FACTORS ASSOCIATED WITH STUNTING IN CHILDREN 0-59 MONTHS IN THE MANZINI REGION IN ESWATINI

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FACTORS ASSOCIATED WITH STUNTING IN CHILDREN 0-59 MONTHS IN THE MANZINI REGION IN ESWATINI

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ABSTRACT

FACTORS ASSOCIATED WITH STUNTING IN CHILDREN 0-59 MONTHS IN THE MANZINI REGION IN ESWATINI

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This study aimed to identify and describe factors associated with stunting in children the Manzini region so that evidence-based recommendations could be made to relevant policymakers. A quantitative, cross-sectional study design was employed. Convenience sampling was done at two child welfare clinics, and data was collected from 338 mother-child pairs using a questionnaire and a checklist for anthropometric measurements. On multivariate analysis, statistically significant factors associated with stunting were children with an age gap of less than two years their older sibling [OR = 2.47, p = 0.05] , a birthweight of less than 2500g [AOR = 4.00, p = 0.005]. Drinking treated water [AOR = 0.36, p = 0.01] had a statistically significant protective effect. Therefore, to reduce stunting and its consequences, policymakers must improve nutritional support for children born with low birth weight, maternal access to family planning, and the provision of clean, safe water to Manzini residents.

KEYWORDS: risks for stunting; children under five years of age; child malnutrition; demographic factors; socio-economic factors; health-related factors; environmental factors; feeding practices; maternal factors.

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LIST OF ABBREVIATIONS

BMI: Body Mass Index

CSO: Central Statistics Office

HAZ: Height-for-Age Z-score

HIV: Human Immunodeficiency Virus

UN: United Nations

UNICEF: United Nations Children's Fund

WHO: World Health Organization

CHAPTER 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Chronic undernutrition in children can result in stunting, defined as low height for age (WHO factsheets 2021). A height less than -2 SD of the WHO Child Growth Standards median is considered stunting (USAID 2020:3). Childhood stunting is the best indicator of children's well-being. It accurately reflects social inequalities because it results from a complex interaction between household, environmental, socioeconomic, and cultural influences (De Onis & Branca 2016:12). Globally, it is estimated that 149.2 million children are stunted (WHO 2021:2).

In 2016, 59 million children were recorded to be stunted in Africa (Mannar, Micha, Allemandi et al 2020:34), implying that 36% of the total stunted children globally were from Africa. As of 2020, the prevalence of stunting in Africa in under 59 months old (under five years) children is reported to have been 30% (Mannar et al 2020:132), much higher than the global average rate of 21.9 % (Mannar et al 2020:49). Southern Africa, of which Eswatini is a part, also has a 29.3% burden of stunting (Mannar et al 2020:50). However, according to the 2020 Global Nutrition Report, Eswatini is one of only eight countries that are on course to meet four out of the ten nutritional goals by 2025 (Mannar et al 2020:50). Significant progress has been made with a drop in stunting prevalence from 30.9% in 2010 (Swaziland Central Statistics Office 2010:14) to 26.6% in 2019 (Eswatini Government, SADC, WORLD Vision, FAO 2019:32), although still higher than the global average of 21.9% (Mannar et al 2020:34).

These statistics support the concern that the country is off-track in Sustainable Development Goal number 2 (Achieving zero hunger) with the persistently high levels of stunting (Eswatini Ministry of Economic Planning and development of 2019:18).

1.2 DESCRIPTION OF THE STUDY PROBLEM

Stunting poses a challenge in Eswatini, with an overall prevalence of over 25% in children under 59 months (UNICEF Eswatini 2022), but with a mentioned 35% in children under 24 months old. Although the stunting rates declined nationally, the opposite happened to the stunting rates in Manzini, which have been increasing (UNICEF Eswatini 2022). Analysis of disaggregated population data by region from the Vulnerability Assessment Report 2019 revealed that Manzini had the second-highest stunting prevalence of 27.6% compared to Shiselweni and Lubombo, which have stunting prevalence rates of 25.9% and 23.1%, respectively (Eswatini Government et al 2019:32). There is a need to investigate the factors associated with this particular trend within the Manzini region. Stunting has negative consequences on the cognitive function of children with detrimental effects on future educational performance, adult wages, and productivity, as well as the risk of nutrition-related chronic disorders (De Onis & Branca, 2016:12). The high levels of stunting must be addressed to prevent a long-term negative impact on health and well-being, as is explained.

1.3 RESEARCH AIM

This study aimed to identify and describe the factors associated with stunting in children aged 0-59 months in the Manzini region in Eswatini to formulate recommendations to address the problem.

1.4 RESEARCH OBJECTIVES

In order to achieve the aim of the study, the following objectives were set:

1. Identify and describe the child-related factors associated with stunting in children 0-59 months old in the Manzini region of Eswatini.
2. Identify and describe the maternal-related factors associated with stunting in children 0-59 months old in the Manzini region of Eswatini.
3. Identify and describe the feeding-related practices associated with stunting in children 0-59 months in the Manzini region in Eswatini.

4. Identify and describe the environmental-related factors that are associated with stunting in children 0-59 months in the Manzini region in Eswatini.
5. Formulate recommendations to address the identified risk factors for stunting in children 0-59 months in the Manzini region, Eswatini, in an attempt to reduce the prevalence.

1.5 RESEARCH PARADIGM

This study follows a positivist/realism research paradigm that emphasizes rational and scientific methods and assumes that reality is objective and can be measured and known, as described by Antwi (2015:218). Standardized data collection tools, namely a questionnaire (see Annexure G) and a data capturing sheet (see Annexure F), were utilized to collect the relevant data to describe the possible factors associated with stunting.

1.6 RESEARCH DESIGN

A quantitative, cross sectional study design describes the phenomena of interest within a single subject group and related variables with no intervention from the researcher (Burns & Grove, 2017: 337)**.** In this study, the measurement of stunting and the associated risk factors were done quantitatively using a questionnaire (see Annexure G) and a data capturing sheet (see Annexure F).

1.6.1 Quantitative Research

Quantitative research is concerned with structured data collection and analysis that can be represented numerically (Goertzen 2017:11). This type of research was most fitting for this study as it enabled the researcher to objectively describe variables related to stunting in children 0-59 months.

1.6.2 Descriptive

The purpose of a quantitative descriptive study is to describe the phenomena of interest and its component variables within a single subject group conducted in a natural setting (Burns & Grove 2017:206). It can answer a research question related to the incidence,

prevalence, and frequency of occurrence of a phenomenon of interest and its characteristics (Omair 2015:4). A description of the maternal factors, child factors, and nutritional and environmental factors related to stunting is described within this study context.

1.7 DEFINITION OF CONCEPTS

1.7.1 Stunting

Stunting is defined as a child's length or height at least two standard deviations below the World Health Organisation child growth standards median for the same age and gender (De Onis & Branca 2016:12).

1.7.2 Maternal factors

Maternal factors refer to characteristics relating to the mother, especially during pregnancy, delivery and after childbirth (Muglia, Benhalima, Tong et al 2022:1).

1.7.3 Feeding practices

Feeding practices is a term that refers to the caregiver-child feeding actions that determine how, when, why, and with what a child is fed (Mallan & Miller 2019:3).

1.7.4 Environment

The environment is defined as everything around us: the air we breathe, the water we drink and use, and the food we consume, together with the chemicals, radiation, microbes and physical forces with which we come into contact (Yang, He, Cheng et al 2023:1).

1.7.5 Population

A population is defined as a group of individuals who share similar characteristics (Shukla & Satishprakan 2020:2).

1.8 STUDY POPULATION

The targeted population of the study was the mother and child pairs who were attended to at the selected child wellness clinics. The 2021 data from the Manzini HMIS (Health Monitoring Information System) was used to identify the top two under-five-years (0-59 months) wellness clinics (in healthcare facilities) in Manzini where the highest number of children under five (0-59 months) were attended to. The total population of under-fives attended to at the two clinics from January to December 2021 was 9 769 children (Manzini HMIS 2021:1).

1.9 SAMPLING AND SAMPLING METHODS

Sampling refers to the process of obtaining data from a subgroup of the population that is representative of the population (Burns & Grove 2017: 94). Non-probability, convenience sampling of study participants was done at each of the top two selected wellness clinics, which attended to the highest number of children under the age of five years (0-59 months). This convenience sampling method refers to selecting people readily available to participate in research (Ehrlich 2017:105). It was the preferred method for this study because it is the best at controlling sampling bias from all the non-probability sampling methods, as all available subjects have an equal opportunity for participation (Andrade 2021:86). All mother-child pairs available at the facility on the data collection days and who met the inclusion criteria (see Chapter 3, Section 3.6.2.1) had an equal opportunity to be included in the study.

1.9.1 Sampling of the facilities

The 2021 data from the Eswatini HMIS system report was used to identify the two facilities where the highest number of children 0-59 months were attended to (Manzini HMIS 2021:1).

1.9.2 Sampling of the respondents

All the mother-child pair attendees at the under-five wellness clinic who met the inclusion criteria (see Chapter 3, Section 3.6.2.1) had details about the study from the information

letter (see Appendix D) shared with them by the nurse in charge, who acted as the gatekeeper.Three hundred and forty (340) participants were selected (see sample size calculation Chapter 3, Section 3.6.4).

1.10 RESEARCH TECHNIQUE

A thorough literature review was done, after which a data-capturing tool was compiled to collect the anthropometric measurements from both children and mothers (see Annexure F), and a questionnaire (see Annexure G) was developed to collect the quantitative data from the respondents (mothers of the children).

1.10.1 Validity

The validity of an instrument refers to the extent to which it actually measures what it is meant to be measuring (Ehrlich 2017:123). The content validity of the questionnaire and the data capturing tool was verified by the experts in the scientific review committee and the statistician involved in the statistical analysis of the data. The questionnaire was pre-tested before data gathering commenced (see Chapter 3, Section 3.7.3). This was done to ensure that the language, length, structure, and questions in the questionnaire were appropriate. The validity of anthropometric measurements was enhanced daily by the researcher positioning the scale on a flat surface and checking the accuracy of the measurements using a standard weight. The researcher thus calibrated the scale.

1.10.2 Reliability

According to Ehrlich (2017:301), reliability is the extent to which an instrument produces reproducible results which remain consistent on repeated measurements or with different users. The research assistants were comprehensively trained on taking appropriate measurements and filling in the checklist and questionnaire to ensure adequate standardisation and accuracy of the data collection procedures (see Chapter 3, Section 3.5 for more details).

1.11 DATA MANAGEMENT AND ANALYSIS

The data collected was recorded and stored securely. Data analysis was done using descriptive and analytic statistics applied to the anthropometric measurements. The child factors, maternal details, feeding practices, and environmental factors identified using the questionnaire were also described quantitatively.

1.12 ETHICAL CONSIDERATIONS

Ethical approval was obtained from the College of Human Health Sciences Research Ethics Committee, University of South Africa (see Annexure A), and permission was granted from the Eswatini Research Ethics Committee (see Annexure B) to conduct the study. All the participants gave their written informed consent (see Annexure E) after an information letter (see Annexure D) was explained to them by the research assistant. All ethical principles and how they were adhered to are discussed in detail in Chapter 3, Section 3.6.

1.13 CHAPTER LAYOUT

The dissertation will be presented in five chapters detailed in Table 1.1.

Table 1.1: Chapter outline

Chapter	Content
Chapter 1	Overview of the study.
Chapter 2	Literature review on epidemiology, pathophysiology, and factors associated with stunting.
Chapter 3	Research design and methodology.
Chapter 4	Data analysis, interpretation, presentation and discussion of the findings.

Chapter 5	Conclusion, limitations and recommendations.

1.14 CONCLUSION

Chapter 1 described the research problem, study aims, objectives and research design. A brief overview of the methodology was given, which will be discussed in detail in Chapter 3. A literature review will be presented in Chapter 2.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the literature review relevant to the objectives of the study. The review captured the definition, the overall burden, the impact of stunting, and the factors associated with stunting. According to Chigbu, Atiku, & Du Plessis (2023:1), a literature review is a thorough, systematic evaluation of research works available on a specific academic topic under investigation. The literature review's primary objectives included identifying up-to-date knowledge in stunting, classifying known information, elucidating the implications of stunting, highlighting gaps and placing the study within the context of the particular field (Leite, Padilla & Cecatti 2019:3).

The literature review concentrated on factors linked with stunting as guided by the WHO framework for stunting (see Figure 2.1). The keywords for the literature search used included "child stunting", the "impact of stunting", "maternal factors", "child factors", "feeding practices", and "water and sanitation" associated with stunting. In the literature review, the researcher used keywords to search various search engines and databases, including Google Scholar, PubMed, Science Direct and Medline.

2.2 STUNTING

Stunting, also known as linear growth retardation, occurs when a child is not growing well in length or height according to their expected full potential (Uwiringiyimana et al 2019:2). There is a global census about the definition due to the existence of robust standards that define expected human growth. Stunting is a height for age z score, or HAZ, of less than -2 standard deviations of the WHO Growth Standards (Leroy & Frongillo 2019:197). To calculate the HAZ score, one has to subtract the observed value from the age and sex-

appropriate median value taken from a standard population and divide it by the standard deviation of the population (WHO 1995:7).

2.2.1 Z-score calculation

The calculation involves comparing the child's height to the reference data and expressing the result as a standard deviation (SD) score, also known as a z-score. If a 24-month-old boy measures 85 cm in height and his height-for-age score is to be calculated using a WHO reference dataset for healthy boys of the same age, the following steps apply:

To calculate a height-for-age score, the information needed includes:

- The child's age (in months).
- The child's height (in centimetres).
- Reference data for a healthy population of children of the same age and sex (e.g., WHO growth reference charts).

Step 1: Find the mean and standard deviation for height at 24 months in the reference dataset. From the reference charts, the mean height for healthy 24-month-old boys is 87 cm, and the standard deviation is 2 cm.

Step 2: Calculate the child's height SD score. SD score = (child's height - mean height for reference population) / standard deviation of height for the reference population.

HAZ score = (85 - 87) / 2 = -1. This result indicates that the child's height is 1 SD below the mean height for healthy 24-month-old boys.

2.2.2 WHO reference standards

The WHO 2006 Growth Standards are the currently recommended standard to use (WHO Multi-center Reference Study Group 2006). Some authors have proposed using height for age instead of the height for age z-score for stunting assessment (Leroy,Ruel, Habitch & Frongillo 2014:3) as they argue that there are age-related changes in the standard deviation of the height which may mask stunting occurring after the age of 24 months. The HAZ score, however, currently remains the standard for defining stunting (UNICEF /

WHO / World Bank Group 2018:15) and, therefore, the one utilised and applicable within this study context.

The WHO Growth Standards were developed from an analysis of growth trends for a large sample of children who were brought up in conditions optimum for child growth and development (Marume, Archary and Mohamed). Studies in low to middle-income countries show a downward shift in the HAZ distribution indicative of uniformly slower growth of children in the less-than-ideal conditions (Marume et al 2022:2). This indicates that in less optimal conditions, children are uniformly affected by some degree of growth faltering. Therefore, using data based on local standards can underestimate the gravity of the stunting burden. The WHO Growth Standards, therefore, are valuable and valid tools for a comparative standard.

2.3 STUNTING EPIDEMIOLOGY

According to UNICEF/WHO/World Bank (2020:2), stunting affects 149,2 million children, 22% of the global population of under-fives. Thus, it is a significant public health problem. Of importance is the fact that there has been a progressive global decline in stunting since 2000, from 203 million (33.1%) to 149 million (22%) in 2020 (UNICEF/WHO/World Bank 2021:4). This shows the significant strides that have been made in tackling stunting globally. The numbers, however, are still high and may increase in the coming years due to the effect of the COVID-19 pandemic on access to nutritious diets and essential nutrition information, which may take years to manifest (Dasgupta & Robinson 2022:2) . The COVID-19 pandemic resulted in job losses, food shortages, and price increases, which led to decreases in the availability and affordability of food and consequently increased food insecurity globally (Dasgupta & Robinson 2022:2). In Eswatini, 75% of caregivers reported that their children consumed a lesser variety of foods due to the effects of the COVID-19 epidemic (UNICEF Eswatini 2022:8).

2.3.1 Stunting in Africa

The number of children affected by malnutrition is declining globally in all regions except for Africa, where numbers have increased from 54.4 million in 2000 to 61.4 million in 2020

(UNICEF/WHO/World Bank 2021:4). It is estimated that 41% of all under-fives affected by stunting live in Africa (UNICEF/WHO/World Bank 2020:4). The continent, therefore, will face an ongoing challenge of stunting including the consequences thereof in the foreseeable future.

A study in Africa covering 33 countries found the highest stunting prevalence in East and Central Africa. In contrast, Southern Africa had the lowest prevalence (Quamme & Iversen 2022:50). The Joint Malnutrition estimates, published in 2021, estimated that the average stunting rates in central Africa were 36.8%, while in southern Africa, rates were much lower at 23.3%. The country with the highest prevalence rates is Burundi, where stunting prevalence is estimated at an alarming 57.8% (UNICEF/WHO/World Bank 2021:16). Even in Southern Africa, the disease burden is variable, with an estimated prevalence of 23.2% in South Africa (UNICEF/WHO/World Bank 2021:18). In comparison, in neighbouring Mozambique, it was estimated at 37.8% in 2020 (UNICEF/WHO/World Bank 2021:18).

2.3.2 Stunting in Eswatini

Eswatini is considered a high-prevalence nation with an estimated stunting prevalence of 22% in 2020 (UNICEF/WHO/World Bank 2021:2). Although stunting rates have steadily decreased from 31.4% in 2010, the stunting prevalence in Eswatini has remained above the 15% target set by the World Health Assembly (Dlamini & Tlou 2022:2).

A prevalence study found that the stunting rates were 18.1% nationally, with the highest rates in the Shiselweni and Manzini regions at 20.8% and 17.6%, respectively (Dlamini & Tlou 2022:4). The stunting rates also vary from 30.7% in the poorest household to 9% in the richest and is higher in rural than in urban households (UNICEF Eswatini, 2020).

The cost of hunger report published by the World Food Program in 2013 indicated that every year, Eswatini loses an estimated $92 million as a result of child undernutrition, an estimated 3% of the national GDP (World Food Program 2014: 36). Stunting, therefore, remains a significant public health problem in the country whose impact will worsen due to the currently prevailing socioeconomic and political challenges.

