Figure 13: Average household monthly income of the respondents

5.2.2.3 Health service utilization of tuberculosis-diabetes mellitus patients

To assess the integration of health services for tuberculosis-diabetes mellitus patients, we conducted an exit interview with patients at each health facility using the questionnaires developed based on the SELFIE framework.

5.2.2.3.1 Health services integration from TB-DM patient's perspectives

Figure 14 illustrates the integration of services for tuberculosis-diabetes mellitus patients in the study area. According to the results of this study, of the total number of health facilities included, 3 hospitals and 11 health centres (25% of the facilities) provided integrated services for TB-DM patients.

This indicates that a minority of health facilities in the study area have implemented integrated services specifically tailored to the needs of patients with both TB and diabetes mellitus.

However, the low percentage of health facilities providing integrated services suggests that there may be gaps in the provision of comprehensive care for TB-DM patients in the study area.

It highlights the need for further efforts to promote and implement integrated care models, improve collaboration between TB and diabetes mellitus programmes, and support health care providers to deliver coordinated services.

Understanding the perspectives of TB-DM patients and their experiences on health services can provide valuable insights to inform strategies to improve service integration. These findings can contribute to the development of targeted interventions and policies aimed at strengthening integration of care and ultimately improving outcomes for TB-DM patients.

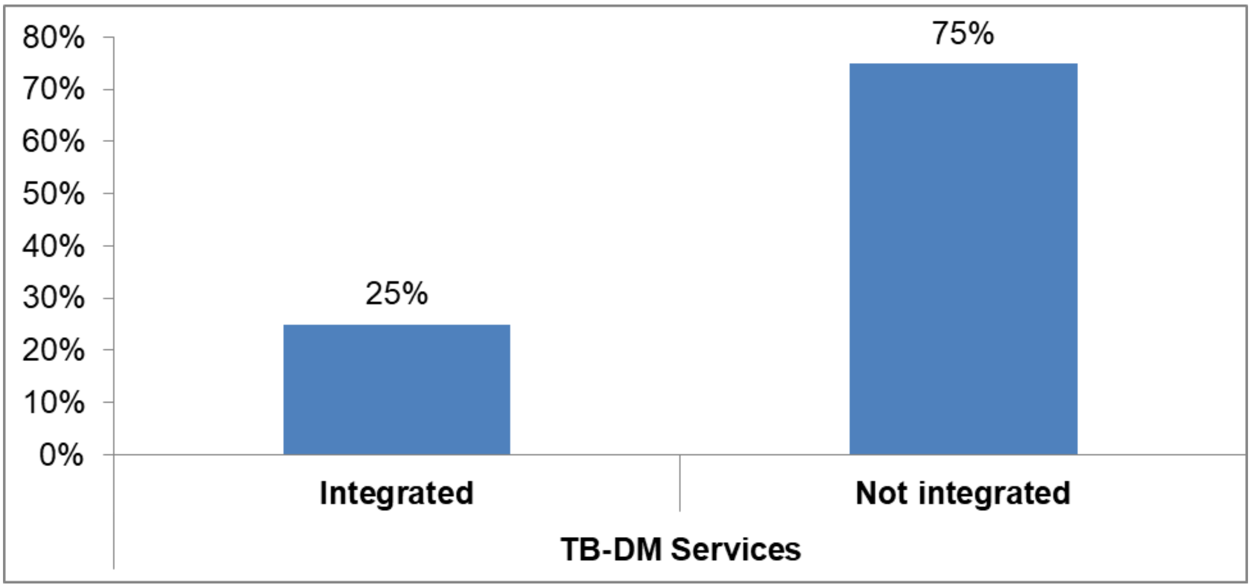


Figure 14: Integrated services for TB-DM patients

5.2.2.3.2 Analysis of factors affecting TB-DM service integration

Reliability and Validity of the items

Data collected from 357 TB-DM comorbid patients in 52 TB DOTS centres in Addis Ababa were used to establish the internal consistency of the measures used in this study. SPSS window 28 was used to calculate the result of Cronbach's alpha. According to Creswell (2018b:215), the Cronbach's alpha value in the range of 0.7 to 0.9 is acceptable, and this result was as predictors of sufficient internal consistency. The overall Cronbach's alpha for health service delivery, health workforce, health leadership and governance, health financing, access to technologies and medical products, and information and research on tuberculosis-diabetes mellitus co-morbidity is 0.861. This indicates that all items of these variables contribute to the overall reliability (Table 5).

Table 5: SELFIE questionnaire scale reliability among the respondents (N=375**)**

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
861	857	24

Health service delivery

Table 6 shows the mode of health service delivery for patients with tuberculosis-diabetes mellitus during the survey. Of the total respondents, 45.1% reported receiving of counselling on the proper use of anti-TB or anti-DM drugs. However, only 14.8% received counselling specifically about the risk of TB during DM care.

Regarding the organisation of TB-DM services, the study found that only 26.3% of patients had received organised TB-DM services, indicating a lack of structured care for this co-morbid condition. Approximately one third of respondents (31.7%) reported the existence of an integrated care policy for TB-DM patients. This suggests that efforts are being made to provide coordinated care for people with both TB and diabetes.

In addition, the survey found that 26.9% of respondents had received continuous integrated care for TB-DM, indicating continuous and coordinated management of both conditions.

Therefore, this study highlights the gaps in health service delivery for TB-DM patients in Addis Ababa and the need for improved counselling services, organised care and policy support to ensure integrated and continuous care for people with this dual diagnosis.

Table 6: Frequency distribution of health service for tuberculosis-diabetes mellitus patients in Addis Ababa, Ethiopia, 2023.

Health service delivery	**Frequency**	**Percentage**
Patient received counselling on proper use anti-TB or DM medicines		
Yes	161	45.1%
No	196	54.9%
Patient received counselling during DM care about risk of TB		
Yes	53	14.8%
No	304	85.2%
TB-DM services are organised.		
Yes	94	26.3%
No	263	73.7%
There is policies to provide integrated care for TB-DM		
Yes	113	31.7%
No	244	68.3%
There is continuous integrated care for TB-DM		
Yes	96	26.9%
No	261	73.1%

Table 7: Association between health service delivery system and health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023**.**

Health service delivery	**Integrated Health service**		**OR**	**95%CI**	**P-value**
	Yes	**No**			
Patient received counselling on proper use anti-TB or DM medicines					
Yes	33 (68.8%)	128 (41.4%)	1.0		
No	15 (31.3%0	181 (58.6%)	3.11	1.6-5.9	<0.001
Patient received counselling during DM care about risk of TB					
Yes	27 (56.3%)	26 (8.4%)	1.0		
No	21 (43.8%)	283 (91.6%)	13.99	6.9-28.1	<0.001
There is organized TB-DM services					
Yes	30 (62.5%)	64 (20.7%)	1.0		
No	18 (37.5%)	245 (79.3%)	6.38	3.3-12.1	<0.001
There is a policy to provide integrated care for TB-DM					
Yes	37 (77.1%)	76 (24.6%)	1.0		
No	11 (22.9%)	233 (75.4%)	10.31	5-21.2	<0.001
There is continuous integrated care for TB-DM					
Yes	28 (58.3%)	68 (22.0%)	1.0		
No	20 (41.7%)	241 (78.0%)	4.9	2.6-9.3	<0.001

Table 7 above shows the association between the health service delivery system and the integration of health services for patients with tuberculosis-diabetes mellitus.

The results of this study indicate several important factors that contribute to the integration of health services for patients with tuberculosis-diabetes mellitus. These factors include the provision of counselling on the correct use of anti-TB or anti-DM drugs, counselling on TB risk during DM care, existence of organised TB-DM services, the existence of an integrated care policy for TB-DM, and the availability of continuous integrated care for TB-DM.

Counselling plays a crucial role in promoting integrated care for TB-DM patients. The study found that patients who received counselling on the correct use of anti-TB or anti-DM drugs were three (OR=3.11, CI: 1.6-5.9, p<0.001) times more to receive integrated care than those who did not receive counselling. This highlights the importance of patient education and empowerment in managing their condition and accessing integrated care services. Similarly, counselling about TB risk during DM care showed a significant association with integrated care. Patients who received this counselling were 13 (OR=13.99, CI: 6.9-28.1, p<0.001) times more likely to receive integrated care than those who did not. This finding highlights the need for comprehensive education and awareness programmes that address the specific risks and challenges faced by TB-DM patients.

In addition to counselling, the study showed the importance of organised TB-DM services. Health systems with organised services were more than six (OR=6.38, CI: 3.3-12.1, p<0.001) times likely to provide integrated care than those without organised services. This suggests that the presence of well-coordinated and structured health system is crucial to facilitating the integration of services for TB-DM patients.

The study also found that the presence of an integrated care policy for TB-DM significantly affected the provision of integrated care. Health systems with an integrated care policy were more than ten (OR=10.31, CI: 5-21.1, p<0.001) times more likely to provide integrated care than those without a policy. This highlights the role of policy frameworks in promoting integration of health services, and emphasises the need for supportive health policies that prioritise the needs of TB-DM patients. This finding is in line with the study of (Almossawi et al 2019:329).

Finally, the availability of continuous integrated care for TB-DM patients was found to be an important factor in promoting integrated care. Patients who received continuous integrated care were about five times more likely to receive integrated care than those who did not. This highlights the importance of on-going support and follow-up for TB-DM patients to ensure the continuity and effectiveness of integrated care interventions.

In conclusion, this study provides valuable insights into the factors associated with the care integration for TB-DM patients. The findings highlight the importance of counselling services, organised health systems, policy support and continuity of care in promoting health service integration. These findings have implications for health policy makers and service providers, highlighting the need to prioritise these factors to improve the delivery of integrated care for people with both TB and diabetes.

Health workforce

Table 8 shows the frequency distribution of health workers involved in the care of TB-DM patients in Addis Ababa. The table provides information on the involvement of a multidisciplinary team, the presence of a TB-DM service coordinator, the adequacy of health workers' knowledge and the involvement of informal caregivers.

Only 14.0% of respondents reported the involvement of a multidisciplinary team, suggesting that a smaller proportion of health facilities have a team of professionals from different disciplines to address the needs of TB-DM patients. Similarly, 17.6% of respondents reported having a TB-DM service coordinator in their facilities, suggesting a relatively low presence of dedicated TB-DM service coordinators.

Regarding the adequacy of health workers' knowledge, 58.0% of respondents reported that health workers had adequate knowledge to care for TB-DM patients. This indicates that there is room for improvement in ensuring that health workers have the necessary knowledge and skills to effectively manage TB-DM cases.

Concerning the involvement of informal caregivers, 12.9% of respondents reported their involvement in the care of TB-DM patients. This suggests that a small proportion of patients received support from informal caregivers, such as family members or friends.

Overall, the data in Table 8 highlight areas where improvements can be made in the health care system to increase the involvement of multidisciplinary teams, establish dedicated TB-DM service coordinators, improve the knowledge of health care workers, and promote the involvement of informal caregivers in the care of TB-DM patients. These improvements can contribute to more comprehensive and integrated care for people with both TB and diabetes.

During the study, only 50 (14.0%) of the respondents reported the involvement of a multidisciplinary team and 63 (17.6%) of them reported having a TB-DM service coordinator in the facilities; and the involvement of informal care givers was reported by 46 (12.0%) of the respondents.

Table 8: Frequency distribution of the health workforce among tuberculosis-diabetes mellitus patients in Addis Ababa, Ethiopia, 2023.

Health workforce	**Frequency**	**Percentage**
There is a multidisciplinary team		
Yes	50	14.0%
No	307	86.0%
Service has a TB-DM service coordinator?		
Yes	63	17.6%
No	294	82.4%
Health workers have adequate knowledge		
Yes	207	58.0%
No	150	42.0%
There is involvement of informal care givers		
Yes	46	12.9%
No	311	87.1%

The results of the study, in the Table 9, indicate that several factors related to the health workforce are determinants of health service integration for patients with TB-DM. Specifically, the presence of a multidisciplinary team, a TB-DM service coordinator, adequate knowledge of TB-DM among health workers, and involvement of informal caregivers were associated with a higher likelihood of integrated health services.

The presence of a multidisciplinary team in the health facility was found to be a significant determinant of health service integration. Facilities with a multidisciplinary team were 20.93 (OR=20.93, CI: 10.1-43.3, p<0.001) times more likely to have integrated health services than those without. This suggests that having a diverse team of health professionals, each bringing their unique expertise, can contribute to the coordination and comprehensive care of TB-DM patients.

The presence of a multidisciplinary team has been shown to enhance the management and outcomes of patients with chronic disease, including TB and DM; and a consistent finding was reported by a scoping review (Andersen, Jensen, Vestergaard, Jensen, Hejlesen & Hangaard 2023: 263355652311659) found the impact of multidiciplinary team on the management of diabetes, glycaemic control, self-management and patient satisfaction.

Similarly, the presence of a TB-DM service coordinator was strongly associated with health service integration. Facilities with a TB-DM service coordinator were more than ten (OR=10.96, CI: 5.6-21.5, p<0.001) times more likely to have integrated services than those without s coordinator. The coordinator is likely to have played a crucial role in facilitating communication and collaboration between different health care providers involved in the care of TB-DM patients. The role of a dedicated TB-DM service coordinator has been recognized as crucial for the coordination and integration of care for patients with both TB and DM. This finding is supported by a study from Ghana (Salifu & Hlongwana 2020: e0235914), which revealed that lack of a TB-DM service coordinator was a barrier for integration of services for patients with TB and DM.

Health workers' adequate knowledge of TB-DM was another important determinant of health service integration. Facilities where health workers had adequate knowledge were six (OR= 6.1, CI: 2.5-14.8, p<0.001) times more likely to have integrated service than those without adequate knowledge. This highlights the importance of ongoing training to ensure that health workers have the knowledge and skills to effectively manage TB-DM and provide integrated care. Health workers' knowledge and competence in managing TB-DM cases are essential for effective integration of health services.

Finally, the involvement of informal caregivers in the health care delivery was strongly associated with integration of health services. Facilities that involved informal caregivers were thirteen (OR=13, CI: 6.4-26.6, p<0.001) times more likely to have integrated Tb-DM services than those did not. This highlights the value of involving family and community caregivers in the care process, as they can play an important role in promoting treatment adherence and self-management.

Engaging informal caregivers, such as family members or community support, can enhance patient adherence to treatment and a self-management. A systematic reviews (Reckziegel, Vachon-Presseau, Peter, Schnitzer, Baliki & Apkarian 2021:139-148;

Pamungkas, Chamroonsawasdi & Vatanasomboon 2017:1-17) revealed the role of family-based intervention in diabetes care and highlighted their positive effect on glycaemic control and psychosocial outcomes.

Overall, these findings underscore the importance of a collaborative and coordinated approach involving a multidisciplinary team, dedicated coordinators, knowledgeable health workers and involvement of informal caregivers in achieving integrated health services for people with TB-DM. Implementing strategies to strengthen these aspects of the health workforce can contribute to improved outcomes and better management of Tb-DM co-morbidity. A study conducted in South Africa (Almossawi et al 2019:329) supports this finding.

Table 9: Association between health workforce and health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023.

Health workforce	**Integrated Health service**		**OR**	**95%CI**	**P-value**
	Yes	**No**			
There is a multidisciplinary team.					
Yes	29 (60.4%)	21 (6.8%)	1.0		
No	19 (39.6%)	288 (93.2%)	20.93	10.1-43.4	<0.001
There is a TB-DM service coordinator.					
Yes	28 (58.3%)	35 (11.3%)	1.0		
No	20 (41.7%)	274 (88.7%)	10.96	5.6-21.5	<0.001
Health workers have adequate knowledge					
Yes	42 (87.5%)	165 (53.4%)	1.0		
No	6 (12.5%)	144 (46.6%)	6.1	2.5-14.8	<0.001
There is involvement of informal care givers					
Yes	24 (50.0%)	22 (7.1%)	1.0		
No	24 (50.0%)	287 (92.9%)	13	6.4-26.6	<0.001

Health leadership and governance

The data presented in Table 10 shows health leadership and governance for patients with TB-DM. The table provides information on patients receiving planned services, their participation in shared decision making and the presence of supportive leadership for TB-DM.

In this study, more than half of respondents (61.1%) reported receiving planned services during the study period. In contrast, 38.9% did not receive planned servicers. This indicates that the majority of patients surveyed had access to organised and planned health services for their TB-DM condition. Planned services are important to ensure continuity of care, timely interventions and effective management of TB-DM.

Of the respondents, 75.9% reported that they had shared decision making with healthcare providers about their planned care for TB-DM. Conversely, 24.1% did not participate in shared decision making. This finding suggests that a significant majority of patients were actively involved in making decisions about their care. Shared decision making promotes patient autonomy, encourages collaboration between patients and healthcare providers, and leads to more patient-centred care.

In terms of supportive leadership, 35.0% of respondents reported having supportive leadership for TB-DM health services, while 65.0% did not perceive supportive leadership. This finding indicates that a subset of patients perceived the presence of supportive leadership in the management of TB-DM services. Supportive leadership plays a critical role in creating an enabling environment, facilitating effective coordination and ensuring the availability of the necessary resources to deliver quality care.

In summary, the data show that the majority of patients received planned services for TB-DM and a significant number actively participated in shared decision-making. However, a significant proportion of patients did not perceive the presence of supportive leadership. These findings highlight the need for on-going efforts to improve health care leadership and governance, ensure access to planned services, promote shared decision making, and foster supportive leadership to improve the quality of care for TB-DM patients.

Table 10: Frequency distribution of the health leadership/governance among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia, 2023

Health leadership and governance	**Yes**	**Percentage**
Patient is receiving planned services.		
Yes	218	61.1%
No	139	38.9%
Patient has shared decision making on planned care.		
Yes	271	75.9%
No	86	24.1%
There is supportive leadership		
Yes	125	35.0%
No	232	65.0%

According to Table 11, the study found that several factors were associated with the integration of health services for TB-DM patients. Receiving planned services, participating in shared decision making, and having supportive leadership were all associated with health service integration.

According to this study, TB-DM patients who received planned services were more than three times (OR=3.14, CI: 1.47-6.7, p=0.003) more likely to receive integrated care than those who did not receive planned services. This suggests that having a structured approach to health care and receiving planned services plays an important role in ensuring the integration of health services for TB-DM patients.

Similarly, patients who had the opportunity to participate in shared decision-making with health care providers about planned care were three times (OR=3, CI: 1.17-7.9, p=0.023) more likely to receive integrated care. Involving patients in decision making can contribute to better coordination of care and a more comprehensive approach to healthcare, leading to improved integration of services for TB-DM patients.

The presence of supportive leadership was also found to have a significant impact on the likelihood of receiving integrated health services. TB-DM patients who had supportive leadership in their health facilities were associated with an eightfold increase (OR=8.45, CI: 4.12-17.3, p<0.001) in the likelihood of receiving integrated care.

Supportive leadership creates an environment that is conducive to collaboration, coordination and effective implementation of integrated care approaches.

These findings highlight the importance of providing planned services, promoting shared decision-making and ensuring supportive leadership in health facilities to improve integration of health services for TB-DM patients.

Table 11: Association between health leadership/governance and health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023.

Health leadership and governance	**Integrated Health service**		**OR**	**95%CI**	**P-value**
	Yes	**No**			
Patient is receiving planned services.					
Yes	39 (81.3%)	179 (57.9%)	1.0		
No	9 (18.8%)	130 (42.1%)	3.14	1.47-6.7	0.003
Patient has shared decision making on planned care.					
Yes	43 (89.6%)	228 (73.8%)	1.0		
No	5 (10.4%)	81 (26.2%)	3	1.17-7.9	0.023
There is supportive leadership for the care of TB-DM patients					
Yes	37 (77.1%)	88 (28.5%)	1.0		
No	11 (22.9%)	221 (71.5%)	8.45	4.12-17.3	<0.001

Health financing

Table 12 presents data on the health financing system for TB-DM patients in public health facilities in Addis Ababa, Ethiopia. The results show that the majority of patients, (90.8%), had no reimbursement system in place to cover their health care costs. This suggests that most TB-DM patients in the region had to pay for their own medical services.

Regarding the perception of health care costs, more than 40% of the respondents considered the costs to be fair. On the other hand, 59.1% of patients did not consider the cost of healthcare to be fair, indicating that a significant proportion of TB-DM patients in Addis Ababa did not consider the cost of healthcare to be fair.

These findings shed light on the existing health financing system for TB-DM patients in Addis Ababa, highlighting the lack of reimbursement system for health care costs and mixed perceptions of the fairness of health care costs.

Table 12: Frequency distribution of the health financing among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia, 2023.

Health Financing	**Frequency**	**Percentage**
Health facilities will reimburse the costs of the services.		
Yes	33	9.2%
No	324	90.8%
Health services cost is fair.		
Yes	146	40.9%
No	211	59.1%

Table 13 shows that reimbursement of healthcare costs and fairness of service costs were both statistically associated with integration of healthcare services. Patients who had mechanisms for reimbursing their healthcare costs were more than four times (OR=4.6, CI: 2.07-10.06, p<0.001) more likely to receive integrated healthcare services than those who did not have reimbursement systems. Similarly, patients who perceived healthcare costs to be fair were more than five times (OR=5.42, CI: 2.7-10.86, p<0.001) more likely to receive integrated healthcare services than those who did not perceive costs to be fair. These results suggest that the existence of reimbursement mechanisms and ensuring the fairness of healthcare costs play a crucial role in promoting the integration of their healthcare and perceive costs as fair, they are more likely to use integrated care.

These findings are consistent with a study conducted in the Philippine (Baja et al 2014:1-7), which also highlighted the importance of reimbursement mechanisms and fairness of healthcare costs in achieving integrated health services. Overall, these findings highlight the importance of addressing health financing systems, including reimbursement mechanisms and equity in health care costs, to improve the integration of health services for TB-diabetes mellitus patients.

Table 13: Association between health financing and health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023

Health Financing	**Integrated Health service**		**OR**	**95%CI**	**P-value**
	Yes (n, %)	**No (n, %)**			
Health facilities will reimburse the costs of the services.					
Yes	12 (25.0%)	21 (6.8%)	1.0		
No	36 (75.0%)	288 (93.2%)	4.6	2.07-10.06	<0.001
Costs of the health services are fair					
Yes	36 (75.0%)	110 (35.6%)	1.0		
No	12 (25.0%)	199 (64.4%)	5.42	2.7-10.86	<0.001

Access of technologies and medical products

The data presented in Table 14 provide insights into access to technology and medical products for TB-DM patients in public health facilities in Addis Ababa, Ethiopia.

Regarding the use of electronic medical record (EMR) system, only a small percentage (12.0%) of patients reported that their health facilities used such systems. This suggests that only a minority of health facilities have adopted electronic record keeping methods. In contrast, the majority (88.0%) of patients reported that their health facilities did not have electronic record systems. This means that most health facilities in Addis Ababa still rely on manual or paper-based medical record keeping.

In terms of access to technologies and medical products for diagnosing TB and DM, 24.1% of patients reported that their health facilities had access to these technologies, while 75.9% of patients reported that their facilities did not have access to these technologies. These technologies can include glucometers (devices to monitor blood sugar levels), AFB tests (acid-fast bacilli tests to detect tuberculosis), GeneXpert (a diagnostic tool for TB and drug resistance) and chest X-rays. The data show that a significant percentage of patients do not have access to these diagnostic tools, which can affect the timely and accurate diagnosis of TB-DM.

Similarly, around 65% of patients reported that their health facility did not have access to medical products specifically designed to treat TB-DM cases, while 35.3% reported that their health facility had access to these products. These drugs are essential for the effective treatment and management of TB-DM.

Regarding the availability of mechanisms to monitor the burden and care of TB-DM, 14.8% patients reported that their health facility had such mechanisms in place. These monitoring mechanisms are essential for tracking the progress of TB-DM patients and ensuring appropriate care. However, a significant majority (85.2%) of patients reported that their health facilities did not have mechanisms in place to monitor TB-DM care. This indicates a lack of structured monitoring systems in the majority of health facilities in Addis Ababa, Ethiopia.

Table 14: Frequency distribution of the access of technologies and medical products among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia, 2023

Health technologies and medical products	**Frequency**	**Percentage**
Health facilities are using electronic medical record system.		
Yes	43	12.0%
No	314	88.0%
Facilities use technologies to assist in diagnosis of TB and DM.		
Yes	86	24.1%
No	271	75.9%
There are mechanisms to monitor care for patients with TB-DM.		
Yes	53	14.8%
No	304	85.2%
Health facilities have access to medical products to treat TB-DM cases.		
Yes	126	35.3%
No	231	64.7%

In this study, the researcher sought to analyse the association between access to technology and medical products; and the integration of health services. Specifically, they analysed the presence of EMR system, access to technologies for diagnosing TB and DM, and the implementation of monitoring mechanisms.

The results of the analysis showed that the presence of an EMR system (OR=6.82, CI: 3.34-13.9, $p<0.001$), access to technologies to diagnosing TB and DM (OR= 3.6, CI: 1.9-6.7, $p<0.001$), and the implementation of monitoring mechanisms (OR=18.12, CI: 8.89-36.97, $p<0.001$) were significantly associated with health service integration (Table 14).

The results showed that health facilities using an EMR system were about seven times more likely to have integrated health services than those without an EMD system. Similarly, facilities that had access to TB and DM diagnostic technologies, such as GeneXpert and glucometers, were about four times more likely to have integrated health services that facilities without such access. This association is consistent with a previous study in Tanzania (Chamba et al 2022:100242), which demonstrated the critical role of technologies such as GeneXpert and glucometers in determining the integration of TB and DM services.

Table 15: Association between access to technologies and medical products with health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023.

Health technologies and medical products	Integrated Health service		OR	95%CI	P-value
	Yes (n, %)	No (n, %)			
Health facilities are using electronic medical records.					
Yes	18 (37.5%)	25 (8.1%)	1.0		
No	30 (75.0%)	284 (91.9%)	6.82	3.34-13.9	<0.001
Facilities use technologies to assist in the diagnosis of TB and DM					
Yes	23 (47.9%)	63 (20.4%)	1.0		
No	25 (52.1%)	246 (79.6%)	3.6	1.9-6.7	<0.001
There are mechanisms to monitor care for patients with TB-DM.					
Yes	29 (60.4%)	24 (7.8%)	1.0		
No	19 (39.6%)	285 (92.2%)	18.12	8.89-36.97	<0.001
Health facilities have access of medical products to treat TB-DM cases.					
Yes	21 (43.8%)	105 (34.0%)	1.0		
No	27 (56.3%)	204 (66.0%)	1.5	0.815-2.8	0.190

Health information and research

According to data in Table 16, the study revealed important information about health information and research related to TB-DM patients.

In terms of individualised data for TB-DM patients, 42.0% of patients had access to such data at the time of the survey. On the other hand, 58.0% of patients did not have individualised data available for their condition.

Of the respondents, 35.6% said that the individualised data they had helped to predict their risk. This suggests that a significant proportion of TB-DM patients found their individualised data valuable in understanding and assessing their risk level.

Regarding the privacy of patient data, 61.3% of respondents reported that health facilities had systems in place to protect the privacy of their data. Conversely, 38.7% of respondents indicated that healthcare organisations did not have such privacy systems in place. This suggests that there is room for improvement in the privacy policies of some health facilities.

In addition, a significant majority of respondents, 78.4%, felt that access to their health information was important. This highlights the importance of giving patients access to their own health information, which can empower them and contribute to their overall healthcare experience.

Overall, these findings underscore the need for effective data management, privacy safeguards and patient engagement in TB-DM care.

Table 16: Frequency distribution of the health information and research among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia, 2023.

Health Information and research	**Yes**	**Percentage**
TB-DM patients have individualized data for TB-DM		
Yes	150	42.0%
No	207	58.0%
There are mechanisms to predict individual risk		
Yes	127	35.6%
No	230	64.4%
Health facilities have a system to protect privacy of your data.		
Yes	219	61.3%
No	138	38.7%
Access to information is important for patients with TB-DM.		
Yes	280	78.4%
No	77	21.6%

The data presented in Table 17 provide insights into the relationship between health information and research; and integration of health services of TB-DM patients. Based on this analysis having individualised TB-DM patient data (OR=7.73, CI: 3.6-16.54, $p<0.001$), mechanisms to predict individual patient risk (OR= 12.76, CI: 5.74-28.35, $p<0.001$) and the importance of the access to tuberculosis-diabetes mellitus information (OR=3.4, CI: 1.18-9.8, $p=0.023$) had a significant statistical association with the health service integration.

The presence of individualised TB-DM patient data is strongly associated with health service integration. The odds ratio of 7.73 indicates that individuals with access to individualised data are approximately 8 times more likely to report integrated health services than those without such data. This suggests that personalised patient information plays a critical role in facilitating integrated care for TB-DM patients. With access to comprehensive and tailored data, healthcare providers can make informed decisions and develop individualised care plans, leading to improved health outcomes.

The availability of mechanisms to predict individual patient risk shows a string positive association with health care integration. The OR of 12.76 indicates that individuals with access to risk prediction mechanisms are approximately 13 times more likely to report integrated health services than those without such mechanisms. This suggests that the ability to assess and predict the risks faced by TB-DM patients enables healthcare providers to proactively manage and address potential complications. By identifying high-risk individuals and implementing targeted interventions, health care providers optimise care and improve patient outcomes.

The importance of access to TB-DM information for patients is significantly associated with health service integration. The OR of 3.4 suggests that individuals who recognise the importance of access to TB-DM information are approximately 3.4 times more likely to report integrated health services than those who do not. This highlights the role of patient engagement and empowerment in achieving integrated care. When patients are well informed about their condition and have access to relevant information, they can be active participants in their own care, make informed decisions and collaborate effectively with healthcare providers. This finding is consistent with a study conducted in South Africa (Almossawi et al 2019:329).

Table 17: Association between health information and research with the health services integration among patients with tuberculosis-diabetes mellitus in Addis Ababa, Ethiopia 2023.

Health Information and research	Integrated Health service		OR	95%CI	P-value
	Yes (n, %)	No (n, %)			
There is individualized data to support TB-DM care.					
Yes	39 (81.3%)	64 (20.7%)	1.0		
No	9 (18.8%)	245 (79.3%)	7.73	3.6-16.54	<0.001
There are Mechanisms to predict individual risk.					
Yes	40 (83.3%)	36 (11.7%)	1.0		
No	8 (16.7%)	273 (88.3%)	12.76	5.74-28.35	<0.001
Health facilities have a system to protect privacy of personal data.					
Yes	28 (58.3%)	191 (61.8%)	1.0		
No	20 (41.7%)	118 (38.2%)	0.86	0.46-1.6	0.645
Access to information is important for patients with TB-DM.					
Yes	44 (91.7%)	236 (76.4%)	1.0		
No	4 (8.3%)	73 (23.6%)	3.4	1.18-9.8	0.023

5.2.2.3.3 Health service integration from the facility managers' perspectives

This study also assessed the integration of TB-DM services from the perspectives of health facility managers. This assessment was conducted using interviews and facility checklists to assess the availability of drugs and diagnostic tests needed for integrated care. A total of 51 health facility managers, including 5 hospitals and 46 health centres were, contacted and included in the study.

Table 18 presents the findings on the provision of integrated health services for TB-DM patients in the surveyed health facilities. Of the total number of health facilities surveyed, 14 (27.5%) reported providing integrated TB-DM services during the study period. Specifically, of the five hospitals included in the study, two (40%) reported providing integrated services. of the 46 health centres, 12 (26.1%) reported providing integrated TB-DM services.

Table 18: Health facilities providing integrated health services for tuberculosis-diabetes mellitus patients in Addis Ababa, Ethiopia, 2023.

Variable	**Hospitals (n=5)**	**Health Centres (n=46)**	**Total (n=51)**
Integrated TB-DM services	2 (40.0%)	12 (26.1%)	14 (27.5%)

These findings shed light on the current state of TB-DM service integration at health facility level. While a proportion of health facilities surveyed reported providing integrated services, it is notable that the majority of facilities did not provide such integration. This suggests that there may be challenges to achieving comprehensive integration of TB-DM service across the health system.

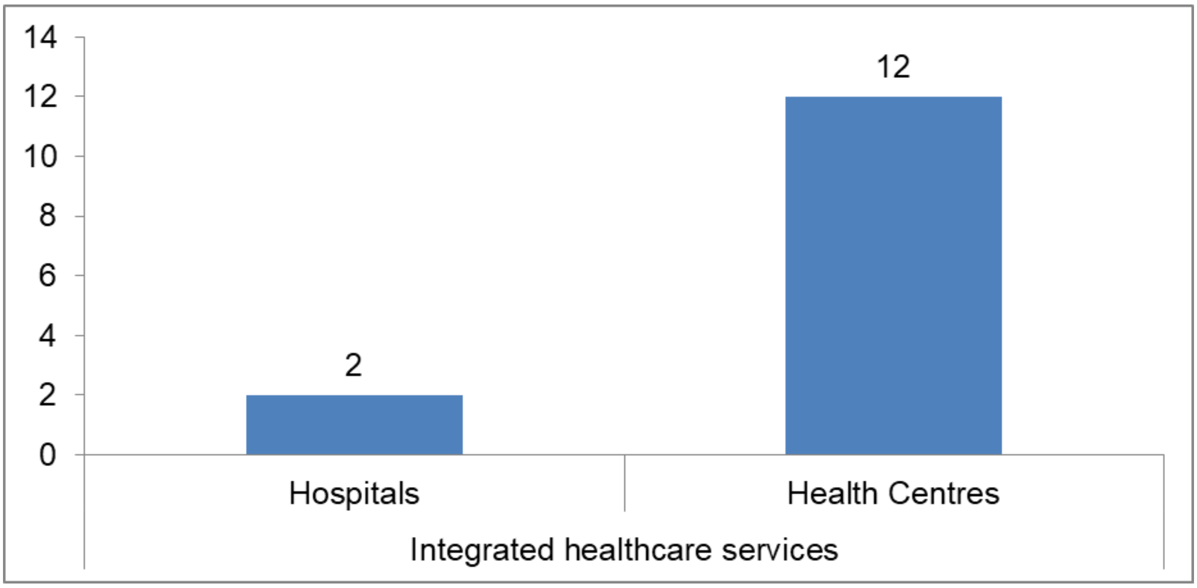


Figure 15: Health facilities providing integrated health services in Addis Ababa, Ethiopia 2023.

Overall, the assessment of TB-DM service integration from the perspective of health facility managers adds valuable insights to the understanding of the current state of integration efforts and can guide future initiatives aimed at improving coordinated care for TB-DM patients.

Factors affecting integration of tuberculosis-diabetes health services

In this study, we used a structured questionnaire developed from the SELFIE framework, which consists of the six pillars of WHO health system building, to assess the factors affecting the integration of tuberculosis and diabetes mellitus services. A total of 51 (98.07%) health facility managers participated.

Health service delivery

Table 19 provides further detail on health service delivery aspects related to the integration of TB-DM services in the surveyed health facilities, including hospitals and health centres. The table shows the percentage of facilities reporting on specific health service delivery aspects.

Access to DM testing for TB patients: Of the five hospitals, 80.0% reported having access to DM testing for TB patients. Similarly, 84.8% of the 46 health centres reported the same. Overall, 84.3% of all facilities surveyed reported having access to smear microscopy for TB patients. This indicates that the majority of facilities had the necessary testing capacity to diagnose and monitor diabetes in TB patients.

Facilities screening DM patients for TB: Of the two hospitals that reported providing integrated services, 50.0% reported screening DM patients for TB. Of the 12 health centres offering integrated services, 30.8% reported that they screened DM patients for TB. In a total, 32.6% of all facilities surveyed screened DM patients for TB. This suggests that a proportion of facilities had protocols in place to screen for TB in people with DM.

Access to TB testing for DM patients: Of the five hospitals, 80.0% reported having access to TB testing for patients with DM. Of the 46 health centres, 87.0% reported the same. Overall, 86.3% of all facilities surveyed reported having access to TB testing for patients with DM. This indicates that the majority of facilities had the necessary testing capacity to diagnose and monitor TB in patients with DM.

Facilities screening TB patients for DM: Of the two hospitals offering integrated services, 50.0% reported screening TB patients for DM. Among the 12 health centres, 29.3% reported the same. In a total, 31.1% of all facilities surveyed screened TB patients for DM. This suggests that a subset of facilities had protocols in place to screen TB patients for DM.

Facilities offering counselling to TB patients: Of the two hospitals offering integrated services, 40.0% reported providing counselling to TB patients. Of the 27 health centres, 58.7% reported doing so. Overall, 56.9% of all facilities surveyed provided counselling to TB patients. This indicates that a significant proportion of facilities provided counselling services to support TB patients.

Facilities offering counselling to DM patients: Of the three hospitals offering integrated services, 60.0% reported providing counselling to DM patients. Of the nine health centres, 19.6% reported doing so. In total, 23.5% of all facilities surveyed offered counselling to DM patients. This suggests that counselling services for DM patients were less common than TB patients.

Facilities with referral link: All five hospitals (100.0%) and 46 health centres (100.0%) reported having referral linkage. This means that all facilities surveyed had established system for referring patients to appropriate health care providers or services when needed.

These findings provide insights into the specific aspects of health service delivery related to TB-DM integration in the facilities surveyed. They highlight the availability of access to DM and TB testing, screening practices, counselling services and referral linkages. These aspects are crucial for the provision of comprehensive and integrated care for TB-DM patients.

Table 19: Health service delivery for the integration of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023**.**

Variable	**Hospitals(n=5)**	**Health Centres(n=46)**	**Total (n=51)**
Health service delivery	**n (%)**	**n (%)**	**n (%)**
There is DM testing access for TB patients	4 (80.0)	39 (84.8)	43 (84.3)
Facilities screening DM patients tested for TB	2 (50.0)	12 (30.8)	14 (32.6)
There is TB testing access for DM patients	4 (80.0)	40 (87.0)	44 (86.3)
Facilities are screening TB patients for DM	2 (50.0)	12 (29.3)	14 (31.1)
Facilities provide counselling to TB patients	2 (40.0)	27 (58.7)	29 (56.9)
Facilities provide counselling to DM patients	3 (60.0)	9 (19.6)	12 (23.5)
Facilities that have referral linkage	5 (100.0)	46 (100.0)	51 (100.0)

Health work force

Table 20 also provides information on the availability of health workers and their training in TB-DM management in surveyed hospitals and health centres.

The facilities have adequate health workers: Of the five hospitals, 60.0% reported having adequate health workers. Of the 46 health centres, 78.3% reported the same. Overall, 76.5% of all facilities surveyed reported having an adequate number of health workers. This suggests that the majority of facilities considered their workforce sufficient to provide TB-DM services.

Health workers trained in TB management: All five hospitals (100.0%) reported that their health workers were trained in TB management. Of the 32 health centres, 69.6% reported the same. Overall, 72.5% of all facilities surveyed reported having health workers trained in TB management. This indicated that a significant proportion of health workers have received training specifically for TB management.

Health workers trained in DM management: Of the five hospitals, 20.0% reported that their health workers had received training in DM management. Of the 13 health centres, 28.3% reported the same. In total, 27.5% of all facilities surveyed reported having health workers trained in DM management. This suggests that a smaller proportion of health workers had received specific training in DM management.

Health workers trained in TB-DM management: None of the hospital or health centres reported having health workers trained specifically in TB-DM co-morbidity management. This suggests that specific training in integrated TB-DM management was not available.

These findings shed light on the availability and training of health workers in TB and DM management, as well as the lack of specific training in TB-DM integration. Adequate availability of health workers is important for comprehensive care of TB-DM patients. However, training of health workers in DM management, and particularly in integrated TB-DM management, appears to be limited in the facilities surveyed.

Table 20: Health workforce for the integration of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023.

Variable	**Hospitals (n=5)**	**Health Centres(n=46)**	**Total (n=51)**
Health workforce	**n (%)**	**n (%)**	**n (%)**
Facilities have adequate health workers	3 (60.0)	36 (78.3%)	39 (76.5%)
Health workers trained on TB management	5 (100.0)	32 (69.6)	37 (72.5)
Health workers trained on DM management	1 (20.0)	13 (28.3)	14 (27.5)
Health workers trained on TB-DM management	0 (0.0)	0 (0.0)	0 (0.0)

Leadership and governance

Table 21 provides information on the availability of health policies and guidelines related to TB-DM management in surveyed hospitals and health centres.

Availability of the 2017 National TB guidelines: Of the five hospitals, 80.0 reported availability of the 2017 National TB Guidelines. Among the 46 health centres, 82.6% reported the same. Overall, 82.4% of all facilities surveyed reported having access to the 2017 National TB management Guidelines. This indicates that the majority of facilities had the guidelines available for reference in their TB management practices.

Availability of TB infection prevention and control guidelines: Of the five hospitals, 20.0% reported availability of the TB infection prevention and control guidelines. Of the 18 health centres reported, 39.1% reported the same. In total, 37.3% of all facilities surveyed reported having access to the TB infection prevention and control guidelines. This suggests that a smaller proportion of facilities had specific guidelines for TB infection prevention and control.

Availability of DM management guidelines: None of the hospitals or health centres reported the availability of DM management guidelines. This indicates that no specific DM management guideline was available in the surveyed facilities.

Availability of TB-DM management guideline: None of the hospitals or health centres reported the availability of a TB-DM management guideline. This indicates that no specific guideline for the integrated management of TB-DM was available in the facilities surveyed.

Donor support for TB: All five hospitals (100.0%) receiving donor support for TB. Of the 37 health centres, 80.4% reported the same. Overall, 82.4% of all facilities surveyed reported receiving donor support for TB. This indicates that a significant proportion of facilities received external support for their TB-related activities.

Donor support for DM: None of the hospitals or health centres reported receiving donor support specifically for DM. This suggests that targeted donor support for DM management was not available in the facilities surveyed.

These findings highlight the availability or lack of specific health policies and guidelines related to TB and DM management in the surveyed facilities. While the 2017 national TB guideline was relatively widely available, specific guidelines for DM management and integrated TB-DM management were lacking. In addition, the availability of guidelines for TB infection prevention varied between facilities. The presence of donor support specifically for TB was more common than donor support for DM.

Having comprehensive and up-to-date guidelines for management of both TB and DM, as well as specific guidelines for the integrated management of TB-DM, can help health care providers provide optimal care for patients with these conditions. It is also important to consider the availability of donor support to ensure sustainable funding for TB and DM programmes.

Table 21: Health leadership and governance for the integration of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023.

Variable	**Hospitals (n=5)**	**Health Centres(n=46)**	**Total (n=51)**
Health leadership Availability of:	**n (%)**	**n (%)**	**n (%)**
2017-National TB guideline	4 (80.0)	38 (82.6)	42 (82.4)
TB infection prevention & control guideline	1 (20.0)	18 (39.1)	19 (37.3)
DM management guideline	0 (0)	0 (0.0)	0 (0.0)
TB-DM management guideline	0 (0.0)	0 (0.0)	0 (0.0)
Donor support for TB	5 (100.0)	37 (80.4)	42 (82.4)
Donor support for DM	0 (0.0)	0 (0.0)	0 (0.0)

Health financing

Table 22 provides information on the availability of health financing related to TB-DM management in the surveyed hospitals and health centres.

Availability of free anti-TB drugs: All five hospitals (100.0%) and all 46 health centres (100.0%) reported the availability of free anti-TB drugs. Overall, 100.0% of all facilities surveyed provided free anti-TB drugs. This indicates that all facilities provided TB treatment at no cost to patients.

Availability of free TB diagnostic services/tests: All five hospitals (100.0%) and all 46 health centres (100.0%) reported the availability of free TB diagnostic services/tests. Overall, 100.0% of all facilities surveyed provided free TB diagnostic services/tests. This indicates that all facilities provided TB testing at no cost to patients.

Availability of free DM drugs: None of the hospitals or health centres reported the availability of free DM drugs. This indicated that free DM drugs were not available in the facilities surveyed.

Availability of free DM diagnostic services/tests: None of the hospitals or health centres reported the availability of free DM diagnostic services/tests. This suggests that there was no provision of free DM tests at no cost to patients in the facilities surveyed.

These findings demonstrate the availability of health financing for TB and DM management in the facilities surveyed. Free anti-TB drugs and free Tb diagnostic services/tests were universally available, indicating that patients did not have to pay for these services. However, free DM drugs and free DM diagnostic services/tests were not available in the facilities surveyed, suggesting that patients may have had to pay for DM management.

Access to affordable drugs and diagnostic services is essential for effective TB and DM management. The availability of free anti-TB drugs and diagnostic services/tests in all facilities surveyed indicates efforts to remove financial barriers for Tb patients. However, the lack of free DM drugs and diagnostic services/tests suggests a potential gap in access and affordability for DM patients in the facilities surveyed.

Table 22: Health financing for the integration of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023.

Variable	**Hospitals (n=5)**	**Health Centres(n=46)**	**Total (n=51)**
Health Financing Availability of:	**n (%)**	**n (%)**	**n (%)**
Free anti-TB medications	5 (100.0)	46 (100.0)	51 (100.0)
Free TB diagnostic services/tests	5 (100.0)	46 (100.0)	51(100.0)
Free DM medications	0 (0.0)	0 (0.0)	0 (0.0)
Free DM diagnostic services/tests	0 (0.0)	0 (0.0)	0 (0.0)

All the services for the Tuberculosis Control Programme are free of charge. In contrast, all diabetes services are paid for out-of-pocket. This may challenge the integration of tuberculosis and diabetes services into the existing health system.

Access of medical products and technologies

Table 23 provides information on the availability of medical products for TB-DM management in the surveyed hospitals and health centres.

Availability of sputum microscopy: All the five hospitals (100.0%) and 37 health centres (80.4%) reported availability of sputum microscopy. Overall, 82.4% of all facilities surveyed provided access to sputum microscopy. This suggests that the majority of facilities had the necessary equipment and resources for sputum microscopy, which is a common diagnostic tool for TB.

Availability of GeneXpert: Two hospitals (40.0%) and one health centre (2.17%) reported availability of GeneXpert. In total, 5.8% of all facilities surveyed had access to GeneXpert. GeneXpert is another diagnostic tool for TB, known for its higher sensitivity in detecting TB and drug resistance. The availability of GeneXpert was relatively limited compared to sputum microscopy.

Availability of chest X-ray: All the five hospitals (100.0%) and three health centres (6.5%) reported availability of chest X-ray. Overall, 13.7% of all facilities surveyed provided access to chest X-ray. A chest X-ray is a diagnostic tool used to detect TB.

Availability of glucometers: Three hospitals (60.0%) and 37 health centres (80.4%) reported the availability of a glucometer. In a total, 78.4% of all facilities surveyed had access to glucometer, which is a device used to measure blood glucose levels and essential for DM management.

Availability of glycated haemoglobin (AbA1c): None of the hospitals or health centres reported the availability of glycated haemoglobin. This indicates that there was no provision for HbA1c testing, which is a key test for assessing long-term glycaemic control in diabetes.

Availability of renal functional tests: All five hospitals (100.0%) and 30 health centres (65.20%) reported the availability of a renal function test. In total, 68.6% of all facilities surveyed provided access to renal function test. A renal function test is used to assess kidney function, which is important for monitoring and managing patients with TB-DM.

Availability of liver enzyme test: All five hospitals (100.0%) and 27 health centres (58.7%) reported the availability of a liver enzyme test. In total, 62.7% of all surveyed facilities provided access to a liver enzyme test. A liver enzyme test is used to assess liver function, which can be affected by both TB and DM drugs.

Availability of first-line anti-TB drugs: All five hospitals (100.0%) and all health centres (100.0%) reported availability of first-line anti-TB drugs. Overall, 100.0% of all facilities surveyed provided access to first-line anti-TB drugs, which is the standard treatment for TB.

Availability of second-line anti-TB drugs: Two hospitals (40.0%) reported availability of second-line anti-TB drugs. No health centre reported this. In total, 3.9% of all facilities surveyed provided access to second-line anti-TB drugs. Second-line anti-TB drugs are used when first-line treatment is ineffective or in case of drug-resistant TB.

Availability of oral hypoglycaemic drugs: all five hospitals (100.0%) and 37 health centres (80.4%) reported the availability of oral hypoglycaemic drugs. Overall, 82.4% of all facilities surveyed provided access to oral hypoglycaemic drugs, which are commonly prescribed for diabetes management.

Availability of insulin: All five hospitals (100.0%) and 14 health centres (30.4%) reported availability of insulin. In total, 37.3% of all facilities surveyed provided access to insulin, which is a critical medical for diabetes management, especially for patients with more severe forms of the disease.

These results demonstrate the availability of various medical products for TB-DM management in the facilities surveyed. While some essential products, such as sputum microscopy and first-line anti-TB drugs, were widely available, the availability of others, such as GeneXpert and HbA1c devices, was more limited. The second-line anti-TB drugs and insulin varied among the facilities surveyed.

Table 23: Access to medical products and technologies for integrated of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023.

Variable	**Hospitals (n=5)**	**Health Centres(n=46)**	**Total (n=51)**
Access of medical products Availability of:	**n (%)**	**n (%)**	**n (%)**
Sputum Microscopy	5 (100.0)	37 (80.4)	42 (82.4)
GeneXpert	2 (40.0)	1 (2.17)	3 (5.8)
Chest X-ray	5 (100.0)	3 (6.5)	7 (13.7)
Glucometer	3 (60.0)	37 (80.4)	40 (78.4)
Glycated haemoglobin device	0 (0.0)	0 (0.0)	0 (0.0)
Renal function test	5 (100.0)	30 (65.20)	35 (68.6)
Liver enzymes test	5 (100.0)	27 (58.7)	32 (62.7)
First line anti-TB medication	5 (100.0)	46 (100.0)	51 (100.0)
Second line anti-TB medication	2 (40)	0 (0.0)	2 (3.9)
Oral hypoglycaemic medications	5 (100.0)	37 (80.4)	42 (82.4)
Insulin	5 (100.0)	14 (30.4)	19 (37.3)

Health information and research

Table 24 provides information on the availability of health information tools for TB-DM management in the surveyed hospitals and health centres.

Availability of TB registration and reporting tools: All the five hospitals (100.0%) and 46 health centres (100.0%) reported the availability of TB registration and reporting tools. Overall, 100.0% of all facilities surveyed had access to TB registration and reporting tools. These tools are used to track and report TB cases, enabling effective monitoring and management of the disease.

Availability of DM registration and reporting tool: Two hospitals (40.0%) and 14 health centres (30.4%) reported the availability of TB registration and reporting tools. In total, 31.4% of all surveyed facilities had access to DM registration and reporting tools.

Availability of TB-DM registration and reporting tools: None of the hospital or health centres reported the availability of TB-DM registration and reporting tools. This indicates a lack of specific tools for tracking and reporting cases of TB-DM co-morbidity in the facilities surveyed.

Availability of TB-DM data analysis system: None of the hospitals or health centres reported the availability of a TB-DM data analysis system. This suggests that the facilities surveyed do not have a dedicated system for analysing data related to TB-DM co-morbidity.

These findings indicate that while TB registration and reporting tools are available in the surveyed facilities, the availability of DM registration and reporting tools is relatively lower. In addition, there is a lack of specific tools and data analysis systems to track and analyse TB-DM co-morbidity. Effective health information systems play a crucial role in the management and surveillance of diseases such as TB and DM. The availability of registration and reporting tools facilitates data collection and reporting, allowing health care providers to make informed decisions. However, the lack of specific tools for Tb-DM co-morbidity and data analysis systems can limit the ability to comprehensively address the intersection of these two diseases.

Improving the availability and use of health information tools specific to TB-DM co-morbidity can improve the understanding and management of this double burden. It is important for health systems to invest in comprehensive health information systems that collect and analyse data on TB, DM and their co-morbidity. This can lead to more targeted interventions, improved patient outcomes and better resources allocation.

Table 24: Health information for the integration of tuberculosis-diabetes mellitus health services in Addis Ababa, Ethiopia, 2023.

Variable	**Addis Ababa regional Hospitals (n=5)**	**Health Centres (n=46)**	**Total (n=51)**
Health Information Availability of:	**n (%)**	**n (%)**	**n (%)**
TB registration and reporting tools	5 (100.0)	46 (100.0)	51 (100.0)
DM registration and reporting tools	2 (40.0)	14 (30.4)	16 (31.4)
TB-DM registration and reporting tools	0 (0.0)	0 (0.0)	0 (0.0)
TB-DM data analysis system	0 (0.0)	0 (0.0)	0 (0.0)

5.3 CONCLUSION

In conclusion, the study findings indicate that there are disparities in TB-DM co-morbidity based on gender and employment status. Only a quarter of health facilities provide integrated services for TB-DM patients. Factors affecting the integration of services include lack of individualised patient data, risk prediction mechanisms, coordinated care, fair reimbursement, access to health information, access to technologies and medical products, counselling, organised services, policy support, supportive leadership, multidisciplinary teams and engagement of informal caregivers.

The study also indicates significant gaps in various areas of the health system, such as service delivery, health workforce, leadership, financing, access to technology and medical products, and information and research systems, which hinder the integration of care for TB-DM patients.

CHAPTER SIX

QUALITATIVE FINDINGS AND DISCUSSION

6.1 INTRODUCTION

This chapter presents the findings of an explanatory qualitative design. The study focuses on describing the challenges and opportunities within the health system and the experiences of experts and practitioners regarding the current integration of health services for patients with TB and diabetes mellitus. It explores the factors that influence the integration of these services, with a particular focus on health system related factors such as health service delivery, health workforce, health leadership and governance, health financing, access to medical products and technologies and health information. The SELFIE framework, which encompasses the six pillars of health systems integration, is used to guide the analysis, and themes and sub-themes that emerged from the research are discussed. Key informant interviews (KII) were conducted and interview questions were developed based on the SELFIE framework and relevant literature. The data analysis process and interpretation of the research findings are explained, and qualitative data were collected through KIIs. The findings are presented in both text and tables.

The purpose of this qualitative component was to gain a deeper understanding of the integration of health services for patients with TB-diabetes mellitus from the perspective of the health system and health professionals. This chapter is divided into four sections. The first section provides information on the socio-demographic characteristics of the participants. The second section describes the experiences of health professionals regarding the current level of integration of health services for patients with both diseases. The third section explores the opportunities and challenges faced by the health system in integrating health services for patients with TB and diabetes mellitus. Finally, the fourth section identifies the components of the integration framework and outlines strategies for integrating services for patients with TB-diabetes mellitus.

6.2 QUALITATIVE DATA MANAGEMENT AND ANALYSIS

The process of qualitative data analysis, as described by Polit and Beck (2017b:749-753), involves several steps. In this study, the researcher followed these steps to analyse the qualitative data collected. The data sources included extensive field notes, audio records and their transcripts.

First, the audio records of the semi-structured in-depth interviews were transcribed verbatim. The researcher then read the transcripts and extended field notes to familiarise himself with the data. The Amharic transcripts were translated into English and the research assistant, who is proficient in both languages, checked the consistency between the two versions.

To gain a deeper understanding of the data on health service integration for TB-diabetes mellitus patients, the researcher analysed the data across participants. Common ideas and concepts were identified and grouped into categories. The thematic analysis approach was used and Atlas.ti8 qualitative data analysis software was used to organise and analyse the data.

During the fieldwork, the initial analysis of the interviews began with the researcher's field notes. The transcripts were then read and reread and coded using Atlas.ti8 software. Two members of the research team independently applied codes to selected transcripts to ensure inter-coder reliability and to establish a verified code structure. Differences in coding were discussed and resolved.

Memos were written throughout the analysis process to capture reflective thoughts and insights. The network view in Atlas.ti8 was used to visualise how concepts were interrelated and related to the research questions. Finally, main themes and sub-themes were extracted quotes.

By following these steps, the researcher was able to analyse and interpret the qualitative data and gain a comprehensive understanding of the challenges, experiences and opportunities related with integrating health services for people with TB and diabetes mellitus.

6.3 DEMOGRAPHIC CHARACTERISTICS OF KEY INFORMANTS

6.3.1 Socio-demographic characteristics of the respondents

Table 25 shows the socio-demographic characteristics of the key informants who took part in the interviews conducted for the study. A total of twenty-three key informants were included in the analysis.

More than half of the key informants (52.2%) who participated at the in-depth interviews were female and 47.8% were male. The age of the participants ranged from 26 to 59 years, with 52.2% being under 30 years of age and the remaining 47.8% being 30 years of age or older. In terms of educational level, 78.3% of the participants had a first degree, while 21.7% had a second degree. In terms of profession, 34.8% of the participants were nurses, 21.7% were health officers, 26.1% were medical doctors and 17.4% were public health specialists.

Regarding work experience, 52.2% of the participants had less than 7 years of experiences, while the remaining 47% had 7 or more years of experience. In terms of responsibilities, 39.1% of participants were TB focal, 26.1% were clinicians/physicians, 17.4% TB programme experts and 17.4% were DM/NCD (diabetes mellitus/non-communicable disease) programme experts (Table 25).

Table 25: Socio-demographic characteristics of key informants from selected health facilities and offices in Addis Ababa, Ethiopia, 2023.

Variables	**Frequency**	**Percentage**
Gender		
Male	11	47.8%
Female	12	52.2%
Age of the participants in year		
Less than 30	12	52.2%
± 30	11	47.8%
Educational level of the participants		
First degree	18	78.3%
Second degree	5	21.7%
Profession of the participants		
Nurse	8	34.8%
Health officer	5	21.7%
Medical doctor	6	26.1%
Public health expert	4	17.4%
Work experience in years		
Less than 7 years	12	52.2%
≥ 7 years	11	47.8%
Responsibility		
TB focal	9	39.1%
Clinician/physician	6	26.1%
TB program expert	4	17.4%
DM/NCD expert	4	17.4%

6.4 CURRENT INTEGRATION STATUS OF TB-DM SERVICES

The study examined the integration of TB and diabetes services across the pillars of SELFIE/health system building blocks. Key informants rated all pillars as below average with an average score of 1.53 as shown in Figure 14. This indicates that there is a significant room for improvement in the integration of TB and diabetes mellitus services across different aspects of the health system.

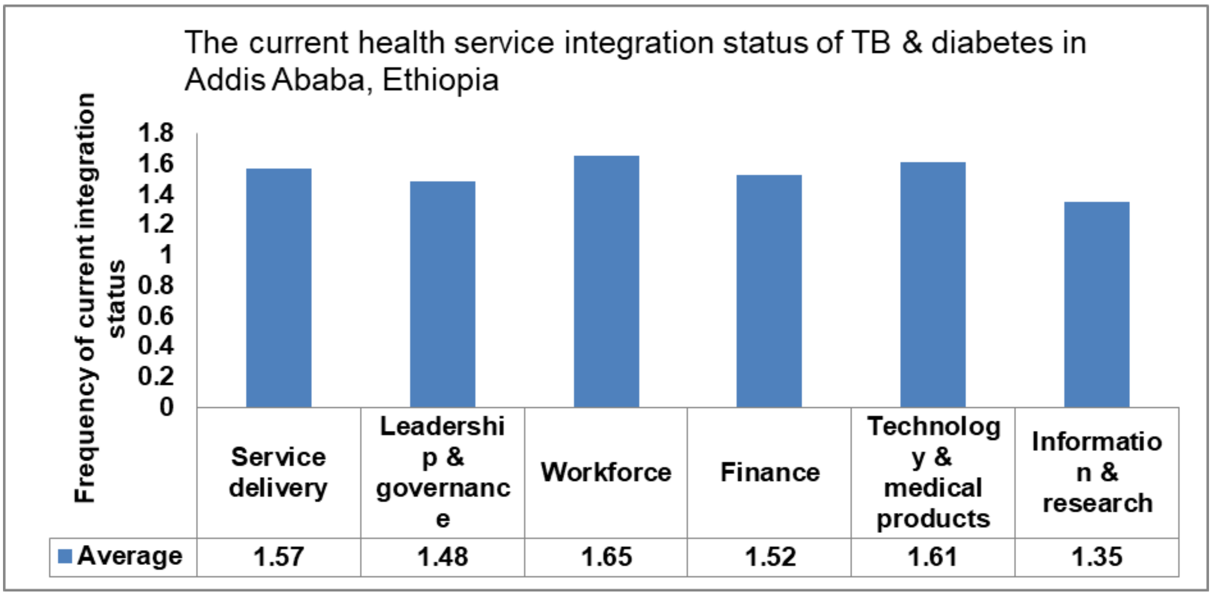


Figure 16: The current health service integration status for patients with TB and diabetes in Addis Ababa, Ethiopia.

Level 1=minimal integration; level 2=basic remote integration; level 3= basic on-site integration; level 4= close integration in a partially integrated system; and level 5= close integration in a fully integrated system.

The following are key observations around each pillar:

6.4.1 Health service delivery

The integration of health services for TB and diabetes patients is currently at a minimal level. Key informats rated this area at 1.57 on a scale of 1-5, indicating a minimal level of integration. This suggests that TB and diabetes mellitus service providers work in separate facilities and with separate systems, resulting in infrequent communication and collaboration on cases. As a result, the delivery of effective, safe and high quality personal and non-personal health interventions for TB and DM patients is hampered and there is a waste of resources.

6.4.2 Leadership and governance

Governance, leadership and accountability are critical elements in ensuring the integration of TB and DM services. This pillar includes establishing a strategic policy framework, providing effective oversight, building coalitions, regulating the system, designing an integrated approach and ensuring accountability. According to key informants, leadership and governance are considered the most important components for integration. However, the current rating for this pillar is 1.48 out of 5, indicating a minimal level of integration in terms of leadership and governance. This suggests that there is a need for improvement in these areas to promote effective integration of TB and DM services.

6.4.3 Health workforce

The integration of health workforce for TB and DM services is currently rated at 1.65 out of 5 by key informants. This indicates a minimal level of integration of the TB and DM health workforce. It was found that almost all health workers involved in TB and DM care were not adequately trained to diagnose, treat and prevent the co-morbidity of these two diseases. This lack of training hinders their ability to provide responsive, equitable and efficient care to achieve the best possible health outcomes for TB and DM patients. Improving the training and capacity building of health workers in this area is essential to improve the integration of TB and DM services.

6.4.4 Health financing

The health financing pillar, which includes financing mechanisms for health services, received a score of 1.52 out of 5 from key informants. This indicates a minimal level of integration of health financing for TB and DM services. Under the current system, health care for TB patients is funded by the government and /or donors and is provided free of charge. However, both diabetes patients and TB patients with co-morbidity diabetes have to pay out-of-pocket to access services. This creates a financial burden for these patients and hinders their ability to access the care they need. To improve integration, it is important to ensure adequate and equitable financing mechanisms that protect individuals from the financial burden of healthcare costs and provide incentives for efficient service delivery.

6.4.5 Access to technologies and medical products

Access to technologies and medical products for TB and DM services is rated 1.61 out of 5 by key informants. This indicated a minimal level of integration interms of ensuring equitable access to essential medical products. In the national TB response, there is currentlt strong access to medical products linked to the Ethiopian Pharmaceuticals Supply Services (EPSS). However, patients with diabetes and those with comorbid TB and DM face challenges in accessing essential drugs and diagnostic tests. There is a shortage of these critical medical products, which hinders the effective management and treatment of these diseases. Improving access to essential drugs and diagnostic tests for patients with diabetes and comorbid TB is essential to improve integration of services and ensure equitable access to quality care.

6.4.6 Information and research

The health information and research pillar, which includes the production, analysis, dissemination and use of reliable and timely information on health determinants, system performance and health status, received the lowest rating of all components. Key informants rated the health information system for TB and DM co-morbidity at 1.35 out of 5, indicating a very minimal level of integration. In the TB programme, different agencies use different data reporting platforms to collect and report data based on donor requirements. However, these health information systems operate on different technical platforms and software. In addition, these information management systems do not adequately take into account the data of patients with diabetes, which further hinders the integration of information system and research efforts are essential to improve the integration of TB and DM services and to ensure comprehensive and accurate data management for both conditions.

6.5 PRESENTATION AND DISCUSSION OF RESULTS

The findings of the study were presented and discussed in detail using data from twenty-three key informant interviews. The analysis involved examining the codes and identifying similarities and relevance, resulting in the development of six main themes and nineteen sub-themes, as shown in Table 26. These themes and sub-themes were presented based on the factors that affect the integration of TB and DM health services. In presenting the findings, the themes were supported by the study objectives and relevant literature. In the discussion section, these themes were further explored in relation to the study objectives and existing research.

Table 26: Themes and sub-themes that emerged from the data analysis

Theme 1: Health service provision		
Subthemes	1.1.	Lack of policies to support TB-diabetes integration
	1.2.	Lack of guidelines for TB-diabetes integration
	1.3.	Poor bi-directional screening for TB and diabetes
	1.4.	Poor collaboration between NTP and NCDCP departments
	1.5.	Well established referral system for the continuity of care
Theme 2: Health workforce		
Subthemes	2.1.	Inadequate knowledge of health workers about TB-DM care
	2.2.	Lack of training for TB-DM care
	2.3.	Inadequate health workforce
Theme 3: Healthcare leadership and governance		
Subthemes	3.1.	Lack of attention to TB-DM care
	3.2.	Lack of accountability
	3.3.	Lack of coordination system for TB-DM care
	3.4.	Perceived interest of health care workers in integrating TB-DM care
Theme 4: Healthcare financing		
Subthemes	4.1.	Lack of financial support for DM care
	4.2.	Patients' inability to pay for DM care
Theme 5: Access to medical products & diagnostic tests		
Subthemes	5.1.	Poor supplies for DM care
Theme 6: Health Information and research		
Subthemes	6.1.	Lack a health related ICT TB-diabetes co-morbidity care
	6.2.	Lack of TB-DM co-morbidity surveillance
	6.3.	Availability of evidence on the burden of TB-DM co-morbidity
	6.4.	Well-established information system for TB control programme

These themes and sub-themes indicates different aspects of the challenges and gaps in integrating TB and diabetes care, including support for policies and guidelines, workforce skills and training, leadership and governance issues, funding constraints, access to medicines and diagnostic tests, and gaps in health information and research.

Addressing these issues is critical to improving service integration and overall management of TB and diabetes co-morbidity.

6.6 HOW DO PATIENTS WITH TB-DM RECEIVE HEALTH CARE?

6.6.1 Challenges and opportunities for integrating health services for TB-DM

Theme 1: Health service provision

The informants clearly explained that health services for TB and diabetes patients are provided in different ways. These are grouped into five sub-themes, namely: 1) the lack of policies to support TB-diabetes integration, 2) the lack of guidelines for TB-diabetes integration, and 3) poor bi-directional screening for TB and diabetes, 4) poor collaboration between NTP and NCDCP and 5) having well-established referral system for continuity of chronic care within the existing health system.

Sub-theme 1.1: Lack of policies to support TB and diabetes integration

Almost all informants strongly agreed that the lack of policies in the existing health system that recognise the need for integration are the main factors in the fragmentation of TB and diabetes mellitus health services. This can impose the integration of TB and diabetes mellitus health services into the existing health system or into TB or TB/HIV collaborative services.

As one male public health expert put it:

> “At the national level there is a directorate for disease prevention and control, under this directorate we have departments for non-communicable diseases (NCDs), and department for communicable disease prevention and control (CDCs). Recently, […there is a national joint plan, between NCD and CDC departments, for the prevention and control of tuberculosis and diabetes mellitus co-morbidity], otherwise there is no national policy for service integration as well as for the prevention and control of tuberculosis and diabetes mellitus co-morbidity epidemics” (KII, FMoH).

Our findings contrast with the research by the World Health Organization (2016c:3), which shows that the fundamental role of health systems is to ensure the promotion, restoration, maintenance and recovery of the health needs of both individuals and populations, regardless of their illness.