2.4 PATHOPHYSIOLOGY OF STUNTING

Despite the high global prevalence, the pathogenesis of stunting is poorly understood (Soliman, Desanctis, Alaaraj, Ahmen, Alyafei and Hamed 2021:3). Semba, Shardell, Ashour, Moaddel, Trehan, Maleta, Ordiz, Kraemer, Khadeer, Ferrucci and Manary et al (2016:247) suggest that a child's linear growth is fundamentally dependent on the function of the chondral growth plate, a key process that requires essential amino acids and is governed by intricate pathways. Dietary patterns poor in protein quality can lead to decreased levels of circulating essential amino acids, potentially causing disruption to these critical growth pathways (Soliman et al 2021:3). This disruption impacts several processes ranging from nutrient absorption and energy use for skeletal growth and the myelination of nervous systems, culminating in the stunted phenotype (Soliman et al 2021:3). Consequently, inadequate intake of essential proteins can disrupt numerous processes integral for normal growth, leading to stunting.

2.5 IMPACT OF STUNTING

2.5.1 Short-term adverse effects

Stunting is associated with numerous immediate adverse outcomes. Stunted children are at immediate high risk of infections such as pneumonia, diarrhoea, sepsis, TB, and Hepatitis (Soliman 2021:2). Undernutrition increases infection risk by its negative impact on epithelial barrier function and altered immune responses (De Onis & Branca 2016:20). Therefore stunting increases the infection risk in the immediate term.

2.5.2 Long-term adverse effects

Several studies have demonstrated the long-term adverse impact of stunting on early childhood cognitive development (Ekholuenetale, Barrow, Ekholuenetale and Tudeme 2020:4; Woldehana, Behrman and Aran 2017:80, Sanou, Diallo, Holding, Nankabirwa, Engebretsen, Ndeezi, Tumwine, Meda, Tylleskär and Kashala-Abotnes 2018:3). Although the direct link is unknown, nutritional stunting is linked with both structural and functional brain pathology together with a wide range of cognitive deficits (Soliman et al 2021:3). Researchers have proposed that the altered brain function and varying degrees

of mental retardation result from deficient development of the neuronal dendritic spine apparatus, reduction in synapses, synaptic neurotransmitters and delayed myelination (Soliman et al 2021:4).

Linear growth retardation and stunting in groups of children not only predicts poor school performance and progress but also reduced earnings and a higher probability of adult poverty (Leroy & Frongillo 2019:199), with reductions of as high as 10% of the GDP in some African countries (Galasso & Wagstaff 2019:1). A meta-analysis of 56 prospective studies showed that a unit increase in HAZ (height for age Z) score in children less than two years resulted in a +0.22 increase in cognitive performance later in childhood (Sudfeld, McCoy, Danaei, Fink, Ezzati, Andrews and Fawzi 2015:1).

It is, however, also important to note that although stunting is a robust indicator of a deficient environment with adverse cognitive outcomes in the long and short term, it should not be seen as the sole cause of poor cognitive development (Leroy & Frongillo 2019:197) as many other factors may contribute.

Stunted children are more likely to have impaired behavioural development in early life. In some settings, they are less likely to enrol at school or enrol late and achieve lower grades, with evidence of a more apathetic response and less exploratory behaviour compared to others (Soliman 2021:4). Therefore, this highlights the behavioural issues that stunted children face, which together with the cognitive challenges, negatively impact on educational progress.

Stunting at 24 months has implications on body composition and blood pressure, which could potentially have a deleterious impact on future metabolic health (De Lucia, de Franca, Vianna, Gigante, Miranda, Yudkin, Horta and Ong 2018:6), thus a cardio-metabolic risk. Evidence for obesity in later adulthood in previously stunted children has been proven in studies globally (Muhammad 2018:160) despite a lack of proof thereof in others (Hanson, Munthali, Ludeen, Ritcher, Norris and Stein 2018:972). The period of starvation results in a decrease in energy requirements to a state where the body is more likely to store fat rather than use it as a source of energy due to ghrelin insensitivity

(Muhammad 2018:161). Therefore, this results in obesity as a sequela of stunting in childhood. There is a higher prevalence of hypertension in children, adolescents, and adults with nutritional stunting (Soliman 2021:18). The pathways proposed for this are related to low birth weight, which is significantly tied with stunting (see Section 2.6.1.3).

2.5.3 Intrapartum effects

Stunting also impacts intrapartum outcomes. Stunted women are at increased risk of dystocia and unfavourable reproductive outcomes (Soliman 2021:2). Shorter mothers have a smaller pelvic inlet and are more likely to have obstructed labour (Leroy & Frongillo 2019:199). Obstructed labour accounts for 3% of maternal mortality globally (Leroy & Frongillo 2019:200). Maternal stunting can result in small gestational age babies (Santosa et al 2022:95). Leeroy & Frongillo (2019:199) reported that short maternal stature is associated with an estimated six million small for gestational age births in low- and middle-income countries. Small for gestational age births are responsible for 20% of stunting cases in children under five (Leroy & Frongillo 2019:199). Thus, stunted mothers have a heightened risk of having stunted children, who are also at high risk of having stunted children.

2.6 FACTORS ASSOCIATED WITH STUNTING

According to the WHO theoretic framework for stunted growth and development, stunting occurs in the context of a child who interacts with multiple factors in their household and community/nation (WHO 2016:2). The factors can be grouped under child factors, extending to maternal factors, related feeding practices, disease and environmental factors as illustrated in Figure 2.1 below.

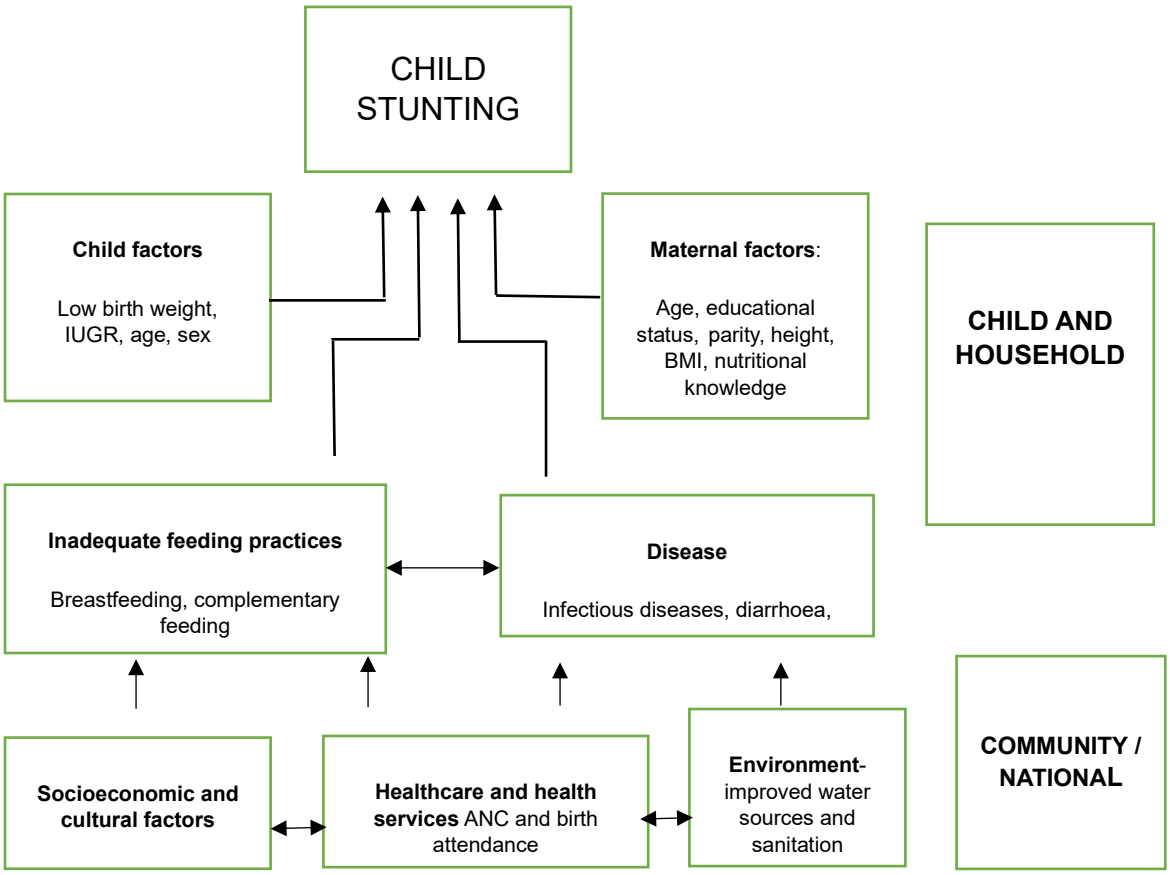

Figure 2.1: Conceptual framework for stunting (Adapted from the WHO Framework for Stunting 2016)

2.6.1 Factors related to the child

Several intrinsic child factors impact child growth, independent of other external factors. These include the age of the child, sex, birth weight, gestational age at birth as well as exposure to infectious diseases.

2.6.1.1 Age

Studies in developing countries such as Eswatini showed that children tend to have increased risks of stunting with increasing age (Sultana, Rahman, and Akter 2019:2; Garcia-Cruz, Gonzalez, Azpeitia, Reyes-Suarez, Santana and Rodriguez et al 2019:9;

Wali, Agho & Renzaho 2020:3;Kasajja, Nabiwemba, Wamani and Kamukama 2022:3). Inappropriate breastfeeding and complementary feeding practices together with the increased infection risk from unhygienic food preparation practices increases stunting risk with age (Geberselassie, Abebe, Melsew, Mutuku and Wassie 2018:8). After breastfeeding cessation, an inadequate complimentary diet can result in malnutrition (Madiba, Chelule & Mohatle 2019: 8). In addition, loss of immune-protective effects of breast milk with increased exposure to contaminated complimentary foods can also result in the onset of infectious diseases and a consequent rise in nutrient requirements (Garcia-Cruz et al 2017:9). Therefore, weaning has a significant impact on linear child growth leading to increased stunting rates in children with increasing age.

In some regions in Ethiopia, children in the younger age group, 6-24 months, were at a significantly higher risk of stunting than older children (Maseta 2019:7). The reasons identified were also related to the early introduction of nutritionally inadequate complementary feeds in place of breastfeeding (Maseta 2019:7).

Low height for age in younger children reflects a continuous process of failing to grow (stunting), while low height for age in children above 36 months shows a state of failure to grow (stunted), which is largely irreversible (Kasajja et al 2022:5). Hence the need for early intervention to avoid permanent adverse outcomes as described in Section 2.7.

2.6.1.2 Sex

Although studies in low to middle-income countries have reported diverse findings about the effect of sex on stunting, a higher preponderance of stunting has generally been found in male children (Madiba et al 2019:8; Garcia-Cruz et al 2017:9, De Boer, Elwood, Platts-Mills, Rogawski, McDermid, Scharf, Jatosh and Mduma. 2022:582). These differences between the sexes are linked to biological mechanisms interacting with social and cultural factors.

Genetically, some propose that the stunting differences observed are tied to the higher morbidity in males due to testosterone, which increases susceptibility to infections (Thurstans, Opondo, Seal, Wells, Khara, Dolan, Briend, Myatt Garenne,Mertens, and

Sear 2022:4). Immunologically, boys also have higher inflammatory responses, with less effective immune responses (Thompson 2021:470). In contrast, girls generally have more robust immune responses and a higher capacity for immunoglobulin production (Thurstans et al 2022:6). This increased susceptibility to infections makes boys more prone to infectious disease morbidity, which can result in growth faltering.

Researchers propose that earlier in life, males tend to have higher birth weights and faster postnatal growth (Amadu, Seidu, Duku, Frimpong, Aboagye, Ampah, Adu and Ahinkorah 2021:90). This results in higher energy needs in males than females (Thomson 2021:470). Boys are more vulnerable to undernutrition and stunting, particularly when the nutritional supply is compromised (Thomson 2021:468).

Regarding social and cultural factors, Garcia-Cruz et al (2017:9), in a study done in Mozambique, suggested that the differences between the sexes in stunting risk are due to recognition of the household and agricultural value of girls. In such settings, girls are more valued and get preferential dietary treatment, resulting in better nutrition and growth (Thomson 2021:471).

Study findings from some studies in Ethiopia, Somalia and Pakistan demonstrated contradictory findings where the females have higher stunting rates than males (Abeway, Gebremichael, Murugan, Assefa and Adinew, 2018:6; Demissie & Worku 2013:6;). These differences were proposed to be due to social factors related to the caregiving behaviours of mothers because of preference, where parents are stricter on girls, and boys tend to have more meal freedom (Abeway et al 2018:6).

The diversity of the cited reasons for the sex differences in stunting incidence reflects the importance of investigating the distinct differences in specific areas.

2.6.1.3 Low birth weight and prematurity.

The WHO defines low birth weight as a weight of less than 2500 grams at birth (WHO 2019:14). Low birth weight is a predisposing factor to poor growth attainment after birth

and is due to either preterm delivery, intrauterine growth restriction or both (Aboagye, Ahinkorah, Seidu, Frimpong, Archer, Adu, Hagan, Amu and Yaya,. 2022:8).

Several studies indicate that low birth weight is a significant stunting determinant in children less than five years of age (Aboagye et al 2022:8; Santosa, Arif & Ghoni 2022:7; Nshimyiryo, Hedt-Gauthie, Mutaganzwa, Kirk, Beck, Ndayisaba, Mubiligi, Kateera, and El-Khatib 2019:7). An Indian study found that low birth weight was a significant contributing factor to stunting in 1 out of 5 stunted children in that country (Halli, Bradar and Prasad 2022:6). Similarly, a study in Rwanda found alarming stunting rates of 79% in children with a history of preterm or low birth weight (Ahishakiye, Abimana, Beck, Miller, Betancourt, Magge, Mutaganzwa, and Kirk 2019:8). According to Aboagye et al (2022:8), in a meta-analysis of stunting determinants in Sub-Saharan Africa, low birth weight is primarily tied in with the mother's nutritional status, weight gain and iron status in pregnancy. This provides evidence for the contribution of preventable antenatal and peripartum challenges to the high burden of stunting and its associated complications in growing children.

Children who are born with low birth weight as a result of premature delivery are more prone to respiratory, digestive, and skin infections. This is primarily due to the immaturity of their immune systems (Santosa et al 2022:7). In addition, the poorly developed digestive and absorptive systems pose challenges with food absorption, hence increasing the risk of growth retardation (Santosa, et al 2022:7). Similarly, infants with low birth weight due to intrauterine growth restriction are more susceptible to infectious diseases, which increases their risk of growth retardation (Santosa et al 2022:7).

Therefore, children born with a low birth weight have multiple challenges that compound and place them at a precarious risk of having growth retardation and its associated consequences.

2.6.1.4 Infectious diarrhoea

According to the UNICEF website, children under the age of five years are particularly vulnerable to infectious diseases, including diarrhoea. Study findings from an Ethiopian

study revealed that children with diarrhoea two weeks prior to assessment had a higher likelihood of stunting than children without a history of diarrhoea Tafesse, Yoseph, Mayiso & Gari 2021:8). Infectious diseases, particularly diarrhoea, therefore, can have a direct impact on linear growth. A recent study in Indonesia indicated that toddlers with a history of diarrhoea had a 7.46 times higher risk of stunting (Audiena & Siagian 2021:153). The duration of illness impacts outcomes. If the diarrhoea lasted for more than 46 days, the stunting prevalence was 53.6%; with the duration of illness of 1-2 days, stunting was 3.6% (Audiena & Siagian 2021:153). Persistent diarrhoeal illness, therefore, carries a significantly elevated risk of stunting.

Diarrhoea leads to undernutrition through diminishing the appetite, reducing nutrient absorption, and increasing the metabolic requirements while increasing the nutrient losses (Tafesse et al 2021:8). Evidence also suggests that diarrhoea may not only result in transient growth deficits but also has cumulative effects that result in permanent growth retardation later on in life (Mengiste, Worku, Aynatem and Shiferaw 2020:7).

According to Kragel, Merz, Flood and Haven (2020:3), findings about diarrhoea and stunting have been inconsistent, with some studies failing to prove an association between infectious diarrhoea and stunting risk. A cohort study in Bangladesh found that diarrhoea from specific pathogens resulted in linear growth restriction instead of all-cause diarrhoea (Schnee et al 2020:3).

Self-reported illness and low height for age can, however, be misleading. Either the illness can contribute to the high rates of stunting or the compromised immune status from chronic malnutrition can result in high rates of diarrheal illness (Kragel et al 2020:3). This also shows the potential vicious cycle that ties infectious diarrhoea and stunting with resulting confounding effects.

2.6.2 Maternal factors

2.6.2.1 Maternal nutritional status

Studies show maternal stature is significantly associated with stunting in children under 59 months (Wali et al 2020:1; Li, Kim, Volmer & Subramania 2020:7; McGrath, Nduati, Richardson, Kristal, Mbori-Ngacha, Farquhar and John-Stewart 2012:760). The maternal height acts as a valuable indicator for assessing intergenerational linkages between the mother and the child's health prenatally, postnatally as well as in the first few years of life (Wali et al 2020:7). Although the paternal height has an impact, it is not as strongly associated with stunting as the mother's height (Wu, Ma, Young & Xi 2021:5).

A Bangladeshi study provided evidence that an increase in maternal height of as low as 1 cm has a protective effect against stunting (Khatun, Rasheed, Alam, Hida and Dibley 2019:6). Children of short mothers had double the stunting risk (Khatun et al 2019:6). Mcgrath et al (2020:6) in a Tanzanian study reported that reducing the maternal height by 1cm increases the odds of stunting by 12%. Therefore, this reflects the significant risk of stunting in children of equally short mothers. The association between short maternal stature and child stunting is higher in daughters than in sons (Wu et al 2021:5). Therefore, there is intergenerational transmission, with shorter mothers having stunted daughters who are at risk of becoming shorter mothers with stunted children.

The proposed mechanisms for the strong association between maternal height and stunting include genetic, biological and environmental factors concerning diet, nutrition and culture (Wali et al 2020:21). Shorter mothers are likely to be unhealthy and be engaged in low-level occupations (Wu et al 2021:6). This results in limited health promotion activities and poor-quality diets, which adversely impacts child growth (Wu et al 2021:6).