In addition, the mandatory component of any health system, health service delivery, is to ensure the existence of comprehensive, accessible, efficient, safe, patient-centred, continuous and coordinated health services (WHO 2007:26; 2018c:9). Furthermore, according to WHO (2007:26; 2018c:9) and Leijten et al (2018:12-22), health systems should prioritise integrated service packages, leadership, patient safety and quality of care, infrastructure and logistics, and influencing demand for care in service delivery. In general, the management of patients with TB and diabetes requires a comprehensive approach that includes lifestyle changes, behavioural modification and appropriate use prescribed medications (Lin, Harries, Kumar, Critchley, Crevel, Owiti, Dlodlo & Kapur 2019:771-772).

Since people with co-morbidity experience different health and social problems, it is particularly important to provide a person-centred and integrated approach to care that is tailored to the individual and their community (Muth, Blom, Smith, Johnell, Gonzalez-Gonzalez, Nguyen, Brueckle, Cesari, Tinetti & Valderas 2019:272-288). Tailored care can be based on a formal holistic assessment (Chan, Wu, Ng, Glass & Tan 2022:1-17; Wong & Luk 2020:56-63; Snowden, Young & Savinc 2018:4836-4845).

Another male public health expert added that:

> "For successful integration of TB and diabetes mellitus services in all health facilities at all levels; [there should be integration guidelines, rules, procedures and treatment protocols which are the main components of the health system policies] there are no policy documents. It is also a challenge for us and our patients to provide effective services, to educate them about disease treatment, drug adherence, prevention strategies and coping mechanisms their illness" (KII, RHB).

This finding is supported by the studies conducted by (Nyaaba et al 2020:100-09); and (Peter and Aighobahi 2019b:1-15), who found that the poor health system and lack of awareness of the situation are the main problems for the fragmentation of TB and diabetes mellitus health services.

However, studies by Leijten et al (2018:12-22), which identified the mandatory healthcare policies for service integration and the availability and accessibility of the necessary services, and another study by Topp et al (2018:298-312) and Tenbensel et al (2021:1-12), showed that healthcare policies are one of the enabling factors for the integration of healthcare services.

In addition, healthcare policies and guidelines are the critical components for the effective implementation of the integration of healthcare services (Lin et al 2019:37-46; Dávila, Castellanos & García 2015b:19-21).

Moreover, an integrated care for patients with co-morbidity provides opportunities to promote various self-management skills (Suls et al 2020:139-148; Trankle, Usherwood, Abbott, Roberts, Crampton, Girgis, Chang, Saini & Reath 2019:1-9; World Health Organization 2016a:9) such as lifestyle changes (World Health Organization 2016a:9), coping strategies (World Health Organization 2016a:3), health literacy (World Health Organization 2015c:10, 2018b:2-5), medication adherence (Sokan, Stryckman, Liang, Osotimehin, Gingold, Blakeslee, Moore, Banas, Landi & Rodrigueze 2022:100201; Monaco, Palmer, Marengoni, Maggi, Hassan & Donde 2020:1353-1358; Goldstein, Gathright & Garcia 2017:547-559), health system navigators (Struckmann, Barbabella, Dimova & Ginneken 2017:1-6), communication skills (Stoop, Lette, Ambugo, Gadsby, Goodwin, Macinnes, Minkman, Wistow, Zonneveld, Nijpels, Baan & de Bruin 2020:1-16; Bartels, DiMilia, Fortuna & Naslund 2018: 153-164; Hilty, Sunderji, Suo, Chan & McCarron 2018: 292-309), goal setting (World Health Organization 2015c:10, 2016a:9), prioritisation (World Health Organization 2018b:6-7) and planning (Palmer, Marengoni, Jureviciene, Laatikainen, Mammarella, Muth, Prado-Torres, Rejken, Rothe, Valderas, Vontetsianos, Zaletel, Forjaz, Souchet, Naviakal & Onder 2016:4-11; World Health Organization 2016a:7).

According to Best (2017:302-309); and Mackie and Darvill (2016:82-87), organisational and structural integration is critical and can facilitate the provision of integrated health services for people with co-morbidity. This is particularly important for the provision of integrated care for patients with co-morbidity across health and social sectors. The need for multisectoral collaboration and continuous communication to address TB-diabetes co-morbidity through the integrated care has been highlighted (World Health Organization 2022:5-7), as has the need to link health and social services (Mackie & Darvill 2016:82-87). People with multiple chronic conditions pose a challenge to effective continuous quality improvement systems, as current quality standards tend to address only a single disease condition (Smith, Wistow, Holder & Gaskins 2019:1-14). The difficulty of identifying and developing indicators for comorbid disease states is also addressed (Leijten et al 2018:12-22).

Furthermore, integrated care services and co-morbidity programmes would benefit from macro-level policies to promote the integration of care across organisations and sectors, for example through close collaboration between ministries of health and social affairs (Booth 2021:8-11; Bibbins-Domingo 2019:1763-1764). Similarly, highly competitive environments require market regulation, such as more flexible anti-trust laws that allow for collaboration between providers while protecting consumer choice. Finally, policies should be in place to ensure service availability and access to services. This affects the availability of community and public health resources, as well as timely geographic and physical access. Access to services should protect vulnerable groups, such as those with co-morbidities of tuberculosis and diabetes. Therefore, this study showed that the lack of policies to support TB-diabetes integration is the challenge for TB and diabetes mellitus healthcare service integration.

Sub-theme 1.2: Lack of guidelines for TB-diabetes integration

All informants clearly explained the lack of guidelines and protocols for the management of diabetes mellitus and tuberculosis-diabetes mellitus co-morbidity, which allows the integration of tuberculosis and diabetes mellitus services into the existing health system. In contrast, almost all respondents agreed that both TB and TB/HIV have updated guidelines that play a major role in case management and prevention and control of the tuberculosis epidemic. Therefore, the lack of standardised guidelines for the prevention and control of diabetes mellitus can impose the integration of diabetes mellitus services on the existing tuberculosis control programme.

One male physician reported that:

> "Nowadays we treat a considerable number of diabetic patients with or without tuberculosis in our health facilities. Personally, I used to treat them based on my clinical judgement and prior knowledge of the disease; there is no standardised guideline and treatment protocol for this particular population to guide and set the specific intervention and recommendations. I believe that diabetic patients with tuberculosis may need something special than diabetic patients without tuberculosis, such as the choice of medication, dose or duration of follow-up; and similarly, diabetic patients with tuberculosis may need the extended duration of anti-TB medication, consultation with endocrinologist or some other medical justifications than those without diabetes" (KII, hospital).

Studies have shown that medication adherence (Cáceres, Calderon & Ugarte-Gil 2022: 1-17; Gast & Mathes 2019:1-17; Smaje, Weston-Clark, Raj, Orlu, Davis & Rawle 2018: 254-266), accumulation of side effects (Zitnik, Agrawal & Leskovec 2018: i457-i466) and drug interactions (Lin et al 2019: 53; Van Crevel, Koesoemadinata, Hill & Harries 2018: 1404-1410; Zheng et al 2017:1264-1272) are potential concerns for people with comorbidities who are taking multiple medications prescribed by multiple healthcare providers (Cáceres et al 2022:1-17). This is due to the fact that the existing evidence is based on a single disease (American Diabetes Association 2022; Federal Democratic Republic of Ethiopia Ministry of Health 2017), and attempts to comply with multiple guidelines for a single disease simultaneously have been criticised (Almossawi et al 2019: 329; Workneh et al 2016b:1-11). Therefore, not only the lack of attention to drug interactions, drug side effects and adherence issues, but also the lack of tuberculosis-diabetes mellitus treatment guidelines and protocols are the major challenges in Ethiopia, particularly in the study area for the integration of the two diseases in health services.

Another male physician added that:

> "This is the consultation point that I usually face from many of the medical practitioners and colleagues in our health facility. […Dr we have a DM patient who is co-infected with TB, severe PTB, and his random blood sugar is very high and on sliding scale for the last one week; and also he is on first line anti-TB for the last two weeks]. If we have standardised guidelines and treatment protocols for tuberculosis-diabetes mellitus, this was a simple consultation, the medical practitioner can manage it without consultation and he can avoid the suffering of his patient" (KII, hospital).

The integration of diabetes mellitus into the existing tuberculosis control programme may therefore be necessary. This finding is supported by studies from different parts of the world. For instance, a study from Sub-Saharan Africa showed that the lack of guidelines and management protocol for diabetes case management and standardisation leads to poor quality as well as loss of life of patients (Alkhatib et al 2021:12449; Mishra et al 2019:55-66; Rawal et al 2019:e029562) and also the American Diabetes Association mentioned that the poor service quality and non-standardised healthcare services are the sign of lack of guidelines and treatment protocols (Diabetes Care 2022: S256-S258).

However, India's Revised National Tuberculosis Control Programme (RNTCP) has evidently explained the availability as well as the role of guidelines, treatment protocols and monitoring mechanisms for the effective implementation of tuberculosis-diabetes mellitus service integration in all healthcare facilities (Ministry of Health and Family welfare Government of India 2017). Therefore, our study revealed that lack of standard guidelines and treatment protocols for patients with tuberculosis and diabetes mellitus can impose the integration of tuberculosis and diabetes mellitus in the existing healthcare system.

One male public health expert reported that:

> "Nowadays, tuberculosis prevention and control including case management is one of the robust health programmes in our country; and it has updated both programmatic and case management guideline. In addition, we have an integrated TB/HIV guideline; as we know, TB/HIV prevention and control programmes are integrated under one umbrella; if there is any update either in TB or HIV, we can update the guideline. In my view, we can learn more about TB/DM service integration from TB/HIV service integration" (KII, RHB).

A study by Workneh et al (2016b:135) and the revised national tuberculosis control programme of India (Ministry of Health and Family welfare Government of India 2017) described the role of standardised tuberculosis prevention and control guidelines in tuberculosis and diabetes mellitus healthcare service integration. Therefore, this study highlighted the availability of standardised tuberculosis prevention and control guidelines as an opportunity for diabetes mellitus health service integration in the existing health system.

Sub-theme 1.3: Poor bidirectional screening for TB and diabetes

Almost all informants assertively agreed that bidirectional screening services for both TB and DM patients were poor in all health facilities. Some of the respondents noted that some of the health facilities had started bidirectional screening of TB patients for DM and DM patients for TB a few years ago with the support of KNCV Tuberculosis Foundation, an International NGO, but currently this screening test has been discontinued for unknown reasons.

One male medical practitioner reported that:

> "I have been managing diabetic patients in this hospital for more than four years; and I know that diabetes is an immune-compromising disease that affects the immune system of the patients and predisposes them to infectious diseases like tuberculosis. TB is a communicable disease that can be spread from infected to non-infected person through droplets; and I know from my experience that most of TB patients are hyperglycaemic, this is due to either stress induced or anti-TB induced transient hyperglycaemia. Currently, we do not screen DM patients for TB and there is no such kind of service" (KII, hospital).

Another female health officer added that:

> "When new TB patients come to our TB clinic, I usually ask them if they have diabetes or not. If they don't know their diabetes status, I continue to ask them about DM-related symptoms and eventually test them for diabetes. [Yes, DM affects the body's resistance and is the cause of TB; and according to the national TB guideline, people with DM are identified as a key population for TB]. [As far as I know, there is no mandatory screening of TB patients for DM]" (KII, Health Centre).

However, the International Union Against Tuberculosis and Lung Disease (Lin et al 2019:2020-11), the National Framework for Joint TB-Diabetes Collaborative (Ministry of Health and Family Welfare Government of India 2017:11-12), and the World Health Organization and the International Union Against Tuberculosis and Lung Disease (2011:19-23) stated that bidirectional screening of tuberculosis patients for diabetes mellitus and diabetes mellitus patients for tuberculosis is mandatory for the integration of tuberculosis and diabetes mellitus health services.

A study in Karachi, Pakistan, demonstrated mandatory bi-directional screening for TB and diabetes, including TB diagnosis, DM screening and TB-DM treatment in their integrated health care programme (Basir, Habib, Zaidi, Khowaja, Hussain, Ferrand & Khan 2019:1-9). This helps in early detection, treatment and control of TB in patients with diabetes and diabetes in patients with TB. Another study from Myanmar recommends urgent improvement of bi-directional screening services for TB and diabetes in the country's health programmes to prevent and control the co-morbidity of the TB and diabetes epidemic (Soe, Soe, Satyanarayana, Saw, San & Aung 2020:19);

and a study also found that bi-directional screening for TB and diabetes in integrated health services prevents loss to follow-up in Malawi (Nyirenda, Wagner, Ngwira & Lange 2022:1-12). Routine screening and management of DM in TB patients has also been reported from Eswatini, Southern Africa (Williams, Vos-Seda, Haumba, Mdluli-Dlamini, Calnan, Grobbee, Otwombe & Klipstein-Grousch 2023:1605551).

Furthermore, studies by Nyirenda et al (2022:1-12) from Malawi, Almossawi et al (2019:329) from South Africa, and Arini et al (2022:1-22) from Indonesia have demonstrated the detection and management of TB in patients with diabetes mellitus, as well as the detection and management of diabetes mellitus in patients with TB, as a strategy for integrating the two diseases.

However, a study from northern India found poor implementation of bi-directional screening for TB and diabetes, combined with inadequate staffing, training and supplies for DM diagnosis (Majumdar, Wilkindo, Rinu, Maung, Bachani, Punia, Jain, Yadav, Jarhyan, Mohan & Kumar 2019:3-10). Another recent study from India also demonstrated mandatory and aggressive detection and bi-directional screening and management of DM in patients with comorbid TB and diabetes, as well as training and supervision of frontline health workers (Vaishya, Misra, Vaish & Singh 2023:1-10). However, delays in provision of screening patients for TB and diabetes, fear and stigma of TB, poor collaboration between TB and DM units, and uneven funding for screening services have been reported as challenges to the provision of bi-directional screening for TB and diabetes in Ghana (Salifu & Hlongwana 2020: e0235914).

Bi-directional screening for TB and diabetes is of paramount importance and improves TB and DM care and prevention (Sannithi, Singh, Angali, Prasad & Sureka 2022:16-21). The implementation of screening of TB patients for diabetes and diabetic patients for TB has been recommended in the national guidelines for the management of TB, DR-TB and leprosy in Ethiopia since 2017 (Federal Democratic Republic of Ethiopia Ministry of Health 2017:121). Thus, our study explored bidirectional screening for TB and diabetes, which is poor and that can impose the integration of tuberculosis and diabetes mellitus in the existing health system.

Sub-theme 1.4: Lack of collaboration between NTP and NCDCP

All informants strongly described the lack of collaboration between national tuberculosis and non-communicable disease prevention and control programmes at national, regional and health facility levels. Most respondents described diabetes patients as being at high risk of tuberculosis infection because DM patients with and without tuberculosis infections receive follow up services in the same room. Few respondents added that the lack of collaboration between the two programmes has a direct impact on patient outcomes and service quality.

One male public health expert expressed that:

> “I have been working as the Deputy Director of the National Tuberculosis Control and Prevention Directorate at the Ministry of Health for over four years. At the end of each budget year, we evaluate the performance of the national tuberculosis control and prevention programme with all stakeholders, including the donors supporting the TB control programme. Prevention and control of HIV co-infection with TB is one of the key areas in the performance evaluation. And at the end, we will set the New Year’s plan for tuberculosis prevention and control. But so far there is no joint programme for prevention and control of non-communicable diseases that aims to work together between the two programmes” (KII, FMoH).

Another male public health expert added that:

> “Nowadays our health facilities are overwhelmed by major non-communicable diseases such as cardiovascular diseases (CVDs), chronic respiratory diseases (CRDs), diabetes mellitus, and various types of cancers; and we are working hard on these major diseases at all levels of the health system. As far as I know, there is no plan to collaborate with programmes for the prevention and control of non-communicable diseases” (KII, Sub city health bureau).

Another female health officer said:

> “I have experience of a TB patient who was on DOTS for over four months, whose smear remained positive at the second and third months of DOTS, and I start to re-assess him and he disclosed to me that he is diabetic and taking the diabetic medication for over five years. Then, I referred him to his attending DM physician and his anti-TB medications were extended to eight months” (KII, hospital).

Another physician further added that:

> "One of my diabetic patients developed active tuberculosis during his DM follow-up and I referred him to a health centre for tuberculosis treatment. So he is currently receiving TB treatment from the health centre and DM treatment from our hospital" (KII, hospital).

The findings are consistent with previous studies from Ghana (Salifu & Hlongwana 2021:1-6), Ethiopia (Workneh et al 2016b:1-11), and South Africa (Almossawi et al 2019: 329), which indicates that health policies are skewed towards communicable disease control and prevention rather than integration with non-communicable diseases. However, study conducted by (Lin et al 2019:85-91) indicates that the goal of collaboration in tuberculosis and diabetes mellitus health service is to avoid unnecessary duplication of service delivery structures and promote optimal and coordinated use of scarce health resources.

In addition, studies stated have found that people with co-morbidity often interact with different professionals, organisations and departments, so it is important to ensure a smooth and monitored transitions throughout the care process (Brown, Moore, MacGregor & Lucey 2021:10-14; Stoop et al 2020:1-16; Bartels et al 2018:153-164; World Health Organization 2015b:1-25). Continuity is identified to as a key factor in fostering good relationships between people with co-morbidity, professionals and informal caregivers (Corbett, Lee, Cummings, Calman, Farrington, Lewis, Young, Richardson, Foster & Bridges 2020, 2022:4823-4833; Meranius & Hammar 2016: 91-98).

Moreover, a study by Raus, Mortier and Eeckloo (2020:1-9) showed that the collaborative care has the potential to improve patient care and public health, reduce health care costs, and improve the experience of health care workers. Another study by Mwangi, Bascaran, Gichuhi, Kipturgo, Manyara, Macleod, Moorman and Foster (2022: 4-11) showed that collaborative health services can fill gaps in health care and prevent disease complications. In addition, collaborative health programmes ensure greater cost-effectiveness of health services, improved quality of care and better health outcomes (Amelung, Stein, Sulter, Goodwin, Nolte & Balicer 2021:7). It also increases patient satisfaction, improves the quality of care and enables access to health services (Baxter, Johnson, Chambers, Sutton, Goyder & Booth 2018:1-13).

In this regard, our study showed that the lack of collaboration between the NTPs and the NCDCPs poses challenge in integrating TB and diabetes mellitus health services into the existing health care system.

Sub-theme 1.5: Well-established referral system for the continuity of care

Despite the drawbacks mentioned above, health services for TB and diabetes mellitus patients are available independently. Almost all informants in this study stated that health services for both DM and TB are available in all hospitals and health centres.

One female medical practitioner added:

> “If we have patients, either diabetics or tuberculosis, who need especial and advanced services like endocrinologists and pulmonologists or other infectious disease specialists, there is a strong referral system in our health system and we refer them without any bureaucracy” (KII, hospital).

Another male public health further added:

> “For those with the complex disease and who a need specialist for further diagnosis and management; we refer them directly to our catchment area referral centre” (KII, health centre).

Another female nurse added that:

> “In Addis Ababa, except a few health centres, all of them do not have GeneXpert and drug sensitivity testing. When the health centres have demand for these tests, they can send either the patients or their samples directly to their referral testing centres” (KII, RHB).

Our study showed that there is a well-established referral system in the existing healthcare system, which aimed to ensure the continuity of patient care at all levels of healthcare. This finding is consistent with the study conducted by Hort, Gilbert, Basnayaka & Annear (2019:7-8), who described the referral system ensures the continuity of the care for patients by sending them to the next healthcare level for the advanced services or skills. Another study conducted by (Sears, Andersson & Cann 2016: 610-625) from Malawi showed that the availability of the referral system is the mechanism that ensures the availability and continuity of the health services.

In contrast, a scoping review conducted by (Seyed-Nezhad, Ahmadi & Akbari-Sari 2017:4364-4375) from Iran showed that technology (electronic referral, coordination, response, and feedback), process (effectiveness and efficiency), organisational (management, policy and planning, rules and regulations) and patient-centred individual (insurance coverage, social capital, transportation, awareness, attitude, satisfaction and social influence) are factors that affect the effective implementation of the referral system.

According to Nakayuki, Basaza and Namatovu (2021:33-44), human and financial constraints, non-compliance with the referral system and poor communication were the major challenges affecting the referral system in low and middle income countries (LMICs); and also a cross-sectional study (Guddu & Demissie 2022: 205031212210894) from central Ethiopia, Addis Ababa, found that ineffective communication among health facilities, health workers experience with the referral system, and the health facility's coordination status in accepting referrals were the main barriers to the referral system. Similarly, according to Auschra (2018:1-14), poor communication between the healthcare facilities can hinder assistance, for instance, by hindering the necessary transfer of knowledge and exchange of information. Furthermore, a lack of communication can lead to ambiguity regarding responsibilities and goals of collaboration.

In addition to that, a study conducted in the south-eastern Amhara region of Ethiopia reported that the unavailability of the healthcare system for the continuity of care of patients with diabetes mellitus. The discrepancy for this may be due to the geographical difference as the current study was conducted in the capital city of the country, Addis Ababa, which has better access to health services than the other regions of the country. In this regard, our study showed the well-established referral system for the continuity of care for patients with diabetes mellitus. This is a golden opportunity to integrate DM services into the existing TB or TB/HIV collaborative services.

Theme 2: Healthcare workforce

The health workforce refers to all people who provide or assist in the provision of health services in health facilities, and includes health professionals working in the health sector, in other sectors and across health sectors. The health services that aim to improve the health of people, which includes different areas of health system such as curative, preventive and rehabilitative care services, as well as health education, promotion and research (World Health Organization 2010:38).

In this study, almost all informants confidently explained how the health workforce in the existing health system provides services to patients with tuberculosis and diabetes mellitus. They described the health workforce in three sub-themes, namely, 1) inadequate knowledge of health workers about TB-DM care, 2) lack of training in TB-DM care, and 3) inadequate health workforce to integrating diabetes mellitus and tuberculosis in the existing health system.

Sub-theme 2.1: Inadequate knowledge of health workers about TB-DM care

Adequate knowledge of TB-DM management among health care workers is essential to optimise the quality of care for patients with TB-DM. However, most participants have inadequate knowledge about TB-DM. They said that there is no training to update health workers with current knowledge about TB-DM care.

Another female nurse reported that:

> "Nowadays, it is not uncommon for health workers to see TB patient's comorbid with diabetes and diabetes patients with TB in our health centre, which requires a strategy as well as special training for health workers to manage these conditions. The existing health system should have to update the knowledge of the health workers on diagnosis, management and prevention of this disease. For me, it's difficult to manage TB patients co-morbid with DM or DM with have TB with the current knowledge" (KII, Health Centre).

As one male physician similarly said that:

> "Healthcare workers do not receive on-the-job training on diabetes mellitus management and prevention; they rely on knowledge acquired during pre-service training. As a result, DM patients are not properly diagnosed and managed by health workers. In contrast, the TB programme provides training for health workers on the latest knowledge and information on tuberculosis" (KII, Hospital).

Further still, another male physician added:

> "We don't have trained health workers on DM or TB-DM. Patients with the co-morbidity of tuberculosis and diabetes mellitus should receive quality health services from trained and skilled health workers such as endocrinologists and infectious disease specialists because these patients may have other health

needs. But when we come to the reality on the ground, almost all DM patients at health centre level receive their services from untrained/unskilled nurses and health officers. In contrast, TB patients receive services from trained and skilled nurses and health officers" (KII, hospital).

A consistent finding was reported by the study conducted by (Arini, Sugiyo & Permana 2022:1-22), which showed that poor knowledge of health workers was a challenge for the integration of DM into the TB control programme; and a rapid situational analysis conducted in Makati City, Philippines on the co-morbidity of TB and diabetes explored the inadequate knowledge level of health workers (Baja, Lansang, Alejandria, Castillo-Carandang, Itable & Serrano 2014:9).

In contrast, the study by Leijten et al (2018:12-22), which explored the need for professional training and development as critical for the integration of patients with co-morbidities into health services, can be further divided into soft skills (such as communication, teamwork, willingness to change and promoting self-management) and managerial skills. Managerial skills such as training as a case manager, conducting assessments, navigating the health and social care system, working with individualised care plans and knowing how to risk stratify to ensure that care is tailored to complexity, are crucial for the implementation of health services integration for patients with comorbidities (Heide, Snoeijs, Quanttrini, Struckmann, Hujala, Schellevis & Rijken 2018:36-43; Leijten et al 2018:12-22).

By the same token, a study by Litchfield et al (2022:777-785) explored that the use of knowledgeable, skilled, motivated and accountable health workers within the health system facilitates the delivery of integrated health services to the population; and also to improve the provision of skilled care and services for patients with co-morbidity, the health system should also capacitate the skills and decision-making abilities of health workers (Aramrat et al 2022:e36); and a study by Adespin et al (2019:78) reported that routine training for health workers improves their skills and capacity for TB and diabetes mellitus service integration.

In contrast, a good knowledge level towards TB and diabetes health service integration was reported from Semarang, Indonesia (Adespin, Julianti, Utami, Wulandari & Nugraheni 2019:78). Therefore, this study showed that the knowledge of health care workers on TB-DM care is insufficient. This can be the challenge for the integration of diabetes mellitus and tuberculosis in the existing health system.

Sub-theme 2.2: Lack of training for TB-DM care

Almost all respondents seemed to describe a lack of training in diabetes mellitus and diabetes–tuberculosis co-morbidity care. Only one medical practitioner remarked that he had attended diabetes mellitus case management training once in four years. This can impose the integration of diabetes mellitus services on the existing tuberculosis control programme.

Another male public health expert added:

> "I have been working as a TB programme expert in the regional health office for over 15 years. We have trained dozens of health workers in case management and prevention and control of TB or TB/HIV. In contrast, there are no trainings in DM and TB-DM care" (KII, RHB).

Another female nurse also reported that:

> "I have been working as a TB focal person for over six years; and I have attended a three-day orientation on co-morbidity of tuberculosis and diabetes mellitus by the Ministry of health of Ethiopia. [I am the only one who attended this orientation; no one has received any training on DM or TB-DM care from this health centre]. I work alone here in the TB DOTS unit; and usually I am forced to interrupt the DOTS unit services when I have other duties such as seminars, trainings or family problems. [Even I couldn't take my annual leave]" (KII, health centre).

Another female medical practitioner reflected:

> "I have been working as a medical practitioner in adult OPD and IPD for more than five years. To be honest, I have been working on the basis of my pre-service level knowledge; I haven't attended any training on NCD and DM care" (KII, hospital).

Another male medical practitioner said:

> "I had the opportunity to attend the five-days training on diabetes mellitus case management by Ministry of Health of Ethiopia. I learnt a lot and got a lot of updates on the national as well as global pictures of diabetes mellitus and I really appreciate those who are coordinating this training" (KII, hospital).

Consistent findings have been reported from South Africa (Almossawi et al 2019:329), Ethiopia (Workneh et al 2016b:1-11) and Indonesia (Sulistiyani, Ginandjar, Nugroho, Kristini, Rianto & Handayahi 2019) explored that lack of training on tuberculosis and diabetes mellitus management was the challenge of integrated health care for patients with tuberculosis and diabetes mellitus; and also to improve the skills and capacity of health workers in TB and diabetes integration, the role of routine healthcare workers training is suggested (Adespin et al 2019:78). Therefore, this study explored the lack of training in TB and diabetes mellitus care for health workers, which may impose TB and diabetes mellitus health care integration.

Sub-theme 2.3: Inadequate health workforce

Most respondents remarked the shortage of health workers in both tuberculosis and non-communicable disease prevention and control departments. Few of them added that they couldn't get their annual leave because there were no health workers to cover their duties.

One female nurse said:

> "I have been working as a TB focal nurse in this health facility for more than five years; and we have a lot of TB patients on DOTS. I am the only nurse trained in tuberculosis case management, prevention and control; and I have been working alone in this unit since I was assigned as a TB focal nurse. I haven't been able to take my annual leave. To your surprise, when I go for training or I face family problem, I couldn't get anyone to replace me in the DOTS unit" (KII, health centre).

Another health officer reported that:

> "We have three adult OPDs for non-communicable diseases including diabetes mellitus in our health centre and in each department there are three health officers and one assistant nurse. Other departments in our health centre have an annual rotation from one department to another. But this kind of rotation doesn't affect the NCD department because of the lack of experienced health workers" (KII, health centre).

This finding is consistent with the study conducted by (Koya, Lordson, Khan, Kumar, Grace, Nayar, Kumar, Pillai, Sadasivan, Pillai & Abdullah 2022:104-112; World Health Organization 2022:4; Salifu & Hlongwana 2021b:1-11; Shayo & Shayo 2021: e0254349; Sulistiyani et al. 2019; Rajan 2018:41-43) have shown that inadequate health workforce is the challenge for integrating tuberculosis and diabetes mellitus health services. However, a study by (Arini, Sugiyo & Permana 2022b:1-14; Joshi, Behera, Luca, Tanna, Ameer, Yakubu & Praveen 2022:512; Workneh et al 2016b:1-11), health workforce was not the challenge for tuberculosis and diabetes mellitus integration.

Research has shown that organisational level workforce planning is needed, including attention to workload and adequate team resources, professional education, and sustainability of staff and informal caregivers for integrated health services (Leijten et al 2018:12-22). Increasing pressure on the traditional workforce and the need to contain costs is driving the need to explore new professional roles or task shifting to specially trained professionals (World Health Organization 2015c:15). Thus, this study explored the inadequacy of the health workforce in the current health system. This may pose a challenge to the integration of health services for patients with TB and diabetes mellitus.

Theme 3: Healthcare leadership and governance

As the health system is a complex and dynamic issue, health leadership and governance is a priority (Figueroa, Harrison, Chauhan & Meyer 2019:1-11). The World Health Organization (2010:100) states that leadership and governance ensures the existence of a strategic policy framework combined with effective oversight, coalition building, regulation, attention to the system and accountability. The role of leadership and management in healthcare includes organisation, planning, administration, implementation, budgeting and analysis (Desta, Abitew, Beshir, Argaw & Abdlkader 2020:1-15; Thukral & Madaan 2017:107-110); and it also creates the means to apply and achieve organisational goals in a professional manner (Dean & Dean 2020:9-27; Thukral & Madaan 2017:107-110).

In this study, almost all informants described health leadership and governance in the study area in different ways. Most respondents described the existing health system in a negative way in terms of integration of health services for TB and diabetes mellitus patients, and only a few respondents defined it in a positive way. In general, they described the existing health system in terms of four sub-themes, namely 1) lack of attention TB-diabetes care, 2) lack of accountability, 3) lack of coordination system for TB-DM care and 4) perceived interest of health workers in integrating TB and diabetes mellitus services.

Sub-theme 3.1: Lack of attention to TB-DM care

Almost all informants agreed that TB-DM is a neglected disease, although the number of cases increases from time to time. There are no updated clinical guidelines and no training in the management of TB-DM patients in all health facilities. The attention given to TB-DM in the existing health system is minimal. As a result, there is no consistent way for health workers to diagnose and manage diabetes in different health facilities. In contrast to the drawbacks mentioned above, all respondents noted that there is a strong and consistent political commitment to support TB programmes within the existing health system. Similarly, there was a consensus among respondents that political leaders and health managers at all levels would be committed to supporting DM services if they were integrated into existing TB control or TB/HIV services.

One male Physician said:

> "Unlike TB and TB/HIV diseases, there are no guidelines or treatment protocols for TB-DM patients to refer to. As a result, we have been diagnosing and treating TB-DM patients based on our experiences and justifications" (KII, hospital).

Another male medical practitioner added that:

> "I have participated in different types of training programme such as TB, TB/HIV and NCDs prevention and control. Except for TB and TB/HIV, other trainings including DM do not have updated standardised training materials and guidelines" (KII, hospital).

One male public health expert added that:

> "Today, TB is one of the identified priority public health problems in Ethiopia. As a result, TB is the focus of government attention as it is one of the targets of the Health Sector Transformational Plan II (HSTP II). Various efforts are being made to achieve the HSTP II targets related to TB. The integration of DM into the existing DOTS structure can be welcomed by the government as one of the efforts to reduce the TB burden" (KII, RHB).

This is supported by the study conducted by (World Health Organization 2022:4; Workneh et al 2016b:1-11), which showed poor attention given from the government leadership can impose the integration of tuberculosis and diabetes mellitus healthcare services in the existing healthcare system.

Sub-theme 3.2: Lack of accountability

Most of the informants strongly agreed that the health manager is responsible for all health activities in the health facility. The health facility manager is responsible for organising training for staff working in TB and TB/HIV clinics, and for requesting and collecting registration and reporting tools through the established health system. Almost all informants noted that all TB and TB/HIV reports were signed and sent to the next level with his/her full approval. In contrast, healthcare managers do not have kind of responsibility for TB-DM care in all health facilities at all levels. This imposed the integration of DM into the existing TB control programme or TB/HIV collaborative.

One male public health expert witnessed that:

> “We conduct supportive supervision, mentoring and catchment area meetings for TB and TB/HIV prevention and control in every quarter of the year; usual project plan, we conduct the annual review meetings with the programme investigators, programme officers, experts, clinicians and all stakeholders; to assess the annual work performance, share the good lessons, identify the challenges and set the future directions. In my experience, diabetes care and its impact on the TB control programme was never on the agenda of the meetings” (KII, RHB).

Another nurse still added that:

> “Our health facility, the health centre, the known health centre by providing care for tuberculosis patients for a long time with a high load of TB patients. There are also TB patients with co-morbid diabetes mellitus. I report all the TB and TB/HIV patients on follow-up and new cases on a monthly basis for the Sub City TB programme officer. Personally, I have often raised questions to the sub city TB programme officer as well as the health centre manager about the reporting mechanisms of TB/DM patients and their treatment prognosis, as many of them took a long time, about four months, to become smear negative and some of them developed drug resistance to the first-line anti-TB drugs. But nobody can answer my questions” (KII, Health Centre).

This finding is supported by a study conducted by (Bhat, Esawarathasan, Jacob, Poole, Sapaetharan, Sidhu & Thomas 2022: e049296), who explored that the lack of accountable health leaders to assess and learn from existing policy pitfalls and translate published evidence into policy action is a challenge for health service integration.

Similarly, a study (Tello & Barbazza 2015:14) stated that the role of health leadership and governance is to coordinate the process of clinical and non-clinical health service delivery mechanisms for people with co-morbidity by involving health workers, health managers, administrators and clinical providers, as well as patients, family members and other caregivers.

In contrast, Best (2017:302-309) pointed out that the responsibility of health leaders is to organise shared training and facilitate holistic work activities in the health system is an opportunity for health service integration. Furthermore, a study by Litchfield et al (2022:777-785) indicated that the role of leadership and governance in health care is to ensure the existence of strategic policy frameworks and institutional oversight that shape the service delivery. This includes regulation, institutional design and accountability for people living with co-morbidities. Another study (Raus et al 2020:1-19; Tello & Barbazza 2015:14) recognises that the comprehensive design of health policy, direction, structure of institutional arrangements, design of implementation programmes, and strategies for patients with comorbidities are the primary tasks of health care leadership and governance.

Sub-theme 3.3: Lack of coordination system for TB-DM care

All informants noted that there is strong coordination for TB and TB/HIV control programmes in all health facilities at all levels; and similarly, all respondents strongly agreed that all health facilities have a TB focal person who is responsible for managing and coordinating TB and TB/HIV control activities. In contrast, DM does not have a coordinator/focal to facilitate DM prevention and control activities in all health facilities. Therefore, the integration of DM care with the TB control programme can be challenged on the existing health system.

One male public health expert said that:

> “Today, the co-morbidity cases of tuberculosis and diabetes mellitus are obvious. We have both TB and DM/NCD clinics in almost in all health facilities, providing independent services for both TB and DM patients within the existing health system. For me, it’s easy and possible to integrate services for TB and DM patients, but there is a poor coordination system in almost all health facilities” (KII, RHB).

Another one medical practitioner added that:

> "I haven't heard of a DM or NCD focal point, but as far as I know we are all responsible for providing health services. I think it's better if there is a responsible person who coordinates the DM/NCDs services because currently we have dozens of patients with DM and also she/he helps us to know the burden of DM with TB at health facility level" (KII, hospital).

The study showed that the availability of a coordinator, including the multidisciplinary team (MDT), for patients with comorbidities is a cornerstone that makes the health service process more robust and decisive in optimising treatment and improving the quality of care for patients with comorbidities (Abukar, Ramsanahie, Martin-Lumbard, Herrington, Winslow, Ahmed & Thaha 2018:1057-1061; Flanagan, Damery & Combes 2017:1-11). For people with co-morbidity, multidisciplinary teamwork across the boundaries of health, social care and volunteering (World Health Organization 2018c:40-48). It is important to recognise that multidisciplinary teams need to be tailored to the target population and situation, and that effective teamwork takes time; and a key aspect of effective teamwork is good communication between those involved in the process (Al-Rawee, Barhawi, Alsabee & Al-Fathy 2022:2278-2294). Clear roles and responsibilities for all individuals, including those with comorbidities themselves, are therefore desirable. Having a designated coordinator is considered important (Al-Rawee et al 2022:2278-2294; Leijten et al 2018:12-22; Kirst, Im, Burns, Baker, Goldhar, O'Campo, Wojtak & Wodchis 2017:612-624).

A patient-centred approach demonstrated the functional availability of the doctor-patient relationship, prioritised health problems and shared decision making, supporting self-management and integrated care for the essential management of co-morbidities at the micro-level of the health system (Aramrat, Choksomngam, Jiraporncharoen, Wiwatkunupakarn, Pinyopornpanish, Mallinson, Kinra & Angkurawaranon 2022:e36). In addition, India's revised national TB control programme demonstrated that strong national coordination is critical for the integrated TB and diabetes mellitus health care system is crucial (World Health Organization 2022:4; Ministry of Health and Family Welfare Government of India 2017). However, in this study, we explored the lack of coordination for TB patients who are co-infected with diabetes mellitus. This finding is supported by a study by Marais & Petersen (2015:14) in South Africa, which identified poor coordination as a barrier to integration of TB and diabetes health services.

Sub-theme 3.4: Perceived interest of health care workers in integrated TB-DM care

Most respondents agreed that integrated TB-DM service delivery is possible within the existing health system, if there are gaps in DM service delivery. They explained that by defining specific roles that each health care organisation can play, integrated TB-DM services can be provided at all levels of public and private health care organisations.

As one male physician said:

> "It is possible to provide integrated TB-DM services at all levels of existing health facilities, including private facilities. TB-DM as well as TB/HIV and DM services can be integrated. It is now very common for many DM and HIV co-morbid patients to present at health facilities for various reasons. DM can therefore be integrated into existing DOTS or TB/HIV collaborative programmes. However, in order to provide quality services to patients suffering from the double burden of TB and DM, several existing problems affecting the provision of DM service need to addressed" (KII, hospital).

One male public health expert added:

> "Regarding integration of health services, we have practical experience in integrating TB and HIV health services. As you know, TB and HIV service integration has a policy including overarching policy documents, coordinators and focal persons at central/federal, regional, zonal, and district levels of the health system including health facilities. TB and HIV control programme has partner organisations that support TB and HIV prevention and control. If TB and DM have such a system, including financial support, it's possible to integrate the service for patients with both diseases" (KII, RHB).

In this study, most of the respondents confidently stated that they were interested in the integrated health services for the tuberculosis and diabetes mellitus patients. This finding is supported by the previously conducted studies (Workneh et al 2016b:1-11) from the Southeast Ethiopia; (Rajan 2018:23-32) from Kerala, India. Thus, this study explored that the perceived interest of health workers in integrating tuberculosis and diabetes mellitus is an opportunity.

Theme 4: Healthcare financing problems

The key role of health financing is to mobilise, accumulate, allocate and manage financial resources to ensure their efficient and effective use for the provision of health services, both individually and collectively within the health system. As health financing is the most important component of health systems worldwide, its effective implementation is critical to achieving universal health coverage and improving health outcomes (World Bank 2019:14; World Health Organization 2010:86). Health financing is essential in low-, middle- and high-income countries because it helps ensure that health services are accessible to all, regardless of their ability to pay; improve the quality of health services by ensuring adequate resources for investment in health infrastructure, equipment, and human resources; and helps contain health care costs by facilitating the efficient and cost-effective delivery of health services (Stenberg, Hanssen, Edejer, Bertram, Brindley, Meshreky, Rosen, Stover, Verboom, Standers & Soucat 2017:e875-e887; World Health Organization 2010:72-72). However, in this study, most respondents described the health financing system of the existing health system for integrating TB and diabetes ways. Most informants described the financing system in a negative way, and only a few respondents described it in a positive way. All respondents described the health care financing system using two sub-themes, namely 1) lack of financial support for TB-diabetes care, 2) inability of patients to pay for diabetes mellitus services to integrate TB and diabetes mellitus into the existing health care system.

Sub-theme 4.1: Lack of financial support for DM care

Almost all informants assertively described the lack of a financial support system for diabetes patients in the existing health system. In contrast, all health services for tuberculosis patients are exempted and there is a financial support system in all health facilities.

One male public health expert said:

> “At national level, TB, HIV and TB/HIV services are exempted and their services are supported by donors; but diabetes mellitus patients use out-of-pocket payment system for all services received” (KII, FMoH).

In contrast to the problems described above, informants reported that there was no problem with the supply of TB services. The Ethiopian Pharmaceutical Supply Agency

(EPSA) supplies TB drugs and reagents to health facilities based on the forecast and consumption reports received from health facilities. Each TB patient receives the prescribed regimen free of charge.

Another male public health expert said:

> "We don't have problems with drugs and reagents for tuberculosis treatment. EPSA brings us all the necessary TB drugs and reagents based on our needs. TB supplies are always available in the health facilities. Every TB patient gets their anti-TB drugs in a kit with their name on it free of charge" (KII, RHB).

This finding is supported by studies conducted by (Salifu & Hlongwana 2020: e0235914, 2021a:1-6; Rajan 2018:49 & Workneh et al 2016b:1-11). In contrast, in the studies by (Arini et al 2022b:1-14; Koya et al 2022:104-112; World Health Organization 2022:3-4 & Salifu & Hlongwana 2021b:1-11), lack of financial support was not the challenge for integrating tuberculosis and diabetes mellitus health services. This is because integrated tuberculosis and diabetes mellitus care had limited support.

Due to the lack of financial support and allocated resources for integrated tuberculosis and diabetes care, all health facilities in the existing health system are providing tuberculosis and diabetes mellitus care. Tuberculosis diabetics had to buy insulin and insulin injections and also needed special diets, for which there was no additional financial support beyond that provided for tuberculosis patients. Therefore, this study explored the lack of financial support for tuberculosis diabetics. This can impose the integration of tuberculosis and diabetes mellitus health services into the existing health system.

Sub-theme 4.2: Patients' inability to pay for DM care

All respondents mentioned that DM patients have financial constraints for both diabetes medications and point - of - care testing services, such as random or fasting blood glucose testing services. Some of the respondents added that DM patients are forced to cease taking their medication and missed follow-ups due to lack of money to buy DM medication, transportation and follow-up fees.

As one female public health officer said:

> "There is a user fee for DM services. Almost all of our DM patients are requested to pay out-of-pocket for the services they received. Only

underprivileged patients who have a certificate are exempted from the payment at government health facilities; and this may affect the integration of tuberculosis and diabetes mellitus health services" (KII, RHB).

One male physician stated that:

"After a month's follow-up, one of my diabetic patients came to my office in the hospital and said: […Doctor, I haven't taken the medication you prescribed for me in the last month, and I have also skipped my blood sugar test because […it's too expensive], and I can't afford this money" (KII, hospital).

In contrast to, a study outlined that the role of health finance, at micro(facility) level is to ensure that individuals and households have access to affordable and quality health services without financial hardship, and that health systems are designed to meet people's health needs, both individually and collectively, including basic financing and incentives (Litchfield et al 2022:777-785). Similarly, payment and reimbursement for interventions, even in person-centred integrated care programmes, must be generous enough to ensure equitable financial access for those in need. Payment structures must also ensure that professionals have sufficient time to work with people with co-morbidities and informal caregivers (Leijten 2018c:12-22). These out-of-pocket costs can impact access, [non-]compliance, and the nature of and content of care, so consideration should also be given to co-payments, co-insurance and deductibles for covered services, as well as the level of direct payments. Financial incentives can be used to motivate people with co-morbidity to participate in and adhere to integrated care programmes (Savitz & Bayliss 2021:980-989; Leijten 2018d:12-22; Tsiachristas 2016:1-4).

Another male physician further added that:

"I know that one of my TB-DM patients complained about diabetic medications; and he told me that he couldn't buy insulin and insulin syringe. You know what he added recently, you told me that I must be selective in my diet and take the medication regularly as prescribed; also our nurse taught me about the diets recommended and not recommended for diabetics; also high protein diets for some us because we are co-infected with tuberculosis. How can I afford all these things, as you know there is no one to support me, not even for diabetic medications" (KII, Hospital).

This study demonstrated the inability of patients to pay for health services for diabetes mellitus. This may hinder the integration of healthcare services for both diseases in the existing healthcare system. This finding is supported by the previous studies previously conducted by (Workneh et al 2016b:1-11) from southeaster Ethiopia, which showed that inability of patient to pay for diabetes mellitus care was the most prominent challenge in integrating tuberculosis and diabetes mellitus healthcare services; and also another study conducted by (Rajan 2018:49) from Kerala, India found that inability tuberculosis diabetics was the challenge in providing integrated healthcare services.

According to Mclntyre, Kutzin & World Health Organization (2016:1-36), the role of health finance at the meso-level is to manage financial resources for the provision of health services by health care organisations. Healthcare organisations must also ensure that their services are affordable and accessible to all members of the community, regardless of their ability to pay; and healthcare finance managers can also help to develop financing mechanisms, such as insurance schemes and subsidies, to ensure that healthcare services are available to all who need them.

Furthermore, at the macro level, the key function of the health financing system is to ensure the overall financial structure, policies and their implementation at the country level (Mclntyre et al 2016:1-36). In the case of developing countries, including Ethiopia, tax-based health financing is a common approach (Raus et al 2020:1-19). Therefore, this study explored that the inability of the patients to pay for diabetes care was the challenge of integrating tuberculosis and diabetes mellitus healthcare services in the existing healthcare system.

Theme 5: Access to medical products and diagnostic tests

It's imperative for a health system to ensure equitable, scientifically sound and cost effective access to essential medicines, vaccines and technologies of guaranteed quality, safety, and efficacy (World Health Organization 2010:74).

In this study, access to medical products and diagnostic tests for tuberculosis and diabetes mellitus patients is described in only one way. For instance, almost all respondents described access to medical products and diagnostic tests services for tuberculosis control programmes in a positive way. In contrast, most respondents described access to medicines and diagnostic tests for diabetes care as poor. In general, they described the access to medical products and diagnostic tests services for tuberculosis and diabetes mellitus services by using one sub-theme, namely 1) poor supplies for diabetes mellitus care on the existing health system.

Sub-theme 5.1: Poor supplies for DM care

Almost all informants agreed that to achieve sustainable programme implementation, it is very important to ensure that all health facilities involved in the prevention, diagnosis and management of tuberculosis and diabetes mellitus have adequate and uninterrupted supplies of drugs, laboratory reagents, medical supplies and equipment. However, most informants noted that the supply management system for DM care is poor. Almost all informants from health centres expressed that DM patients are challenged by lack of basic diabetic drugs and access to diagnostics; similarly, majority of informants from hospitals also mentioned that DM patients face shortage of drugs.

One male public health officer said:

> "It's clear that access to medical technology has improved from time to time. But based on the number of patients flow, health facilities and demand from the private health facilities, we have shortage of access to DM diagnostics and screening test products like urine ketone, fasting or random blood glucose and glyacated hemoglobin (HbA1C) in all health facilities" (KII, RHB).

One female nurse said:

> "We have patients with co-morbidity of tuberculosis and diabetes in our health facility; interruption of their blood glucose monitoring is common due to lack of glucometer machine and usually I gave their anti-TB medication irrespective of their blood glucose level" (KII, health centre).

Another female health officer reflected that:

> "I have been working as a NCD expert in this health facility for more than six months. Usually our patients suffer from lack of laboratory facilities and first-line diabetes mellitus medications such as oral hypoglycaemic agents (like metformin and glibenclamide) and insulin and I write prescriptions for them to buy from the private retail drug stores or pharmacies" (KII, health centre).

Another male public health expert added that:

> "We have a national standard treatment guideline for health centres which lists all the recommended essential drugs for health centres and usually our request is based on these standards and the case load of the health centre.

> Even when we request drugs based on this standard, the supply is not according to the standards and also not proportional to the cases we are handling” (KII, health centre).

In contrast, almost all informants strongly agreed that there is a well-established supply chain management for tuberculosis control programme.

As one female nurse said:

> “We have a well-established supply management system for tuberculosis control. Every TB patient has a TB patient kit labelled with the patient’s name. TB patient kit is a pre-packed container containing the full course of anti-TB drugs needed to treat a single patient” (KII, health centre).

Another male public health expert:

> “There is no problem with TB diagnosis. We have access to AFB and GeneXpert tests including their reagents in our health centre and our health centre is linked to the Yekatit-12 comprehensive hospital through a referral system for radiological examinations and other advanced diagnostic tests that are beyond the scope of the health centre” (KII, health centre).

Also another male public health expert added that:

> “Also for those TB patients who need drug resistance tests including multidrug resistance such as TB culture and drug sensitivity test (DST), we use either the Addis Ababa regional laboratory or the national laboratory through the referral system” (KII, RHB).

Therefore, this study explored the poor supply management system for diabetes mellitus prevention and control. This can impose the integration of diabetes mellitus with the tuberculosis control programme in the existing health system. A consistent finding is reported by (Letta, Aga, Yadeta, Geda & Dessie 2021: 4335-4349; Shiferaw, Letebo, Misganaw, Feleke, Gelibo, Getachew, Defar, Assefa, Bekele, Amenu, Teklie, Tadele, Taye, Getnet, Gonfa, Bekele, Kebede, Yadeta, Gebremichael, Challa, Girma, Mudie, Guta & Tadesse 2018) from Ethiopia, (Rawal, Kande, Biswas, Tanim, Poudel, Renzaho, Abdullah, Shariful & Ahmed 2019: e029562) from Bangladesh, found that inadequate supply of diabetic drugs and laboratory reagents were the prominent challenges in diabetic care.

In contrast, a study from South Africa by (Almossawi et al 2019:329) revealed that availability of medicines and point-of-care diagnostics were the enablers of the tuberculosis and diabetes mellitus health service integration. Therefore, the poor supply of DM care can be a challenge for the integration of diabetes mellitus and tuberculosis in the existing healthcare system.

Theme 6: Health information and research

One of the major challenges in healthcare is the proliferation and diffusion of fragmented health information systems and the large volumes of data generated by growing heterogeneity of patient data. A health information system (HIS) contains healthcare data and concepts used by patients to improve healthcare management. The four main HIS functions, such as data generation, compilation, analysis and synthesis, communication and utilization, are used as a basis for decision making (Shahmoradi & Habibi-Koolaee 2016:1096-1097).

In this study, almost all informants described the health information and research system in a mixed way. They used four sub-themes, namely 1) lack of access to health related ICT for diabetes and TB-diabetes co-morbidity care, 2) lack of TB-diabetes mellitus co-morbidity surveillance, 3) availability of evidence on TB-diabetes mellitus co-morbidity, and 4) well-established TB control programme information system for integrating TB and diabetes mellitus services into the existing health system.

Sub-theme 6.1: Lack of access to health related ICT

Information and communication technology is a key component of integrated health care, and its use should be customized to the capabilities of the patients with co-morbidity. Examples of micro-level ICT applications include electronic medical records (EMRs) and patient portals. The literature shows that electronic medical records facilitate the exchange of information between professionals, organisations, patients and informal caregivers (Tahsin, Armas, Kirakalaprathapan, Kadu, Sritharan & Steele 2023:e44035), provide access to patient portals across services (Feger, Crump & Scott 2021:e100376), improve communication (Falconer, Kho & Docherty 2018:2337-2349), exchange of patient clinical data, streamline operations, enhance administration and control, improve decision making and continuity of care (Okemiri et al 2020:235-248; Ramirez, Wu, Ryan, Towfighi & Vickrey 2017:e7106); and for video conferencing between providers (Sinsky, Jerzak & Hopkins 2021:429-437). Electronic health tools or telemedicine can help people co-morbidities to live independently in their own homes with improved remote care facilities (Kronenfeld & Penedo 2021:659-663; Sinsky et al 2021:429-437).

However, all informants clearly described the lack of access to health related ICT for patients co-morbid with TB and diabetes in all health facilities at all levels of the health system. Thus, the lack of a health related ICT can pose a challenge to the integration of TB and diabetes services into the existing health system.

One male medical practitioner said:

> "Nowadays we treat a considerable number of clients with diabetes mellitus every day in our health facilities. Regarding the health information system, I think it's better to say something about how and who collect and compile data on DM services at facility level, which can provide information at the facility level for decision making and planning (e.g. request for drugs and diagnostics). I haven't seen such activities in our hospital, which is very critical" (KII, hospital).

In integrated care services, individual patient-level data must be used effectively in the care process, particularly for the continuity of care. This may include notifying a core team of experts for visits to appropriate departments, sharing drug-related and hospital discharge information with primary care providers and pharmacists (Hong, Siegel & Ferris 2014:1-19). The integration of individual patient data therefore helps to prevent delays in the treatment of patients in emergencies, wrong prescriptions due to misdiagnosis as a result of unavailability of patients history, lack of interoperability of health data and loss of life (Okemiri, Rita, Isaiah, Christian, Christopher & Chima 2020: 235-248). The data collected can be used to predict individual patient risk and contribute to preventive care through early treatment of risk factors (Schulte & Bohnet-Joschko 2022:23).

Another female public health added that:

> "In our health facility, we always submit the total number of DM patients on a monthly basis to our NCD coordinator without disaggregation. For me it is better, if the report should be disaggregated by age, sex and other co-morbidity status because we can use for different types of interventions including the health education. There is no well-organized registration and reporting format" (KII, health centre).

Data ownership and privacy must be considered when information is shared and used by multiple care providers. Networked information systems assume that different professionals and care organisations have access to data at different levels depending on the case. There are also more practical approaches, such as sending experts to provide access to other people's website.

The information collected can also be used for risk stratification at both individual and population levels. Triage systems and predictive modeling can classify patients into different levels of complexity to tailor care and estimate future care needs, for example based on their electronic medical record (EMR) and questionnaire data (Schulte & Bohnet-Joschko 2022:23; Okemiri 2020:235-248; Seyedamini, Riahi, Mohmoudi-Majdabadifarahani,Tabibi & Masoudi-Asl 2018:99-105). Such stratification can also be incorporated into future capacity and budget planning. Today, innovative research in the area of integrated and comorbidities could improve evidence for interventions in complex cases and for future planning (Han & Geum 2022:142-154; Okemiri 2020:235-248; Madanian, Parry, Airehrour & Cherrington 2019:e100071; Prasser, Kohlbacher, Mansmann, Bauer & Kuhn 2018:e57-e65).

One male public health expert reflected that:

> "There are 177 indicators for TB prevention and control with their source document or register; and all registered TB patients' data are entered into the DHIS2 software by Health Information Technicians (HIT) from the HMIS department of the health facilities. Thus, for TB and HIV, all reports are available through the DHIS2 software and also those who are privileged to access of the software can get the detailed information and reports from it. In contrast, DM does not have standardised registration and reporting tools at all levels of the health facilities. Therefore, I think the poor data management of DM services can impose the integration of DM services on the existing TB or TB/HIV collaborative services" (KII, RHB).

Consistent findings from Iran revealed that poor health information management (Valizadeh, Vali, Bahaadinbeigy & Amiresmaili 2019:175) and lack of DM service recording and reporting tools (Valizadeh et al 2019; Ravaghi, Sajadi, Ghotbi, Sarvarizadeh, Shabafchizadeh & Kermachi 2014: 1013-1022) was the barrier for patients to access full care. Furthermore, studies from Yogyakarta, Indonesia (Arini et al 2022:1-22), South Africa (Almossawi et al 2019:329) and south-eastern Ethiopia

(Workneh et al. 2016b:1-11) showed that poor health information management for diabetes and tuberculosis co-morbidity was the barrier for integrating tuberculosis and diabetes mellitus health services.

A study by the World Health Organization (2010:84) found that mandatory data generation and strategic use of information, intelligence and research on health and health systems enable decision-makers at all levels of the health system to identify problems and needs, make evidence-based decisions on health policy and optimally allocate scarce resources to patients with co-morbidities and multi-morbidities. Ellingsen and Monteiro (2018:223-236) stated that the integration of health information system in an integrated care is a therapy to address the fragmentation of services that causes the duplication, inconsistency and redundancy in health service delivery.

Apart from data ownership, privacy should be maintained at the organisation level and data protection laws should be in place when information is shared between different organisations (Prasser 2018:e57-e65). In addition, policies that promote integrated care and research into co-morbidities can benefit innovation, care and ultimately people living with co-morbidities. At the macro (system) level, the health systems have a responsibility to generate and manage data, and to facilitate the analysis and integration that supports evidence-based healthcare provision (Litchfield et al 2022:777-785).

Access to various technologies and medical products enable all aspects of patient management, such as accurate diagnosis and remote monitoring (Litchfield et al 2022:777-785). Given the large number of healthcare providers and care settings involved, an integrated information system accessible by professionals can greatly facilitate communication, person-centred, tailored care and care coordination (Chen, Amaize & Barath 2021:801-811; World Health Organization 2018c; Yoshiura, Azevedo-Marques, Rizewuska, Vinci, Sasso, Miyoshi, Furegato, Rijo, Del-Ben & Alves 2017:1-10). Such shared information systems support continuity of care organizations and throughout the care process (Leijten et al 2018d:12-22; World Health Organization 2018c; Pietrantonio, Orlandini, Moriconi & La Regina 2015:759-765). The use ICT systems by different organizations involved in the care process of patients with co-morbidity emphasizes the need to develop interoperable or linked information systems.

National policies that promote technological development and innovation, particularly ICT and e-health, are more likely to support integrated care for co-morbidity and/or multi-morbidity (World Health Organization 2015a:6-12, 2022b:45-47).

In addition the availability of and equitable access to technologies and effective medical products are important for improving the quality of life of people with co-morbidity as well as multi-morbidity (He, Cao, Liu, Wu & Zhang 2022:1-10; Mariani, Borsini, Cecil, Felix, Sebert, Cattaneo, Walton, Milaneschi, Cochrane, Amid, Rajan, Giacobbe, Sariz, Agusti, Sorg, Herault, Miettunen, Parmar, Cattane, Jaddoe, Lotjonen, Buisan, Gonzalez Ballester, Piella, Gelpi, Lamers, Penninx, Tiemeier, Tottleben, Thiel, Heil, Jarvelin, Parjante, Mansuy & Lekadir 2022: e0245475; Noordman, Heide, Hopman, Schellevis & Rijken 2015).

It is clear that health programmes, like evidence-based decision making at all levels of the health system, need high-quality registries that can be used to assess quality of care, programme effectiveness and service use (Okemiri et al 2020:235-248; Prasser, Kohlbacher, Mansmann, Bauer & Kuhn 2018:e57-e65; Hong, Siegel & Ferris 2014:1-19). However, in this study, almost all informants assertively explored the lack of a health information system for diabetes and TB-diabetes co-morbidity care. Thus, the lack of a health information management system can be a challenge for the integration of TB and diabetes in the existing health system.

Sub-theme 6.2: Lack of TB-DM co-morbidity surveillance

All informants seemed to explain that there is no surveillance system for TB and diabetes mellitus co-morbidity in the existing health system, although most of the informants added that TB-diabetes mellitus case is are not on the list of diseases that we report to the next level of the health system.

One male public health expert said that:

> "As far as I know, there is no surveillance system for tuberculosis and diabetes mellitus co-morbidity cases in national health system. But, we have a strong focus on tuberculosis; and tuberculosis and HIV co-morbidity surveillance system at all levels of health system" (KII, FMoH).

Another one male public health expert said:

> "Nowadays all diseases have a strong surveillance system and we use the International classification of Diseases to register and report the diseases to the Federal Ministry of Health, but the disease is among the list of other diseases, so we do not collect and report it" (KII, RHB).

Another female nurse added that:

> "We register all tuberculosis and TB/HIV co-infected cases on a monthly basis and report them to the next level. In contrast, there is no such system for tuberculosis-diabetes mellitus co-infection" (KII, health centre).

This finding is supported by (Aborode, Hasan, Jain, Okerereke, Adedeji, Karra-Aly & Fasawe 2021:100841) which showed that poor surveillance system leads to poor disease response and loss of lives; and also other studies (Peter & Aighobahi 2019a:1-15; Kozlowska, Lumb, Tan & rea 2018:64-80; Workneh et al 2016b:1-11) showed that poor tuberculosis and diabetes mellitus co-morbidity surveillance system is a barrier to service integration.

In contrast, a well-established disease surveillance system, which is able to define and identify the information of the specific disease, facilitates data management and analysis; and also helps in knowledge translation and dissemination of information to stakeholders (Tello & Barbazza 2015:34); and also the Indian national framework for joint TB-DM collaborative activities (Ministry of Health and Family Welfare Government of India 2017:7-8), and the International Union Against Tuberculosis and Lung Disease guideline on diabetes mellitus-tuberculosis management (Lin et al 2019:76-78) reported that an effective tuberculosis-diabetes mellitus co-morbidity surveillance and monitoring system is key to integrating tuberculosis and diabetes mellitus health care. Therefore, this study explored whether the lack of tuberculosis-diabetes mellitus co-morbidity surveillance can be a barrier to the integration of healthcare services for patients with tuberculosis and diabetes mellitus in the existing healthcare system.

Sub-theme 6.3: Availability of evidence on the burden of TB-DM co-morbidity

Despite the above-mentioned drawbacks, almost all the respondents seemed to state that the availability of both national/local and international scientific evidence on the prevalence and burden of tuberculosis and diabetes mellitus co-morbidity is a positive factor. Most informants reflected that the co-morbidity of tuberculosis and diabetes mellitus affects not only the management of tuberculosis in patients with diabetes mellitus or diabetes mellitus patients with tuberculosis, but also the quality of the life of the patients. Because the public health importance of the TB-DM co-morbidity is underestimated, it hasn't received much attention from health policy makers and other partners involved in integrated care.

As one male public health expert said:

> "Last year we have conducted a facility based assessment to investigate the prevalence of co-morbidity of the two diseases. The result showed that the prevalence of TB-DM co-morbidity among patients attending the health facilities is high and it was more than 7 %" (KII, FMoH).

Another male public health expert added:

> "Currently, the prevalence of TB-DM co-morbidity in our region is higher than ever before. For example, more than 15% of our TB patients have DM. The possible reason for the increasing number of comorbidities may be the increasing number of cases of diabetes mellitus, which affects the immune system and predisposes them to tuberculosis infection, associated with increasing urbanisation and improvement in socio-demographic and economic characteristics" (KII, RHB).

Further still, another female nurse added:

> "I have been working as a TB focal person here in the DOTS unit for more than seven years; and during these years I have not seen any significant cases of diabetes mellitus co-morbidity with tuberculosis. But in recent years, diabetes mellitus has become more common in tuberculosis patients. For instance, we currently have 64 TB patients on DOTS in our health facility and 12(18.75%) of these patients have comorbid diabetes mellitus. This could be due to the change in lifestyle, socio-economic status and the effect of diabetes mellitus on the immune system of the clients, making them more vulnerable to tuberculosis infection" (KII, health centre).

This finding is consistent with the studies conducted by Jerene et al (2022:100306) from Addis Ababa, Ethiopia, Du et al (2021b:1553-1559) from Chain; Sembiah et al (2020:91-96) from India; and Munseri, Kimambo and Pallangyo (2019:4-11) from Dar es Salaam, Tanzania, which found a high prevalence of diabetes mellitus and TB co-morbidity.

Regarding the burden of tuberculosis-diabetes mellitus co-morbidity, some respondents noted that the treatment outcome of patients with TB-DM co-morbidity is unfavourable; some patients may die or other patients may develop anti-TB drug resistance.

As one male public health expert said:

> “I have been working as a non-communicable disease prevention and control expert in this sub city health office for more than five years. During this period, I have seen the co-morbidity of tuberculosis cases on diabetes mellitus patients; and also we had a significant number of diabetes patients who died in our sub city had tuberculosis disease” (KII, Sub-city Health Bureau).

This finding is also consistent with the studies by Desai et al (2021:111), Fonkeng et al (2017:1-13), Gautam et al (2021:1-2) and Ko et al (2017:115-123), which found higher mortality in patients with comorbid tuberculosis and diabetes mellitus than either tuberculosis or diabetes mellitus alone.

Another female public health officer added:

> “There are significant number of patients with comorbid tuberculosis and diabetes mellitus. Of these patients, one third on second line anti-TB drugs and have been referred to St. Peter Specialized hospital. We do not have access to second-line anti-TB drugs here at our health centre. I think diabetes causes them to develop drug resistance for TB because we have no patients who developed drug resistance for anti-TB; they were only TB-DM comorbid patients who developed drug resistance for anti-TB drugs” (KII, health centre).

Consistent findings have been reported by Gautam et al (2021:1-2), Pinto and Carvalho (2019:219-243), and Wu et al (2022:1-9), indicating a higher rate of anti-TB drug resistance in patients with diabetes mellitus patients than in tuberculosis alone. As a result, the availability of evidence on the prevalence and burden of TB-DM is a good entry point for integrating the DM service into the existing TB control programme or TB/HIV collaborative.

Sub-theme 6.4: Well-established information system for TB control programme

All informants confidently explained that the health information and research system of tuberculosis control activities is well established at all health facilities at all levels of the health system. This is a golden opportunity to integrate the diabetes mellitus services into the existing health system of the tuberculosis control programme or TB/HIV collaborative.

One male public health expert witnessed that:

> "Todays, the health information system for tuberculosis is much more robust than ever. There are standardised registration and reporting formats for tuberculosis patients in all health facilities; these registrations can be updated at based on the patient's visit for follow up and medication arrangement/change based on the national tuberculosis treatment protocol. After filling in the hardcopy/registration form, the data is er-entered into DHIS2 software, and then the TB programme expert and those who access the software can get the data as well as the detailed information of the patients treatment" (KII, RHB).

Another female nurse added that:

> "There is regular reporting of tuberculosis patients from the health facility to the next higher level on a monthly basis; also the reporting form is integrated with the existing HMIS reporting system which consists of disaggregated data of both drug susceptible and drug resistance tuberculosis case notifications, treatment outcomes and other important parameters to monitor and evaluate the programme performance" (KII, Sub city Health Bureau).

This finding is consistent with the study conducted by Seyedamini et al (2018:99-105), which showed that well-established tuberculosis health information management is a good entry point for health service integration diabetes. According to Groseclose and Buckeridge (2017:57-79), established health information systems is aim to improve the efficiency and effectiveness of the health system, the roles of health system stakeholders, the analysis and interpretation of surveillance data, approaches to system monitoring and evaluation, scientific rigour and improved outcomes; and also explore the link between the health system and the health security of the nation(Brown, Bridge, Marthini, Um, Williams, Choupe, Ho, Chungong & Kandel 2022:1-17). In addition, a well-established tuberculosis disease information system indicates the burden of the disease, the performance level of the programme. And forecasts the diagnostic and treatment products (Diriba, Kebede, Tola, Alemu, Tadesse, Tesfaye, Mehammed, Meaza, Yenew, Molalign, Sinshaw, Amare, Moga & Sied 2019:1-6). Therefore, this study showed that a well-established tuberculosis information management system is a good opportunity to integrate diabetes mellitus health services into the existing tuberculosis control programme.

6.7 CONCLUSION

In conclusion, Chapter 6 provides valuable insight into the qualitative findings of the study on the integration of TB and DM services. The study shows that the current level of integration of TB and DM within the health system is minimal, indicating the need for improvement.

The chapter indentifies six main themes and nineteen sub-themes that explore the challenges and opportunities for integrating TB and diabetes mellitus into the existing health system. These challenges include a lack of supportive policies, guidelines and collaboration between the NTP and NCDCP, and inadequate knowledge and training of health workers. Financial barriers, limited access to medical supplies and technology, and the lack of a comprehensive surveillance system for TB-DM co-morbidity were also identified as challenges.