Several chromosomes, including sex chromosomes, link the height association between parents and offspring (Wali et al, 2020:21) . Besides genetics, the maternal intrauterine environment is an independent factor. Studies in children born from egg donation showed that the stunting risk was more strongly associated with the egg recipient's height than

the egg donor's height (Wu et al 2021:5). This shows the significant effect of the general maternal state of health and nutrition on child outcomes as a factor beyond the genetic links.

A mother's weight is an important factor, as there is some evidence that underweight mothers also have a greater risk of stunted children. While short maternal stature highlights nutritional deprivation early on in life, low BMI reflects poor nutrition in adult life (Porwal, Agarwal, Ashraf, Acharya, Ramesh, Khan, Johnston and Sarna, 2021:628). An Ethiopian study found that underweight mothers are more than three times more likely to have stunted children than mothers with average weights (Amaha & Woldemanuel 2021: 6). The likely explanation is that children who are born to underweight mothers are more likely to suffer from macro and micronutrient deficiencies due to the increased maternal demands of pregnancy and lactation. There is also a higher need to gain more weight during the pregnancy compared to mothers who start with an average weight (Amaha & Woldeamanuel 2021:6). Therefore, the competition for nutrients between the mother and the child puts the child at high risk of low birth weight and subsequent growth retardation.

2.6.2.2 Maternal age

Children of younger mothers are at a greater risk of stunting than children of older mums (Astuti, Azka and Rockmayanti 2022:485; Wemakor, Gart, Azongo, Garti and Atosona 2018:2; Santosa 2022:95). The stunting risk is eight times higher for these younger mothers compared to older ones, as shown by a Ghanaian study (Wemakor et al 2018:2). To support this, a maternal age of more than 25 years had a significant protective effect on the odds of newborn stunting in an Indian study (Sari & Sartika 2021:315). Therefore, with a higher age at first pregnancy, between 27 to 29 years, there is lower infant mortality and adverse child health outcomes, including stunting (Sari & Sartika 2021:315).

Young mothers tend to face challenges concerning inadequate dietary intake, poor access to safe water, poor social circumstances with limited access to resources, and challenges with nursing their babies (Wemakor et al 2018:3). In addition, adolescent mothers who are growing themselves, have to compete with the developing foetus for

nutrition. This results in a heightened risk of low-birth-weight babies, who are more likely to grow stunted (Santosa 2022:95).

Older women are at an increased risk of having comorbidities, particularly hypertension, diabetes, and pregnancy complications. For these reasons, advanced maternal age carries a risk of intrauterine growth restriction, low birth weight and subsequent stunting (Fall, Sachdev, Osmond, Restrepo-Mendez, Victora, Martorell, Stein, Sinha, Tandon, Adair and Bas 2015: 368).

It is important to note that although maternal age appears to be a significant factor, some studies have failed to show a significant relationship between maternal age and nutritional status, particularly stunting (Wati, Wahyurin, Sari, Zaki and Dardjito 2022:538; Kiik & Nawa 2021:85). Further research can elucidate the impact of this factor on the stunting risk in the Eswatini setting.

2.6.2.3 Maternal Education

Several studies have highlighted the higher levels of child stunting in mothers with lower educational levels (Susyani, Febry, Margarhety, Sadiq, Sartono, Sari and Ni'mah 2022:1602; Javid & Pu 2021:381; Amaha & Woldeamanuel 2021:4). According to Amaha and Woldeamanuel (2021:4), mothers with primary education are 25% less likely to give birth to stunted children than mothers with no education. Increasing maternal education reduces the stunting odds by 7% per year at school (Amaha & Woldeamanuel 2021:4). Any additional maternal education at any level carries significant benefits. Mothers who reach the tertiary level reduce the odds of having stunted children by 72% compared to uneducated mums (Amaha & Woldemanuel 2021:4).

A study in South Africa investigating the mechanisms by which maternal education affected the probability of stunting at two years showed that 18% of the effect was mediated prenatally through the birth weight pathways and 80% through postnatal mechanisms related to infant feeding and care (Casale, Espi & Norris 2018:1815-1816).

The benefits of maternal education include better decision-making ability, access to better nutritional sources, and a higher likelihood of employment (Casale et al 2018:1815-1816). More educated mothers are more likely to have better health-seeking behaviour that enables quick identification and treatment of illnesses (Javid & Pu 2020:381; Wali et al 2020:21).

The impact of maternal education is, however, not universal. A meta-analysis of stunting in countries of low socioeconomic status failed to reveal a significant association between maternal education and stunting in Kenya (Amugsi, Dimbuene, & Kimani-Murage 2020:13).

2.6.2.4 Maternal employment

Economic and social changes have increased women's participation in the labour market. Maternal employment generally results in the early introduction of complementary feeds (Chavez-Zarate, Maguina, Quichiz-Lara, Zapata-Fajardo, and Mayta-Tristán 2019:8). Comparison of employed and unemployed mothers in Ethiopia showed that unemployed mothers are 23 per cent less likely to have stunted children (Amaha & Woldeamanuel 2021:6). In an investigation into sociodemographic factors associated with linear growth, Amugsi et al (2021:13) found that maternal work was inversely related to child growth for women doing any work. Higher stunting odds were found in children whose mothers were engaged in agriculture or manual work than in mothers engaged in professional work in Uganda (Nankinga, Kwagala, & Walakira 2019). The negative impact of maternal employment on growth is related to inadequate childcare and attention due to the limited time working mothers have to interact with their children (Amugsi et al 2021:7).

However, other studies have found stunting prevalence slightly higher among children of unemployed mothers in Ethiopia and Nepal, respectively (Ahmed, Zepre, Lentero, Gebremariam, Jemal, Wondimu, Bedewi, Melis and Gebremeskel 2022:6). In some settings, maternal work can result in better access to resources for childcare, nutrition and better nutritional outcomes. Other studies also failed to show any significant

association between maternal employment and child stunting (Brauner-Otter, Baird & Ghimire 2019:224; Chavez-Zarate et al 2019:8).

2.6.2.5 Maternal antenatal care (ANC) visits

According to the 2018 WHO Antenatal Care Guidelines, at least four antenatal care (ANC) visits are required for safe maternal care. Studies in several low and middle-income countries report that the number of ANC visits before delivery is significantly associated with stunting (Amaha & Woldeamanuel 2021:7; Mtongwa, Festo & Elisaria 2021:7; Amadu et al 2021:7). In an Ethiopian study, attending at least four antenatal visits reduced the odds of stunting by 24% (Amaha & Woldeamanuel 2021:8). The odds of stunting decreases by 7% for every ANC visit (Amaha & Woldeamanuel 2021:8) . Mtongwa et al (2021:7) in Tanzania reported that mothers who attend antenatal care visits have lower odds of having low birth weight children, who in turn have a lower likelihood of stunting. This shows the importance of antenatal care as one of the crucial strategies in preventing stunting.

According to Amadu et al (2022:6), antenatal visits reduce children's chronic malnutrition risk because mothers who attend ANC visits are educated on the best nutritional practices and general child health through antenatal health education. In addition, antenatal care visits provide an entry point for other health services. Mothers are more likely to be aware of danger signs of illness, access and utilisation of immunisation services, and are well equipped with knowledge of appropriate feeding practices (Tessema, Teshale, Tesema, and Tamirat 2021:12).

However, Amaha & Woldeamanuel (2021:9) also emphasise the importance of care in interpreting the impact of ANC visits. Mothers who regularly visit the clinic for antenatal care are more likely to live in wealthier areas and are more educated, hence the potential confounding from these factors.

2.6.2.6 Maternal parity

Maternal parity refers to the number of children born to a mother (Islam & Khan 2022:80). Multiparity impacts child outcomes, including stunting. According to a study by Taufiqoh, Suryantoro, and Kurniawati (2018:67), children of multiparous women are at a three times higher risk of stunting than their primiparous counterparts. In Sierra Leone, a study reported that maternal parity was significantly associated with stunting in urban areas, particularly in the subcategory of those with two to four children (Sserwanja, Kamara, K., Mutisya, Musaba and Ziaei 2021:7). Similar findings were also reported in Kenya, where the odds of stunting in children born to mothers who had three or more births were 39% higher (Abuya, Ciera and Kimani-Murage.2012:7).

Families with many children under five years of age, particularly those with poor socioeconomic status, are generally unable to provide sufficient food, time, and attention to all young children (Kasaye, Bobo, Yilma, & Woldie 2019:11)

It is important to note that a systematic review of global evidence for national drivers of stunting declines found that parity accounts for less than 7% of the height for age change over the years (Vaivada, Akseer, Akseer, Somaskandan, Stefopulos, and Bhutta, et al 2020:787). The low contribution shows that high parity is a modest contributor to child stunting.

Several studies failed to find evidence for any association between maternal parity and stunting (Nkhoma, Ng'ambi, Chipimo and Zambwe 2021:7; -, Bwembya, Halwiindi, Mugode, and Banda 2018:6).

2.6.2.7 Nutritional knowledge

Improving mothers' nutritional knowledge has been one of the critical interventions promoted in nutritional intervention programs. Several studies have provided evidence of the protective effect of maternal nutritional knowledge on child stunting (Asna, Erianti, Syah, Hasan, and Sartika 2023; Hall et al 2018:1214).

A mother's nutritional knowledge is the key to household management. It determines the choice of ingredients, understanding of the child's nutritional status and state of well-being (Forh, Apprey. and Agyapong 2022:5). The mother's nutritional knowledge, mainly regarding health, helps safeguard children from occasions that reduce height for age, such as diarrhoeal episodes and other acute illnesses (Fadare, Amare, Mavrotas, Akerele, and Ogunniyi 2021:1).

On the other hand, some studies have failed to demonstrate any association between maternal nutritional knowledge and stunting. Studies done by Forh et al (2022:8) in Ghana, and Asna et al (2023:1) in Indonesia failed to demonstrate any significant association between nutritional knowledge and stunting. Cited reasons include the influence of socioeconomic, cultural, and environmental factors beyond maternal control, which limit the application of maternal knowledge (Asna et al 2023:1). In other studies, the nutritional knowledge of the caregivers did not contribute to better nutritional outcomes as knowledge assessment was based on western food sources, unavailable in the local context (Wanjihia, Chepkirui, Hitachi, Muniu, Nyandieka, and Ndemwa 2021:7). This reflects the importance of adapting the nutritional knowledge assessment tools to suit the study setting and understanding the context in which the maternal nutritional knowledge is being assessed and applied.

2.6.3 Feeding practices

The adequacy of dietary intake determines the ability of a child to achieve their full growth potential. The vital practices in infant and young child feeding include early breastfeeding initiation, exclusive breastfeeding for the first six months, safe introduction of complementary feeds and continued breastfeeding for up to two years and beyond (Masuke, Msuya, Mahande, Diarz, Stray-Pedersen, Jahanpour and Mgongo, 2021:6). In terms of diets and feeding practices, UNICEF global databases in December 2022 showed that globally, only 47% of children are initiated on breast milk within two hours of birth, and 47% were exclusively breastfed in the first five months. In Sub-Saharan Africa, 75% of children are introduced to solids at 6-8 months, 50% are not fed minimum meal frequency, and 31% have minimal dietary diversity (UNICEF 2022).

2.6.3.1 Breastfeeding

According to UNICEF 2021, infants should ideally be breastfed within 1 hour of birth, exclusively breastfed for the first six months, and breastfeeding should continue for up to two years and beyond. Breastfeeding should be combined with age-appropriate feeding of safe, nutritious semisolid and soft foods at six months.

2.6.3.1.1 Early breastfeeding initiation

Early breastfeeding initiation within two hours of birth is essential for providing nutrient-rich breast milk, and this can be an entrance to successful breastfeeding later (Muldiasman, Kusharisupeni, Laksminingsih et al 2018:339). The benefits of early breastfeeding initiation are related to the colostrum produced when the baby starts suckling. Colostrum contains immune factors that protect against infectious diseases and provides a safe, protective coating for the baby's intestines (Khaira, Widgangsih & Qadrijati 2022:10). Therefore, children who can suckle and take in colostrum are protected from diseases that can impact on early nutrition.

Initiation of breastfeeding more than six hours after birth, discarding colostrum due to ignorance of its health benefits and early breastfeeding supplementation are risk factors for poor nutritional outcomes in children under five (Muldiasman et al 2018:226).

An Indonesian study showed that children who did not get early breastfeeding initiation were 1.3 times more likely to be stunted than those who breastfed early (Muldiasman et al 2018:339). Other evidence states that children who do not receive early breast milk are at four times increased risk of stunting (Khara et al 2022:10). A meta-analysis by Susianto et al (2022:3) also reported a reduced stunting risk together with reduced early neonatal morbidity and mortality with early breastfeeding initiation. These studies provide evidence for the potential nutritional risks of delayed breastfeeding initiation.

Other studies investigated and failed to demonstrate any impact of early breastfeeding initiation on stunting (Tello, Rivadeneira, Moncayo, Buitrón, Astudillo, Estrella, and Torres 2022:7; Smith, Locks, Manji, McDonald, Kupka, Kisenge and Aboud 2017:61). Therefore,

a specific investigation into the impact of early breastfeeding initiation in a specific region is warranted.

2.6.3.1.2 Exclusive breastfeeding

According to the WHO 2025 Policy Against Stunting (WHO 2014:3), exclusive breastfeeding for the first six months is critical to protection against infections and stunting. Introduction of any other liquid or food before the age of six months is associated with an increased risk of gastrointestinal disease, which results in growth retardation, micronutrient deficiencies and vulnerability to infectious diseases (Kuchenbecker, Jordan, Reinbott, Herrmann, Jeremias, Kennedy, Muehlhoff, Mtimuni and Krawinkel 2015:9). Prior to the age of six months, the infant gut is not yet ready for complementary foods (Kuchenbecker et al 2015:9). The food is poorly absorbed, puts them at higher infection risk, and deprives the growing child of the much-needed breast milk.

A study in Indonesia found that exclusively breastfed children are 25% less likely to be stunted than those not exclusively breastfed (Hadi, Fatimatasari, Irwanti, Kusuma, Alfiana, Asshiddiqi, Nugroho, Lewis and Gittelsohn, 2021:7). In India, children who did not receive exclusive breastfeeding were 2.45 times more likely to be stunted than those exclusively breastfed (Umiyah & Hamidiyah 2020:475). A study by Zaragoza-CortesTrejo-Osti, Ocampo-Torres, Maldonado-Vargas, and Ortiz-Gress (2017:276) in Mexico found that for infants introduced to complementary foods by the age of three months, stunting becomes evident by the fourth month of life. This shows the direct impact of early complementary feeding. Children who were never breastfed also have overall higher stunting rates (Zaragoza-Cortes et al 2017:276).

However, other studies in Rwanda and South Africa failed to demonstrate any association between exclusive breastfeeding for the first six months and stunting in children (Nsereko, Mukabutera, Iyakaremye, Umwungerimwiza, Mbarushimana, and Nzayirambaho 2018:18; Kaldenbach, Engebretsen, Haskins, Conolly and Horwood 2022:7). The suggested reason given is that any protection conferred by exclusive breastfeeding does not overcome other adverse factors that affect child growth including poor nutritional

intake, infections, and diarrhoea (Nsereko et al 2018:3). The maternal diet and nutritional status also impact on the quality of the breast milk, hence if the mother is nutritionally compromised, this may result in limited exclusive breastfeeding benefit for the growing infant (Umiyah & Hamidiyah 2020:475).

2.6.3.1.3 Prolonged Breastfeeding

The WHO 2025 stunting policy brief gives breastfeeding to 24 months and beyond as one of the factors promoted in the fight against stunting (WHO 2014:3). Breast milk provides nutrients for growth in the first few months of life. However, breast milk becomes insufficient at 4-6 months of age to cover a growing baby's energy and nutritional needs (WHO, 2020). Late introduction of supplementary feeds can trigger dietary disturbances, resulting in malnutrition (Ajmal, Ajmal, Ajmal, and Nawaz. 2022:3).

Recent studies reported that breastfeeding for more than 18 months can lead to increased susceptibility to malnutrition (Syeda, Agho, Wilson, Maheshwari, and Raza 2021:16). A study done in Pakistani found that children were more likely to be stunted with increased duration of breastfeeding (Syeda et al 2021:16). In a Rwandan study, breastfeeding for more than a year was a significant risk factor for stunting (Nsereko et al 2018:6). Kumwenda, Zgambo, Umugwaneza, Nthani, Silavwe and Audain (2021:8) in Zambia also found similar results.

Prolonged breastfeeding duration can result in stunting due to inappropriate or inadequate supplementary feeding due to ignorance or lack of resources (Syeda et al 2021:16). Other studies postulate that prolonged breastfeeding itself is a response to poor growth; hence there is reverse causality (Nsereko et in 2018:3; Kumwenda et al 2021:12). Mothers who notice that their children are not growing well continue breastfeeding for a prolonged period as a strategy to manage the growth faltering.

Contrary to the above findings, other studies have shown that prolonged breastfeeding can be protective against stunting (Mgongo, Chotta, Hashim, Uriyo, Damian, Stray-Pedersen, Msuya, Wandel and Vangen et al 2017:509). Breastfeeding helps to prevent infections that can contribute to stunting. However, it is essential to note that breast milk

alone may not protect against stunting if not adequately complimented with the right additional food at the right time.

2.6.3.2 Complimentary feeding

From conception up to six months, a child entirely depends on the mother's nutrition through the placenta and breastfeeding. Complementary foods introduced at six months must be rich in nutrients and given according to the child's needs (Azizah, Lanti, and Dewi, 2022:5). The timing of introduction and the quantity and quality of the feeds are crucial to achieving good growth.

2.6.3.2.1 Timing

The WHO recommends that infants receive complementary foods at six months of age to cover the energy and nutrient deficits which breast milk cannot provide (WHO, 2022). Early introduction of complementary feeds can result in a higher risk of recurrent diarrhoea and other infectious diseases (Masuke et al 2021:5). In addition, the gastrointestinal tract of children below six months is not yet fully developed and is unable to adequately digest other foods (Masuke et al 2021:5). Early introduction of complementary feeds results in adverse nutritional outcomes. A study in Tanzania found that early introduction of complementary food before six months was associated with a higher risk of nutritional deficits, including stunting (Masuke et al 2021:7).