On the other hand, the study identified several opportunities for integration, such as a well-established referral system for continuity of care, health workers' interest in integrating TB-DM care, the availability of evidence on TB-DM co-morbidity, and the presence of an effective information management system for TB control.

These findings underscore the importance of addressing these challenges and capitalising on the opportunities identified to improve integration of TB and DM services in Addis Ababa, Ethiopia.By implementing policies, guidelines and training programmes, improving coordination and collaboration, ensuring financial support and strengthening the health information system, the health system can work towards more integrated and effective care for people with TB and DM.

Overall, this chapter contributes to the understanding of the current status, challenges and opportunities for TB and DM integration within the health system, and provides a basis for futher improvments in health care delivery and patient outcomes.

CHAPTER SEVEN

FRAMEWORK FOR INTEGRATION OF TB-DM

7.1 INTRODUCTION

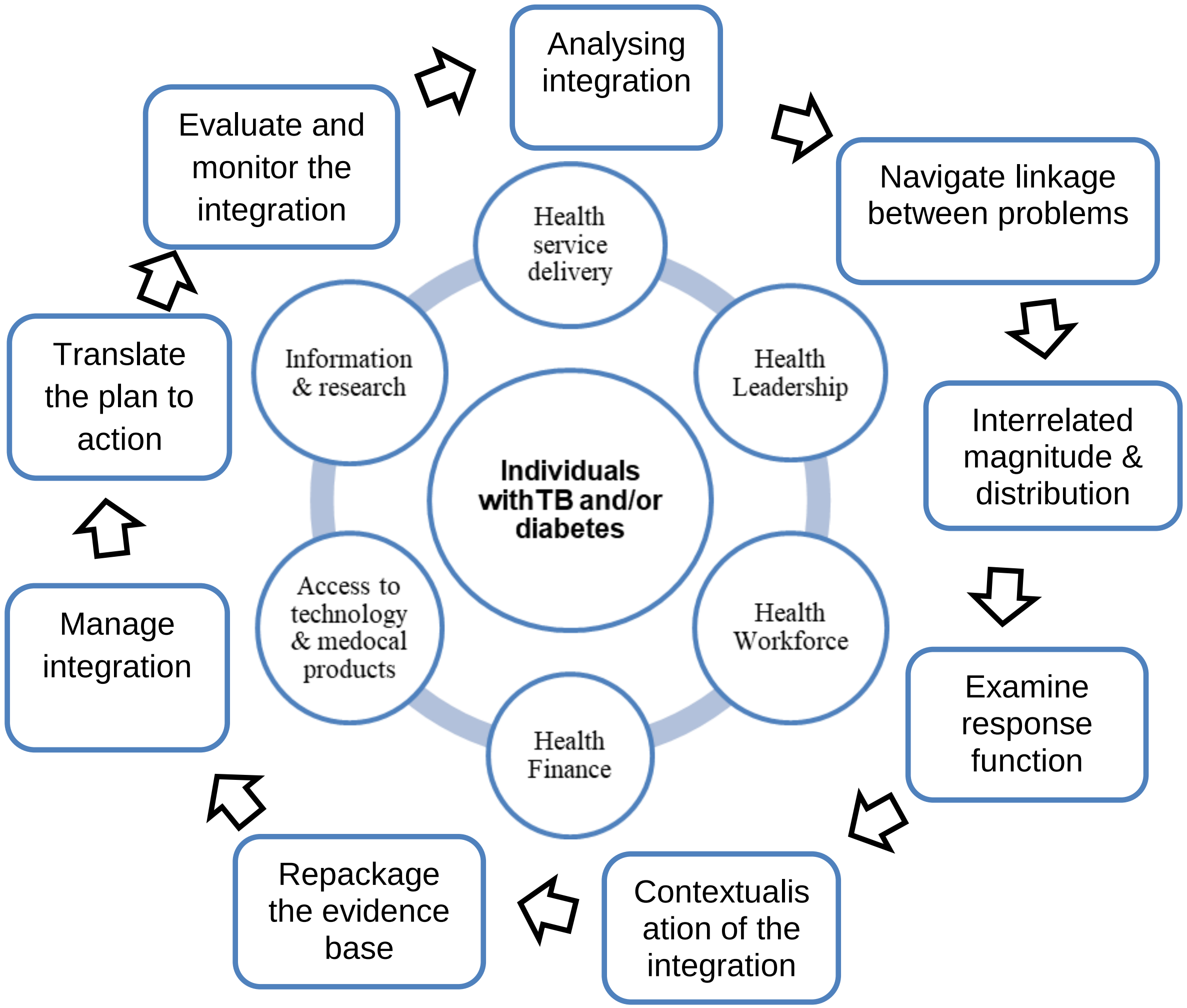
Although there is no consensus on how integrated TB-DM care can be delivered or integrated into existing health systems, the need to address the growing burden of TB-DM comorbidities is increasingly recognised by the global public health community, policy makers and international organisations. To address the growing threat of TB-DM co-morbidity, WHO and the Union launched a “Collaborative Framework for the Care and Control of Tuberculosis and Diabetes” in 2011 (WHO and The Union 2011). This framework made bold recommendations, including policy strategies for routine implementation of regular bi-directional screening for the two diseases (i.e. screening diabetic patients for TB and screening TB patients for diabetes), establishing mechanisms for integration between TB and DM control programmes, providing quality-assured treatment for patients with both diseases, and preventing TB in people with diabetes.

To further support integrated care for TB and DM, the Union and the World Diabetes Foundation developed technical guidelines on TB-DM management in 2019 (Lin, Harries, Kumar, Critchley, Crevel, Owiti, Dlodlo & Dejgaard 2019). The WHO has also recently published a framework for collaborative action on TB and co-morbidities, with DM being one of the five highlighted co-morbidities (WHO 2022c).

7.2 THE SELFIE FRAMEWORK FOR INTEGRATION

Integration consists of a series of steps that integration managers should implement to achieve effective integration of functions. When integration managers use a systematic integration process, there is a greater chance of successful integration than when fragmented and unsystematic integration processes of integration processes are used.

This chapter describes a framework for the process of integrating TB and diabetes mellitus health service functions, using the acronym SELFIE. Each letter in the SELFIE acronym represents a step in the cycle of action that must be completed before moving on to the next step. The nine steps in the SELFIE framework are shown in the figure below.



<u>Underlying Principles</u>

- Interconnected problems need integrated response
- Similarity drives integration, difference drives differentiation
- Integration does not happen in a vacuum
- Evidence is used only when it is in the right form
- Integration management is key to effective integration

Figure 17: Integration framework with 5 principles, 6 action fields and a 9- step action cycle.

As described in Figure 17 above, the resulting framework has five underlying principles, five key processes, six action areas and a nine-step action cycle. These principles, key processes and steps are illustrated in the following sections.

7.2.1 Interconnected problems need integrated response

Key process I: Analyse connection between problems

As with many other management functions, integrating health services for TB and DM begins with an understanding of TB and diabetes and the relationship between them. Syndemic theory and the ecological model help to analyse the connection between TB and diabetes at the population, problem and individual levels. This analysis is important for the overall policy approach.

Step 1: Interrelate the magnitude and distribution of the problem

Correlating the prevalence and distribution of TB and diabetes at the population level is important to identify epidemiological links between the problems. Lessons learned from population-level correlations inform broader policy approaches and priorities. It also highlights the need for more detailed analysis. The prevalence of TB and diabetes may be correlated at specific points in time, over time, in different geographical settings and in different population groups. Cluster analysis, trend analysis and correlation analysis techniques can be used to explore different dimensions of the association between TB and diabetes patterns and trends.

An analysis of the epidemiological overlap between TB and diabetes in developing countries, including Ethiopia, reveals that diabetes is prevalent. A narrative literature review of current studies in Ethiopia shows that diabetes is prevalent among tuberculosis patients (Alemu et al 2021:82-91; Gezahegn et al 2020:3879-3886; Alebel et al 2019:1-10; Damtew et al 2014a:389-396).

Step 2: Navigate the linkage between the problems

At the disease level, analysing the linkage between TB and diabetes and presenting the linkage in a framework is important to better understand the link between the diseases. We have developed a framework to illustrate the analysis of linkage between diseases. This analysis is important for designing intervention packages and developing the content of interventions. The linkage between TB and diabetes has a direct or indirect pathway and is based on both risk and severity.

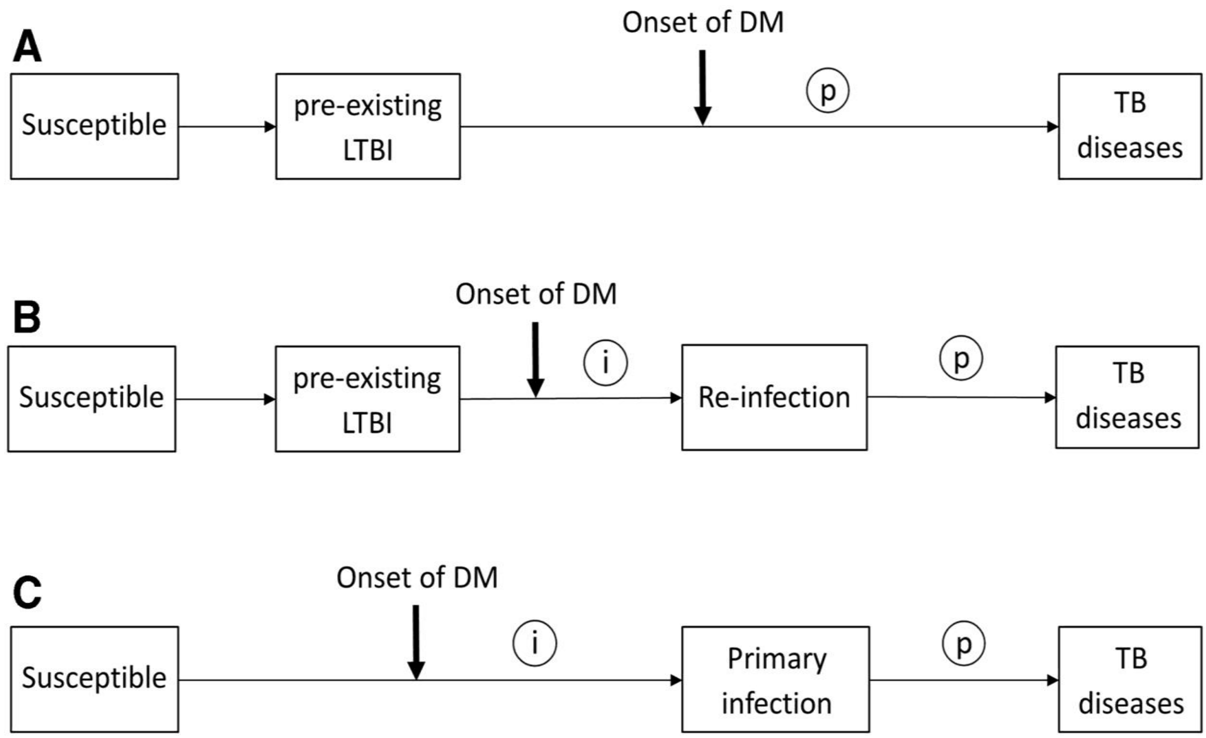


Figure 18: The linkage between onset of diabetes mellitus and the occurrence of tuberculosis infection (Lin et al 2019:e029948).

Key: Circled letters indicate times when DM could possibly affect the pathogenesis of TB (i.e. increased susceptibility to TB infection; p, accelerated progression from infection to clinical disease). (A) Onset of DM with a pre-existing latent TB infection (LTBI). (B) Onset of DM with a pre-existing LTBI, but before reinfection. (C) Onset of DM before the primary TB infection.

Step 3: Testify individual level co-occurrence of the problem

The third level of analysis of the extent of co-occurrence of TB-DM involves the study of co-morbidity and multi-morbidity. We conducted systematic reviews to illustrate the study of co-morbidity, because health systems in developing countries can't afford to assign more than a single health care provider to manage a patient with co-morbidity, and patients in these settings have the right to receive all the health services they need from a single service delivery point. Therefore, analysing of the extent of TB and diabetes co-morbidity is important for an effective health programme that can address the needs of patients with co-morbidity and multi-morbidity.

Tuberculosis and diabetes are not only the world's two leading causes of death and disability, but our systematic review also found that diabetes is fuelling the spread of TB, mainly because diabetes rates are skyrocketing around the world, and having diabetes increases a person's risk of developing TB; diabetes makes a person two to three times more likely to develop TB; and diabetes is also more difficult to manage in people with

TB. A person with both diseases is likely to have complications that are not usually seen in either disease is present alone.

7.2.2 Similarities drive integration and differences drive differentiation

Key process II: Examine the similarities and differences between response

Step 4: Examine the similarities and differences between response functions

Examining the similarities and differences between TB & DM responses is an essential step. We did a major qualitative assessment to have an in-depth understanding of what constitutes a response, on what basis responses can be compared.

Table 27: Evidence of prevalence of diabetes in patients with TB from literature review

Prevalence of Diabetes in TB patients: Recent studies		
Region/Country/Authors	**TB patients with DM**	**Year published**
Asian/Thailand (Buasroung et al 2022: 374-379)	42.6%	2022
African/South Africa (Alisjahbana et al. 2021: 634-643)	26%	2021
African/Ethiopia (Alemu et al 2021: 82-91)	12.77%	2021
Asian/India (Desai et al. 2021: 111)	38.5%	2021
Asian/India (Kumar et al 2021: 223-232)	31%	2021
African/Sub-Saharan Africa (Alebel et al 2019: 1-10)	21%	2019
Africa (Munseri et al 2019: 4-11)	31.97%	2019
African/Kenya (Mburu et al 2018: 9-13)	37.2%	2018
Asian Countries (Zheng et al 2017: 1264702)	50%	2017
African/Ethiopia (Damtew et al 2014a: 389-396)	15.8%	2014

7.2.3 Integration doesn't happen in vacuum

Key process III: Scan the health systems environment for the integration

Step 5: Glance over the health system's environment for integration

In reviewing integration-related experiences with HCWs and experts, it became clear that the health system environment plays an important role in the integration of responses. This is because integration takes place in the real environment. However, there are many forces around the health system that can influence the way it works and its scarce resources. These include the internal environment of the units to be integrated (e.g. health workers, health facilities, health managers), the task environment (e.g. patients/clients, other actors, partners, donors, pressure groups), and the external environment (political, socio-cultural and technological factors). Accordingly, scanning the different elements of the health system environment (in the context of integration) is the next step.

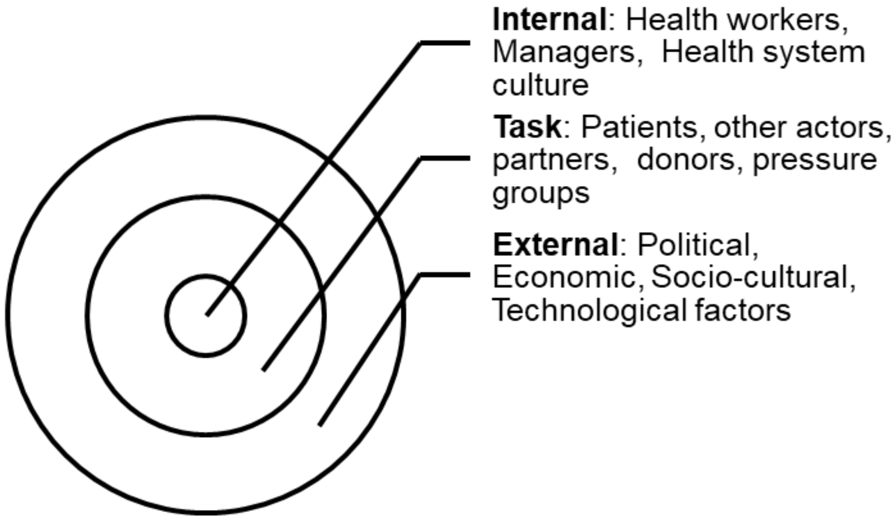


Figure 19: Health system environment for the integration of TB and diabetes services in Addis Ababa, Ethiopia.

7.2.4 Evidence is used only when it's in the right form

Key process IV: Repackage evidence for integration

Step 6: Repackage and share evidence in a usable form

Evidence repackaging is about presenting evidence in a more understandable, readable, acceptable and usable format. The findings from the analysis of the above steps will indicate the need for integration, the characteristics that can be integrated, and the various factors that influence integration, the desired level of integration, the existing level of integration, and the gaps between the desired and existing levels of integration. The findings from the analysis of the problem, the answers to the problem and the environmental factors should be consistent with the 'form of integration' being considered.

But what is the 'form of integration?' It is evidence in the form of integration models, nest or audience.

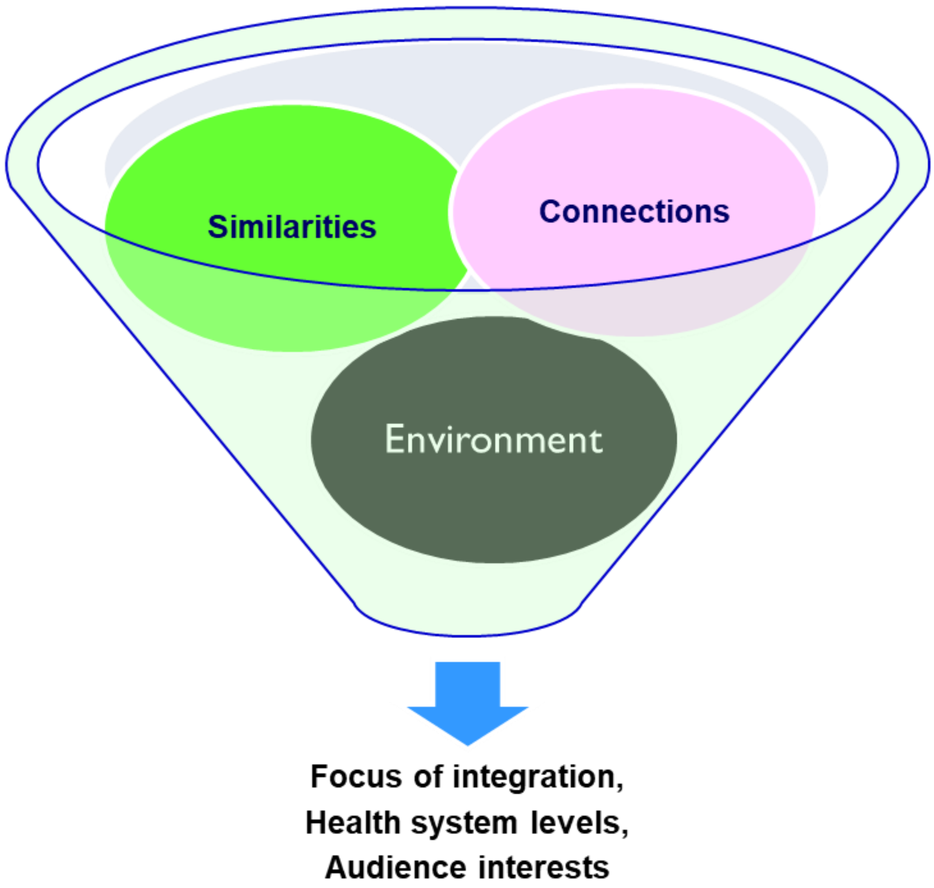


Figure 20: Repackaging the evidence for the integration of TB and diabetes services in Addis Ababa, Ethiopia.

7.2.5 Integration management is a key to effective integration

Key process IV: Managing integration

Step 7: Ascertain the plan of integration

Levels of integration can be seen as parts of a continuum. Several integration level frameworks have been developed based on the integration of health services (Lin, Islam, Leeder, Huo, Hung, Yeoh, Gillespie, Dong, Askildsen, Liu, Cao, Yip & Castelli 2022:1-28; Martens, Danhiexu, Belle, Wouters, Damme, Remmen, Anthierens & Olmen 2021:1668-1681; Lynn 2019). It can be assumed that there will always be some degree of integration between any two functions. The first task in this step is to determine the existing level of integration between the two functions. The next task is to determine the desired level of integration between the functions. This is the purpose of the integration process.

The integration manager should develop a detailed policy/strategy/integration plan describing the relevant components to be integrated, the existing and desired levels of integration, the strategies to be used, the resource requirements, and the benefits and risks of integration. It serves as a roadmap for the entire integration process. Evaluating local and global integration experience and best practice is essential. Communication and coordination are very important at this stage. Measurable objectives should be developed and agreed up on. Situational factors such as personal preferences and the urgency of the problem and interests of the various stakeholders involved may influence the integration of planning and implementation.

The choice of integration approach depends on the local context. For example, policy integration of TB and diabetes can be achieved through a single policy on TB and diabetes or through specific policies on integration of TB and diabetes control. Policy statements supporting the integration of TB and diabetes responses can also be included in the TB and diabetes policy document. Such policies/strategies can lead to integration at programme, management and information levels.

Table 28: Evidence about the integration of TB and diabetes from the literatures

Evidence about TB and diabetes integration in the literature
1. Diabetes—tuberculosis care in Eswatini: A qualitative study of opportunities and recommendations for effective services integration (Williams et al 2023:1605551). 2. Integrated care for tuberculosis and diabetes mellitus co-morbidity in Asian countries: health system challenges and opportunities (WHO 2022b). 3. Framework for collaborative action on tuberculosis and comorbidities (WHO 2022c). 4. Exploring the mechanisms of collaboration between the Tuberculosis and Diabetes Programs for the control of TB-DM Co-morbidity in Ghana (Salifu & Hlongwana 2021a:1-6). 5. Assessment of the Implementation of Tuberculosis and Diabetes Care in health systems (Peter & Aighobahi 2019b:1-15). 6. National framework for joint TB-Diabetes collaborative activities (Ministry of Health and Family Welfare, Government of India 2017). 7. Clinical management of concurrent diabetes and tuberculosis and the implications for patient services (Riza et al 2016:740-753). 8. Assessment of health system challenges and opportunities for possible integration of diabetes mellitus and tuberculosis services in South-Eastern Amhara Region, Ethiopia: A qualitative study (Workneh et al 2016b:1-11). 9. Collaborative framework for care and control of tuberculosis and diabetes (WHO and The Union 2011). 10. Formative evaluation of integrated diabetic care in TB patients in Primary Health Centres: A study in Trivandrum, Kerala (Rajan 2018). 11. Availability and readiness of diabetes health facilities to manage tuberculosis in Tanzania: A path towards integrating tuberculosis-diabetes services in a high burden setting? (Shayo & Shayo 2021:1-7). 12. Frontline healthcare workers' experiences in implementing the TB-DM collaborative framework in Northern Ghana (Salifu & Hlongwana 2021b:1-11).

Step 8: Translate the plan to action

Service delivery, leadership/governance, workforce, financing, access to technology and medical products, and information and research have been identified as action field for health services integration. The integration strategies to be used may vary depending on both the action field and the desired level of integration. A clear and shared action plan is needed to describe the existing level of integration, the desired level of integration, the strategies, resources, risks, benefits, and responsibilities associated with integration.

7.2.5.1 Health service delivery

7.2.5.1.1 Health service delivery at micro-level

At the *micro-level*, service delivery refers to the provision of patient-centred, proactive and customised care, considering everything that emerges from the holistic understanding/assessment. As persons with co-morbidity suffer from different health and social problems, it is particularly important to provide a person-centred and integrated approach to care that is tailored to the individual and their community (Muth, Blom, Smith, Johnell, Gonzalez-Gonzalez, Nguyen, Brueckle, Cesari, Tinetti & Valderas 2019:272-288). Tailored care can be based on a formal holistic evaluation (Chan, Wu, Ng, Glass & Tan 2022:1-17; Wong & Luk 2020:56-63; Snowden, Young & Savinc 2018:4836-4845).

Integrated care for patients with co-morbidity often includes promoting various self-management abilities (Suls et al 2020:139-148; Trankle, Usherwood, Abbott, Roberts, Crampton, Girgis, Chang, Saini & Reath 2019:1-9; WHO 2016a:9) like life style changes (WHO 2016a:9), coping strategies (WHO 2016a:3), health literacy (WHO 2015c:10, 2018b:2-5), medication adherence (Sokan, Stryckman, Liang, Osotimehin, Gingold, Blakeslee, Moore, Banas, Landi & Rodrigueze 2022:100201; Monaco, Palmer, Marengoni, Maggi, Hassan & Donde 2020:1353-1358; Goldstein, Gathright & Garcia 2017:547-559), health system navigator (Struckmann, Barbabella, Dimova & Ginneken 2017:1-6), communication skills (Stoop, Lette, Ambugo, Gadsby, Goodwin, Macinnes, Minkman, Wistow, Zonneveld, Nijpels, Baan & de Bruin 2020:1-16; Bartels, DiMilia, Fortuna & Naslund 2018:153-164; Hilty, Sunderji, Suo, Chan & McCarron 2018:292-309), goal setting (WHO 2015c:10, 2016a:9), prioritizing (World Health Organization 2018b:6-7) and planning (Palmer, Marengoni, Jureviciene, Laatikainen, Mammarella, Muth, Prado-Torres, Rejken, Rothe, Valderas, Vontetsianos, Zaletel, Forjaz, Souchet, Naviakal & Onder 2016:4-11; WHO 2016a:7).

People with comorbidities often deal with different professionals, organizations and departments, so it is important to ensure a smooth and monitored transition throughout the care process (Brown, Moore, MacGregor & Lucey 2021:10-14; Stoop et al 2020:1-16; Bartels et al 2018:153-164; WHO 2015b:1-25). Continuity is pointed to as a key factor in fostering good relationships between people with co-morbidity, professionals and informal caregivers (Corbett, Lee, Cummings, Calman, Farrington, Lewis, Young, Richardson, Foster & Bridges 2020, 2022:4823-4833; Meranius & Hammar 2016:91-98).

Medication adherence (Cáceres, Calderon & Ugarte-Gil 2022:1-17; Gast & Mathes 2019:1-17; Smaje, Weston-Clark, Raj, Orlu, Davis & Rawle 2018:254-266), accumulation of side effects (Zitnik, Agrawal & Leskovec 2018:i457-i466), and drug interactions (Lin et al 2019:53; Van Crevel, Koesoemadinata, Hill & Harries 2018:1404-1410; Zheng et al 2017:1264702) are potential concerns for people with comorbidities taking multiple pills prescribed by multiple healthcare providers (Cáceres et al 2022:1-17). Because guideline evidence is often based on studies of patients with a single disease (ADA 2022; FDREMoH 2017), attempts to simultaneously adhere to multiple guidelines for a single disease have been criticized (Almossawi et al 2019:329; Workneh et al 2016b:1-11). Hence, not only the lack of attention about the drug interactions, drugs side effects and adherence issues but also lack of tuberculosis-diabetes mellitus treatment guideline and protocols are the major challenges in Ethiopia, particularly in the study area.

7.2.5.1.2 Health service delivery at meso-level

This level refers the provision of equitable and timely access to safe and appropriate care (Litchfield, Kingston, Narga & Turner 2022:777-785). According to Best (2017:302-309); and Mackie and Darvill (2016:82-87) organizational and structural integration is critical and can facilitate the delivery of integrated health services for people with co-morbidity. This is particularly important for the provision of integrated care for patients with comorbidities across health and social sectors. The need for multisectoral collaboration and ongoing communication to combat tuberculosis-diabetes mellitus co-morbidity through the integrated care for have been highlighted (WHO 2022:5-7), as well as the need for health, and social services to be linked (Mackie & Darvill 2016:82-

87). Individuals with multiple chronic diseases pose challenges to effective continuous quality improvement systems, as current quality standards tends to address only a single disease condition (Smith, Wistow, Holder & Gaskins 2019:1-14). The difficulty of identifying and developing indicators for co-morbidity diseases condition is also addressed (Leijten et al 2018:12-22).

7.2.5.1.3 Health delivery at macro-level

Integrated care services and co-morbidity programs would benefit from macro-level action to promote the integration of care across organizations and sectors, for example through close collaboration between ministries of health and social affairs (Booth 2021:8-11; Bibbins-Domingo 2019:1763-1764). Similarly, highly competitive environment requires market regulation, such as more flexible anti-trust laws, that enable cooperation among providers while protecting consumer's choice. Finally, policies should be in place to ensure service availability and access. This impacts the availability of community and public health resources, as well as timely geographic and physical access. Access to services should protect vulnerable groups such as those with comorbidities of tuberculosis and diabetes.

7.2.5.2 Leadership and governance

Since the healthcare system is a complex and dynamic issue, the healthcare leadership and governance is a priority (Figueroa, Harrison, Chauhan & Meyer 2019:1-11). WHO (2010:100) states that leadership and governance ensure the existence of strategic policy framework combined with effective oversight, coalition-building, regulation, attention to system and accountability. Leadership and management role in healthcare include organization, planning, administration, implementation, budgeting and analysis (Desta, Abitew, Beshir, Argaw & Abdlkader 2020:1-15; Thukral & Madaan 2017:107-110). Create the means to use and achieve organizational goals in a professional manner (Dean & Dean 2020:9-27; Thukral & Madaan 2017:107-110).

7.2.5.2.1 Leadership and governance at micro-level

As the micro level is the most operative level of service delivery (Tello & Barbazza 2015:14), the role of health leadership and governance is the coordination of process for clinical and non-clinical service provisions, typically engaging the health workforce, health manager, administrators and clinical providers as well as patients, family members and other caregivers

7.2.5.2.2 Leadership and governance at meso-level

According to Litchfield et al (2022:777-785) healthcare leadership and governance at this level refers to the existence of strategic policy frameworks and organizational oversight that shapes the delivery of care; including regulation, system design and accountability.

7.2.5.2.3 Leadership and governance at macro-level

Overarching and all-encompassing health system, direction and architecture of institutional arrangements are set at this level (Tello & Barbazza 2015:14). A person-centred integrated care programme can benefit from wider political commitment and should be well-embedded in the structure and governance of the region and national system, as these can both positively and negatively influence a programme. Thus it is important that (inter)national/regional policy and action plans on chronic diseases and multi-morbidity promote multidisciplinary and inter-organizational collaborative care. This is the level where the health policy maker should remain careful to assess, design and implement the programs and strategies (Raus et al 2020:1-19).

7.2.5.3 Health workforce

Health workforce refers to all people who deliver or assist in the delivery of health care services in the health care facilities; and this includes health care professionals working in the health sectors, other sectors and in the health sectors. The health care services aimed in enhancing the health of people, which includes different domains of healthcare system like curative, preventive and rehabilitative care services as well as health education, promotion and research (WHO 2010:38).

7.2.5.3.1 Health workforce at micro-level

The availability of a multidisciplinary team (MDT) is a cornerstone in making the MDT process more robust and decisive in optimizing treatment and improving quality of survivorship (Abukar, Ramsanahie, Martin-Lumbard, Herrington, Winslow, Ahmed & Thaha 2018:1057-1061; Flanagan, Damery & Combes 2017:1-11). For people with co-morbidity multidisciplinary teamwork that transcends the boundaries of healthcare, social care and volunteerism (WHO 2018c:40-48). It is important to recognize that multidisciplinary teams need to be tailored to the target population and the situation, and that effective teamwork takes time; and a key aspect of effective teamwork is good communication between parties involved in the process (Al-Rawee, Barhawi, Alsabee &

Al-Fathy 2022:2278-2294). Clear roles and responsibilities for all individuals, including those with comorbidities themselves, are therefore desirable. Having a designated coordinator is considered important (Al-Rawee et al 2022:2278-2294; Leijten et al 2018:12-22; Kirst, Im, Burns, Baker, Goldhar, O'Campo, Wojtak & Wodchis 2017:612-624).

A patient-centred approach indicated the functional availability of doctor-patient relationship, prioritized health problems and shared decision making, supporting self-management and integrated care for the essential management of comorbidities at the micro-level of the healthcare system (Aramrat,Choksomngam, Jiraporncharoen, Wiwatkunupakarn, Pinyopornpanish, Mallinson, Kinra & Angkurawaranon 2022: e36).

7.2.5.3.2 Health workforce at meso-level

According Leijten et al (2018:12-22), professional education and development is crucial for the integrated care of multi-morbidities that can further be classified in to the soft skills (such as communication, teamwork, willingness to change and self-management promotion) and managerial skills. Managerial skills include training in being a case manager, conducting assessment, navigating the health and social care systems, working with individualized care plans and knowing how to risk- stratify in order to ensure that care is tailored to complexity (Heide, Snoeijs, Quanttrini, Struckmann, Hujala, Schellevis & Rijken 2018:36-43; Leijten et al 2018:12-22).

Organizational level workforce planning is necessary and includes attention to workload and adequate team resources, professional education, and sustainability of staff and informal caregivers (Leijten et al 2018:12-22). Increased pressure on the traditional workforce and the need to contain costs drives the need to explore new professional role or task shifting to specially trained professionals (WHO 2015c:15).

7.2.5.3.3. Health workforce at macro-level

This level refers to the use of knowledgeable, skilled, motivated and accountable health workers within the health system to organise and deliver the health services to the population (Litchfield et al 2022:777-785). To promote the management of co-morbidity, the health system should improve access to care and provides a decision-making system (Aramrat et al 2022:e36). In general, demographic changes and future types of care should be considered when planning training and staffing.

7.2.5.4 Health financing

Healthcare financing is the process of mobilizing, accumulating, allocating and managing financial resources to ensure their efficient and effective use for the delivery of health care services individually and collectively within the healthcare system. As healthcare financing is the most important component of healthcare systems worldwide, its effective implementation is critical to achieving universal health coverage and improving health outcomes (World Bank 2019:14; WHO 2010:86). There are several reasons why health financing is essential in low-, middle- and high-income countries. First, it helps ensure that health services are accessible to everyone, regardless of their ability to pay. This is especially important in low- and middle-income countries, where many people cannot afford out-of-packet healthcare costs. Health financing can therefore provide a safety net for these people and ensure that they are not excluded from essential health services. Second, health financing helps improve the quality of healthcare services by ensuring adequate resources for investment in health infrastructure, equipment, and human resources. This leads to improved health and increased patient satisfaction. Third, healthcare finance helps contain health care costs by facilitating the efficient and cost-effective delivery of health care services. This is important in both high-income and low-income countries, where health care costs are a major concern (Stenberg, Hanssen, Edejer, Bertram, Brindley, Meshreky, Rosen, Stover, Verboom, Standers & Soucat 2017:e875-e887; WHO 2010:72-72)

7.2.5.4.1 Health finance at micro-level

At the micro level, health financing refers to the financing of healthcare at the individual or household level, its main objective is to ensure that individuals and households have access to affordable and quality health services without financial hardship, and that health systems are designed to meet people's health needs, both individually and collectively, including basic financing and incentives (Litchfield et al 2022:777-785).

Payment and reimbursement for interventions, even in person-centred integrated care programmes, must be generous enough to ensure equitable financial access for those in need. Payment structures must also ensure that professionals have sufficient time to work with people with co-morbidities and informal caregivers (Leijten 2018c:12-22). These out-of-pocket costs can impact access, [non-]compliance, and the nature of and content of care, so consideration should also be given to co-payments, co-insurance and deductibles for covered services, as well as the level of direct payments. Financial incentives can be used to motivate people with co-morbidity to participate in and adhere to integrated care programmes (Savitz & Bayliss 2021:980-989; Leijten 2018d:12-22; Tsiachristas 2016:1-4).

7.2.5.4.2 Health finance at meso-level

At the meso level, health financing refers to the management of financial resources for the provision of health services by healthcare organizations and providers, and its main functions are: (1) ensuring that healthcare organizations have adequate financial resources to provide quality health care services. This includes managing sources of income such as insurance, reimbursement and government funding, and allocating resources to different areas of health care provision such as clinical services, administration and research; (2) promoting the financial sustainability of healthcare organizations. Healthcare organizations need to generate sufficient revenue to cover their operating costs and invest in new technologies and infrastructure, and healthcare finance manager can play a critical role in developing financial strategies that ensure long-term sustainability while maintaining high quality health care services. This can include identifying new sources of revenue, managing costs and optimising financial performance; and (3) ensuring equitable access to healthcare services. Healthcare organizations must ensure that their services are affordable and accessible to all members of the community, regardless of their ability to pay, and healthcare finance managers can also help develop financing mechanisms, such as insurance programs and subsidies, that ensure that healthcare services are accessible to all (Mclntyre, Kutzin & WHO 2016:1-36).

7.2.5.4.3 Health finance at macro-level

At macro level, a health financing system refers to the overall structure and policies for financing health services in a country, the implementation of which may vary depending on specific circumstances (Mclntyre et al 2016:1-36). Tax-based and social health insurance schemes are a common approach in many countries, including Ethiopia. This is the all-encompassing level where the amount of the resources that are willing to invest and their evaluation mechanisms to assess the program successfulness will be determined (Raus et al 2020:1-19).

7.2.5.5 Access to technologies and medical products

It's imperative for a health system to ensure equitable, scientifically sound and cost effective access to essential medicines, vaccines and technologies of guaranteed quality, safety, and efficacy (WHO 2010:74).

7.2.5.5.1 Access to technologies and medical products at micro-level

Information and communication technology is a key component of integrated health care, and its use should be customized to the capabilities of the patients with co-morbidity. Examples of micro-level ICT applications include electronic medical records (EMRs) and patient portals. The literature shows that electronic medical records facilitate the exchange of information between professionals, organisations, patients and informal caregivers (Tahsin, Armas, Kirakalaprathapan, Kadu, Sritharan & Steele 2023:e44035), provide access to patient portals across services (Feger, Crump & Scott 2021:e100376), improve communication (Falconer, Kho & Docherty 2018:2337-2349), exchange of patient clinical data, streamline operations, enhance administration and control, improve decision making and continuity of care (Okemiri et al 2020:235-248; Ramirez, Wu, Ryan, Towfighi & Vickrey 2017:e7106); and for video conferencing between providers (Sinsky, Jerzak & Hopkins 2021:429-437). Electronic health tools or telemedicine can help people co-morbidities to live independently in their own homes with improved remote care facilities (Kronenfeld & Penedo 2021:659-663; Sinsky et al 2021:429-437).

7.2.5.5.2 Access to technologies and medical products at meso-level

This level refers to the provision of various technologies and medical products that enable all aspects of patient management, such as accurate diagnosis and remote monitoring (Litchfield et al 2022:777-785). Given the large number of healthcare providers and care settings involved, an integrated information system accessible by professionals can greatly facilitate communication, person-centred, tailored care and care coordination(Chen, Amaize & Barath 2021:801-811; World Health Organization 2018c; Yoshiura, Azevedo-Marques, Rizewuska, Vinci, Sasso, Miyoshi, Furegato, Rijo, Del-Ben & Alves 2017:1-10). Such shared information systems support continuity of care organizations and throughout the care process (Leijten et al 2018d:12-22; WHO 2018c; Pietrantonio, Orlandini, Moriconi & La Regina 2015:759-765). The use ICT systems by different organizations involved in the care process of patients with co-morbidity emphasizes the need to develop interoperable or linked information systems.

7.2.5.5.3 Access to technologies and medical products at macro-level

National policies that promote technological development and innovation, particularly ICT and e-health, are more likely to support integrated care for co-morbidity and/or multi-morbidity (WHO 2015a:6-12, 2022b:45-47). In addition the availability of and equitable access to technologies and effective medical products are important for improving the quality of life of people with co-morbidity as well as multi-morbidity (He, Cao, Liu, Wu & Zhang 2022:1-10; Mariani, Borsini, Cecil, Felix, Sebert, Cattaneo, Walton, Milaneschi, Cochrane, Amid, Rajan, Giacobbe, Sariz, Agusti, Sorg, Herault, Miettunen, Parmar, Cattane, Jaddoe, Lotjonen, Buisan, Gonzalez Ballester, Piella, Gelpi, Lamers, Penninx, Tiemeier, Tottleben, Thiel, Heil, Jarvelin, Parjante, Mansuy & Lekadir 2022:e0245475; Noordman, Heide, Hopman, Schellevis & Rijken 2015).

7.2.5.6 Information and research

One of the major challenges in healthcare is the proliferation and diffusion of fragmented health information systems and the large volumes of data generated by growing heterogeneity of patient data. A Health Information System (HIS) contains health service data and concepts used by patients to improve the management of healthcare, with the four main HIS functions such as data generation, compilation, analysis and synthesis, communication and utilization as the basis for decision making (Shahmoradi & Habibi-Koolaee 2016:1096-1097).

7.2.5.6.1 Information and research at micro-level

In integrated care services, individual patient-level data must be used effectively in the care process, particularly for the continuity of care. This may include notifying a core team of experts for visits to appropriate departments, sharing drug-related and hospital discharge information with primary care providers and pharmacists (Hong, Siegel & Ferris 2014:1-19). The integration of individual patient data therefore helps to prevent delays in the treatment of patients in emergencies, wrong prescriptions due to misdiagnosis as a result of unavailability of patients history, lack of interoperability of health data and loss of life (Okemiri, Rita, Isaiah, Christian, Christopher & Chima 2020: 235-248). The data collected can be used to predict individual patient risk and contribute to preventive care through early treatment of risk factors (Schulte & Bohnet-Joschko 2022:23).

7.2.5.6.2 Information and research at meso-level

Data ownership and privacy must be considered when information is shared and used by multiple care providers. Networked information systems assume that different professionals and care organisations have access to data at different levels depending on the case. There are also more practical approaches, such as sending experts to provide access to other people's website.

The information collected can also be used for risk stratification at both individual and population levels. Triage systems and predictive modelling can classify patients into different levels of complexity to tailor care and estimate future care needs, for example based on their electronic medical record (EMR) and questionnaire data (Schulte & Bohnet-Joschko 2022:23; Okemiri 2020:235-248; Seyedamini, Riahi, Mohmoudi-Majdabadifarahani,Tabibi &Masoudi-Asl 2018:99-105). Such stratification can also be incorporated into future capacity and budget planning. Today, innovative research in the area of integrated and comorbidities could improve evidence for interventions in complex cases and for future planning (Han & Geum 2022:142-154; Okemiri 2020:235-248; Madanian, Parry, Airehrour & Cherrington 2019:e100071; Prasser, Kohlbacher, Mansmann, Bauer & Kuhn 2018:e57-e65)

7.2.5.6.3 Information and research at macro-level

In addition to data ownership at meso-level, privacy and data protection laws are also important considerations when sharing information between different organizations (Prasser 2018:e57-e65). Moreover, policies that promote integrated care and research into co-morbidities can benefit innovation, care and ultimately people living with comorbidities. At macro-level, healthcare system has the responsibility to generate and manage data, facilitate the analysis and integration that supports evidence-based medicine (Litchfield et al 2022:777-785).

The generation and strategic use of information, intelligence and research on health and health system enables decision makers at all levels of the health system to identify problems and needs, makes evidence based decisions on health policy and allocate scarce resources optimally (WHO 2010:84). Integrated health information is called a potential therapy for problems fragmentation produce such as for duplication, non-consistency and redundancy (Ellingsen & Monteiro 2018:223-236).

Step 9: Evaluate and monitor the integration

Assessing and monitoring of integration involves the framework's six action field to monitor improvements in population health, patient experience and the cost reduction (Leijten et al 2018c:12-22). Monitoring can be used as a means of providing feedback and promoting sustainable improvement at the three levels of integration as per the SELFIE framework.

The following conceptual framework allows macro-level integration managers to use national integration policies, strategies, senior management, budgets and unintended consequences of integration as inputs. At the meso level, inputs to service integration are management, organisational structure, service delivery processes, service delivery plans, service costs, and unintended consequences; and at the micro level, service providers, service users, informal caregivers and unintended consequences are inputs to service integration.

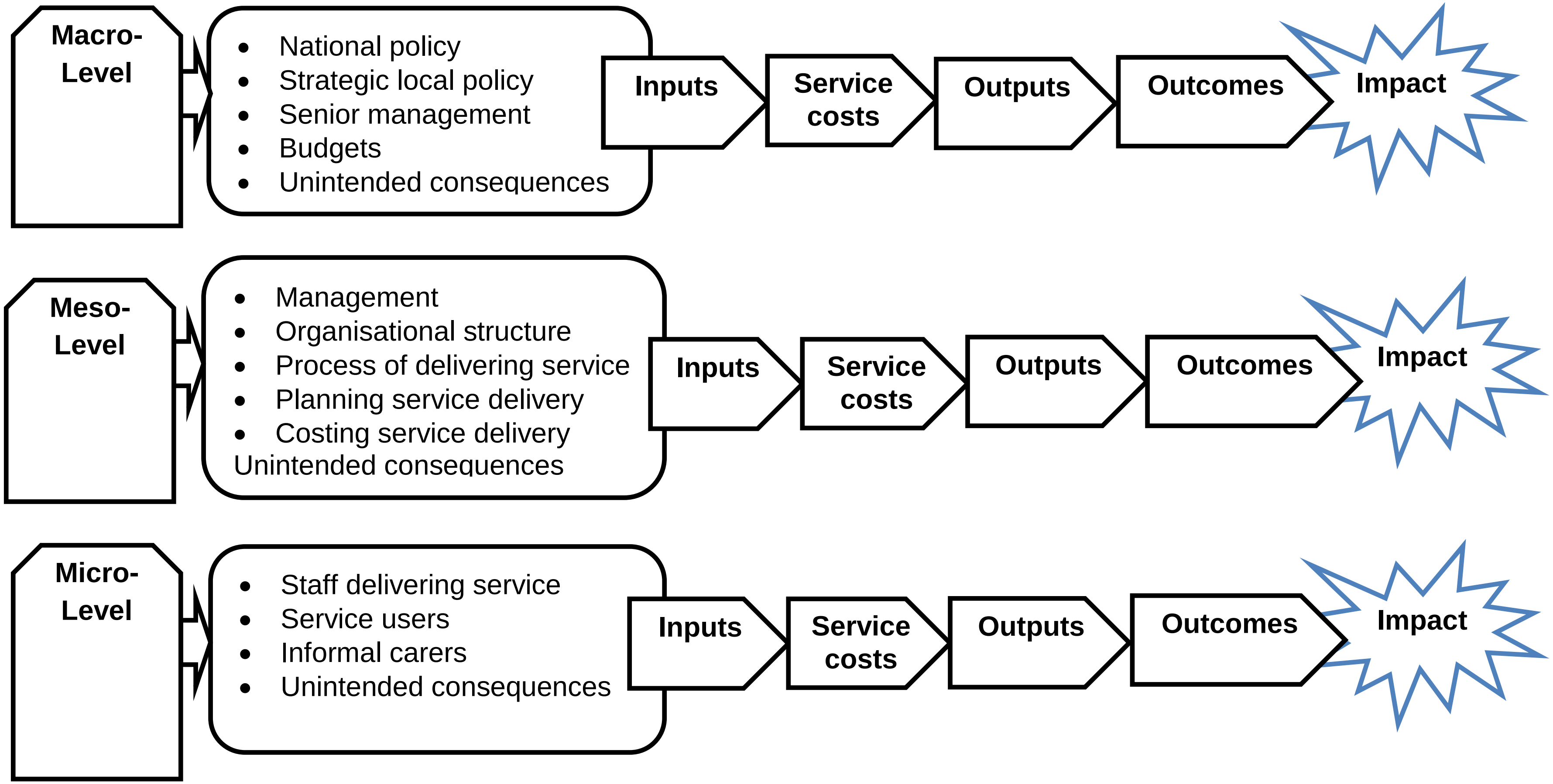


Figure 21: A conceptual framework for monitoring and evaluating service integration.

7.3 CONCLUSION

Chpater 7 presents the framework for integrating TB and DM care. It indicates the need to address the increasing burden of TB-DM comorbidities and presents collaborative efforts bu global health organisations. The SELFIE framework, consisting of a nine-step cycle of action, is presented as a guide to interrating TB and DM health services.

The chapter discusses the analysis of the link between TB and diabetes at different levels and underscores the importance of understanding the epidemiological links between the two diseases. It also examines the similarities and differences in responses to TB and DM, and emphasises the role of the health system environment in the integration efforts.

The chapter concludes by considering the repackaging of evidence and the importance of integration management in achieving successful integration.

CHAPTER EIGHT

CONCLUSION AND RECOMMENDATIONS

8.1 INTRODUCTION

The study aimed to analyse the factors affecting the integration of health services for patients with TB and diabetes mellitus, to examine the current level of integration of health services from the experiences of practitioners and experts, and to explore the health system challenges and opportunities for developing the framework for integrating health services for patients with TB and diabetes mellitus in the public health facilities of Addis Ababa. The chapter presents summary for conclusion and recommendations, conclusions on the factors affecting health service integration, the current level of health service integration, and the challenges and opportunities for integrating health services for patients with TB and diabetes mellitus in the public health facilities of Addis Ababa. The conclusions answer the objectives stated in chapter one. The possible strengths and limitations of the study and recommendations for future research are also presented in this chapter. The recommendations are based on the findings presented in chapters five and six**.**

8.2 SUMMARY FOR CONCLUSION AND RECOMMENDATIONS

The objectives of this study were to integrate TB and diabetes into health services at public health facilities in Addis Ababa; to the analyse the factors affecting integration of health services; to explore practitioners' and experts' experiences of the current level of service integration; the health system challenges and opportunities for providing these services; and to propose a framework for integrating TB and diabetes services in the context of Ethiopia. The study was conducted in 52 health facilities in Addis Ababa. An explanatory sequential design was used, starting with quantitative data collection and analysis, followed by qualitative data collection and analysis, leading to interpretation, as a means to exploring practitioners' and experts' experiences of the current status of TB and diabetes service integration; and to explore the health system challenges and opportunities for developing the integration framework for people living with TB and diabetes.

The study was conducted in two phases: Phase 1 analysed the factors affecting the integration of TB and diabetes mellitus services in the hospitals and health centres.

Phase 2 focused on developing an integration framework to improve health service delivery for patients with TB and/or diabetes in hospitals and health centres by exploring the status of TB and diabetes service integration and the challenges and opportunities for the health system. The SELFIE multi-morbidity integration framework was used by the researcher to improve the health status of the Ethiopian population through integrated approaches to health service delivery was used as the central concept on which the study was based.

Cluster sampling with stratified simple random sampling was used to select hospitals and health centres. Simple random sampling technique was used to select patients with TB and diabetes for the quantitative study. Purposive sampling was then used to select key informants for the in-depth interviews. A structured questionnaire adapted from the SELFIE framework was used to collect quantitative data from the TB-diabetes comorbid patients and facility managers running the health facilities during the phase 1 study period, with an overall response rate of 96.45%. Quantitative data analysis was performed out using SPSS version 28 software. Both bivariate and multivariate logistic regression analyses were performed. The association of the dependent variable, integrated health services, with the independent variables was analysed. Specific interventions and recommendations for each finding were then proposed in the recommendation section. During phase 2 of the study, an in-depth interview guide was used to collect qualitative data from the key informants and thematic analysis was carried out using ATLAS.ti8 software for qualitative data. The findings from the phase 2 were triangulated and analysed considering the findings from phase 1 on integrated health services for TB and diabetes.

8.3 CONCLUSION

The study examined the factors affecting the integration of health services for patients with tuberculosis and/or diabetes mellitus. Several factors were identified, including lack of appropriate counselling on drug use, lack of awareness of TB risks among DM patients, lack of organised TB-DM Services and integration strategies, limited availability of continuous integrated care, and inadequate knowledge among health care wokers. The study found that although facilities reported having access to TB screening and testing for DM patients, implementation was low and counselling on drug use was poor for both TB and DM patients. Qualitative findings supported these results;

foreground the lack of supportive policies, poor screening practices and limited collaboration between relevant departments.

The study also investigated at health workforce factors and found that the presence of a multidisciplinary team, a designated TB-DM coordinator, adequate knowledge of health workers and the involvement of informal care givers were positively associated with integration. However, health workers lacked sufficient knowledge about TB-DM care and there was a lack of specific training in this area. The study emphasised the importance of planned care, shared decision-making and supportive leadership in improving patient outcomes. It also highlighted the need for guidelines, resources and reimbursement mechanisms specifically focused on DM management and TB-DM co-morbidity.

Disparities in access to diagnostic technologies, drugs and financial support for DM care were found in the study. Facilities lacked electronic medical record systems, advanced diagnostic tools and specific guidelines for DM management or TB-DM co-morbidity. The lack of individualised patient data, limited access to patient information, and lack of registration and reporting tools for DM and TB-DM co-morbidity hindered service integration and comprehensive care.

Based on the study findings, an integration framework for patients with TB and/or DM was developed to address the challeneges and fragmentation of health services. The framework provides a comprehensive tool for identifying and manging comorbidities and is recommended for use by policy makers, health care providers, educators and other stakeholders to improve the quality and cost-effectiveness of care reduce the burden of TB-DM co-morbidity and improve patient satisfaction.

8.4 RECOMMENDATIONS

Based on the findings of the study, the researcher made the following recommendations to the governmental and non-governmental organisations involved in health, health care providers, policy makers and researchers interested in conducting further research.

- **Ministry of Health of Ethiopia**
  - The ministry of health should support the implementation of the integration framework developed in the study. This can be done by disseminating the framework to health care providers, organising training programmes and monitoring its implementation and impact.

- The ministry of health should establish mechanisms to monitor the progress and quality of care for patients with TB-DM co-morbidity. Regular evaluations and assessments can help identify areas for improvement and ensure the provision of integrated and comprehensive services.
- Ministry of health should develop specific guidelines and ploicies focused on TB-DM co-morbidity. These guidelines should cover screening practices, counselling on drug use, integrated care approaches and management of TB-DM co-morbidity.
- Adequate resources should be allocated to support the integration of health services for TB-DM co-morbidity. This includes funding for training programmes, diagnostic technologies, electronic health record system and reimbursement mechanisms.
- Ministry of health should encourage collaboration between relevant departments and health facilities to facilitate integration of services. This can be achieved through policy guidelines, incebtives and support for multidisciplinary teams.

❖ **Health workers**

- Health workers should receive adequate training and education on the management of TB-DM co-morbidity. This should include counselling on drug use, screening practices and integrated care approaches. Continuing education programmes and workshops can help improve htier knowledge and skils.
- Healthcare workers should work with colleagues from different disciplines to provide comprehensive care for patients with TB-DM co-morbidity. A multidisciplinary team approach, including a designated TB-DM coordinator, can help streamline care and improve patient outcomes.
- Health workers should prioritise patient-centred care, involving patients in decision making and considering their individual needs and preferences. Effective communication and counselling can improve patient understanding and adherence to treatment regimens.

❖ **Researchers**

- Researchers should conduct further studies to explore the challenges and opportunities to integrating health services for TB-DM co-morbidity in different settings. This may help to identify new strategies and interventions to improve service integration and patient outcomes.
- Researchers should evaluate the effectiveness of different implementation strategies, such as the integration framework developed in the study, real-world

settings. This will provide valuable insignts into the feasibility and impact of these frameworks.

- **Patients with TB and/or DM**
  - Patients with tuberculosis and/or diabetes mellitus should actively seek integrated healthcare services that address both conditions. They should inquire about the availability of integrated care, counselling on drug use, and proper management of TB-DM co-morbidity.
  - Patients should actively participate in their treatment plans, engage in shared decision-making with health care providers, and express their preferences and concerns.

8.5 CONTRIBUTIONS OF THE STUDY

The study used the SELFIE framework for integrated care for multi-morbidity. Health service integration is complex and multi-dimensional. This study has documented valuable findings of challenges to health service integration for patients with tuberculosis and diabetes mellitus in public health facilities in Addis Ababa, Ethiopia. This study explored the experiences of health practitioners and experts on the status of TB and diabetes mellitus integration; and the health system challenges for the integration of health services.

The study makes four contributions to the field of health systems research. The first contribution was analysis of the factors affecting integration of TB and diabetes mellitus servicers. The second contribution was exploration of health system challenges and opportunities to integrate TB and diabetes mellitus services. The third contribution was investigation of the current health service integration level for patients with TB and/or diabetes mellitus from the perspectives of the health practitioners and experts. The last contribution was the development of the integration framework for TB and diabetes mellitus services in public health facilities of Addis Ababa, Ethiopia.

The results of this study have provided more understanding and awareness creation on the implementation status of TB and diabetes mellitus service integration in the public health facilities of Addis Ababa, Ethiopia. The study also provided some evidence on how activities to reduce the burden of TB-DM co-morbidity were being implemented in the public health facilities of Addis Ababa and the challenges that need to be addressed in efficient TB and/or diabetes mellitus care. Overall, as a result of the findings of this study, the researcher developed a strategy of TB and/or diabetes mellitus service integration framework for health professionals, policy makers and health managers that can be easily used in delivery of integrated services for patients with TB and diabetes mellitus in health care facilities of Addis Ababa, Ethiopia. It is hoped that this framework, if utilised in Addis Ababa, will greatly contribute to improving TB and diabetes integration, not only in Addis Ababa but also in all the other regions of Ethiopia.

8.6 LIMITATIONS AND STRENGTHS OF THE STUDY

8.6.1 Limitations of the study

The following are some of the limitations of this study:

- The study was conducted in an urban context and may not be representative of the rural context. In addition, the study cannot show the perspective of private health facilities in integrating health services for people with diabetes and/or tuberculosis.

8.6.2 Strength of the study

The use of multiple data sources, including in-depth key informant interviews, patients with TB-diabetes co-morbidity, programme focal persons from each study site, practitioners, health facility managers, facility assessment checklist, programme experts for both diseases in all sub-city health departments, Addis Ababa Regional Health Bureau and the Ethiopian Ministry of Health.

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ANNEXURES

ANNEXURE A

Ethical clearance from UNISA

UNISA university of south africa

COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

20 January 2021

NHREC Registration # :
Rec-240816-052
CREC Reference # : 64053989_CREC_CHS_2021

Dear Sisay Tiroro Salato

Decision:
Ethics Approval from 20 January 2021 to 20 January 2024

Principal Researcher(s): Salato ST (email: 64053989@mylife.unisa.ac.za)

Supervisor (s): Prof KG Setswe (email: gsetswe5@hotmail.com)

Title: Assessment of the integration of tuberculosis and diabetes mellitus in health services in Addis Ababa, Ethiopia

Degree Purpose: PhD research project

Thank you for the application for research ethics clearance by the Unisa College of Human Science Ethics Committee. Ethics approval is granted for three years.

The ***low -Risk application*** *was* ***reviewed*** by College of Human Sciences Research Ethics Committee, on **24 November 2020** 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

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
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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 **(20 January 2024).** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number ***64053989*** **_CREC_CHS_2021 should** *be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours Sincerely,

Signature :

Dr. K.J. Malesa
CHS Ethics Chairperson
Email: maleskj@unisa.ac.za
Tel: (012) 429 4780

Signature : pp AHMudzusi

Prof K. Masemola
Executive Dean : CHS
E-mail: masemk@unisa.ac.za
Tel: (012) 429 2298

ANNEXURE B

Ethical clearance request letter to Addis Ababa Regional Health Bureau

Addis Ababa City Administration Health Bureau
P.O. Box 3000738
Addis Ababa, Ethiopia
SALATO ST MR
Mobile: +251-922-77-63-73
Addis Ababa, Ethiopia
10-01-2021

ADDIS ABABA REGIONAL HEALTH BUREA PUBLIC HEALTH EMERGENCY MANAGEMENT AND RESEARCH DIRECTORATE

Dear Sir/Madam

I, Sisay Tiroro Salato, hereby wish to apply for a permission to conduct research study in the public health facilities in Addis Ababa. I'm currently working for Ethiopian National Defence Health Main Department in Addis Ababa: as a public health Emergency management (PHEM) officer and I'm doctoral student at the University of South Africa (UNISA).

My study is entitled "**Assessment of integration of tuberculosis and diabetes in health services in Addis Ababa, Ethiopia**". I will be interviewing around 370 people seeking services for tuberculosis and diabetes at public health facilities. Participation of participants will not influence the flow of service delivery in the specific hospital. I'll appreciate your timeous response as your permission is one of the requirements for ethical approval of my proposal.

Thanking you in advance.
Kind Regards

SALATO ST MR

ANNEXURE C

UNISA Addis Ababa Regional Learning Centre Cooperation Request for in-country ethical clearance from Addis Ababa City Administration Health Bureau

UNISA university of south africa

08 February, 2021

UNISA-ET/KA/ST/29/08-02-2021

Addis Ababa City Administration Health Bureau

Public Health Research and Emergency Management Core Process

Addis Ababa

Dear Madam/Sir,

The University of South Africa (UNISA) extends warm greetings. By this letter, we want to confirm that Mr. Sisay Tiroro Salato (student number 64053989) is a PhD student in the Department of Health Studies at UNISA. Currently, he is about to go out for data collection on his doctoral research entitled "***Assessment of the integration of tuberculosis and diabetes mellitus in health services in Ethiopia***".

This is therefore to kindly request your cooperation in assisting the student by giving him in-country ethics clearance. We would like to thank you in advance for all the assistance that you would provide to the student. Attached, please find the ethical clearance that the student has received from the Department.

Sincerely,

Dr. Tsige GebreMeskel Aberra

Director

UNISA REGIONAL LEARNING CENTRE
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+251-114-350078
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ANNEXURE D

Ethical clearance form Addis Ababa Regional Health Bureau

አዲስ አበባ ከተማ አስተዳደር ጤና ቢሮ
City Government of Addis Ababa Health Bureau

Ref.N.o A/A/9868/227

Date 24/7/13

TO:

- Yeka sub-city Health Office
- Bole sub-city Health Office
- Arada sub-city Health Office
- Nefas Silk Lafto sub-city Health Office
- Kolfe Keranio sub-city Health Office
- Kirkos sub-city Health Office
- Lideta sub-city Health Office
- Akaki kality sub-city Health Office
- Addis Ketema sub-city Health Office
- Gulelle sub-city Health Office
- TIRUNESH BEIJING GENERAL HOSPITAL
- ZEWDITU MEMORIAL HOSPITAL
- RAS DESTA DAMTEW MEMORIAL HOSPITAL
- YEKATIT 12 HOSPITAL MEDICAL COLLEGE
- MENILIK II REFERRAL HOSPITAL
- Gandhi Memorial Hospital

Subject: Request to access Facilities to conduct approved research

The letter is to support **SISAY TIRORO SALATO** to conduct research, which is entitled as **"INTEGRATION OF TUBERCULOSIS AND DIABETES MELLITUS IN HEALTHCARE SERVICES IN ADDIS ABABA, ETHIOPIA ."** The study proposal was duly reviewed and approved by Addis Ababa Health Bureau IRB, and the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required. Therefore we request the facility and staffs to provide support to the principal investigator.

With Regards

Ethical Clearance Committee

Cc

- **SISAY TIRORO SALATO**
- To Ethical Clearance Committee

ANNEXURE E

Permission request from the health facilities

To Health Centre/Hospital

SALATO ST MR.

Mobile: +251-922-77-63-73
Addis Ababa, Ethiopia

REQUEST TO CONDUCT A RESEARCH STUDY AT----------HOSPITAL/HEALTH CENTRE

Dear/madam --------------
I, Sisay Tiroro Salato, am doing research with Professor Keitshepile Geoffrey Setswe, a Managing Director for the Implementation Research Division at the Aurum Institute, in the department of health studies towards PhD in public health at the University of South Africa. We are inviting you to participate in a study entitled “Assessment of integration of tuberculosis and diabetes mellitus in health services in Addis Ababa, Ethiopia”.

The aim of the study is to assess integration of healthcare services for people with tuberculosis and diabetes; and to develop the integration framework which helps to improve the detection and management of TB and diabetes comorbidities.

The reason for selecting the public health facilities is first over the 85% of the people in Addis Ababa are receiving medical healthcare services from the public health institutions and the secondly the prevailing health system is relatively more mature from the private health institutions, which helps us to assess the health delivery system for the identified group of patients.

The study will entail interview of some predetermined questions regarding the health deliver system for patients with who have co-morbidity conditions of tuberculosis and diabetes mellitus.

There are no direct benefits for participating in this study, but the findings from this will benefits patients with comorbidities in future by providing appropriate solution for the identified problem though this study. Again, the findings from this study will be important for people who make policy decisions about health system integration for TB and diabetes.

There are no known risks associated with this study. However, the participants may share some personal or confidential information by chance, or that they may feel uncomfortable talking about some of the topics; we do not wish for this to happen. They do not have to answer any question or take part in the interview if they feel the question(s) are talking about them makes you uncomfortable.

Feedback procedures will entail sharing of the knowledge that we get from this research with you and your organization before it is made widely available to the public. Further the interview result will be grouped with other individuals on all reports related to this study. If results of this study are reported in journals or at meetings, your identity will remain secret.

Yours sincerely

SALATO ST MR

ANNEXURE F

Measures to be taken during data collection to prevent a COVID-19 pandemic

Title of the project: - Assessment of integration of tuberculosis and diabetes in healthcare services in Addis Ababa, Ethiopia.

The purpose of this document is to prevent COVID-19 infection during the research, particularly during data collection from both respondents and data collectors. Therefore, to prevent the COVID-19 infection, the researcher has planned the following preventive measures.

Before data collection begins, the researcher will clearly communicate to the data collection team that the aim is to protect the people who will take part in the study. The aim of the training is to help them understand what COVID-19 is, how it is spread, how they can catch the virus and infect others, and that it takes a while for symptoms to appear. The researcher will encourage the team to share information about the preventive practices they will be using, and the enrolment team will be asked to share any misinformation or rumours about the spread of the disease. Include this in the debriefing and reporting to ensure that we maintain the trust of the community.

During the data collection, both the data collection team and the study participants will implement the COVID-19 infection prevention strategies according to the WHO and Ethiopia regulatory system. For instance, both the questionnaire administrator and the interviewer will wear masks during the interview by maintaining a physical distance of at least 2 metres between them. The practice of good hand hygiene, which means either washing hands with soap and water or using a disinfectant, is always recommended after coughing, sneezing or blowing one's nose; touching one's eyes, mouth or nose; and avoiding close physical contact with anyone who is unwell during any interview or social interaction. During in-depth interviews, all data collection teams are reminded to maintain a physical distance of at least 2 meters between themselves.

Yours sincerely

SALATO ST MR

Researcher

ANNEXURE G

Patient interview information sheet and consent form

Title: Assessment of integration of tuberculosis and diabetes in healthcare services in Addis Ababa, Ethiopia.

This document has three parts:-

- **Information Sheet** (to share information about the research with you)
- **Consent document** (for signatures if you agree to take part)

PART I: PARTICIPANT INFORMATION SHEET

Introduction

I am, Sisay Tiroro Salato, a PhD student at the University of South Africa (UNISA) under the supervision of Prof Geoffrey Setswe, and we are conducting research on the assessment of the integration of tuberculosis and diabetes in health services, which is a poorly understood and implemented type of health service in our country. I am going to give you information and invite you to be part of this research. You do not have to decide today whether you want to take part in the research or not. Before you decide, you can talk about the research with anyone you feel comfortable with.

There may be some words you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have any questions later, you can ask me or the research assistants.

Background and purpose of the research

The co-morbidity of tuberculosis and diabetes in the same patient is becoming a public health issue, especially in countries like ours. Research shows that people with diabetes are two to three times more likely to have tuberculosis than people without diabetes, and that tuberculosis worsens the treatment outcomes for patients with diabetes. Fragmented health systems do not respond well to the needs of patients with both TB and diabetes.

Responsible organisations (such as WHO and the Union) recommend that health care for TB and diabetes patients should be integrated to meet their needs. The purpose of this research is to analyse the factors that affect the integration of health services for people with TB and diabetes in public health facilities in Addis Ababa, and to recommend a health system that helps to improve the detection and management of TB in people with diabetes.

Participant Selection

We are inviting all diagnosed adult TB patients who have tested positive for adult-onset diabetes and who attend the DOTS unit of the hospital/health centre for anti-TB treatment to participate in the research.