The delay in the introduction of complementary feeds has a negative impact on child growth. Breast-milk dependence, poor appetite for complementary feeds and chewing difficulties in children are some of the challenges faced by children who are introduced to solid food at a stage later than recommended (Syeda et al 2021:16). Timely introduction of complementary feeds is crucial to ensure adequate child growth.

2.6.3.2.2 Frequency of meals

WHO recommends that infants should start receiving complementary foods at six months, at a frequency of two to three meals/day at 6-8 months of age, increasing to three to six times a day at 9-12 months and 12-24 months, with 1-2 nutritious snacks in between

(WHO website 2022). The number of meals children receive is vital because the chances of receiving an adequate diet meeting all energy needs with a lower-than-recommended meal frequency are meagre (Shaka, Woldie, Lola, Olkamo, and Anbasse 2020:7). A child's nutritional status will always be adversely impacted if the number of meals is low (Shaka et al 2020:7).

Babys, Dew & Rahardjo (2022:474), in a meta-analysis of studies done in Africa and Asia, showed that low complimentary food frequency increases the stunting rate by 1.85 times overall. Stunting rates are highest in children with a meal frequency of fewer than three times daily (Babys et al 2022:474). In Tanzania, Masuke et al (2022:7) also reported that children who received a low meal frequency were at a 2.5 times higher risk of having poor linear growth. In Ethiopia, children who did not receive the recommended daily meal frequency were 4.5 times more likely to be stunted (Shaka et al 2020:7). When complementary feeds are introduced, the number of meals received can independently impact growth outcomes regardless of diet quality.

A study in India, however, failed to find any significant association between minimal meal frequency and stunting (Solanki, Parande, Salunke, Sangwan and Tambe 2022:169). Minimal meal frequency was more aligned with acute than chronic malnutrition, which causes stunting (Solanki et al 2022:169).

2.6.3.2.3 Dietary diversity

According to Amoah, Danquah, Stanislav, Danquah, Stanislav, Drokow, Yacong, Wang and Lyu (2022:2), minimum dietary diversity is defined as the consumption of four or more of the seven food groups that are needed to meet the energy and nutritional needs of growing children (Solomon, Aderaw and Tegegne 2017:2). The cut-off of four is associated with better quality diets for both breastfed and non-breastfed infants (Solanki et al 2022:169). Dietary diversity, therefore, describes the quality and constituents of a balanced diet. Meeting minimal dietary diversity is a long-term, sustainable strategy to reduce micronutrient deficiency (Solanki et al 2021:169). Dietary diversity is essential in

children due to rapid growth, heightened nutritional requirements and undernutrition risks in early life (Solanki et al 2021:169).

Children who did not get an adequately diverse diet were at a 1.8 times higher risk of stunting in Tanzania (Masuke et al 2021:7). Another study in Tanzania reported that children who received an appropriately diverse diet had an appropriate height level compared to those whose diet did not meet the minimum dietary diversity Khamis, Mwanri, Ntwenya and Kreppel 2019:7). The quality of a child's diet is, therefore, one of the key contributors to good growth and nutritional outcomes. Other studies have failed to show any correlation between dietary diversity scores and the nutritional status of children (Nithya & Bhavani 2018:419).

2.6.4 Environmental factors

The natural and physical environment of the child contributes significantly to the child's health (Vilcins, Sly & Jagals 2018:553). The environmental factors that have previously been investigated for association with stunting include clean water, improved sanitation, and hygiene (WASH). Poor sanitation and drinking unsafe water can cause diarrheal disease and lead to environmental enteropathy, which causes intestinal damage and disrupts nutrient absorption (Ademas, Adane, Keleb, Berihun and Tesfaw 2021:2; Regassa, Tamiru, Duguma and Belachew 2023:14). These changes eventually lead to chronic undernutrition and stunting.

2.6.4.1 Sanitation

Unsanitary conditions are tied to stunting through multiple pathways such as repeated diarrhoea, infection, and environmental enteric pathways (Kwami, Godfrey, Gavilan, Lakhanpaul and Parikh 2019:2). Environmental enteropathy is a subclinical disorder that pathologically causes villous atrophy, crypt hyperplasia, increased permeability, and modest malabsorption (Rah, Cronin, Badgaiyan, Aguayo, Coates, and Ahmed 2015:8). These intestinal changes lead to reduced absorption of essential nutrients and hence growth retardation (Rah et al 2015:8).

Improving the proportion of latrines at the village level and reducing the usage of open defecation reduces stunting levels (Vilcins, Sly & Jagals 2018:553). A study demonstrated that a ten per cent increase in open defecation leads to a 0.7% increase in stunting prevalence (Vilcins, Sly & Jagals 2018:553). Woodruff, Wirth, Bailes, Matji, Timmer and Rohner (2017:242) provided evidence for the link between the lack of toilet facilities and stunting in Ethiopia. Lack of proper sanitation facilities and improper disposal of faecal waste leads to environmental contamination (Vilcins, Sly & Jagals 2018:553). Children growing in such environments are adversely impacted due to infections and the malabsorption that results from that.

On the other hand, several studies have failed to show any link between sanitation and stunting. A large-scale randomised controlled trial in Zimbabwe with water, sanitation and hygienic (WASH) interventions identified a weak to non-existent linkage between improved sanitation facilities and stunting (Humphrey, Mbuya, Ntozini, Moulton, Stoltzfus, Tavengwa, Mutasa, Majo, Mutasa, Mangwadu and Chasokela 2019:145). Possible theories cited for the lack of association included the lack of immediate impact of improved sanitation on environmental enteric dysfunction and the presence of other confounding factors, such as intergenerational genetic factors (Humprey et al 2019:145). This highlights the importance of identifying specific sanitation challenges and their impact on stunting in a particular area.

2.6.4.2 Water

The impact of access to safe drinking water on stunting is inconclusive, as there have been contrasting findings from extensive studies.

Studies in Ethiopia and Uganda showed an association between improved water access and a reduction in stunting prevalence (Ademas et al 2021:7; Akombi, Agho, Hall, Wali, Renzaho and Merom 2017:9) A study in Ethiopia also found that unimproved drinking water was significantly associated with stunting in children under five years (Berhanu, Mekonnen and Sisay et al 2019:7).

It is, however, vital to note that three randomised controlled trials in Bangladesh, Kenya, and Zimbabwe, where there were comprehensive WASH interventions, failed to show any impact on stunting (Cumming, Arnold, Ban, Clasen, Esteves Mills, Freeman, Gordon, Guiteras, Howard, Hunter and Johnston 2019:7). The results of these trials reflect that as much as environmental factors are an important contributor to child stunting, intervention in this area in isolation from other discussed factors is unlikely to affect child linear growth. A study in India, however, also failed to show any association between improved water sources and stunting (Vilcins, Sly & Jagals 2018: 554).

2.7 CONCLUSION

Childhood stunting is a public health problem that occurs in the context of nested child, household, and national factors whose complex interplay drives the burden of chronic malnutrition. To address the persisting burden of stunting, comprehensive research into particular factors that impact linear growth in children in Eswatini must be done so that policymakers can use evidence-based information to address the challenges.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Chapter 3 describes each stage of the research project, detailing the study aims, objectives, research design, setting, population, sampling process, data collection, and data management. Ethical considerations that were made in the study are also discussed. Data were collected at two wellness clinics for children under five at two healthcare facilities in the Manzini region, Eswatini.

3.2 AIM OF THE STUDY

This study aimed to identify and describe the factors associated with stunting in children aged 0-59 months (under five years) in the Manzini region in Eswatini. Recommendations are formulated to address the factors associated with stunting in an attempt to reduce the risk of stunting in the region.

3.3 OBJECTIVES OF THE STUDY

To reach the aim of this study, the objectives of the study were to:

1. Identify and describe the child-related factors associated with stunting in children 0-59 months in the Manzini region, Eswatini.
2. Identify and describe the maternal-related factors associated with stunting in children 0-59 months in the Manzini region, Eswatini.
3. Identify and describe the feeding-related practices associated with stunting in children 0-59 months in the Manzini region in Eswatini.
4. Identify and describe the environmental factors associated with stunting in children 0-59 months in the Manzini region in Eswatini.
5. Formulate recommendations to share with policymakers to address the risk factors associated with stunting in children 0-59 months in the Manzini region, Eswatini.

3.4. RESEARCH DESIGN

The research design refers to the structured approach the researcher follows to answer a particular research question (Ehrlich 2017: 78). The researcher chose a quantitative, cross sectional study design. In this design, there is a description of the phenomena of interest within a single subject group at a single point in time without intervention from the researcher (Burns & Grove, 2017: 337)**.** This study measured stunting and risk factors quantitatively using a data capturing sheet and a questionnaire (see Annexures F and G).

3.4.1 Quantitative

Quantitative research is conducted to describe variables or concepts, examine relationships between variables and investigate the effect of an intervention on an outcome (Burns & Grove 2017:67). Measurement is a critical component of the quantitative method as it reveals and illustrates the relationship between quantitively derived variables (Edmonds & Kennedy 2017:30). This type of research was found to be most suitable for this study as it enabled the researcher to objectively measure and describe variables that are related to stunting in children under five years (0-59 months).

In quantitative research, data is collected using predetermined instruments (Apuke 2017:41). Data for this research was collected using predesigned tools, namely a data capturing sheet and a questionnaire (see Annexures F and G), which were prepared and finalized prior to the data collection stage.

3.4.2 Descriptive

According to Aggarwal and Ranganathan (2019:34), a descriptive study describes the distribution of one or more selected variables without regard to causation or other hypotheses. The purpose of a quantitative descriptive study is to describe the phenomena of interest and its component variables within a single subject group (Burns & Grove 2017:206).

In this study, the researcher collected data (measurements) from children accompanied by their mothers to assess the child's nutritional status. Data was also gathered from the mothers of the children, identifying and describing the factors that could possibly be associated with stunting. A data capturing sheet to capture measurements and a questionnaire to obtain data from the mothers were utilised (see Appendices F and G). Anthropometric measurements were taken and classified using WHO standards and captured on the data-capturing sheet. The identified factors associated with stunting were grouped into the child, maternal, feeding practices, and environmental factors.

3.5 RESEARCH METHODOLOGY

The research methodology provides a theoretic, philosophic, and data analytic stance for the research (Edmonds & Kennedy 2017:1). It generally includes details about the researcher's decision-making related to essential information such as subject selection, setting choice, attempts to limit factors that may introduce error, how the data is collected, and the choice of the statistical tests used (Burns & Grove 2017:85).

3.5.1 Setting

The study was conducted in the Manzini region in Eswatini, a Southern African nation bordering South Africa to its north, west and south and Mozambique in the northeastern region. Eswatini has a population of 1.1 million people. The Manzini region has a population of slightly below 360 000 people (Eswatini Central Statistics Office 2019:4). This represents the most significant national share of the population relative to the other three regions at 32,6% of the total (Eswatini Central Statistics Office 2019:4). Children under five years (0- 59 months) make up 11% of this population at about 40 000 (Eswatini Central Statistics Office 2019:16). There are two major referral hospitals, six district hospitals, and 101 public clinics, which are government and NGO-operated, serving the mentioned community (Manzini HMIS 2021:1).

As is the trend in most areas of the country, most (76.2%) residents stay in rural areas where the primary food source is subsistence farming. In comparison, 32.7% reside in urban areas (Eswatini Central Statistics Office 2019:3). Water is obtained from home

taps, communal boreholes, and open wells. The common sanitation facilities are flushing toilets, pits (dry and bucket) latrines, and pour-flush latrines.

3.5.2 Study population

A population is defined as a group of individuals who share similar characteristics (Edmonds & Kennedy 2017:19). The researcher's accessible population was the mother and child pairs who routinely visit the wellness clinics at healthcare facilities for growth monitoring, immunisations, vitamin supplementation, as well as management of minor ailments. The study population comprises two wellness clinics at two healthcare facilities, with the highest population of under-fives attended in 2021. All the mother-child pairs who attended the wellness clinics on the data collection days and who met the study inclusion criteria formed part of the study population.

3.5.3 Sampling

Sampling involves selecting a group of people, events, behaviours or other elements to conduct the study (Burns & Grove 2017:515). According to the sampling theory, sample elements are selected from the accessible population, the portion of the target population to which the researchers have reasonable access (Burns & Grove 2017:516). Data from clinic attendance in 2021 was used to make these calculations, as shown in Table 3.1.

3.5.4 Site sampling

In this study, the two facilities with the highest number of children under five years attended to at the under-five wellness clinics in the region were purposively identified to form the sample of facilities (see Table 3.1). One facility was a child health clinic in a public hospital and the other one was a child health clinic in a public health unit.

Table 3.1: Top 2 sites with the highest number of under-fives in attendance (Manzini HMIS 2021).

Clinics	Total Under-5s attended to in 2021
Site A	6659
Site B	3110

3.5.5 Sampling of mothers paired with children

A statistician was engaged to assist in calculating a sample size of 340 (see Section 3.6.6), ensuring that the study had adequate power.

3.5.5.1 Inclusion Criteria

Mother-child pairs with children 0-59 months old who came to the facility for wellness visits on the data collection days and consented to participate. All mothers with children in the 0-59 months age category and, above the age of 18.

3.5.5.2 Exclusion Criteria

1. Children who came with a guardian who is not the mother. One of the study objectives was to describe the maternal factors contributing to stunting; thus, the mother needed to be present for assessment.

2. Children who were critically sick because it would be unethical to carry out measurements on a critically sick child for research purposes.

3. Children who had a physical disability that could impact their weight or height measurements.

3.5.6 Sample size calculation

The sample size was calculated using a single population proportion formula. The following assumptions were considered, where n = required sample size, Z = critical value for normal distribution at 95% confidence level (1.96), and Prevalence = 27.6% (Eswatini Government, SADC, WORLD Vision & FAO 2019: 36) and d = 0.05 (5% proportion of tolerable sampling error between the sample and the population).

Thus, the sample size is calculated by:

$N = Z^2 \times p \times (1-p)/ d^2$

$= 1.96^2 \text{ X } 0.276\text{X}(1-0.276)/0.05^2$

$= 308$

Adding a 10% non-response rate gives a sample size of a total N = 340.

Data were collected on the data collection days from Monday to Friday between 0800 and 1200 until the desired sample size was reached. The number of participants chosen per facility was proportional to the annual number of children attended to at that facility relative to the other selected facility.

A non-probability stratified convenience sampling method was applied to sample mother-child pairs. In this sampling method, respondents were chosen based on their convenience and availability (Creswell 2014:204). All mother-child pairs who were accessible and available at the selected facilities on the data collection days and who met the inclusion criteria had an equal opportunity of being included in the study. Stratification was done using the differences in the population of patients attended to in the previous period at the selected health facilities.

Table 3.2: Sample size allocation.

Facility	% of the total sampled	Absolute number sampled
Site A	**68%**	**231**
Site B	**32%**	**109**

Total	**100%**	**340**

3.6 DATA COLLECTION

3.6.1 Research Assistants

Two research assistants were recruited using the following criteria:

- Education up to Form 5.
- Ability to communicate in both English and Siswati.
- Prior data collection experience.

The research assistants underwent a one-day training program facilitated by the researcher. The topics that were covered during this training included:

- Introduction and background of the study.
- How to obtain informed consent.
- The sampling procedures.
- How to conduct the Anthropometric measurements accurately.
- Effective and neutral communication during the data collection stage.
- How to complete the questionnaire.

The research assistants were also involved in the questionnaire pretest to allow them to experience the data collection process and identify areas where they need support. On the data collection days, their role included explaining details of the information letter, attending to inquiries of potential participants, as well as obtaining informed consent before administering the data collection tools. The researcher assessed these processes to ensure compliance with the set ethical principles.

3.6.2 Data collection process

Data collection is defined as the process of selecting subjects and gathering data from them (Burns & Grove 2017:769). In this research step, study variables are measured, and the data collected is recorded systematically for each subject (Burns & Grove 2017:111).

On the days of data collection, the gatekeeper ensured that a private room was available to conduct the data collection in a space that ensured privacy and adherence to the COVID-19 protocols. The gatekeeper, attending to the clients at the under-five child wellness clinic, shared the information letters (see Annexure D) with the potential participants who met the inclusion criteria. She/he explained that participation was voluntary and that participants would still receive regular care if they decided not to participate in the study. All mothers who volunteered to participate were introduced to the research assistant present at the clinic reception area. The research assistant introduced himself or herself and accompanied the mother to the private room. The research assistant then explained further details in the information letter, answered all questions raised and asked for the mother's written consent to participate in the study. After obtaining written consent, the research assistant proceeded to collect the data with assistance from the researcher. The second research assistant was available at reception to receive new volunteers.

Two data collection tools were used: A data capturing tool (see Annexure F) and a questionnaire (see Annexure G). Participants were free to withdraw at any point in the data-gathering process. The researcher was involved in conducting the first five days of the interviews, after which the two research assistants continued with the data collection. The data collection team, including the researcher, had daily debriefing meetings. The researcher also did spot checks for the days she was absent at the study sites. Data collection took place over three weeks between October and November 2022.

3.7 DATA COLLECTION TOOLS

The researcher collected the desired data using two data collection tools, namely the data capturing sheet and a questionnaire (see Annexures F and G).

3.7.1 Data capturing sheet

The data capturing sheet was developed using reference ranges from the WHO Standard Growth Charts (WHO, 2006). The anthropometric measurements documented in the data

capturing sheet included each child's weight, length/ height, mid-upper arm circumference and the mother's weight and height.

Weight measurements were taken using an electronic SECA scale to the precision of 0.1 kg, with the child/mother standing. For those who could not stand, a Salter hanging scale was used. This scale similarly measured the nearest 0.1 kg. All clothes were removed from the infants.

Length was measured for children under 24 months of age and height for those over 24 months. Measurements were done using a standard height/length board with a movable panel with a precision of 0.1 cm. The mother positioned the child, less than two years of age, on the horizontal board under the instruction of the data research assistant, who recorded the length. For the height measurement in children above 24 months of age, the child/mother stood on the vertical board, and the researcher noted the height measurement.

All measurements were repeated three times, and the average was taken. This was done to improve the validity of the measurements.

The researcher used the WHO nutrition tables to classify the children nutritionally. The weight was classified as follows:

Weight classification: Underweight: weight for age < –2 standard deviations (SD) of the WHO Child Growth Standards median.