Voluntary participation

Your participation in this research is completely voluntary. It is your choice whether to participate or not. Whether you choose to participate or not, all the services you receive at this health facility will continue and nothing will change. If you decide not to take part in this research project, you will be offered the treatment that is routinely provided in this facility, and we will tell you more about this later. You can change your mind later and stop participating, even if you have agreed to participate earlier.

Risks

There are no known risks associated with this study. However, you may inadvertently disclose some personal or confidential information, or you may feel uncomfortable talking about some of the topics; I do not want this to happen. You do not have to answer any questions or take part in the interview if you feel uncomfortable with the questions.

Benefits

There is no direct benefit for taking part in this study, but the results will benefit patients like you in the future by providing an appropriate solution to the problem identified by this study. Again, the results of this study will be important for people making policy decisions about integrating TB and diabetes into health systems.

Confidentiality

We will not share any information about you with anyone outside of the research team. The information we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is, and we will keep this information under lock and key. It will not be shared or given to anyone except my supervisor, who will have access to the information.

Right to Refuse or withdraw

You do not have to take part in this research if you do not want to, and refusing to take part will not affect your treatment at this facility in any way. You will continue to receive all the benefits you would otherwise receive at this facility. You can stop participating in research at any time without losing any of your rights as a patient here. Your treatment at this institution will not be affected in any way.

Who to contact to Questions

If you have any questions or require further information about the study, the study investigators can be contacted on mobile phone: +251922-77-6373/+251912-67-46-84 or email: sisaytiroro@yahoo.com, just ask to speak to Mr. Sisay Tiroro. If you have questions about this study, please contact the supervisor, Professor Geoffrey Setswe on +27 72 025 9875 or gsetswe5@hotmail.com.

PART II: INFORMED CONSENT FORM (ICF)

I have read all the above information or it has been read to me. I have asked questions and received satisfactory answers about anything I did not understand. I have received a copy of this consent form.

Print Name of Participant__________________

Signature of Participant ___________________

Date ___________________________

Day/month/year

Statement by the researcher/consent holder

I have carefully read the information sheet to the potential participant and have made sure, to the best of my ability that the participant understands that the following will be done:

1. Questionnaire interview

I confirm that the participant was given the opportunity to ask questions about the study and all questions asked by the participant were answered correctly and to the best of my ability. I confirm that the participant was not coerced into giving consent and that consent was given freely and voluntarily.

A copy of this ICF has been given to the participant.

Name of researcher/person taking the consent________________________

Signature of researcher /person taking the consent__________________________

Date ___________________________

Day/Month/Year

ANNEXURE H

Patient interview questionnaire

Questionnaire Number [ ][ ][ ]

Instructions:

This questionnaire has been prepared to be used interviews with patients to study the integration of tuberculosis and diabetes mellitus health services in public health facilities in Addis Ababa. All information provided will be kept confidential. Patients' names will not be written on this questionnaire.

Please answer all the questions by circling the list corresponding to your chosen answer. Answer all the questions as honestly, frankly, and objectively as possible. Answer according to your own opinion and experience.

Type of facility

1. Hospital
2. Health centre

Part-I. Socio-demographic characteristics

Code	Questions	Answer
101	Gender of the respondent	1. Male 2. Female
102	How old are you?	______[in full year]
103	Where is your residence?	1. Urban 2. Rural
104	What is your highest level of education you have attained?	1. No schooling 2. Primary school 3. Secondary school 4. Diploma and above
105	Which of the following best describes your current occupation status?	1. Employee 2. Unemployed 3. Student 4. Housewife 5. Retired 6. Other[specify[________

		]
106	What is your household average monthly income in Ethiopian Birr?	______________
Part-II. Health system assessment questions		
Code	**I. Questions to assess health services delivery**	
201	Do you think the health facility provide an integrated TB-DM service?	1. Yes 2. No
202	Have you received counselling services on the proper use of anti-TB or DM medicines during care?	1. Yes 2. No
203	Have you received counselling services during DM care about the risk of TB treatment?	1. Yes 2. No
204	Do you think the TB-DM integrated services are organized?	1. Yes 2. No
205	Do you think the TB-DM integrated services have policy?	1. Yes 2. No
206	Do you think the health facilities are providing continuous integrated care for patients with TB-DM?	1. Yes 2. No
Code	**II. Questions to assess health Workforce**	
301	Do you think the facility has multi-disciplinary team to provide integrated care for patients with TB-DM?	1. Yes 2. No
302	Do you think the health facility has a coordinator for patients with TB-DM?	1. Yes 2. No
303	Do you think the health workers have adequate knowledge to provide integrated services for you as patients with TB-DM?	1. Yes 2. No
304	Have you seen the involvement of informal care givers in integrated TB-DM services during your care?	1. Yes 2. No
Code	**III. Questions to assess leadership and Governance**	
401	Do you think the health services that you are receiving are planned and based on your need?	1. Yes 2. No
402	Do you have experience of shared decision making with the health workers on your planned care?	1. Yes 2. No
403	Do you think the health facility has a supportive leadership for the care of TB-DM patients?	1. Yes 2. No
404	Do you think the health facility has a policy for patients with TB-	1. Yes

	DM?	2. No
Code	**IV. Questions to assess health Financing**	
501	Do you think the health facility will reimburse the costs of the TB-DM care services?	1. Yes 2. No
502	Do you think the health services cost is fair?	1. Yes 2. No
Code	**V. Questions to assess technology and medical products**	
601	Do you think the facility use of an electronic medical record during for your care?	1. Yes 2. No
602	Do you think the facility have technologies to assist in diagnosing TB and DM?	1. Yes 2. No
603	Do you think the facility have a way for monitoring your care for TB-DM remotely?	1. Yes 2. No
604	Do you think the facility have access of medical products to treat TB-DM?	1. Yes 2. No
	VI. Questions to assess information and research	
701	Do you think the facility have individualized data for TB-DM patients?	1. Yes 2. No
702	Do you think the health workers have a mechanisms to predict your individual risk?	1. Yes 2. No
703	Do you the facility have a system to protect the privacy of your data?	1. Yes 2. No
704	Do you think that the access of information is an important for clients with TB-DM?	1. Yes 2. No

Thank you!!!

Name of interviewer _ _ _ _ _ _ _ _ _

Time finished _ _ _ _ _ _ _ _ _ _ _

ANNEXURE I

Amharic language version of the consent form for the TB-DM patients

በጥናቱ እንዲሳተፉ ስለመጠየቅ
ለጥናቱ የመረጃ ቅጽ እና የመስማሚያ ቅጽ

የስነ ምግባር ክሊራንስ የማጣቀሻ ቁጥር 64053989_CREC_CHS_2021

ርዕስ: "Assessment of the Integration of Tuberculosis and Diabetes Mellitus in Healthcare Services in Addis Ababa, Ethiopia"
ውድ ዕጩ ተሳታፊ

ስሜ ሲሳይ ቲሮሮ ይባላል በደቡብ አፍሪካ ዩኒቨርሲቲ በሕብረተሰብ ጤና ላይ በፒኤች.ዲ በጤና ጥናት ክፍል በአዩም ኢንስቲትዩት የአተገባበር ጥናት ክፍል ማኔጂንግ ዳይሬክተር ፕሮፌሰር ኬትሼፊል ጂኦፍሬይ ሴስዌ ጋር ጥናት እያደረግሁ ነው። በአዲስ አበባ ኢትዮጵያ ውስጥ የቲቢ እና የስኳር በሽታ ውህደት ምዘና በሚል ርዕስ ጥናት እንድትካፈሉ ጋብዘናል።

የጥናቱ ዓላማ ምንድን ነው?

ይህ ጥናት በአዲስ አበባ ውስጥ የቲቢ እና የስኳር በሽታ ላለባቸው የጤና እንክብካቤ አገልግሎቶች ውህደት ላይ ተጽዕኖ የሚያሳድሩትን ምክንያቶች ለመገምገም፣መፈለጊያ እና አያያዝን ለማሻሻል የሚረዳውን የውህደት ማዕቀፍ ለማዘጋጀት ይጠቅማል ተብሎ ይጠበቃል። የቲቢ በሽታ ያለበቸው የስኳር በሽተኞች እና (2) የስኳር በሽታ ያለባቸውን የቲቢ በሽተኞች።

ለመሳተፍ ለምን ተጋበዝኩ?

በጥናቱ ለመሳተፍ የፀረ-ቲቢ ሕክምናን ለመፈለግ በሆስፒታል/ ጤና ጣቢያ የዶትስ [DOTs] ክፍልን በመመርመር በአዋቂዎች ላይ ለሚከሰት የስኳር በሽታ አዎንታዊ ምርመራ የተደረገባቸውን በአዋቂዎች የተመረጡ የጎልማሳ የቲቢ ህመምተኞችን እንጋብዛለን።

በዚህ ጥናት ውስጥ የተሳተፍኩበት ባህርይ ምንድን ነው?

በዚህ ጥናት ውስጥ ለመሳተፍ ከተመረጡ ሚናዎች በተዋቀረው መጠይቅ አማካይነት በጥናት ቃለመጠይቁ ውስጥ እየተሳተፈ ነው፣ ይህም ማህበራዊ-ስነ-ህዝብ፣ የጤና አገልግሎት አሰጣጥ፣ አመራር እና አስተዳደር፣ የሰው ኃይል፣ ፋይናንስ፣ ቴክኖሎጂዎች እና የህክምና ምርቶች እና የጤና መረጃ እና የጥናት ጥያቄዎች እንድትሳተፉ ከተመረጣችሁ በዚህ ጥናት ፕሮጀክት መጠይቅ ወቅት አንድ ጊዜ ብቻ አንድ ሰዓት ለሚሆን ጊዜ እንድትሳተፉ ይጠበቅባችኋል።

ለመሳተፍ ከተስማማሁ በኋላ ከዚህ ጥናት መውጣት እችላለሁ?

በዚህ ጥናት ውስጥ ለመሳተፍ ሙሉ በሙሉ በፍቃደኝነት ላይ የተመሰረተ ሲሆን ተሳትፎን ለመፍቀድ ግዴታ የለብዎትም። ለመሳተፍ ከወሰኑ ይህ የመረጃ ወረቀት እንዲኖርዎት እና በጽሑፍ ስምምነት ቅጽ

እንዲፈርሙ ይጠየቃሉ። በማንኛውም ጊዜ እና ያለ ምክንያት ለመውጣት ነፃ ነዎት እና ይህ በምንም መንገድ በዚህ ተቋም ውስጥ በሚደረግ ተሳትፎዎ ላይ ተጽዕኖ አይኖረውም። አለበለዚያ በዚህ ተቋም ውስጥ ሊያገኙዋቸው የሚችሏቸው ሁሉንም ጥቅሞች አሁንም ያገኛሉ። እዚህ ምንም መብትዎን ሳያጡ በሚፈልጉት በማንኛውም ጊዜ በጥናቱው ላይ መሳተፉዎን ማቆም ይችላሉ። በዚህ ተቋም ውስጥ የሚደረግ ቆይታ በምንም መንገድ ተጽእኖ አይደረግበትም።

በዚህ ጥናት ውስጥ የመሳተፍ ጠቀሜታዎች ምንድ ናቸው?

በዚህ ጥናት ውስጥ ለመሳተፍ ቀጥተኛ ጥቅሞች የሉም፤ ነገር ግን ከዚህ ጥናት የሚገኘው ግኝት ለወደፊቱ እንደ እርስዎ ያሉ ታካሚዎችን ይጠቅማል ተብሎ ይታሰባል። እንደገና ፣ ከዚህ ጥናት የተገኘው ውጤት ለቲቢ እና ለስኳር በሽታ የጤና ስርዓት ውህደትን በተመለከተ የፖሊሲ ውሳኔ ለሚወስኑ ሰዎች አስፈላጊ ይሆናል።

በጥናት ሥራ ውስጥ ከተሳተፍኩ በእኔ ላይ ምን ዓይነት አሉታዊ ውጤቶች ይኖራሉ?

ከዚህ ጥናት ጋር ተያይዘው የሚመጡ ስጋቶች የሉም። ሆኖም፣ አንዳንድ የግል ወይም ምስጢራዊ መረጃዎችን በአጋጣሚ ሊያጋሩ ይችላሉ፣ ወይም ስለ አንዳንድ ርዕሶች ማውራት የማይመች ሆኖ ሊሰማዎት ይችላል፤ ይህ እንዲከሰት አንፈልግም። ጥያቄዎቹ ምቾት ካልሰጧችሁ መልስ መመለስ ወይም በመጠይቁ መሳተፍን መተው ይችላሉ።

ለጥናት አድራጊው የምሰጠው መረጃ እና ማንነቴ ሚስጥራዊ ይሆናል?

እኛ ከጥናት ቡድን ውጭ የእርስዎን መረጃ ለማንም አናጋራም። ከዚህ የጥናት ፕሮጀክት የምንሰበስበው መረጃ የግል ሆኖ ይቀመጣል። በስምዎ ምትክ ስለእርስዎ ያለ ማንኛውም መረጃ በላዩ ላይ የሚስጥር ቁጥር/ኮድ ይኖረዋል እንዲሁም ከሚሰጡት መልስ ጋር ማንም ሊያገናኝዎት አይችልም። መልሶችዎ ቁጥር ወይም ሀሰተኛ ስም ይሰጣቸዋል እናም በውሂቡ፣ በማንኛውም ህትመቶች ወይም እንደ ኮንፈረንስ ሂደቶች ያሉ ሌሎች የጥናት ሪፖርቶች ዘዴዎች በዚህ መንገድ ይጠራሉ። የመረጃ አሰባሳቢዎቹ እና የስታቲስቲክስ ባለሙያው መረጃው በሚስጢራዊ የሚያዝ በመሆኑ የተገደበ ግንኙት አላቸው። ጥናት አድራጊው እና ሱፐርቫይዘር ዋናውን መረጃን ያገኛሉ። መልሶችዎ በጥናት ግምገማ ኮሚቴ አባላት ሊገመገሙ ይችላሉ። አለበለዚያ ሌሎች ሰዎች መዝገቦቹን እንዲያዩ ፈቃድ ካልሰጡ በስተቀር እርስዎን የሚለዩ መዝገቦች በጥናቱ ላይ ለሚሰሩ ሰዎች ብቻ ይገኛሉ። ከዚህ ቃለ-ምልልስ ያልታወቁ መረጃዎች ለሌላ ዓላማ ሊውሉ ይችላሉ፣ ለምሳሌ እንደ ጥናት ዘገባ፣ የመጽሔት መጣጥፎች እና/ ወይም የጉባኤ ሂደቶች ተሳታፊዎች ግን በእንደዚህ ዓይነት ሪፖርት ውስጥ ተለይተው አይታወቁም።

ጥናት አድራጊው የመረጃ ደህንነት ጥበቃ እንዴት ያደርጋል?

ለወደፊት ጥናት ወይም ለአካዳሚክ ዓላማዎ በቢሮዬ ውስጥ በተቆለፈ ቁም ሣጥን/ ፋይል ካቢኔ ውስጥ የመልስዎ የወረቀት ቅጂዎች/ኮፒዎች በተመራማሪው ቢያንስ ለአምስት ዓመት ይቀመጣሉ ፤ የኤሌክትሮኒክ መረጃ በይለፍ ቃል በተጠበቀ ኮምፒተር ላይ ይቀመጣል። የተከማቸው መረጃ ለወደፊቱ ጥቅም ላይ የሚውል ከሆነ ለወደፊቱ የጥናት ሥነምግባር ግምገማ እና ማረጋገጫ ይሆናል። ተመራማሪው ከማንኛውም የጥናት መረጃ ከመወገዱ በፊት መረጃው ለአምስት ዓመታት የሚጠበቅበትን ዝቅተኛ የማቆያ ጊዜ እንዳላለፈ ለማረጋገጥ ዩኒቨርስቲውን ያማክራል። መልሶ የማገገም እድል ከሌለው መረጃው በማይቀለበስበት መንገድ የሚወገድበት ጊዜ ብቻ ነው። በወረቀት ላይ የተመሰረቱ መዝገቦች ይቦጫጭቃሉ እና የኤሌክትሮኒክ ቅጅዎች አግባብነት ያለው የሶፍትዌር ፕሮግራም በመጠቀም ከኮምፒውተሩ ሃርድ ድራይቭ ላይ እስከመጨረሻው ይሰረዛሉ።

በዚህ ጥናት ውስጥ ለመሳተፍ ክፍያ ወይም ማንኛውንም ማበረታቻዎችን እቀበላለሁ?

በዚህ ጥናት ውስጥ ለመሳተፍ ምንም ክፍያ ወይም ማበረታቻ የለም፤ ሆኖም ተመራማሪው 50 የኢትዮጵያ ብር የትራንስፖርት ወጪን ይሸፍናል። ጥናቱ የሥነ ምግባር ማረጋገጫ አግኝቷል ይህ ጥናት በ 64053989 CREC_CHS 2021, UNISA ከሚገኘው የጥናት ሥነ ምግባር ኮሚቴ የጽሑፍ ማረጋገጫ አግኝቷል። ከፈለጉ የማረጋገጫ ደብዳቤውን ቅጅ ከተመራማሪው ማግኘት ይቻላል።

ስለ ጥናቱ ግኝት/ ውጤቶች እንዴት ማወቅ እችላለሁ?

የመጨረሻውን የጥናት ግኝት ለማወቅ ከፈለጉ እባክዎ ሲሳይ ቲሮሮን በ + 251-922-77-63-73/ + 251-912-67-46-84፣ ወይም sisaytiroro3@gmail.com ያነጋግሩ ግኝቶቹ ከጥቅምት 21 እስከ ህዳር 2015 ዓ.ም ድረስ ተደራሽ ናቸው። ተጨማሪ መረጃ ከፈለጉ ወይም ስለ ማንኛውም ጥናት ተመራማሪውን ለማነጋገር ከፈለጉ እባክዎን በ +251-922-77-63-73/+251-912-67-46-84፣ ወይም sisaytiroro3@gmail.com. ጥናቱ በተካሄደበት መንገድ ላይ ስጋት ካለዎ ፕሮፌሰር ጂኦፌሪ ሴትዌ በ +277-202-598-75/ gsetswe5@hotmail.com. ሊያነጋግሩዋቸው የሚችሏቸውን የዶ/ር ኤስ ሻኳን የጥናት ሥነምግባር ሊቀመንበር ያነጋግሩ ወይም (PHSREC አባል) shakws@unisa.ac.za.

ማንኛውም የሥነ ምግባር ሥጋት ካለዎት ይህንን የመረጃ ወረቀት ለማንበብ ጊዜ ስለወሰዱ እናመሰግናለን። በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ ከሆኑ ከዚህ በታች ያለውን የስምምነት ቅጽ ይሙሉ።

ከሰላምታ ጋር
ሲሳይ ቲሮሮ
ጥናት አድራጊው

በጥናቱ ውስጥ ለመሳተፍ የተደረገ ስምምነት

እኔ ______________________________ (የተሳታፊው ስም)፣ በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃዴን የጠየቀኝ ሰው ስለ ተፈጥሮ ፣ የአሠራር ሂደት ፣ ሊኖሩ ስለሚችሉት ጥቅሞች እና ስለተሳትፎ አለመመጣጠን የነገረኝ መሆኑን ያረጋግጡ። በመረጃ ወረቀቱ ላይ እንደተብራራው አንብቤያለሁ (ወይንም አስረድቼዋለሁ) ጥናቱን ተረድቻለሁ። ጥያቄዎችን ለመጠየቅ በቂ እድል አግኝቻለሁ እናም በጥናቱ ለመሳተፍ ተዘጋጅቻለሁ።

የእኔ ተሳትፎ በፈቃደኝነት እንደሆነ እና ያለ ቅጣት በማንኛውም ጊዜ ለመልቀቅ ነፃ ነኝ። የዚህ ጥናት ግኝቶች ወደ ጥናታዊ ሪፖርት፣ ወደ ጆርናል ህትመቶች እና/ ወይም ወደ ጉባኤዎች ሂደቶች እንደሚካሄዱ አውቃለሁ፣ ግን በሌላ መንገድ ካልተገለጸ በስተቀር የእኔ ተሳትፎ በምስጢር እንደሚጠበቅ በመረጃ ስምምነት የተፈረመ ቅጅ ደርሶኛል።

የተሣታፊ ሙሉ ስም እና ፊርማ _____________________ (እባክዎን ይፃፉ)

የተሳታፊዎች ፊርማ _______________________ ቀን ________________

የጥናት አድራጊ ሙሉ ስም ______________________ ቀን ___________ (እባክዎን ይፃፉ)

የጥናት አድራጊ ፊርማ _____________________ ቀን _______________

ANNEXURE J

Amharic language version questionnaire for TB-DM patients

የአማርኛ መጠይቅ

ይህ መጠይቅ በአዲስ አበባ በጤና ተቋማት ላይ ያለውን የቲቢ- ስኳር ህመም የአገልግሎት ውህደት ለመጥናት የተዘጋጀ ነው።

የጤና ተቋም አይነት

1. ሆስፒታል 2. የጤና ጣቢያ

መጠይቁ የተሞላበት ቀን -----/----/2013 ዓ.ም

ክፍለ 1 የማህበረ - ስነ ህዝብ አሰፋፈር ባህርያት

ኮድ	ጥያቄዎች	ምላሽ
101	የምላሽ ሰጪ ፆታ	1. ወንድ 2. ሴት
102	እድሜዎ ስንት ነው?	--------------ዓመት
103	የመኖሪያ አድራሻዎ የት ነው ?	1. ከተማ 2. ገጠር
104	የደረሱበት ከፍተኛ የትምህርት ደረጃ ምንድነው?	1. አልተማርኩም 2. የመጀመሪያ ደረጃ 3. ሁለተኛ ደረጃ 4. ዲፕሎማ እና ከዚያ በላይ
105	ከሚከተሉት የትኛው የእርስዎን ወቅታዊ ስራ ሁኔተ ይገልፃል?	1. ሰራተኛ 2. ስራ የሌለው 3. ተማሪ 4. የቤት እመቤት 5. ጡረተኛ 6. ሌላ ካለ ይገለጽ ----------
106	በቤታችሁ ውስጥ እርስዎን ጨምሮ ስንት ሰው ይኖራል?	---------------------------
107	የቤተሰባችሁ አማካይ ወርሃዊ ገቢ በብር ምን ያህል ነው?	----------------------------
ክፍል 2 የጤና ስርዓት ግምገማ ጥያቄዎች		

ኮድ	2. የጤና አገልግሎት አሰጣጥን የሚመዝኑ ጥያቄዎች	
201	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ቀጣይ እና የተቀናጀ የቲቢ-ስኳር ሕክምና አገልግሎት ያቀርባል ብለው ያስባው?	1. አዎን 2. የለም
202	በጤና ጣቢያዎች/ሆስፒታሎች ውስጥ መደበኛ ያልሆኑ ሕክምና ሰጪዎችን ለታካሚዎች ያቀርባሉ ብለው ያስባው?	1. አዎን 2. የለም
203	ጤና ጣቢያዎች/ሆስፒታሎች የቲቢ-ስኳር ታማሚዎችን ተጠቃሚ ለማድረግ የራስ አስተዳደር ስርዓት አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
204	የፀረ-ቲቢ ወይም የስኳር ህመም መድሀኒት ሲወስዱ ስለአጠቃቀም የጤና ትምህርት/ምክር አገልግሎት አግኝተዋል?	1. አዎ 2. የለም
205	በቲቢ ህክምና ጊዜ የስኳር ህመም ስጋት ስለመኖሩ የጤና ትምህርት/የማማከር አገልግሎት አግኝተዋል?	1. አዎ 2. የለም
206	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የስኳር ህመም እንክብካቤ ካስፈለጋችሁ ሪፈር የሚያደርጉበት ስርዓት ወይም ወደ ከፍተኛ ደረጃ ግንኙት እንዳለው ያስባው?	1. አዎ 2. የለም
207	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ጥሩ የተደራጀ እና የተቀናጀ የቲቢ- ስኳር ህመም አገልግሎት ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም
208	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ- ስኳር ታካሚዎች ጥራት ያለው የህክምና ስርዓት ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም
209	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ- ስኳር ህመም ታካሚዎች የተቀናጀ የህክምና አገልግሎት ለማቅረብ የሚያስችል ጥሩ ፖሊሲ አለው ብለው ያስባው?	1. አዎ 2. የለም
210	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ- ስኳር ታካሚዎች ሁልጊዜ የተቀናጀ አገልግሎት ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም
211	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ሁልጊዜ ለቲቢ-ስኳር ታካሚዎች የተቀናጀ ተደረሽ ሆነ አገልግሎት ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም
	3. የጤና ሰራተኞችን የመመዘኛ ጥያቄዎች	
301	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የተቀናጀ እና ዘርፈ ብዙ አገልግሎት ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም
302	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የቲቢ-ስኳር የተቀናጀ ህክምና አመቻች ለታካሚዎች ያቀርባል ብለው ያስባው?	1. አዎ 2. የለም

303	ዶክተሮች እና ነርሶች የተቀናጀ አገልግሎት ለቲቢ-ስኳር ህመም ታካሚዎች አገልግሎቱን ለማቅረብ በቂ እውቀት እና ክህሎት አላቸው ብለው ያስባው?	1. አዎ 2. የለም
304	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች በቀጣይነት የስልጠና መርሃ ግብር እና ለዶክተሮችን እና ነርሶችን ለማጐልበት ይጠቀማሉ ብለው ያስባው?	1. አዎ 2. የለም
305	ለቲቢ-ስኳር ታካሚዎች መደበኛ ያልሆኑ የህክምና አገልግሎት የሚሰጡ ባለሙያዎች ይሳተፈሉ ብለው ያስባው?	1. አዎ 2. የለም
306	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የተቀናጀ አገልግሎት ለታካሚዎች መስጠት የሚችሉ ሰራተኞች አላቸው ብለው ያስባው?	1. አዎ 2. የለም
307	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የተቀናጀ ሕክምና ለማቅረብ ለሰራተኞቹ ትምህርት የመስጠት እቅድ አላቸው ብለው ያስባው?	1. አዎ 2. የለም
ኮድ	**4. የአመራር እና አስተዳደር ግምገማ ጥያቄዎች**	
401	የሚያገኙት አገልግሎት በፍላጐታችሁ ላይ ተመስርቶ የታቀደ ነው ብለው ያስባው?	1. አዎ 2. የለም
402	በታቀደው ህክምናችሁ ከጤና ሰራተኞች ጋር የጋራ ውሳኔ ሰጪነት ልምድ አላችሁ?	1. አዎ 2. የለም
403	በጤና ጣቢያ/ሆስፒታል የምታገኙት አገልግሎት የተቀናጀ እና ፍላጐታችሁን የሚያሟላ ነው ብለው ያስባው?	1. አዎ 2. የለም
404	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ/ስኳር ታካሚዎች ደጋፊ የሕክምና አመራር አላቸው ብለው ያስባው?	1. አዎ 2. የለም
405	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለሚያቀርቡት አገልግሎት ግልጽ እና ተጠያቂነት ያለው የአገልግሎት እቅድ አላቸው ብለው ያስባው?	1. አዎ 2. የለም
406	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የራሳቸው የጤና ሰራተኞች ጥሩ የስራ አፈፃፀም መለኪያ ስርዓት አላቸው ብለው ያስባው?	1. አዎ 2. የለም
407	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የጋራ ራዕይ፣ ፍላጐት እና እሴቶች ባህል አለው ብለው ያስባው?	1. አዎ 2. የለም
408	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ/ስኳር ታካሚዎች የፖሊሲ እና ድርጊት እቅድ አላቸው ብለው ያስባው?	1. አዎ 2. የለም
409	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ/ስኳር ታካሚዎች ጥሩ ሕክምና	1. አዎ

	ለማቅረብ ፖለቲካዊ ቁርጠኝነት አላቸው ብለው ያስባው?	2. የለም
410	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ስራቸውን ለማሻሻል ስትራቴጂዎች እና የማሻሻያ መንገዶች አላቸው ብለው ያስባው?	1. አዎ 2. የለም
ኮድ	**5. የጤና ፋይናንስን መገምገሚያ ጥያቄ**	
501	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ሁልጊዜ የቲቢ-ስኳር ታካሚዎችን የገንዘብ ወጭ ለመሸፈን የሚጠቀሙበት መንገድ አለ ብለው ያስባው?	1. አዎ 2. የለም
502	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለምታገኙት አገልግሎት የኪስ ወጭ ገንዘብ ይሸፍነል ብለው ያስበሉ?	1. አዎ 2. የለም
503	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች ጥሩ ስራ ለሚሰሩ የፋይናንስ አገልግሎት ማበረታቻ አላቸው ብለው ያስባው?	1. አዎ 2. የለም
504	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች ለአስተባባሪዎች ማበረታቻ አላቸው ብለው ያስባው?	1. አዎ 2. የለም
505	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለምታገኙት አገልግሎት ገንዘብ የመመደቢያ አሰረር አላቸው ብለው ያስባው?	1. አዎ 2. የለም
506	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለፈጠራ የጤና አገልግሎት ማበረታቻ ይሰጣሉ ብለው ያስባው?	1. አዎ 2. የለም
507	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል አገልግሎቱን ለሚፈልጉ ዋጋቸው መጠነኛ እና ተደራሽ ነው ብለው ያስባው?	1. አዎ 2. የለም
ኮድ	**6. ቴክኖሎጂን እና የሕክምና ምርቶችን መገምገሚያ ጥያቄዎች**	
601	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለህክምናችሁ የኤሌክትሮኒክ ህክምና ምዝገባ ይጠቀማሉ?	1. አዎ 2. የለም
602	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ እና ለስኳር ታካሚዎች ምርመራ ድጋፍ የሚያደርጉ ቴክኖሎጂዎችን ይጠቀማሉ?	1. አዎ 2. የለም
603	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የሕክምና ቁጥጥር የሚያደርጉበት መንገድ አለ?	1. አዎ 2. የለም
604	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የጋራ የመረጃ ስርዓት አላቸው?	1. አዎ 2. የለም
605	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የቴክኖሎጂ ፈጠራን ለመጠቀም ፖሊሲዎች አላቸው?	1. አዎ 2. የለም

606	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የቲቢ-ስኳር ህመም ታካማዎችን ለማከም የቴክኖሎጂ እና የሕክምና ምርት ይጠቀማሉ?	1. አዎ 2. የለም
607	የሚጠቀሙበት ጤና ጣቢያል/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የተቀናጀ አገልግሎት ለማቅረብ በቂ ቴክኖሎጂ (የስኳር ህመም መመርመሪያ አገልግሎቶች) አላቸው?	1. አዎ 2. የለም
	7. የመረጃ እና ጥናት ግምገማ ጥያቄዎች	
701	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች የግለሰቦች ዳታ አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
702	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የግል ስጋቶቻችሁን የሚተነብዩበት ስርዓት አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
703	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች ጥናትን ለማነቃቃት ፖሊሲዎች አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
704	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል የእርሶን ዳታ ግላዊነት የመጠበቂያ ስርዓት አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
705	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች መረጃውን ለማሰደግ የፈጠራ ጥናት ድጋፍ አላቸው ብለው ያስባሉ?	1. አዎ 2. የለም
706	የሚጠቀሙበት ጤና ጣቢያ/ሆስፒታል ለቲቢ-ስኳር ታካሚዎች መረጃ ለመጨመር የፈጠራ ጥናት ድጋፍ ያደርጋሉ ብለው ያስባሉ?	1. አዎ 2. የለም
707	ለቲቢ-ስኳር ታካሚዎች መረጃ ማግኘት ጠቃሚ ነው ብለው ያስባሉ?	1. አዎ 2. የለም

አመሰግናለሁ

የጠያቂው ስም ------------------------------------

ያለቀበት ሰዓት ------------------------------------

ANNEXURE K

Health facility manager information sheet and consent form

Title: Assessment of integration of tuberculosis and diabetes in healthcare services in Addis Ababa, Ethiopia.

This document has three parts:-

- **Information Sheet** (to share information about the research with you)
- **Consent document** (for signatures if you agree to take part)

PART I: PARTICIPANT INFORMATION SHEET

Introduction

I am, Sisay Tiroro Salato, a PhD student at the University of South Africa (UNISA) under the supervision of Prof Geoffrey Setswe, and we are conducting research on the assessment of the integration of tuberculosis and diabetes in health services in public health facilities of Addis Ababa, Ethiopia.

The goal of the study is to analyse factors affecting health service integration for patients with tuberculosis and/or diabetes in public health facilities of Addis Ababa. The study also explores the health system challenges and opportunities to integrate the health services for patients with tuberculosis and/or diabetes; and finally the researcher develops the health service integration framework that helps to improve the detection and management of tuberculosis in patients with diabetes and diabetes in patients with tuberculosis.

Permission to conduct the study within the selected health facilities was granted by the Addis Ababa Regional Health Bureau public health emergency management directorate ethical review committee.

You are hereby kindly requested to participate in this study by completing the check list pertaining to your hospital/health centre in view of providing integrated health services for patients with tuberculosis and/or diabetes mellitus regarding the health system building blocks. This will take approximately 20 minutes of your precious time. You have the right to self-determination, fair treatment, and protection from discomfort and can be assured that all information provided will be kept confidential. Your anonymity will be ensured as your name or that of your institution will not be required on the questionnaire. You have the right not to participate in this study or not to answer any part of the question you don't feel comfortable to respond. If you have any questions or require further information about the study, the study investigators can be contacted on mobile phone: +251922-77-6373/+251912-67-46-84 or email: sisaytiroro@yahoo.com, just ask to speak to Mr. Sisay Tiroro. If you have questions about this study, please contact the supervisor, Professor Geoffrey Setswe on +27 72 025 9875 or gsetswe5@hotmail.com.

I have read all the above information and I have asked questions and received satisfactory answers about anything I did not understand. I have received a copy of this consent form.

Print Name of Participant__________________

Signature of Participant ___________________

Date ___________________________

Day/month/year

Statement by the researcher/consent holder

I have carefully read the information sheet to the potential participant and have made sure, to the best of my ability that the participant understands that the following will be done:

1. Questionnaire interview

I confirm that the participant was given the opportunity to ask questions about the study and all questions asked by the participant were answered correctly and to the best of my ability. I confirm that the participant was not coerced into giving consent and that consent was given freely and voluntarily.

A copy of this ICF has been given to the participant.

Name of researcher/person taking the consent________________________

Signature of researcher /person taking the consent__________________________

Date ___________________________

Day/Month/Year

ANNEXURE L

Facility assessment check list for facility manager

Type of facility: 1. Hospital 2. Health centre		
1. Health service Delivery		
Code	**Questions**	**Options**
101	Do you have access to diabetes testing for TB patients in your facility?	1. Yes 2. Not available
102	If yes to Q101, do you test TB patients for DM screening?	1. Yes 2. No
103	Do you have access to TB testing for diabetic patients in your facility?	1. Yes 2. Not available
104	If yes to Q103, do you test DM patients for TB screening?	1. Yes 2. No
105	Does your facility offer counselling for TB patients?	1. Yes 2. No
106	Does your facility offer counselling for patients with diabetes patients?	1. Yes 2. No
107	Does your facility have a referral linkage system for patients who need special services?	1. Yes 2. No
3. Health workforce		
Code	**Questions**	**Options**
201	Do you have adequate health workers to integrate TB-DM health services?	1. Yes 2. No
202	Are HCWs working in TB clinics are trained in national TB management?	1. Yes 2. No
203	Are HCWs working in a DM clinic are trained in DM management?	1. Yes 2. No
204	Do you have HCWs trained in TB-DM co-morbidity management?	1. Yes 2. No
3.Health leadership		
301	Do you have a national TB management guideline-	1. Yes

	2017? (the most recent update)	2. No
302	Do you have a guideline to prevent TB infection?	1. Yes 2. No
303	Do you have a diabetes management guideline?	1. Yes 2. No
304	Do you have a TB-DM management guideline?	1. Yes 2. No
305	Do you have support from non-governmental organisations to strengthening TB prevention and control?	1. Yes 2. No
306	Do you have support from non-governmental organisations to strengthen prevention and control of DM?	1. Yes 2. No

4. Health financing		
	Which of the following services and medicines are freely available to patients in your facility?	
401	TB medications	1. Yes 2. No
402	TB diagnostic services/tests	1. Yes 2. No
403	DM medications	1. Yes 2. No
404	DM diagnostic services/tests	1. Yes 2. No
5. Access of medical products/technologies		
	Which of the following supplies/commodities/diagnostic tests are available in your health facility?	**Options**
501	Sputum Microscopy	1. Yes 2. No
502	GeneXpert MTB/RIF	1. Yes 2. No
503	Chest X-ray	1. Yes 2. No

504	Glucometer	1. Yes 2. No
505	Glycated Haemoglobin Device	1. Yes 2. No
506	Renal function and liver enzyme test access	1. Yes 2. No
507	First line ant-TB Medications	1. Yes 2. No
508	Second line anti-TB medications	1. Yes 2. No
509	Oral hypoglycaemic medication	1. Yes 2. No
510	Insulin	1. Yes 2. No
6. Health Information		
Code	**Questions**	**Options**
601	Do you have a TB- registration and reporting tool?	1. Yes 2. No
602	Do you have a DM registration and reporting tool?	1. Yes 2. No
603	Do you have a TB-DM co-morbidity registration and reporting tool?	1. Yes 2. No
604	Do you have a facility-based TB-DM co-morbidity data analysis and information dissemination system?	1. Yes 2. No

ANNEXURE M

Information sheet and consent form for in-depth interview

This information sheet and informed consent form are for experts and health practitioners working in the TB and DM facilities, and who we are invited to participate in the research entitled “Assessment of integration of tuberculosis and diabetes mellitus health services in Addis Ababa, Ethiopia”.

This document has two parts:

- **Information Sheet** (to share information about the research with you)
- **Informed Consent Form** (for signatures if you agree to take part)

<u>PART I: INFORMATION SHEET</u>

Introduction

I am, Sisay Tiroro Salato, a doctoral student at University of South Africa (UNISA). We are conducting research on the integration of tuberculosis and diabetes in health services in our country. I am going to give you information and invite you to be part of this research. You do not have to decide today whether you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them of me or the research assistants.

Background and Purpose of the research

The occurrence of both tuberculosis and diabetes in one patient is becoming a public health issue, particularly in countries like ours. Research shows that people with diabetes are 2 to 3 times more likely to have tuberculosis than those without diabetes, and also tuberculosis worsens the treatment outcome of patients with diabetes. The fragmented health systems are not responding well to the needs of patients with both TB and diabetes.

Responsible organizations (like WHO and the UNION) recommend that health care provided to patients with TB and diabetes should be integrated to meet their needs. The reason why we are conducting this research is to analyse factors affecting integration of health services for people with TB and diabetes in Addis Ababa, and to recommend a health system that helps to improve the detection and management of TB in patients with diabetes.

Type of Research Intervention

This research will involve your participation in an in-depth interview that will take about one and a half hour.

Participant Selection

You are being invited to take part in this research because we feel that your experience as an expert or a practitioner can contribute much to our understanding and knowledge of local health practices.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. The choice that you make will have no bearing on your job or on any work-related evaluations or reports. You may change your mind later and stop participating even if you agreed earlier. You have the right to withdraw at any given point.

Procedure

We are asking you to help us learn more about your experiences on how health services are given for patients with tuberculosis and diabetes in your community. We are inviting you to take part in this research project. If you accept, you will be asked about how the health services are given for tuberculosis and diabetes patients; if is there any integrates services given for TB & DM, and about the challenges and opportunities to provide integrated services in the existing health system; and if possible, at what level of health system can we integrate services for both diseases?

You will participate in an interview with me. During the interview, I will sit down with you in a comfortable place at the Centre. If it is better for you, the interview can take place in your home or a friend's home. If you do not wish to answer any of the questions during the interview, you may say so and I will move on to the next question. No one else but I will be present unless you would like someone else to be there. The information recorded is confidential, and no one else except my supervisor, is responsible for monitoring this study, will access to the information documented during your interview. The entire interview will be tape-recorded, but no-one will be identified by name on the tape. The tape will be kept in locker /cabinet which will be locked. The information recorded is confidential, and no one else except me will have access to the tapes. The tapes will be destroyed after 48 months which is the end of this study.

Duration

The research takes place over 48 months after data collection in total and during that time there is no other visit to you.

Risks

There are no known risks associated with this study. However, you may share some personal or confidential information by chance, or that you may feel uncomfortable talking about some of the topics; I do not wish for this to happen. You do not have to answer any question or take part in the interview if you feel the question(s) are talking about them makes you uncomfortable.

Benefits

There will be no direct benefit to you, but your participation is likely to help us find out more about the challenges of the health system for the integration of health services; and also your contribution in this study will benefit others in the future by helping to improve the existing health system for tuberculosis and diabetes diseases.

Reimbursements

You will not be provided any incentive to take part in the research. However, we will give you 100 Ethiopian Birr for your time, and travel expense.

Confidentiality

We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is and we will lock that information up with a lock and key. It will not be shared with or given to anyone except [my supervisor will have access to the information].

Sharing the Results

Nothing that you tell me today will be shared with anybody outside the research team, and nothing will be attributed to you by name. The knowledge that we get from this research will be shared with you and your community before it is made widely available to the public.

Your interview result will be grouped with other individuals on all reports related to this study. If results of this study are reported in journals or at meetings, your identity will remain secret.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so, and choosing to participate will not affect your job or job-related evaluations in any way. You may stop participating in the interview at any time that you wish without your job being affected. I will give you an opportunity at the end of the interview to review your remarks, and you can ask to modify or remove portions of those, if you do not agree with my notes or if I did not understand you correctly.

Who to Contact

If you have any questions, you can ask me now or later. If you wish to ask questions later, you may contact any of the following: Sisay Tiroro Salato,:+251-922-77-63-73/+251-912-67-46-84/email:sisaytiroro@yahoo.com.

This proposal has been submitted for review and approval by Health Studies Research Ethics Committee (HSREC) of University of South Africa, which is a committee whose task it is to make sure that research participants are protected from harm.

PART II: INFORMED CONSENT FORM

I have read the foregoing information. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant__________________

Signature of Participant ___________________

Date ___________________________

Day/month/year

I also consent to having the interview audio recorded.

Name of participant: ____

Signature: _____________________________Date____________

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. In-depth Interview

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Name of Researcher/person taking the consent________________________

Signature of Researcher /person taking the consent_________________________

Date __________________________

Day/month/year

ANNEXURE N

In-depth interview guide

Good day, my name is Sisay Tiroro. I am a Doctor of Public Health (PHD) student at Unisa conducting research on integration of TB-DM in health care services in Addis Ababa.

1. Explanation of the process

Have you participated in a face-to-face interview before? Face-to-face interviews are being used more and more often in conducting research. Information obtained from the interviews will be used only for research purposes and no names of participants will make known in the report. The interview will be audio-recorded to make a transcript for data analysis purposes.

About face-to-face interview*:*

- We learn from your (positive and negative) aspects of integration of TB and diabetes in health services.
- Not trying to achieve consensus, we are gathering information.

In this study, we are doing face-to-face interview. The reason for using this tool is to explore your views, ideas, experiences, and knowledge on integration of TB and diabetes in health services.

1. Key Informant Information (KII) **Date---------May/2022**

Sr.#	Questions	Response options
1	Sex	1. Male 2. Female
2	Age	_____in full year
3	Educational level	1. Diploma 2. First degree 3. Second degree
4	Profession	1. Nurse 2. Health Officer 3. Medical Doctor 4. Public Health Specialist
5	What's your work experience	_______in year
6	What is your responsibility?	1. TB focal at facility 2. TB-DM focal at facility 3. Clinician/Physician

		4. Medical Director/Health Manager 5. TB program expert 6. Non-Communicable Disease Expert
7	Health facility type	1. Hospital 2. Health centre 3. Federal/Regional/sub regional/ Health office

<u>Main questions for In-depth interview</u>

1. Tell us about how **TB-DM patients are receiving health services**?
    - How is the **magnitude of TB-DM**?
    - How did you see an **integrated service given for TB-DM services**?
      Probe: Why? (Policy, strategy, screening, TB-DM guideline) Would you give me an example?
2. Please share your views on the current level of integration for the following service components by ranking from 1 to 5 (please put √ on the selected level).

		Level of TB and diabetes service integration				
S.no	Service component	Minimal integration	Basic remote integration	Basic On-site integration	Close integration in a partially integrated system	Closely integrated in a fully integrated system
1	TB and DM health service delivery					
2	Leadership and governance					
3	Workforce for TB and DM services					

4	TB and DM Financing					
5	Access to technology and medical products for TB and DM					
6	Information and research on TB and DM					

3. **Health workforce** (clinical, non-clinical and informal care givers)
    - In your opinion, do you think the health workforce is adequate to provide TB-DM services? (skilled/trained)

      Probe: why? How?
    - What do you know about educational and workforce planning in the country's health system?

      Probe: How?
4. **Political commitment**
    - How is the **leadership support** on TB-DM health service integration?

      Probe: Why? How? Would you give me an example?
    - Tell us about the health system have **policy, strategy** and **plan** on TB-DM co-morbidity?

      Probe: why?
5. **Health service financing** for TB-DM patients
    - From your experience how is **health service financed** for patients with TB-DM patients?

      Probe: Why, How, Who?
    - How TB-DM patients get did services? (E.g. cost for drugs, laboratory tests/other diagnostic services), any reimbursement mechanism?

      Probe: Why? How?
6. **Access to medical products and technologies**
    - In your opinion, do you think TB-DM patients have an access of **technologies** (e.g. diagnostics tools like glucometer…etc.) and **medical**

products (e.g. drugs…etc.)

Probe: How? Why?

- Tell us how a shared information system is used for patients with TB-DM?

7. **Information and research data** for patients with TB-DM
   - How do you get information about TB-DM cases?

     Probe: why? How?
   - How is TB-DM co-morbidity monitoring mechanism in your hospital/health? (Registration book for TB-DM, separate medical record, TB-DM reporting formats…etc.)

     Probe: Why? How?
8. Is there something you would like to add about the integration of health services for patients with TB-DM?

This is the end of our discussion

Thank you for taking time out of your busy schedule to provide us with this valuable input today!

ANNEXURE O

Services of statistician confidentiality agreement form

Services of statistician confidentiality agreement form

This study, **<u>assessment of integration of tuberculosis and diabetes in the health services in Addis Ababa, Ethiopia</u>**, is being undertaken by, Mr. <u>Sisay Tiroro Salato</u>, at University of South Africa.

I, ______________, (name of Statistician) agree to assist the principal investigator with this study by assisting during data entry and analysis by using statistical software. I agree to maintain full confidentiality when performing these tasks.

Specifically, I agree to

1. Keep all the research information shared with me confidential by not discussing or sharing the research information in any form or format (e.g. disks, tapes, transcripts) with anyone other than the Principal Investigator(s).
2. Hold in strictest confidence the identification of any individual that may be revealed during the course of performing the research tasks;
3. Not make copies of any raw data in any form or format (e.g., disks, tapes, transcripts), unless specifically requested to do so by the primary investigator;
4. Keep all raw data that contains identifying information in any form or format (e.g., disks, tapes, transcripts) secure while it is in my possession.
   This includes:
   - Keeping all digitized raw data in computer password-protected files and other raw data in a locked file;
   - Closing any computer programs and documents of the raw data when temporarily away from the computer;
   - Permanently deleting any e-mail communication containing the data; and
   - Using closed headphones if transcribing recordings;
5. Give, all raw data in any form or format (e.g., disks, tapes, transcripts) to the primary investigator when I have completed the research tasks;
6. Destroy all research information in any form or format that is not returnable to the primary investigator (e.g., information stored on my computer hard drive) upon completion of the research tasks.

Statistician:	Statistician Signature:	Date
Wasihun Gebetu	[signature]	15 July 2022
Principal Investigator	**PI Signature**	**Date**
Sisay Tiroro	[signature]	July 15 2022

This study, **assessment of integration of tuberculosis and diabetes in the health services in Addis Ababa, Ethiopia**, is being undertaken by, Mr. Sisay Tiroro Salato, at University of South Africa.

I, ______________, (name of Statistician) agree to assist the principal investigator with this study by assisting during data entry and analysis by using statistical software. I agree to maintain full confidentiality when performing these tasks.

Specifically, I agree to

1. Keep all the research information shared with me confidential by not discussing or sharing the research information in any form or format (e.g. disks, tapes, transcripts) with anyone other than the Principal Investigator(s).
2. Hold in strictest confidence the identification of any individual that may be revealed during the course of performing the research tasks;
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4. Keep all raw data that contains identifying information in any form or format (e.g., disks, tapes, transcripts) secure while it is in my possession.

   This includes:

   - Keeping all digitized raw data in computer password-protected files and other raw data in a locked file;
   - Closing any computer programs and documents of the raw data when temporarily away from the computer;
   - Permanently deleting any e-mail communication containing the data; and
   - Using closed headphones if transcribing recordings;
5. Give, all raw data in any form or format (e.g., disks, tapes, transcripts) to the primary investigator when I have completed the research tasks;
6. Destroy all research information in any form or format that is not returnable to the primary investigator (e.g., information stored on my computer hard drive) upon completion of the research tasks.

Statistician:	**Statistician Signature**:	**Date**
________________________	_____________	___________
Principal Investigator	**PI Signature**	**Date**
________________________	_______________	___________

ANNEXURE P

Confidentiality agreement form for data collectors

Confidentiality agreement form for data collectors

Title of the project: - Assessment of integration of tuberculosis and diabetes health services in Addis Ababa, Ethiopia

Introduction:-

I am, Mr. Sisay Tiroro, a doctoral student at University of South Africa (UNISA) conducting research on the mentioned topic, and you are also participating as a research assistant in the important part of the research activities like data collector or independent data coder.

Researchers in the biomedical as well as social and behavioural sciences are expected to be proactive in designing and performing research to ensure that the dignity, welfare, and privacy of individual research subjects are protected and that information about an individual remains confidential. This expectation is expressed in the ethical codes of conduct of professional societies. Protecting the confidentiality of information collected about individuals is also vital to fulfilling the ethical responsibilities described in the Belmont Report.

Purpose

The purpose of this form, confidentiality agreement, is not to address all dimensions of issue regarding the ethical codes and conduct in research involving humans, but to focus on those aspects that are especially important in protecting against breaches of data confidentiality during data collection, coding or/and assisting the researcher in statistical analysis.

In addition to protecting research subjects from harm that might result from their participation in research, confidentiality protections minimize subjects' concerns over the use (or misuse) of the data.

Responsibilities of the data collector

As a data collector I realize that I will collect the data after signing the informed consent form.

I realize that I will not collect data from study participants who are under the age of 18 years.

I understand that all study data will be kept confidential.

I understand that all the materials I will use for data collection purpose is confidential for anyone, and I will not keep any copies of the information nor allow third parties to access them.

I understand that the consent forms, interview tapes, sound files or interview notes can only be discussed with the researchers.

I understand I will be paid 50 Ethiopian birr per questionnaire when I complete the data collection.

Expectation from the researcher

Based on this agreement I realize that I will pay 15 Ethiopian birr per questionnaire at the end of the data collection.

I will give two days training concerning the research ethics, how to maintain the confidentiality of the study participants, how ask the request for consent form, and how to interview. In addition, the objective of this research will be described with the data collectors including the whole data collection processes.

The researcher has been explained to me. I have read and understand this confidentiality agreement form, all of my questions have been answered, and I agree to participate as a data collector. I understand that I will be given a copy of this signed agreement form.

S/r Helen Getachew — 15th Sep 2021

Signature of data collector — Date

SISAY TSRORO — 10TH Oct 2021

Signature of investigator — Date

Title of the project: - Assessment of integration of tuberculosis and diabetes health services in Addis Ababa, Ethiopia

Introduction:-

I am, Mr. Sisay Tiroro, a doctoral student at University of South Africa (UNISA) conducting research on the mentioned topic, and you are also participating as a research assistant in the important part of the research activities like data collector or independent data coder.

Researchers in the biomedical as well as social and behavioural sciences are expected to be proactive in designing and performing research to ensure that the dignity, welfare, and privacy of individual research subjects are protected and that information about an individual remains confidential. This expectation is expressed in the ethical codes of conduct of professional societies. Protecting the confidentiality of information collected about individuals is also vital to fulfilling the ethical responsibilities described in the Belmont Report.

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Expectation from the researcher

Based on this agreement I realize that I will pay 15 Ethiopian birr per questionnaire at the end of the data collection.

I will give two days training concerning the research ethics, how to maintain the confidentiality of the study participants, how ask the request for consent form, and how to interview. In addition, the objective of this research will be described with the data collectors including the whole data collection processes.

The researcher has been explained to me. I have read and understand this confidentiality agreement form, all of my questions have been answered, and I agree to participate as a data collector. I understand that I will be given a copy of this signed agreement form.

______________________	______________________
Signature of data collector	Date
______________________	______________________
Signature of investigator	Date

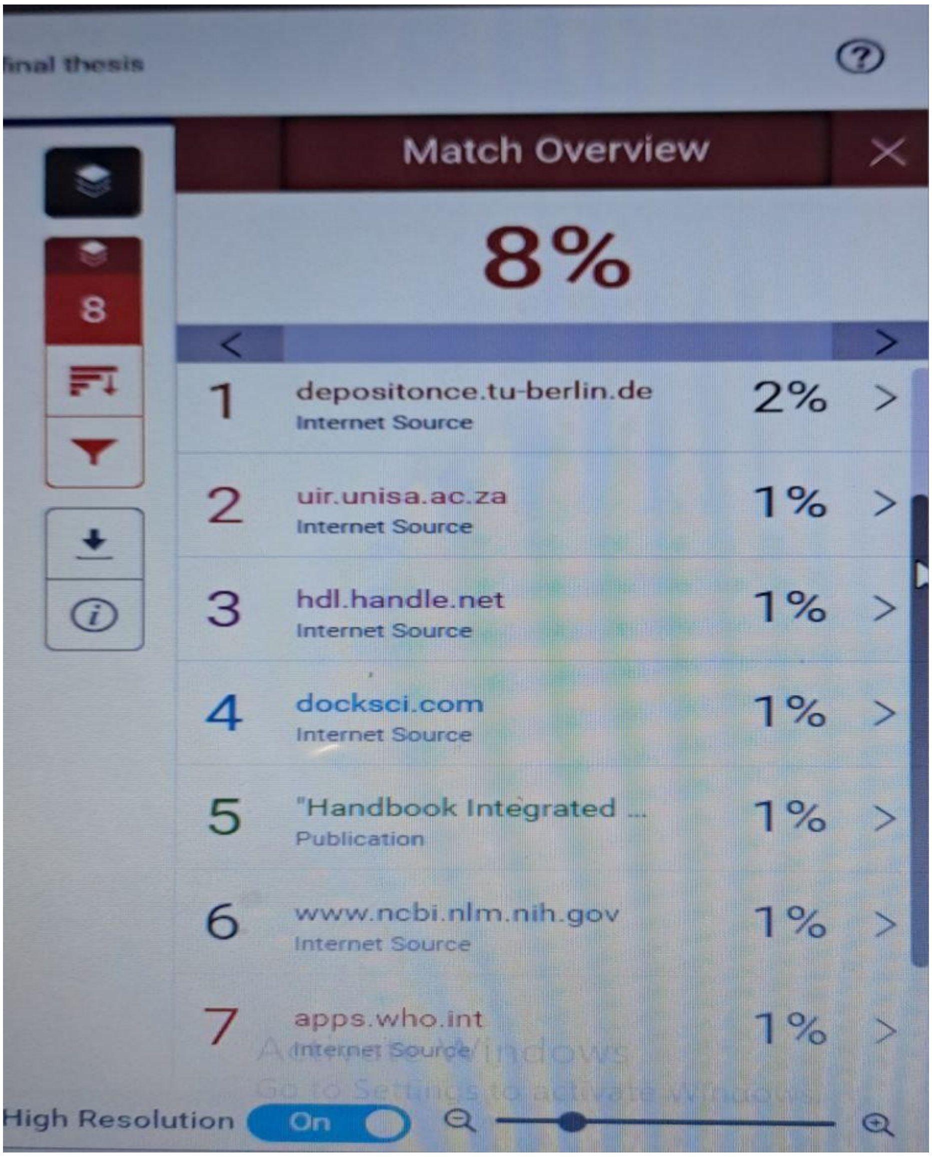
ANNEXURE Q

Turntin originality report

Processed on: 24-Sep-2023 09:23 AM (UTC+0200)

Submission ID: 2174946432

Word count: 78,633



N.B: Exclude quotes **on**

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ANNEXURE R

Language editor certificate

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Wollo University
Institutional Quality
Relevance & Assurance Directorate
Dessie

Ref. No: WU/E/Q/A/R/25/23
Date: Sept. 11, 2023

To: University of South Africa
Graduate Studies Program
Pretoria

Subject: Language editing and proofreading

I hereby testify that I have edited and proofread Sisay Tiroro Salato's PhD thesis entitled **"Assessment of Integration of Tuberculosis and Diabetes Mellitus in Health Services in Addis Ababa, Ethiopia"**.

I have also thoroughly edited it from grammatical and linguistic perspectives. Further still, I have witnessed that Mr. Salato has incorporated all the editorial comments given.

Hence, I hope that you will consider his work as a valuable effort since his thesis can really be applicable in the Ethiopian public health arenas.

Best regards,

አሊ ያሲን (ዶ/ር)
Ali Yasin (PhD)
ወሎ ዩኒቨርሲቲ የትምህርት ጥራት
ማረጋገ ዳይሬክተር
Wollo University Director for
Academic Quality Assurance

ANNEXURE S

Thesis formatting letter

SOLRIN TECHNICAL EDITING

Rinnie: 076 925 2896

E-mail: tlomerm@gmail.com

"Pleasure in the job puts perfection in the work"

To Whom It May Concern

Re: Technical Editing

This letter serves to inform you that the Doctoral thesis for Mr. Sisay Tiroro Salato, title: **"ASSESSMENT OF INTEGRATION OF TUBERCULOSIS AND DIABETES MELLITUS IN HEALTH SERVICES IN ADDIS ABABA, ETHIOPIA",** was technically edited and formatted.

Regard

Rinnie Matlou

ANNEXURE T

CURRICULUM VITEA OF THE RESEARCHER

Full name: SISAY TIRORO SALATO

Date of birth: 02 May 1990

Address: Yeka Sub City, Addis Ababa, Ethiopia

Mobile: +251-922-77-63-73/+251-912-67-46-84

Email: **sisaytiroro3@gmail.com/sisaytiroro@yahoo.com**

1. Area of expertise

- Expert in public health surveillance, preparedness and response systems, and other public health emergencies.
- Proficient in vulnerability risk assessment and mapping (VRAM), emergency preparedness and response plan (EPRP); and public health emergency response monitoring and evaluation.
- Proficient in the design and development of surveillance guidelines, tools, protocols, implementation frameworks, and indicators.
- Surveillance data collection, management, analysis, interpretation and report writing.
- Excellent in statistical and epidemiological software applications such as Epi info, SPSS, STATA, ArcGIS, ATLAS.ti9 and ODK.

2. Educational History

- **Field Epidemiology/EFELTP- Intermediate**: from 21st December /2021 to 6th October/2022 Ministry of Health of Ethiopia in collaboration with WHO and US-CDC.
- **Master of Public Health (MPH)**: from October 14th 2013 to July 9th 2015, Addis Ababa University (AAU), Addis Ababa, Ethiopia.
- **Bachelor of Science in Nursing (BSc.N)**: from March 28th 2006 to Sept 20th 2008, University of Gondar (UoG), Gondar, Ethiopia.

3. Experience

3.1. Early Warning Alert Surveillance and Response team leader

Ethiopian National Defense Force [since 1st Jan, 2018]

Key roles and responsibilities

- Coordinate and oversee comprehensive surveillance programmes for infectious and non-infectious diseases and public health emergencies.
- Develop, implement and monitor early warning surveillance and response activities.
- Provide technical assistance and capacity building to health workers, surveillance officers and public health managers.
- Lead the collection, analysis, interpretation, and dissemination of surveillance data to support evidence-based decision making by public health leaders.
- Enhance the capacity of surveillance teams to effectively monitor and respond to epidemic-prone diseases through training, supportive supervision and mentorship.
- Undertake vulnerability risk assessments, mapping and contingency planning.
- Adapt and implement surveillance guidelines, tools, protocols and frameworks for an integrated disease surveillance and response system, including national guidelines for event-based and community-based surveillance.
- Ensure compliance with the functions of the International Health Regulations (IHR 2005), including hazard identification, verification, risk assessment and reporting.
- Identify and address gaps in the implementation of surveillance systems within the existing health infrastructure.
- Lead outbreak investigations and ensure appropriate response and control measures are implemented.
- Foster partnerships and collaborations with national government organisations and international NGOs to strengthen public health emergency management.

3.3. Early Warning Alert Surveillance and Response officer

Ethiopian National Defense Force [1st Jan 2015 to 30th Dec 2017]

Key roles and responsibilities

- Collect, manage, analyse and interpret surveillance data for immediate and weekly notifiable diseases/events and communicate findings to the Early Warning Alert Response Team Leader for possible action.
- Detect and respond to outbreaks and implement control and prevention measures.
- Monitor and supervise surveillance and other PHEM officers in health facilities and Ethiopian National Defence Forces offices to ensure the implementation of

surveillance and other public health programmes for the prevention and control of emerging and re-emerging disease epidemics.

- Confirm the integration of surveillance data with the parallel health structure of the national system.
- Participate in risk assessment and mapping of public health vulnerabilities and in the planning and implementation of emergency preparedness.
- Provide training to surveillance and PHEM officers at regional, sub-regional and local levels on the analysis and use of surveillance data at site level.
- Ensure timely and complete reporting of immediately and weekly notifiable diseases and events to enable prompt detection and control of outbreaks.
- Promote the use of surveillance data among health managers, clinicians and other public health professionals.
- Support the response to public health emergencies in accordance with established health emergency procedures.
- Contribute to the strengthening of basic national capacity for surveillance and response to events of public health significance, as required by the Ethiopian Ministry of Health and the International Health Regulations (IHR).

3.4. Health promotion and disease prevention officer

Ethiopian National Defense Force [1st Jan 2012 to 30th Dec 2014]

Key role and responsibilities

- Coordinate integrated health promotion and disease prevention strategies, monitor their implementation at different levels of the Ethiopian National Defence Forces health facilities and prepare consolidated reports.
- Organise and supervise awareness campaigns on primary health care, HIV/AIDS, sexually transmitted diseases, substance abuse, effects of cigarette smoking, and general health promotion and disease prevention.
- Provide training on basic infection prevention and control (IPC), HIV/AIDS and sexually transmitted diseases (STDs).
- Work with designated hospital staff to regularly monitor compliance of health facility activities related to disease prevention, treatment and health promotion with applicable protocols, guidelines, rules and regulations, policies and measures.
- Provide basic training on TB, TB/HIV and leprosy prevention and control programmes for health workers.

- Provide technical support for the development and implementation of communicable disease prevention and control programmes, with emphasis on strengthening local health services to implement programme activities.
- Support the promotion and coordination of research on communicable and non-communicable diseases.
- Support the development of defence health information systems and epidemiological surveillance of communicable and non-communicable diseases.
- Support the development and strengthening of laboratory activities in support of communicable disease control.

3.5. Expert Nurse-clinician

Armed Forces referral and teaching hospital (15th Oct 2009 to 30th Dec 2011)

Key roles and responsibilities

- Coordinate a team of nurses to deliver clinical excellence and improve patient outcomes.
- Provide guidance, feedback and development resources to enhance individual and team effectiveness.
- Actively participate in the design and implementation of improvements to achieve clinical, satisfaction and efficiency outcomes.
- Facilitate the use of the nursing process to provide holistic, compassionate, safe, high quality and patient-centred care.
- Demonstrate practices that promote safety, recognise differences in the populations served and prevent harm to patients, families, staff and self.
- Ensure the safety, comfort, care and treatment of patients in accordance with established legal, ethical and institutional standards.
- Initiate and lead performance improvement activities aimed at achieving top quartile performance on clinical indicators.
- Continuously evaluate quality and safety performance, identify opportunities for improvement, and plan and implement improvement programmes.
- Work as a change agent with multi-disciplinary teams working on HIV, TB/HIV, STIs and Gender Based Violence (GBV) to develop system performance standards that improve patient outcomes.
- Represent the work team and hospital in planning, organising and implementing HIV, TB/HIV, STI and GBV programme activities.

5. Trainings and Certificates

- ETHIOPIAN AVoHC SURGE RESPONDER-Training on the Emergency Preparedness and Response Flagship Initiative in collaboration with the World Health Organization, Africa CDC and the Ethiopian Public Health Institute from 8 May to 9 June 2023.
- Rapid Response Teams Essentials Course - World Health Organization (WHO).
- Public Health Emergency Operation Centre and Incident Management System Training - in collaboration with Ethiopian Public Health Institute and Africa CDC.
- Public health responses to pandemics and epidemics - World Health Organization (WHO).
- WHO incident management system - World Health Organization.
- WHO health cluster coordination - World Health Organization.
- Cholera outbreaks: Emergency preparedness and response - World Health Organization (WHO).
- Risk communication and community engagement in public health emergencies (RCCE) - Ministry of Health in collaboration with Amerf Health Africa in Ethiopia.
- Hands-on training in event-based surveillance (EBS) - Ethiopian Public Health Institute (EPHI) in collaboration with CDC-Atlanta.
- Mentoring for frontline field epidemiology - Ethiopian Public Health Institute (EPHI) in collaboration with US Defense Threat Reduction Agency (DTRA).
- Training of Trainers (TOT) on Basic Public Health Emergency Management (PHEM) - Ethiopian Public Health Institute (EPHI) in collaboration with African Field Epidemiology Network (AFENET).
- Basic Quality Improvement for HIV/AIDS Epidemic Control - Ethiopian National Defence Forces Health Directorate in collaboration with CDC-Ethiopia.
- Open Data Kit (ODK)/ KoBo Toolbox software [form development, data management and analysis] - Ethiopian Statistical Institute in collaboration with Addis Ababa University.
- National Comprehensive TB, Leprosy and TB/HIV from Dec 21-26/2018 CDC-Ethiopia in collaboration with DHMD, Bishoftu, Oromia, Ethiopia.
- Tuberculosis infection prevention and control in the healthcare facilities from Jan 29-31/2011- UCSD in collaboration with DHMD, Addis Ababa, Ethiopia.
- National Comprehensive HIV Care and Treatment - CDC-Ethiopia in collaboration with DHMD, Bishoftu, Oromia, Ethiopia.

- MDR-TB management from Aug 22-26/2011UCSD in collaboration with DHMD, Addis Ababa, Ethiopia.
- Advanced training on Microsoft Office Excel – from Addis Ababa University.
- Training of trainers (TOT) on Health Information Management System (HMIS) - Ethiopian National Defence Force Health Main Department in collaboration with CDC-Ethiopia.
- Statistical Data Analysis Using SPSS – Addis Ababa University.
- Statistical Data Analysis Using STATA – Ethiopian Statistical Association in collaboration with Addis Ababa University.

8. Hobbies

— Watching movies

— Reading books

— Participating in professional seminars

10. References

1. Aschalew Abayineh (MPH, BSc)

World Health Organization: Senior scientific writer and former Ethiopian Public Health Institute Deputy Director General.

Address: - Mobile = +251-911-02-64-82, email = workineha@who.int

2. Tolcha Kebebew (PhD, MPH)

Public Health Surveillance Specialist/Field Epidemiology Training Programs (FETP) at CDC/U.S-Ethiopia

Address: - Mobile = +251-911-45-09-81, email = tochakebebew@gmail.com

3. Dr. Yiheyis Aytenfsu (MPH, MD)

Ethiopian National Defense Force Health Main Department: HIV, TB/HIV, STI, Hepatitis B & C virus and other disease prevention and control team leader and Principal Investigator of PEPFAR funded HIV/AIDS program.

Address: - Mobile= +251-912-15-18-54, email: - hidu.kiya@gmail.com