Wasting: weight for height < –2 SD of the WHO Child Growth Standards median

Overweight: weight for height > +2 SD of the WHO Child Growth Standards median

Height/length classification: Stunting: height/length for age < –2 SD of the WHO Child Growth Standards median (measured in cm).

For the mothers**, BMI** was used to classify their nutritional status. Underweight was classified as a BMI of <18.5; normal BMI was between 18.5 and 25.9; overweight BMI was between 25 and 29.9; and obesity was classified as a BMI greater ≥ than 30.

Height classification for the mothers was classified as follows:

Height less than 148 cm = short stature

Height more than 148 cm = normal

3.7.2 Questionnaire

A questionnaire is a self-report form designed to elicit information through written, verbal, and electronic responses of the subject (Gray, Grove and Sunderland 2016: 304). Questionnaires are often used in descriptive studies to gather a broad spectrum of information, such as facts about subjects, events or situations and even subjects' beliefs, attitudes, and opinions (Gray et al 2016:304).

The researcher developed the questionnaire based on a literature review that covered the significant risk factors for stunting, including child factors, maternal factors, feeding practices, and environmental factors. The FAO 2018 "Dietary Assessment and Resource Guide to Method Selection and Application in Low Resource Settings" was used as a guide for the selection of food lists (FAO 2018: 53). The FAO 2014 guidelines for assessing nutrition-related knowledge, attitudes, and guidance were also used when the researcher drafted questions for evaluating nutritional knowledge (Fautsch Macías, & Glasauer 2014:23-30). However, these were adapted and modified for the local setting.

The questionnaire consisted of 40 questions and was divided into four sections as follows:

Section A: Child details – demographic, birth history, illness history.

Section B: Maternal information – demographic, parity, pregnancy history, education, income and general health.

Section C: Feeding practices – breastfeeding practices, nutritional knowledge, child feeding practices, dietary diversity.

Section C: Environmental factors – water sources, ablution facilities.

Data were collected through face-to-face questionnaire administration, where the interviewer presented the questions orally to the subjects. This was the preferred data collection method because it enabled the researcher to obtain the information in a standardised manner.

The advantages of face-to-face interview-administered questionnaires, which contributed to them being selected as the method of choice, are that:

1. Questions could be presented consistently to each respondent; hence, opportunities for bias were less than in the case of interviews (Gray et al 2016:304). All participants in the study were asked the same questions in the same way.

2. Having an interviewer asking the questions increased the reliability of the information obtained, especially when the respondents might have been illiterate (Ehrlich 2017:113). In this study, it was possible that some of the mothers could have been illiterate in writing and reading, which could have impacted questionnaire completion.

3. There is a higher response rate than self-administered questionnaires (Kabir 2016:207). It was anticipated that administration of the tool would lead to good response rates and, hence, a shorter duration of the data collection period.

Face-to-face questionnaire administration also has some challenges mentioned in the literature:

1. They tend to be expensive and time-consuming (Kabir 2016:207). Time and money were needed to train the data research assistants who conducted the interviews. In addition, transport money and allowances could also be expensive. To address this challenge, the costs were minimised by training the research

assistants over one day, and the data collection days were limited to 10-15 days. This financial implication was catered for in the budget.

2. They are prone to interview bias and interpreter bias (Kabir 2016:207). The training was, therefore, necessary to reduce these biases and ensure the administration and interpretation of standard tools.

3. Physical contact might bring in interpersonal factors (Ehrlich 2017:113). The presence of the interviewer and their demeanour may have interfered with data collection as it could cause difficulty when sensitive questions were being asked. The research assistants' training program addressed this challenge by teaching them how to communicate in a neutral, polite manner to keep the participants comfortable and at ease.

The need for face-to-face contact posed an additional challenge during the COVID-19 pandemic.Strict adherence to the COVID-19 prevention measures was used to safeguard the researchers and participants. All participants and those involved in the research had to undergo routine symptom screening at the facility entrance. Those with positive screens (high temperature or any other symptoms) were excluded from the study on the day of data collection. Strict adherence to the given COVID-19 protocols was enforced, with a supply of alcohol for hand sanitisation, wearing masks, and social distancing between the interviewer and the participant. The height and weight measuring scales and the MUAC tapes were cleaned with a 70% alcohol solution after every participant had been attended to.

3.7.3 Pre-test

The researcher and the research assistants conducted a pre-test of the questionnaire after the study had obtained ethics approval. The respondents were recruited from study site B and they met the inclusion criteria. No sampling was done. The nurse in charge recruited ten volunteers on a single selected date. The respondents were given the information letter (see Annexure D) and had an opportunity to ask questions. Consent

forms were also provided for them to sign (see Annexure E). The purpose of the pre-test was to determine the time taken to complete the questionnaire and the appropriateness of the questions asked regarding understandability and cultural sensitivity. Changes were made to the questionnaire (see Annexure G) based on the on the output given after modifications were approved by the research supervisor (see Table 3.3)

Table 3.3: Adjustments made based on the pre-test.

Issue identified	**Corrective action**
Question 42 The reasearcher presented the options to the respondent instead of waiting for the respondent's response so that he can tick in the given boxes to assess patient knowledge	Additional instruction was added for the research assistants for him/her to await a respondent's response as follows "Please await patient response and tick where appropriate"
Question 45 The respondents had more information about different information about signs of malnutrition, which was not included in the questionnaire	Option 'Other' was added to accommodate all possible responses.
The questionnaire took an average of 20 minutes to fill, with a shorter duration for the respondents with children less than 6 months of age. However, participants complained that the questionnaire took too long for them as they had not budgeted for the additional time they had to spend at the clinic.	As part of the information given, participants were advised about the anticipated duration of the questionnaire administration.

Pretest participants were not included in the study results.

3.7.4 Data management

Data was collected using physical copies of questionnaires and data capturing tools and entered in the Stata tool for analysis. The questionnaires were stored in waterproof, fireproof, lockable containers. An Excel sheet with a line list of all files by date, name, and document type was kept. Each page had a unique identifier together with the file code.

3.7.5 Rigour

In quantitative research, rigour refers to soundness or precision in planning, data collection, analysis, and reporting (Marquart 2017:1). The rigour of measurement instruments is usually evaluated using validity and reliability (Ehrlich 2017:123).

3.7.5.1 Validity

Validity is the extent to which a measuring instrument measures what it is designed to measure (Ehrlich 123 2017:123). If a data collection tool has high validity, it produces measurements corresponding to the natural characteristics of the variable in the physical world. In this study, the researcher's supervisor verified the face and content validity of the checklist and questionnaire. The Scientific Review Committee of the Department of Health Studies (UNISA) and the Eswatini Health and Human Research Ethics Committee.

Content validity requires that the measure used accounts for all the elements of a variable or concept being investigated (Ehrlich 2017:126). According to Taherdoost (2016), content validity involves literature reviews and follow-up by expert judges or panels. For this research, the questionnaire was developed after an extensive literature review utilising existing knowledge and resources to measure the variables of interest broadly and accurately. The Scientific Review Committee also evaluated and approved the data collection instruments.

Face validity evaluates the appearance of a questionnaire in terms of feasibility, readability, formatting, style consistency, and clarity of the language used (Taherdoost

2016:2). The questionnaire was drafted in English and translated to Siswati. This translation aimed to improve the face validity of the questions asked as the questions needed to accurately assess what they were meant to measure and make sense for the participants. The questionnaire was also translated back to English from Siswati to ensure the meaning was preserved in the translation process.

Internal validity is the extent to which observations made from the measuring instruments represent the truth in the population we are studying (Patino & Ferreira 2018:183). For this research, the questionnaire was pre-tested using a pilot after the study was approved on a sample of ten willing participants from one of the selected facilities. This was also done to ensure appropriate language, length, structure, and questions.

Criterion-related validity involves evaluating the results of the measurement instrument against the most valid measurement available (Ehrlich 2017:126). The scale's validity was enhanced by daily positioning on a flat surface and checking the accuracy of the measurements using a standard weight.

3.7.5.2 Reliability

Reliability refers to how consistently a method can make a particular measurement (Ehrlich 2017:125). A measuring instrument is reliable if the same result can be consistently achieved using the same method under the same circumstances. Several steps were taken to ensure that the measuring instruments were reliable.

The anthropometric measurements (weight, height, MUAC) were measured three times, and the average of the three readings was captured. The repeated measurements were done to assess the stability of the measuring instrument. Every morning, the researcher calibrated the scales using a standard measure to ensure the accuracy of the weight measurements. The research assistants were recruited based on their ability to converse with the study participants' cultures and languages: Siswati and English. Intensive training of the research assistants was carried out. This was done to standardise the application of the tool, hence reducing inter-observer

variation. Periodic spot checks were done for quality control purposes, with daily feedback sessions during the debriefing meetings with the research assistants.

3.8 ETHICAL CONSIDERATIONS

Ethics can commonly be defined as the norms of conduct distinguishing between acceptable and unacceptable behaviour (Resnik 2020:2). The Belmont Report articulated three broad principles on which the standards of ethical conduct are based, namely, respect for human dignity, beneficence and justice (Polit & Beck 2017:210). The researcher, therefore, followed the steps necessary to ensure that the study was conducted ethically by obtaining the necessary permissions, respecting the dignity of participants, minimising harm, and ensuring strict confidence and privacy for all the research participants.

3.8.1 Permission

Ethical approval for this study was sought and granted from the Eswatini Science and Ethics Research Committee and the UNISA College of Human Health Sciences Research Ethics Review Committee (see attached Annexures A and B).

3.8.2 Respect for human dignity

Respect for human dignity in research implies that all persons have a right to full autonomy and full disclosure (Polit & Beck 2017:211).

3.8.2.1 Autonomy

An autonomous individual is a person who is capable of deliberating about their personal goals and acting under the direction of such deliberation (Ehrlich 2017:34). All adult participants had autonomy throughout the data collection process. This means that each adult was respected as a person capable of making their own decisions and had the personal freedom to act upon these decisions during the study. The participants had the right to refuse to give any information or withdraw from the study at any point, as explained to them in the information letter (see Annexure D).

3.8.2.2 Full disclosure

Right to full disclosure means that all study participants had a right to make informed, voluntary decisions about their study participation after the researcher had described to them all details about the study, each person's right to refuse to participate, the researcher's responsibilities as well as the anticipated risks and benefits of participation (Polit & Beck 2017:213).

Informed written consent was sought from all the adult participants of the study. An information letter was provided in English and Siswati (see Annexures C and D). The contents were read to participants before they signed a consent form (see Annexure E). Adult participants, more than 18 years of age, gave consent for their children's measurements (0-59 months). To respect participant autonomy, participants were advised that they were free to withdraw from the study at any point as they saw fit. The participants were not under any undue coercion, as there were no direct rewards for participating in the study. Conversely, participants were assured that their possible withdrawal from the study would not negatively affect the care they were supposed to receive at the facility.

Children below five years are legally and mentally incompetent to give informed consent because they cannot make decisions regarding participation and withdrawal from the study (Burns & Grove 2017:276). Therefore, for children to participate in research, there must be minimal risk to the child, and there should be assent from both the child (if more than nine years old) and the parent or guardian (Burns & Grove 2017:278). There was a minimum risk for the children in this study as only measurements, which are routinely checked, were obtained, and no intervention was given. In addition, parental consent was sufficient as the children were all under five years old.

3.8.3 Non-maleficence (do no harm)

To honour participants' right to freedom from harm, researchers should not subject them to unnecessary risks of harm or discomfort, and their participation must be essential in achieving the study's aims (Polit & Beck 2017:211). To avoid loss of privacy, which may

lead to harm (maleficence), according to Polit and Beck (2010:121), interviews were conducted in a separate, private space. Study participants also have a right to expect that any data they provide be kept in strict confidence through confidentiality procedures (Polit & Beck 2010:129.) To uphold the principle of confidentiality, the information captured was anonymised using numbers on the data collection tools. There were no identifiers or names of the participants in any of the data collection forms. The data in bulk (the findings) will be shared without identifiable information from any specific facility or respondent.

3.8.4 Justice

The Belmont Report also emphasizes the ethical principle of justice (Polit & Beck 2010:124), according to which participants must be treated equally, with a fair distribution of study risks and benefits. The selection of participants for this study was voluntary; hence, all persons at the facility who met the inclusion criteria were given an equal opportunity to participate. Results of the study will be shared with the institutions that participated, and participants will be able to access these results at those respective institutions.

Multi-disciplinary audience: A plain language report will also be shared with Action Against Hunger, an NGO involved in sensitizing communities on nutrition-related matters. The research report will be published in a peer-reviewed journal, and the author will apply to present the abstract at the International Conference of Nutrition in South Africa. The PDF Research Thesis Report will also be added to the UNISA digital archives for future access.

3.9 CONCLUSION

This chapter explained the study aims and objectives and described the research design and methodology, including the setting, population, sampling, data collection and analysis processes. Data was collected using a data capturing sheet and a questionnaire. The steps taken to ensure validity, reliability, and ethical considerations were also described.

CHAPTER 4

DATA ANALYSIS, INTERPRETATION OF FINDINGS AND DISCUSSION

4.1 INTRODUCTION

This chapter discusses the data analysis, the presentation of the findings, and the interpretation and discussion of the study's findings.

4.2 DATA ANALYSIS AND MANAGEMENT

Data analysis involves systematically examining data using statistical and logical techniques so that it can be interpreted into useful information (Hair et al 2019:10). Data analysis aims to uncover beneficial information and draw conclusions to support decision-making (Hair et al 2019). In this study, a statistician assisted the researcher with the data analysis and interpretation. The WHO Anthro analyser computed the height Z-scores. The raw data was captured in an Excel spreadsheet and exported by the statistician for analysis using STATA 17 and Epi Info Version 7.2.5.0. Univariate analysis was performed to calculate the frequencies and proportions of different variables and the prevalence of stunting. Bivariate analysis using the Pearson chi-squared test determined the associations between the child factors, maternal factors, feeding-related factors, and environmental factors and stunting. Multivariate logistic regression analysis was applied to adjust for confounding. Odds Ratios (OR), Adjusted Odds Ratios (AOR) and their 95% level of confidence (95% CI) and significance level of $p< 0.05$ were used to measure the strength of association and statistical significance.

In the discussion of the results, the following conventions apply:

N: Capital "N" represents the total number of records or questionnaires.

n: Lowercase "n" represents the number of files or questionnaires included, thus excluding files or questionnaires where there were missing data.

F: Capital "F" represents the frequency.

f: Lowercase "f" represents the percentage from "F" or "n" where applicable.

4.3 RESEARCH RESULTS

4.3.1 Characteristics of the study sample

The total sample was 340 respondents, with 338 complete questionnaires with usable data, thus a 99% response rate. This response rate was reasonable as the American Medical Association Journal considers a 60% response rate acceptable (Sataloff & Vontella 2021:683). Two hundred and twenty-eight mother-child pairs were from Site A, and one hundred and ten were from Site B. The characteristics are described under the socio-demographic (see Section 4.3.3), Antenatal care, feeding and child health factors (see Section 4.3.2).

4.3.2 Socio-demographic characteristics of the study participants (mother-baby pairs)

The socio-demographic variables were categorised as age, child sex, maternal educational level, employment status, monthly income, water source, sanitation and facilities region. These characteristics are illustrated in Table 4.1

Table 4.1: Socio-demographic characteristics of study participants (mother-baby pairs)

Variable	Category	Frequency (N = 338)	Proportion
Health Facility	Site A Site B	228 110	67.5 32.5
Child sex	Male Female	189 149	55.9 44.1
Child Age (Months)	<6 6-11 12-23 24-35 36-48 >48 Median = 18	37 75 88 60 58 20	11.0 22.2 26.0 17.8 17.1 5.9
Birth Weight (g)	<2500 2500-4000 ≥4000	38 233 14	11.5 83.7 4.7
Maternal age (Years)	=18 19-24 25-30 31-39 >39 Median = 29	4 83 129 105 17	1.2 24.5 38.2 31.1 5.0
Maternal level of education	Never attended. Primary Secondary Tertiary	4 20 242 72	1.2 5.9 71.6 21.3
Employment Status	Employed Unemployed	152 186	44.9 55.1
Monthly income (E)	<1000 1000-3000 >3000	114 145 79	33.7 43.0 23.3
Water source	Piped water Borehole Dug well Other	291 33 10 4	86.0 9.8 3.0 1.2
Sanitation facilities	Flush toilets Pit latrines	137 201	40.5 59.5

4.3.2.1 Age (N = 338)

All participants were sampled from child welfare clinics (see Table 4.1). The children's ages ranged from 0 to 59 months, as required according to the inclusion criteria. The age distribution of the participating children is illustrated in Table 4.1. Among the 338 respondents, most children were in the age group 12-23 months with a total frequency of 88 (f = 26%), 75 (f = 22.2%) were between 6-11 months, 60 (f = 17.8%), 24 to 35months of age,58 (f = 17.1%) were 36 to 48 months. The age ranges with the lowest proportion of respondents were lower than six months, with 37 (f = 11%) and 49-59 months with 20 (f = 6%).

The median age of the participants was 18 months, with a mean of 22.4 months and a standard deviation of 16.3. The median age is similar to that found in a Ugandan study investigating child welfare clinic attendance in the COVID era, which also found a median age of attendance of 15 months (Biri-Baidoo, Agyapong, Mohammed, Ayensu, Osman 2023:5). Prior studies have provided evidence for an association between age and stunting (Sultana et al 2019:2; Garcia-Cruz et al 2019:9; Wali et al 2020:3; Kasaja et al 2022:3). The same was demonstrated in the research findings (see Section 4.4.2.2).

4.3.2.2 Sex (N = 338)

Although studies in low to middle-income countries have reported diverse findings about the effect of sex on stunting, a higher preponderance of stunting has generally been found in male children (Madiba et al 2019:8; Garcia-Cruz et al 2017:9, De Boer et al 2022:582).

As illustrated in Table 4.1, there were 189 male (f = 55.9%) and 149 female (f = 44.8%) participants.

4.3.2.3 Birth weight (N = 338)

Birth weight is a recognised predisposing factor for poor future linear growth (Aboagye et al 2022:8).

As listed in Table 4.1, 283 (83.7%) of 338 children sampled had birth weights within the normal range of 2400 to 4000g. Children born with low birth weight were fewer at 38 (f = 11.5%), and 16 (f = 4.73%) children had a high birth weight (above 4000g).

The proportion of low-birth-weight children in this sample corresponds to what would be expected in the Eswatini population, where, according to the World Bank (2023) and Global Nutrition Report (UNICEF/WHO/World Bank, 2023), 10% of babies born in Eswatini have a low birth weight. These averages are also comparable to the pooled prevalence of 10.3% for newborns in Sub-Saharan Africa (Tessema et al 2021:9). In this study, low birth weight was strongly associated with stunting (see Table 4.6).

4.3.2.4 Maternal age (N = 338)

The mother's age plays a significant role in stunted development. Younger mothers often encounter difficulties such as inadequate dietary intake, limited access to safe water, unfavourable social circumstances with restricted resources, and challenges with breast-feeding their infants (Wemakor et al 2018:3). In this study, the maternal age range was categorised into five groups, as shown in Table 4.1.

A small proportion of mothers, 4 (f = 1.18%), were of 18 years of age, while a significant proportion, 83 (f = 24.5%), fell within the age groups of 19-24 years, 25-30 years (93, f = 38.2%), and 31-39 years (77, f = 31.1%). Only a minority, 17 (f = 5%) of respondents, were older than 40 years. Analysis conducted on fertility rates by maternal age in the United States indicated that those aged between 25 and 30 had the highest fertility rates, followed by those aged 30 to 34 (Osterman, Hamilton, Martin, Driscoll and Valenzuela, 2022:4). These findings align with the results from this study.

Despite the evidence for a link between maternal age and stunting (Section 2.10.2), the study results did not identify any significant link between maternal age and stunting (see Section 4.4.2).

4.3.2.5 Level of education (N = 338)

A mother's educational level impacts her knowledge, health-seeking behaviour, and access to better nutritional sources (Azizah et al 2022:370; Casale et al 2018:1815-1816). Not surprisingly, in general, higher levels of child stunting were reported in mothers with lower educational levels (Susyani et al 2022:1602; Javid & Pu 2021:381; Amaha & Woldeamanuel 2021:4). In this study, the highest level of education of mothers was defined based on the four main levels namely never attended school, primary school, secondary school, and tertiary education (see Table 4.1).

Of the 338 respondents, 20 (f = 5.92%) were educated up to the primary school level, 242 (71.6%) secondary school level, and 72(21.3%) tertiary level. Only 4 (1.18%) had never attended school. The proportion of mothers educated up to the secondary level in this sample is close to that reported by USAID, which states that the secondary school enrolment for the general population in Eswatini is 83.1% (USAID, 2023). As discussed in Section 4.4.2, this study found no significant association between maternal education levels and child stunting. Nevertheless, it is worth noting that mothers with lower educational attainment tended to have a higher proportion of children who experienced stunting, which aligns with findings from previous studies (see Section 2.10.3).

4.3.2.6 Monthly household income (N = 338)

The socio-economic status of households has a direct influence on food security and the subsequent growth of children (Chowdhury, Khan, Rafiqul Islam, Perera, Shumack and Kader 2016:8). Children from economically disadvantaged families often face limited access to both nutritious food and healthcare services, resulting in an elevated risk of growth failure (Khan, Zaheer and Safdar 2019:13) and potentially resulting in stunted development (Utami, Setiawan and Fitriyani 2019:609).

Respondents were asked to estimate their household's total earnings, which was then divided into three income ranges for analysis. According to the World Bank (2023), individuals earning less than US$1.90 per day or less than 1000 Eswatini Emalangeni a month are classified as living below the poverty line. Table 4.1 illustrates that out of the

338 households, 114 (33.7%) earned less than 1000E per month, while 145 (42.8%) fell within the range of 1000-2000E and a further 79 (23.3%) earned more than 3000E as monthly income. These findings align with information from UNDP's report stating that approximately 39.7% of Eswatini's population lives under the E1000 poverty threshold (UNDP 2022). It is worth mentioning that the household income of study participants did not show a significant association with stunting, as stated in Section 4.4.3.3. Nonetheless, it should be emphasised that children from low-income households are particularly susceptible to stunting and, therefore, require protective measures to ensure their well-being.

4.3.2.7 Water sources

Ensuring a clean and sanitary environment is crucial for the well-being of young children, as inadequate sanitation and contaminated drinking water can lead to the transmission of diarrheal diseases through faecal-oral routes, along with environmental enteropathy (et al 2021:2). Over time, this can cause damage to the intestines and hinder proper nutrient absorption, ultimately resulting in stunting (Ademas et al 2021:2).

Table 4.1 illustrates the water sources for the participants where 291 (f = 86.09%) participants used piped tap water as the primary source of drinking water, followed by borehole water 33 (f = 9.76%) and dug wells 10 (f = 2.96%). These findings are consistent with the SDG report that states, as of 2020, 80% of the population in Eswatini utilises water from improved drinking water sources such as piped water and boreholes (SDG 2022). Although water sources were not associated with stunting, research findings demonstrated that water treatment had a protective effect (see Section 4.3.4).

4.3.2.8 Sanitation facilities

Unsanitary conditions have been identified as a significant contributing factor to stunting through various pathways, such as recurrent diarrhoea, infections, and environmental enteric dysfunctions (Kwami et al 2019:2). The World Health Organization characterises improved sanitation facilities as those effectively isolating human waste from any contact with humans, such as flush toilets and pit latrines (WHO 2023). Within the scope of this

study, all participants utilised the named improved sanitation facilities. Specifically, 137 (40%) of participants used flush toilets, while 201 (59.47%) participants relied on pit latrines (see table 4.1).

Nevertheless, it is vital to highlight that Eswatini still has a relatively elevated open defecation rate of approximately 10.65%, predominantly observed in rural regions (UNICEF 2020). Given that the study sample is entirely constituted of peri-urban inhabitants with widespread access to adequate sanitation infrastructure, such as operational flush toilets, this circumstance explains the lack of a significant association we found between the utilisation of proper sanitation facilities and stunting in our results (see Section 4.35).

4.2.3 Antenatal care, breastfeeding, and child health status characteristics

Table 4.2: Antenatal care, breastfeeding and Child Health Status

Variable	Category	Frequency	Proportion
Parity (N = 338)	1-2 3-4 >4	229 82 27	67.7 24.3 8.03
Antenatal care visits (N = 338)	0 1-3 ≥4	2 34 302	0.6 10.1 89.3
Ever breastfed (N = 338)	Yes No	309 29	91.4 8.6
Exclusive breastfeeding before six months (N = 228)	No Yes	141 147	49.0 51.0
Reasons for not exclusively breastfeeding (n = 141)	Child hungry/thirsty Mother going to work/school Breastfeeding challenges Advised to stop by others Other	56 27 19 9 30	39.7 19.1 13.5 6.4 21.3
Fluids given at stopping exclusive breastfeeding (N = 288)	Plain water Milk Juice Tea	204 160 54 12	70.8 55.6 18.8 4.2
Child ever visited clinic in the past 12 months (N = 338)	Yes No	248 90	73.4 26.6
Illness reasons for visiting clinic (n = 248)	Cough Diarrhea Vomiting Fever	130 75 39 42	45.4 26.2 13.6 14.6

Dietary diversity (N = 300)	Adequate Inadequate	176 124	58.7 41.3
Maternal nutritional knowledge (N = 338)	Adequate Inadequate	319 19	94.0 6.0

4.2.3.1 Parity (N = 338)

Mothers with higher parity tend to have more stunted children as families struggle to provide adequate attention and food to all the children (Podungge, Yulianingsih, Porouw, Saraswati, Tompunuh, Claudia, Zakaria and Labatjo 2021:1723).

As illustrated in Table 4.2, most mothers (67.7%) had between one and two children, while 24.2% had three to four children, and a smaller proportion (7.9%) had more than three children. As of 2020, the reported fertility rate in Eswatini was 2.9 births per woman (Healthy Newborn Network 2023). Thus, it is expected that most women of reproductive age in the country have given birth fewer than three times and have one to two children on average. The findings indicate that nearly two-thirds of the participants surveyed had less than three childbirths – a significantly lower figure compared to other women residing in Sub-Saharan Africa, where an average woman has five children, according to Tesfa, Tiruneh, Azanaw, Gebremariam, Engidaw, Tiruneh, Dessalegn and Kefale (2022:9). Although the study results did not show any significant association between maternal parity and stunting, stunting frequencies were higher in women with more children (see Section 4.4.3.3), thus confirming the adverse impact of higher parity on nutritional outcomes**.**

4.2.3.2 ANC visits (N = 338)

Antenatal care programs play a crucial role in offering comprehensive support and guidance to promote the well-being of expectant mothers and their children, including providing essential information on optimal nutritional practices (Amadu et al 2022:6). Therefore, participants were asked about the frequency of antenatal care visits they received throughout their pregnancies.

Out of the 338 participants, only 2 (f = 0.6%) did not receive healthcare before delivering their baby. Interestingly, most of the participants, 302 (89.3%), had attended four or more antenatal care visits, which slightly exceeds the reported figure of at least 76% of women in Eswatini receiving at least four ANC visits according to UNICEF (UNICEF 2023). It is worth noting that since our sample was drawn from healthcare facilities, it is likely that these individuals have good health-seeking behaviour and willingly access services like antenatal and postnatal care along with other health care.

4.2.3.3 Ever breastfed (N = 338).

Various studies have shown that breast-feeding can protect against stunting (Campos, Villa Compte & Hawkings 2020:7; Garcia et al 2017:12). At an individual level, breast-feeding offers protective elements that enhance the vulnerable immune system and lower the risk of stunting (Campos et al 2020:7).

Out of the 338 participants surveyed, the majority, 309 (f = 91.42%), breastfed their children at some point, whereas only 29 (f = 8.58%) reported that their children had never been breastfed. This aligns with the high prevalence rate of breastfeeding in Eswatini, where more than 68% of infants are exclusively breastfed for the first five months (UNICEF 2023). In comparison, neighbouring countries like Lesotho have even higher breastfeeding rates of over 96% (Bureau of Statistics 2018:117).

Despite existing evidence showing the protective effects of breastfeeding on stunting, as mentioned in previous studies, no significant association between having breastfed a baby and stunting rate was found in this study (see Section 4.4.3). Nevertheless, it is important to acknowledge breastfeeding as an essential factor for protecting against stunting based on the literature findings detailed in Section 2.11.1.

4.2.3.4 Exclusive breastfeeding (N = 228).

Exclusive breastfeeding is defined as an infant solely receiving breast milk for the first six months of life, barring drops or syrups encompassing vitamins, minerals, supplements, or medicines (WHO 2015). However, non-exclusive breastfeeding bears a risk as it may

limit the complete absorption of breast milk nutrients, expose infants to infections, and could culminate in nutritional deficits (Feleke, Kassahun, Tassaw & Chanie 2021:2).

In this study, 147 (f = 51%) of the 288 children older than six months were exclusively breastfed for the first six months, while 141 (f = 49%) began other feeds before six months (see Table 4.2). In a preceding study in Eswatini, it was observed that only 40% of infants were exclusively breast-feeding during the first six months (Dallmeier & Gewa 2020:38). Our study's finding mirrors the 50.6% reported in Ghana (Yeboah, Forkuor & Agyemang-Duah 2019:3) and surpasses the lower 37% figure reported in Zimbabwe (Mundagowa, Chadambuka, Chimberengwa and Mukora-Mutseyekwa 2019:6).

4.2.3.4.1 Reasons given for stopping exclusive breastfeeding (N = 141).

Participants were asked to provide reasons for initiating early supplementary feeding to gain insight into the factors influencing mothers' decision to introduce fluids/feeds before the recommended six months, potentially impacting child nutrition and growth.

According to the data presented in Table 4.2, a significant number of mothers, 56 (f = 40%), reported that they believed their child was hungry or thirsty, while others cited reasons such as returning to work or school 27 (f = 19%), facing challenges with breastfeeding 19 (13%) and receiving advice from others to stop breastfeeding 9 (6%). Interestingly, some mothers, 26 (18%), did not have an apparent reason for discontinuing exclusive breastfeeding. These findings underscore the need to educate mothers and caregivers about the importance of breastfeeding in alleviating child hunger and to support individuals facing breastfeeding challenges, which are critical strategies in mitigating child stunting.

4.2.3.4.2 Fluids given after stopping exclusive breastfeeding.

Mothers gave different types of fluids to their children after stopping exclusive breastfeeding. Most, 204 (70.8%), gave plain water, followed by milk,160 (55.6%), and the least offered was tea 12 (4.2%). There was an overlap as some respondents gave more than one fluid type. For those who were given milk, 147 (91.9%) were fed with infant

formula, 7 (4.4%) were fed with cow's milk and six (3.8%) were fed with both formula and cow's milk.

4.2.3.4.3 Type of solid food introduced.

The mothers were asked to state the food they give to the children when starting solids. As shown in Figure 4.1 below, 65% of the children started on starchy foods, including porridge (65%), inembe (fortified sour porridge) (13%), cereal (8%), and purity and potatoes at 7% each. Starch-based foods such as porridge are commonly given in Sub-Saharan countries like Eswatini (Masuke et al 2022:12). The solids introduced are not in line with WHO complementary feeding guidelines, which indicate that infants and young children should receive a complimentary diet that includes animal source foods, fruits, and vegetables as well as pulses, nuts and seeds (WHO 2023:24).

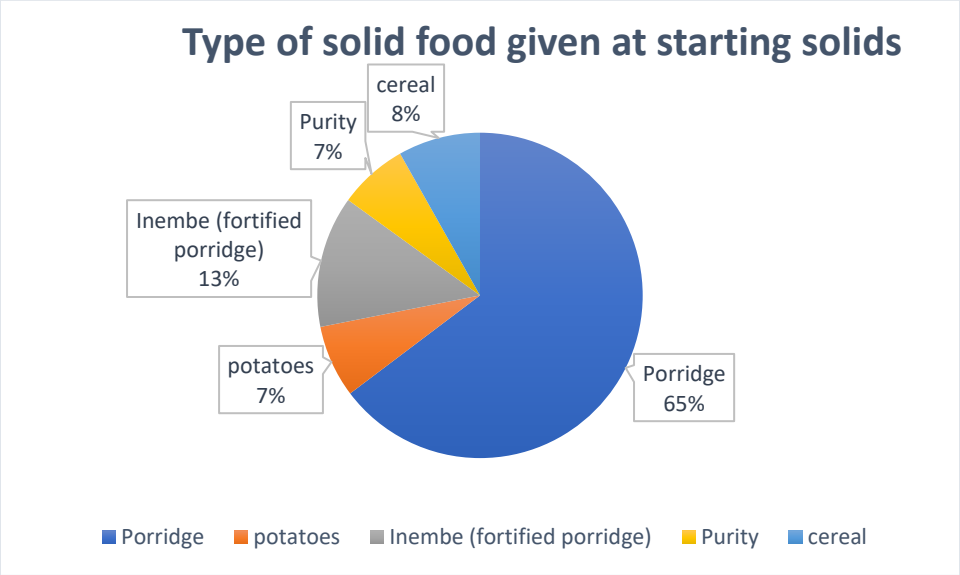

Figure 4.1. The type of solid food introduced

4.2.3.5 Child health facility visits for Illness in the past 12 months (N = 338)

Infections such as diarrheal disease augment a child's susceptibility to nutritional deficits and stunting (Audiena & Siagian 2021:153). In this study, 90 (f = 26.63%) children had not visited a health facility for any illness in the year prior to the last assessment, while

248 (f = 73.37%) reported at least one sick visit. Out of the 248 who visited the clinic, 130 (45.4%) had a cough, 75 (26.2%) had diarrhoea, 39 (13.6%) had vomiting, and 42 (14.6%) had a fever (see Table 4.2). This data corresponds with the notion that diarrheal disease and pneumonia are leading causes of childhood morbidity and mortality globally (UNICEF 2022).

4.4 PREVALENCE AND BIVARIATE ANALYSIS OF FACTORS ASSOCIATED WITH STUNTING

The stunting prevalence is calculated in the next section, and bivariate analysis is done using the Pearson chi-squared test to identify a statistically significant relationship between stunting and the child factors, maternal factors, feeding practices and environmental factors.

In this study, 337 questionnaires included all the information needed for information for stunting assessment. Out of the 337 children examined, 65 were stunted, resulting in a prevalence of stunting at 19.6%. Disaggregated by sex, 36 of 188 males and 30 of 149 females were stunted, giving a prevalence of 19.1% and 20.1% among males and females, respectively. Additionally, the prevalence was higher in children over 12 months than in children under 12 months of age at 24.4% and 9.8%, respectively (see Section 4.3.2.1.1).

The Pearson Chi-squared test was employed to identify if there was any statistically significant relationship between stunting and the child factors, maternal factors, feeding practices and environmental factors as described below.

4.4.1 Factors related to the child and stunting.

On bivariate analysis using the Chi-Square test, there was a statistically significant association between stunting and child age [$X^2 = 10.2$, $p = 0.001$], childbirth weight [$X^2 = 10.21$, $p = 0.006$] and age gap from older sibling [$X^2 = 8.57$, $p = 0.01$]. Although there was a statistically significant association, the direction could not be determined; hence, multivariate analyses were performed to determine the direction and control for

confounding (Section 4.3.4). The association between child sex [$X^2 = 0.05$, $p = 0.82$] and gestational age [$X^2 = 0.74$, $p = 0.69$] was not statistically significant (see Table 4.3).

Table 4. 3: Child factors associated with stunting, Eswatini 2022

Variable	Category	No Stunting (n = 66)	Stunting N =	Chi-Square	p-value
Sex	Male Female	36 30	152 119	0.05	0.82
Age (months)	≥12 < 12	101 170	11 55	10.15	**0.001***
Birth Weight (g)	<2500 2500-4000 ≥4000	24 233 14	15 49 55	10.21	**0.006***
Age gap from older sibling (years)	<2 ≥ 2 No sibling	26 133 112	15 28 23	8.57	**0.01***
Gestational age (weeks)	<37 ≥37	245 26	58 8	0.74	0.69

4.4.2 Maternal factors and stunting

On bivariate analysis using the Chi-Square test between stunting and maternal factors, there was no statistically significant association found between stunting and maternal educational level [X^2 = 0.65, p = 0.72], household monthly income [X^2 = 2.23, p = 0.14] and maternal height [X^2 = 0.04, p = 0.84], maternal BMI [X^2 = 0.81, p = 0.67], parity [X^2 = 3.61, p = 0.16] and working outside home [X^2 = 0.23, p = 0.63]. Multivariate logistic regression was performed to control for confounding and determine the direction of possible associations, and though not statistically significant, higher odds of stunting were found in mothers with low BMI, higher parity, and lower education (Section 4.3.4).

Table 4.4: Maternal factors associated with stunting, Eswatini 2022

Variable	Category	No stunting (n = 271)	Stunting n = 66	Chi-Square	p-value
Age (years)	=18 19-24 25-30 31-39 40+	4 68 100 85 14	0 15 29 19 3	1.94	0.70
Level of education	Primary Secondary Tertiary	18 196 57	6 45 15	0.65	0.72
Household monthly income [E]	<1000 ≥1000	96 175	17 49	2.23	0.14
Maternal height (cm)	<150 ≥150	11 260	5 61	0.04	0.84
BMI (kg/m2)	<18.5 18.5-24.9 ≥25	13 110 148	5 29 32	0.81	0.67
Parity	>4 3-4 ≤2	18 66 187	9 16 41	3.61	0.16
Work outside home	Yes No	121 150	35 31	0.23	0.63

4.4.3 Feeding practices and environmental factors associated with stunting.

On bivariate analysis using the Chi-Square test to determine the association between stunting and feeding and environmental factors, water treatment [$X^2 = 7.47$, $p = 0.006$] was the only statistically significant factor (see Table 4.5). There was no statistically significant association between stunting and being ever breastfed [$X^2 = 1.72$, $p = 0.19$], time to the initiation of breastfeeding initiation [$X^2 = 2.06$, $p = 0.36$], ANC visits [$X^2 = 0.79$, $p = 0.67$] age of solid introduction [$X^2 = 0.20$, $p = 0.14$], dietary diversity [$X^2 = 0.04$, $p = 0.84$], feeding knowledge [$X^2 = 0.18$, $p = 0.67$] and sanitation methods [$X^2 = 0.05$, $p = 0.82$]. Multivariate logistic regression was performed to control for confounding and determine the direction of possible associations, if any (Section 4.3.4).

Table 4.5: Feeding practices and environmental factors associated with stunting, Eswatini 2022

Variable	Category	No stunting (n = 271)	Stunting (n = 66)	Chi-Square	p-value
Antenatal care visits	<4 ≥4	31 240	6 60	0.79	0.67
Ever breastfed	Yes No	245 26	63 3	1.72	0.19
Time to breastfeeding initiation (Hrs)	<2 2-6 ≥6	175 44 25	41 13 12	2.06	0.36
Age of solid introduction	< 6 months ≥ 6 months	77 191	13 53	0.20	0.14
Dietary diversity	Inadequate Adequate	140 131	35 31	0.04	0.84
Feeding knowledge	Inadequate Adequate	16 255	3 63	0.18	0.67
Water treatment	Yes No	77 194	8 58	7.47	0.006*
Sanitation	Flush Pit latrine	111 160	26 40	0.05	0.82

4.4.4 Multivariate logistic regression

Multivariate logistic regression was used to adjust for confounding variables. The Adjusted Odds Ratios (AOR) and their 95% level of confidence (95% CI) and significance level of $p < 0.05$ were used to measure the strength of association and statistical significance (see Table 4.6).

Table 4.6: Factors related to the child associated with stunting, Eswatini 2022

Variable	Category	Stunting (n = 66)	No stunting (n = 271)	OR (95% CI)	AOR	AOR p-value
Sex	Male Female	36 30	152 119	0.94 [0.55-1.61]	0.94	0.86
Age (months)	≥12 < 12	11 55	101 170	0.34 [0.17-0.67]	0.61	**0.01***
Birth weight (g)	<2500 ≥2500	17 49	38 233	2.13 [1.37-5.06]	4.00	**0.005***
Age gap from older sibling (years)	<2 ≥ 2 No sibling	15 28 23	26 133 112	 2.74 [1.29-5.83] 2.81 [1.29-6.12]	 2.47 2.72	 **0.05*** **0.05***
Gestational age (weeks)	<37 ≥37	58 8	245 26	0.74 [0.32-1.72]	1.67	0.38

Table 4.6 illustrates the child-related factors associated with stunting. On multivariate analysis, statistically significant risk factors for stunting were an age gap of less than two years from an older sibling compared to an age gap of more than two years from an older sibling [OR = 2.47, p = 0.05] and those with no sibling at all [OR = 2.72, p = 0.05], and birthweight of less than 2500g [AOR = 4.00, p = 0.005]. On the other hand, being younger than twelve months of age had a significant protective factor from stunting [AOR = 0.61, p = 0.01].

Table 4.7: Maternal factors associated with stunting, Eswatini 2022

Variable	Category	Stunting (n = 66)	No stunting (n = 271)	OR (95% CI)	AOR	AOR p-value
Age (years)	<24 ≥24	15 51	72 199	0.90 [0.66-1.24]	1.04	0.86
Level of education	Primary Secondary Tertiary	6 45 15	18 196 57	1.45 [0.55-3.86] 3.26 [0.43-3.75]	1.14 1.21	0.85 0.80
Household monthly income [E]	<1000 ≥1000	17 49	96 175	0.63 [0.35-1.16]	0.61	0.24
Maternal height (cm)	<150 ≥150	5 61	11 260	1.94 [0.31-4.24]	1.18	0.85
BMI (kg/m2)	<18.5 18.5-24.9 ≥25	5 29 32	13 110 148	1.26 [0.38-4.21] 1.54 [0.47-5.09]	1.04 1.14	0.79 0.96
Parity	>4 3-4 ≤2	9 16 41	18 66 187	0.45 [0.18-1.05] 0.90 [0.48-1.72]	0.44 0.82	0.17 0.64
Work outside home	Yes No	35 31	121 150	1.40 [0.82-2.40]	1.42	0.35
Antenatal care visits	<4 ≥4	6 60	31 240	0.80 [0.32-2.01]	0.70	0.53
Feeding knowledge	Inadequate Adequate	3 63	16 255	0.76 [0.21-2.69]	0.77	0.71

Table 4.7 shows the maternal factors associated with stunting. On both bivariate and multivariate analyses, no significant maternal factors were associated with stunting; however, some factors of public health importance showed some association. Children born to mothers with at most primary education were likely to be stunted compared to those with secondary [AOR = 1.14, p = 0.85] and tertiary education [AOR = 1.22, p = 0.80]. Additionally, children born to mothers with a BMI of less than 18.5 kg/m^2 were likely

to be stunted compared to those with a BMI of 18.5-24.9 kg/m^2 [AOR = 1.04, p = 0.79] and more than 25 kg/m^2 [AOR = 1.14, p = 0.96].

Table 4.8: Feeding practices and environmental factors associated with stunting, Eswatini 2022

Variable	Category	Stunting (n = 66)	No stunting (n = 271)	OR(95% CI)	AOR	AOR p-value
Ever breastfed	Yes No	63 3	245 26	2.23 [0.65-7.60]	2.16	0.20
Time to breastfeeding initiation (Hrs)	<2 2-6 ≥6	41 13 12	175 44 25	 0.77 [0.38-1.57] 0.57 [0.25-1.28]	 0.81 0.51	 0.63 0.16
Age at start solids	<6 moths ≥6 months	13 53	77 191	0.60 [0.35-1.16]	0.63	0.23
Dietary diversity	Inadequate Adequate	35 31	140 131	1.06 [0.55- 1.6]	1.10	0.84
Water treatment	Yes No	8 58	77 194	0.35 [0.16-0.76]	0.36	**0.01***
Sanitation	Flush Pit latrine	26 40	111 160	0.94 [0.54-1.62]	0.92	0.81

Table 4.8 details the feeding practices and environmental factors associated with stunting. Children who initiated breastfeeding within two hours of birth had a reduced likelihood of stunting compared to those who initiated 2-6 hours [AOR = 0.81, p-value = 0.63] and at least six hours later [AOR = 0.57, p-value = 0.16]. Drinking treated water [AOR = 0.36, p = 0.01] was a statistically significant protective factor against stunting. Another protective factor that was not statistically significant but of public health concern was using flush toilets as a sanitation method [AOR = 0.92, p = 0.81].

4.5 DISCUSSION

This study aimed to identify and describe factors associated with stunting among children aged 59 months and below in the Manzini region in Eswatini. The risk factors found to be significantly associated with stunting in the study were the child's age, birth weight, age

gap with older siblings, and water treatment. All these factors influence stunting either directly or indirectly.

4.5.1 Prevalence

This study's observed stunting prevalence of 19.6% aligns with prior research within Eswatini, with a national stunting prevalence of 18.1% and a Manzini regional rate of 17.6% (Dlamini & Tlou 2022:6). By contrast, Mozambique and Malawi recorded higher stunting rates of 37.2% and 39.2% respectively (UNICEF/WHO/World Bank 2022; Chilinda, Wahlqvist, Lee and Huang 2021:3). These findings suggest a downward trend in the occurrence of child stunting in Eswatini relative to the previous prevalence of 24% reported in 2014 (Simelane, Chemhaka and Zwane 2020:5). Although stunting still signifies a critical public health issue, Eswatini remains on track to achieve the WHO target of a 40% reduction in child stunting by 2025 (WHO 2014). However, additional efforts should focus on children with low birth weight and those above 12 months of age**.**

4.5.2 Child factors associated with stunting

4.5.2.1 Age

The findings revealed that children younger than twelve months old had more than thirty per cent reduced odds of being stunted than those older than twelve months of age (see Section 4.3.4). This was confirmed by another study done in Eswatini as well as in Ethiopia and India, where children aged 0-11 months had a 50% lower likelihood of being stunted than those who were older (Dlamini & Tlou 2020:5; Simelane et al 2020:13; Katoch 2022:10; Kwami et al 2019:6).

Numerous factors contribute to a rising risk of stunting as a child ages. One factor is the prevalent practice of breastfeeding during the first six months of life (see Section 4.2.3.3), providing younger children with the immense nutritional benefits of breast milk (Lyons, Ryan, Dempsey, Ross & Stanton 2020:2). As children mature, dietary changes often include a transition to less nutritious complementary foods, such as starchy foods like porridge and potatoes, which may not provide adequate nutrients (see Figure 4.1). This study found that over sixty per cent of children were given such foods as supplementary

nutrition (see Section 4.3.3.4.3). The common misperception that older children are less prone to nutritional deficiencies than infants can lead to caregivers neglecting sufficient nutrition (Prendergast & Humphrey 2015:255). This neglect potentially escalates the probability of stunting in older children. Moreover, as they age, children may be more exposed to environmental pollutants and repeated infections, particularly diarrhoea, eventually leading to nutritional deficits and stunting (Tafesse et al 2021:8; Geberselassie et al 2018:8). The study found that diarrhoea was the second leading cause for clinic visits (see Table 4.2). Consequently, these factors contribute to a higher prevalence of stunting in older children.

Contrary to our findings, several studies have suggested that children under 12 months are significantly more susceptible to stunting than their older counterparts (Maseta 2019:7).

4.5.2.2 Birthweight and gestational age

The results of this investigation revealed a strong relationship between low birthweight and stunting. Children with a birth weight of less than 2500g had quadrupled odds of stunting, as is supported by findings from other studies by Dlamini & Tlou (2022:6) in Eswatini, Aboagye et al (2022:3) in Sub-Saharan Africa and Halli et al (2022:8) in India. This relationship was buttressed by another, though poor, association between gestational age and stunting. Although not statistically significant, stunting rates were higher in children born before 37 weeks. Premature delivery (at less than 37 weeks) is a prominent contributor to low-birth-weight deliveries (Sania, Spiegelman, Hertzmark, Mwiru, Kisenge, and Fawzi 2015:3).

Santosa et al (2022:7) argue that low birth weight infants have a heightened susceptibility to stunting, which derives from an underdeveloped immune system that escalates vulnerability to infectious diseases, potentially leading to growth faltering (Santosa et al 2022:7). This unfortunate sequence of infection and undernutrition forms a vicious cycle. Insufficiently mature digestive and absorptive systems in low-birth-weight infants

compound this issue (Santosa et al 2022:6; Beal, Tumilowcz, Sutrisna, Izwardy and Neufeld. 2018:7).

These findings underscore the importance of addressing key issues – in maternal health, nutrition, and socioeconomic factors – to decrease low birth weight deliveries, which are known to carry a range of long-term risks, including stunting and associated complications (Aboagye et al 2022:8).

Notably, certain studies, such as Ervina, Zulmi, Ariesta and Aridawami (2023:7) and Lewa, Kusika & Jannah (2022:131), contradicted these findings, identifying no significant association between low birth weight, gestational age, and stunting.

4.5.2.3 Child spacing and stunting.

The statistically significant observation that less than two years of spacing between children increases the odds of stunting corroborates research conducted in Ethiopia and the DRC (Endris, Asefa & Dube 2017:8; McKenna et al 2019:6). Short birth intervals can negatively impact optimal parenting practices, thereby adversely influencing the health and nutritional status of closely spaced siblings (Dhingra & Pingali 2021:4). Longer birth intervals enable extended periods of dedicated care, longer breastfeeding duration, and diminished competition for attention and resources (Ntambara, Zhang, Qiu, Cheng and Chu 2023:10), potentially reducing undernutrition and stunting risks. The WHO also promotes at least two years' birth spacing to ensure favourable maternal and child health outcomes (WHO 2007).

Studies conducted in Indonesia, such as those by Eliafiana & Fadilah (2022:47) and Wati, Wahyurin, Sari et al (2021:538), however, did not establish an evident link between child spacing and stunting.

4.5.2.4 Sex

Numerous study findings reveal higher stunting rates in males than females (Madiba, et al 2019:8; Garcia-Cruz et al 2017:9; De Boer et al 2022:582; Thursatans et al 2022:6) as also reported by UNICEF including Eswatini (UNICEF Eswatini website 2022).

Variations in gender ratios may be attributed to biological advantages that favour female children and act as protective factors against stunting (Thomson 2021:468). These advantages include stronger immune systems, lower susceptibility to infections, and decreased energy requirements (Thursatans et al 2022:6), which contribute to the observed lower prevalence of stunting in females reported in recent studies conducted in Eswatini and Bangladesh (Simelane et al 2020:13; Abdulla, Rahman & Hossain 2023:6). However, gender preferences in caregiving can potentially counterbalance these benefits if caregivers exhibit a preference for male children (Abeway et al 2018:6).

In this study context, the findings revealed a weak, non-significant association between the sex of the child and stunting, with the males slightly less likely to develop stunting than the females, as was also the case in Bangladesh (Abdulla et al 2023:6). Eswatini's patriarchal societal structure (Nyawo 2023:2), could reinforce better nutritional support for male children, possibly resulting in the lower stunting rates observed in this study.

4.5.3 Maternal factors associated with stunting

Overall, none of the maternal factors had a significant association with stunting.

4.5.3.1 Body Mass Index (BMI)

A BMI of more than 18.5 kg/m^2 was protective against stunting, as mentioned in Section 4.3.4. Although the association was not statistically significant, it is biologically plausible. Porwal et al (2021:80) propose that children of underweight mothers are likely to suffer from nutritional deficiencies due to the increased demands of pregnancy and lactation on the mother, who already has lower nutrients available for the growing baby. Furthermore, low maternal BMI can result in low birth weight, a strong risk factor for stunting (Amadu et al 2021:7) (also see Section 4.4.2.2). While some past studies have also reported that underweight mothers are more likely to have stunted children than mothers with average weights (Amaha & Woldeamanuel 2021: 6), others have failed to demonstrate any association between maternal BMI and stunting (Aldana-Parra, Vega, & Fewtrell 2020:10).

4.5.3.2 Stature

Similarly, mothers with short stature also had slightly higher odds of having stunted children (see Section 4.3.4, Table 4.7). The findings of this study align with previous research, which revealed that short maternal stature was associated with 4.4 times higher odds of stunting (Karlsson, Kim and Bogin 2022:341). However, within this study context, the researcher observed a lesser impact, which could be attributed to the small number of mothers with short stature in our sample (n = 15; f = 4.5%).

The evident strong connection between maternal short stature and stunting is attributed to a complex interaction between genetic factors, biological factors, and environmental conditions such as diet and culture (Wali et al 2020:21). Consequently, if mothers are exposed to an environment conducive to stunting during their upbringing, they may have children who also experience stunted growth due to ongoing exposure to similar nutritional and environmental circumstances (Wali et al 2020:21). The results, therefore, support the need for nutritional assessment and support for pregnant and lactating women.

4.5.3.3 Parity

Interestingly, compared to mothers with 3-4 children, mothers with at most two children had 28% protection against stunting, which increased to 66% compared to mothers with more than four children (see Table 4.7). Although the association is not statistically significant, the biological gradient phenomenon demonstrated in this study strongly supports this association. In studies conducted in Sierra Leone and Kenya, there was a strong association between multiparity and stunting (Sserwanja et al 2021:7; Abuya et al 2021:7) . Families with many children under five, particularly those with poor socioeconomic status, are generally unable to provide sufficient food, time, and attention that the young children need to grow adequately (Kasaye et al 2019:11). The competition for scarce resources puts children at risk of undernutrition. In contrast, several studies failed to find any evidence of a link between maternal parity and stunting (Nkhoma et al 2021:7; Mzumara, Bwembya, Halwiindi, Mugode and Banda 2018:6).

4.5.3.4 Education and Employment

Although not significant, children in this study whose mothers had at least a secondary level of education were less likely to develop stunting than those with at most primary education. This could have contributed to the high levels of adequate nutritional knowledge 253 (94%) among participant mothers (see Table 4.2). Several studies have also highlighted that maternal education protects against all forms of undernutrition, including stunting (Susyani, et al 2022:1602; Javid & Pu 2021:381; Amaha & Woldeamanuel 2021:4).

More educated mothers are more likely to have better decision-making ability, access to better nutritional sources, and better health-seeking behaviour that enables quick identification and treatment of illnesses (Javid & Pu 2020:381; Wali et al 2020:21) and a higher likelihood of employment (Casale et al 2018:1815-1816). Maternal employment, however, has a complex relationship with stunting (Casale et al 2018:1815-1816). The stunting odds in this study were slightly higher for children of employed mothers (see Table 4.7). Stay-at-home mothers may be more likely to breastfeed exclusively for longer and take better care of their children than their working counterparts (Amaha & Woldeamanuel 2021:7).

Nevertheless, previous research studies have failed to demonstrate a significant link between maternal educational status and stunting (Amugsi et al 2020:13).

A study conducted in Eswatini on the influence of maternal knowledge on feeding practices also discovered that solely having maternal knowledge was insufficient for adopting recommended feeding practices (Dallmeier & Gewa 2020:965). Overall, it can still be argued that maternal education plays a vital role in a child's healthy growth and development and should be promoted.

4.5.4 Feeding-related factors

4.5.4.1 Early breastfeeding initiation

Colostrum contains immune factors that protect against infectious diseases and provides a safe, protective coating for the baby's intestines (Poonia & Shiva 2022:10). Delayed breastfeeding initiation leads to a lower likelihood of introduction of colostrum, thus depriving the newborn of the antibodies, immunoglobulins and increasing infection risk which adversely impacts nutritional status (Raihana, Alam, Chad, Huda, and Dibley, 2021:2).

Compared to the children who were breastfed more than six hours post-delivery, children who were breastfed within two hours post-delivery had 49% protection against stunting (see Section 4.3.4 Table 4.7). This is similar to what was reported in Indonesia (Susianto, et al 2023:6). However, other studies' findings failed to demonstrate any impact of early breastfeeding initiation on child nutrition, including stunting (Tello et al 2022:7; Smith et al 2017:61).

Although not a statistically significant finding, there is a need for continuous education among healthcare workers and mothers to initiate breastfeeding within the first two hours of birth, as recommended by the WHO (WHO 2021).

4.5.4.2 Exclusive breastfeeding

Exclusive breastfeeding is defined as an infant solely receiving breast milk for the first six months of life, barring drops or syrups encompassing vitamins, minerals, supplements, or medicines (WHO 2015). Studies in Indonesia and India found a lower likelihood of stunting in exclusively breastfed children (Hadi et al 2021:7; Umiyah & Hamidiyah 2020:475). Before six months, the infant's gut is not yet ready for complementary foods (Kuchenbecker et al 2015:9). The food is poorly absorbed, puts them at higher infection risk, and deprives the growing child of the much-needed breast milk. However, as was seen in this study, some studies have failed to show any evidence for the benefit of breastfeeding on stunting rates (Tello et al 2022:7, Nsereko et al 2018:18; Kaldenbach et al 2022:7).

Breastfeeding nutritional benefits may be limited by the maternal diet and nutritional status, which impact the quality of breast milk; hence, if the mother is nutritionally compromised, this may result in limited exclusive breastfeeding benefits for the growing infant (Umiyah & Hamidiyah 2020:475). Nsereko et al (2018:3) suggest that any protection conferred by breastfeeding may not overcome other adverse factors that affect child growth, including poor nutritional intake, infections, and diarrhoea (Nsereko et al 2018:3). With most research participants being above six months of age (n = 301, f = 89%), (see Table 4.1), other factors linked to their current diet and living conditions may have influenced child growth to the extent that could nullify any preventive benefits derived from exclusive breastfeeding.

4.5.5 Environmental Factors

4.5.5.1 Water

Contaminated water can lead to repeated cycles of infectious diarrhoea, nutritional deficits, and a heightened risk of malnutrition, leading to stunting (Wahid, Maria & Hidayanty 2020:207). Therefore, children drinking treated water are more likely to be protected from stunting than those drinking untreated water (see Table 4.8), like what was reported in Ethiopia and Sub-Sahara Africa (Ademas et al 2021:7; Akombi et al 2017:9) (see Table 4.8).

Although more than 95% of participants reported getting their water from taps and boreholes, most mothers did not treat the water given to their children (refer to Table 4.1). Fittingly, this study noted that nearly 40% of clinic visits were diarrhoea and vomiting-related incidents, reinforcing this concept (refer to Table 4.2).

In contrast, studies elsewhere failed to demonstrate a difference in linear growth between children who received improved water sources, such as taps and those who used water from unimproved sources, like dug wells (Cumming et al 2018:312). Regardless, access to treated, clean water can be beneficial, principally for developing children, and this study's results will be used to advocate for clean water health promotion exercises.

4.5.5.2 Sanitation

Poor sanitary conditions have been linked with stunting through multiple complex pathways which foster nutrient losses such as repeated diarrhoea, infection, and environmental enteric pathways (Kwami et al 2019:2). Studies in Ethiopia and Indonesia found a significant link between sanitation facilities and stunting (Vilcins, Sly & Jagals 2018:553; Rah et al 2020:6), in contrast with our findings.

This study's findings revealed no statistically significant association between sanitation facilities and stunting (see Table 4.3.4 and Table 4.8), in line with what was reported in Ethiopia and Sub-Saharan Africa (Diana, Haszard, Sari, Rahmannia, Fathonah, Sofiah, Rizqi, Haekal, Gilmartin, Harper and Petri 2021:6, Kwami et al 2019:7). Although having a toilet at home has been shown to reduce stunting (Vilcins, Sly and Jagals 2018:553), in this study, all the children were from homes where they had access to improved sanitation facilities (see Table 4.1). Flush toilets had a small protective effect compared to pit latrines (see Section 4.3.4).

4.6 CONCLUSION

The study findings revealed that the age of a child, the child's birth weight, the age gap between the older siblings, and the water treatment were the only factors significantly associated with stunting. Although not significant, it is important to note that higher gestational age, maternal education, and early breastfeeding initiation had a protective effect from stunting, as proved to be the case as reported in the literature.

Chapter 5 presents the study conclusions, limitations, relevant keyholder recommendations, and future practice recommendations.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 5 contains the conclusions, recommendations, and limitations of the study. Conclusions are made regarding the objectives reached and the recommendations made to improve and address the identified factors associated with stunting in children 0-59 months in the Manzini region. Recommendations for future studies are provided.

This study used a quantitative cross-sectional research design to identify and describe the child-related, maternal, feeding-related- and environmental factors associated with stunting. Convenience sampling was employed to select a sample of 338 mother-child pairs. An interviewer-administered questionnaire was used to collect information about the relevant factors, as identified from an extensive literature review. A data collection tool was used to record the anthropometric measurements. Descriptive and analytic statistics were used to analyse the collected research data.

The researcher will submit a manuscript to the *South African Journal of Child Health* for publication of study findings in this accredited peer-reviewed journal to disseminate these results and add to the broader body of knowledge.

5.2 CONCLUSIONS AND ASSOCIATED RECOMMENDATIONS

Although stunting remains a significant public health challenge in Eswatini, the prevalence rate in the Manzini Region is lower than previously reported, indicating that the region is working towards reducing stunting (refer to Section 4.4.1). Child age, childbirth weight, age gap from older siblings and water treatment were the factors found to be significantly associated with stunting. Maternal BMI had a weak but plausible association with stunting. Both mothers of stunted and non-stunted children had good nutritional knowledge and high levels of education; however, they were not associated with stunting.

5.2.1 The child factors associated with stunting

5.2.1.1 Age

From the results presented (see Section 4.4.2.1), it is clear that age was significantly associated with stunting and therefore, more attention is needed on the nutrition of children in the age group above 12 months to prevent the detrimental consequences of stunting, which become irreversible after the first 1000 days of life (WHO 2022). This highlights the importance of timely interventions such as routine screening and nutritional support. It is, therefore, crucial to allocate attention and resources to the specific age groups at higher risk to achieve more significant gains. These findings align with previous research, which reported higher stunting odds with increasing age (Katoch 2022:10).

Recommendation:

The researcher will electronically share recommendations for early, intensive identification and referral of children with linear growth retardation for complementary feeding, like ready-to-use therapeutic feeds, particularly those above 12 months, with the Family and Child Health nurses through the Manzini Regional Health Management Team (HMT). This can be achieved through consistent height measurement at each clinical visit until they reach the age of five years. Monitoring and evaluation tools must be developed and implemented to ensure compliance with this existing recommendation, which is poorly adhered to by healthcare workers. Mothers should receive comprehensive education on appropriate complementary feeding and care, particularly for children above 12 months, through pamphlets that have clear pictures of locally available nutritious foodstuffs.

5.2.1.2 Birth weight

One major challenge significantly associated with stunting is children born with low birth weight (<2500g). This factor was a strong predictor for child stunting in this study (see Section 4.4.2.2), as has been reported by other studies in Africa (Ahishayike et al 2019:8). Therefore, there is a remaining need to invest in addressing the pre-conceptual and antenatal factors that are associated with low birth weight and its consequences.

Recommendation:

The results will be shared electronically with the Manzini regional SRH department Matron, with recommendations in a cover letter detailing the substantial evidence provided on how low birth weight deliveries carry a massive risk for future stunting. The researcher will highlight measures to be taken to address the preventable antenatal health and nutritional challenges of mothers that result in low-birth-weight babies. This can be done through nutritional, infectious disease and non-communicable disease health screening and providing supplementary food as needed. Babies born with low birth weight also need regular height monitoring to ensure that they catch up with their peers on weight and linear growth. In-service training for healthcare workers would be beneficial in supporting them in doing the anthropometric measurements consistently.

5.2.1.3 Age gap with older sibling

The UNICEF recommended child spacing of at least 2-3 years to promote child survival (UNICEF Uganda 2023). The study demonstrated that shorter birth spacing increases stunting in the younger sibling (refer to Section 4.4.2.3). These findings align with a multivariate analysis in the same region, which showed that children from households with two or more children were more likely to be stunted (Simelane et al 2020:6).

Recommendation:

Empowerment of women of reproductive age regarding their family planning options is needed to positively impact overall child nutrition and health status for each of the children. The researcher will pay a visit to the Manzini SRH Family Planning Department and the directorate at the United Nations Fund for Population Activities (UNFPA Eswatini) to put forward a recommendation in support of health education in the community on the importance of family planning and family size with consistent access and distribution of family planning methods in the region particularly among adolescent and young women. Social media platforms such as Facebook and Instagram can be a valuable tool to promote family planning in young women. This will empower women of reproductive age to adequately space their children and avoid the challenges of caring for many young

children in the home. The researcher will also electronically communicate with the Office of the Permanent Secretary for Health to advocate for the availability of long-term contraceptive methods like implants and intrauterine devices, which are regularly out of stock at Central Medical stores. To promote family planning education at the grassroots level, the researcher will attend the Manzini Tindle region's monthly community meetings and publicly submit to the community chiefs and leadership.

5.2.2 Maternal factors

5.2.2.1 Education

The study findings indicated that stunting odds were higher in respondents with lower education levels (see Section 4.4.3.4). Although the differences were not statistically significant, this suggests that formal education can capacitate mothers in better nutritional care and well-being of their children.

Recommendation:

Universal quality education, including free primary and secondary education for all, is one of the 2030 sustainable development goals. As seen in Section 4.3.2.5, most of the mothers reached the secondary level because primary education is free. The researcher will share the results electronically with advocacy organisations such as AHF Eswatini's Young Peoples Program, AMICALL and UNICEF as part of efforts to lobby policymakers in the Ministry of Education for free or subsidised education for all beyond the primary school level to promote better health outcomes for the future generation. Conversely, maternal childcare health education should be structured to accommodate women at all educational levels. Healthcare workers will also be encouraged to share information in ways that are accessible to all.

5.2.2.2 Maternal Nutritional Status

Mothers with lower BMI (<18.5 kg/m^2) and those with shorter stature had slightly higher odds of stunting than those with better nutritional status (see Section 4.4.3), aligning with previous research (Amaha & Woldeamanuel 2021:6; Karlsson et al 2022:341). To

safeguard the next generation, maternal care should encompass nutritional evaluation and practical support of pregnant and breastfeeding women.

Recommendation:

A systematic review reported that garden-based interventions, particularly home-based gardens, could lead to improved maternal and child health and nutritional outcomes (Skelton, Lowe, Zaltz and Benjamin-Neelon 2020:12). The researcher will send a letter with evidence from the research findings about the nutritional status of women to the regional Social Services Officer and Agricultural Extension Office to recommend that together with their supporting partners, they set up demonstration gardens targeting women in the reproductive age groups. These projects can provide a platform to cater not only for the maternal nutritional needs and those of their children, but they will also gain valuable skills in growing their natural foods, which they can pass on to their children. In the long term, such measures can break the intergenerational cycle of malnutrition (see Section 2.10.1). The researcher will request to attend the regional community meetings in the Manzini Tikundla to advocate for community leaders to mobilise community participation in the demonstration gardens.

5.2.3 Feeding practices

5.2.3.1 Timing of breastfeeding

Breastfeeding initiation within two hours had a protective effect against stunting compared to starting later (see Section 4.4.4.1). The role of early breastfeeding initiation in stunting prevention is widely documented (Susianto, Suprobo & Maharani 2022:3) and should be encouraged for all mothers after delivery.

Recommendations:

Pregnant mothers should also be taught antenatally about the benefits of early breastfeeding initiation. Midwives at birth centres can encourage all mothers to start breastfeeding within one hour of delivery, and healthcare workers can be provided with tools to monitor early breastfeeding initiation actively. The researcher will share this

recommendation with the Office of the Regional Principal Health Administrator, which can train healthcare workers and reinforce guidelines that support mothers to initiate breastfeeding as early as possible after delivery. To the regional Health Promotion Officer, additional recommendations can be made for continuous health education on the benefits of early initiation of breastfeeding and exclusive breastfeeding for at least six months with suggested methods such as posters and billboards.

5.2.4 Environmental factors

5.2.4.1 Water treatment

The study also revealed that drinking untreated water significantly increases stunting odds regardless of the water source (refer to Section 4.4.5.1). Children who drank treated water obtained significant protection against stunting. Access to and knowledge of available water treatment methods must be improved to further reduce child stunting in Manzini.

Recommendations:

An electronic copy of the study findings highlighting the significant association between drinking untreated water and stunting will be shared with the Manzini Regional Water and Sanitation Authority and Environmental Health Practitioners requesting support for the provision of safe water.

Recommendations will also be given to the Manzini Health promotion officer to promote water treatment using accessible methods such as boiling and chlorinating, as seen in this study. Educational material (health education) must be made visible to motivate mothers to give their children treated water, and constant education must be pursued on the importance of utilising modern sanitation methods like pit latrines and flush toilets. The findings will also be presented at the Eswatini annual research day, where researchers from multiple disciplines gather for the dissemination of key research findings.

5.3 STUDY LIMITATIONS

In this study, stunting was assessed through history taking and anthropometric measurements. The measurement method could have brought misclassification bias despite all the measures to avoid it. However, this was reduced by conducting pilot testing for the reliability and validity of the measurement instruments and questionnaires. There was a possibility of recall bias as some of the participants who were interviewed would have forgotten some details, for example, the time intervals between giving birth and starting breastfeeding, foods or fluids given to the child on stopping exclusive breastfeeding and time for solid foods introduction. This could have over- or underestimated the measures of association. Due to high levels of education and knowledge, there was a possibility of social desirability bias where participants told the researcher what they wanted to hear, leading to over- or under-estimation of measures of association. This was reduced by anonymising respondents and assuring confidentiality. The study was conducted at two high-volume site clinics in the peri-urban Manzini region. Children prone to stunting come from different socioeconomic and cultural backgrounds; further research is required to determine if the factors identified apply to other settings. Despite these limitations, insights into the factors associated with stunting in the region were obtained.

5.3.1 Further research

Additional prospective cohort studies with large sample sizes may be required to better understand the effects of child-related, maternal, feeding-related, and environmental factors on stunting outcomes.

5.4 CONCLUDING REMARKS

This research provides notable insights into the multifaceted influences on child stunting in Eswatini's Manzini region. Despite the persisting public health concern of stunting, a lesser prevalence rate is observed compared to prior records, illustrating this region's progressive strides towards stunting reduction. Furthermore, identifying specific factors, including the child's age, birth weight, sibling age difference, and water treatment

significantly associated with stunting, is vital for formulating targeted prevention and intervention strategies, as noted in the recommendations. Although the association between maternal BMI and stunting was less pronounced, this relation could prompt further research to substantiate the observed link.

Intriguingly, the study findings revealed good nutritional knowledge and high educational levels among mothers of both stunted and non-stunted children, indicating that these factors were not directly related to stunting. Overall, this study contributes valuable contextual data for health authorities to minimise stunting rates and enhance child health outcomes in Eswatini.

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ANNEXURES

ANNEXURE A: ETHICAL CLEARANCE, DEPARTMENT OF HEALTH STUDIES, UNISA

UNISA university of south africa

COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

14 December 2021

Dear Dr Sukoluhle Khumalo

Decision:
Ethics Approval from 14 December 2021 to 14 December 2024

NHREC Registration # :
Rec-240816-052
CREC Reference # :
64065200_CREC_CHS_2021

Researcher(s): Name: Dr Sukoluhle Khumalo
Contact details: 64065200@mylife.unisa.ac.za
Name: Prof L Roets
Contact details: Tel: 012 429 2226

Title: Factors associated with stunting in children 0-59 months in Manzini Region ,Eswatini

Purpose: MA

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, in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the

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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 **(14 December 2024).** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:
*The reference number **64065200_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: Khan

Prof. KB Khan
CHS Research Ethics Committee Chairperson
Email: khankb@unisa.ac.za
Tel: (012) 429 8210

Signature: PP

Prof K. Masemola
Exécutive Dean: CHS
E-mail: masemk@unisa.ac.za
Tel: (012) 429 2298

ANNEXURE B: ETHICAL CLEARANCE, ESWATINI HEALTH AND HUMAN RESEARCH REVIEW BOARD (EHHRB)

ESWATINI HEALTH AND HUMAN RESEARCH REVIEW BOARD

ONE YEAR RESEARCH PROTOCOL APPROVAL CERTIFICATE

BOARD REGISTRATION NUMBER	FWA 00026661/IRB 00011253							
PROTOCOL REFERENCE NUMBER	**EHHRRB034/2023**							
Type of review	Expedited	X		Full Board				
Name of Organization	**Masters Student**							
Title of study	Factors associated with stunting in children 0-59 in the manzini region in eswatini							
Protocol version	**1.0**							
Nature of application	New		Amendment		Renewal	X	Extension	CT updates
List of study sites	Raleigh Fitkin Memorial Hospital Child Outpatients Clinic, and King Sobhuza II Public Health Unit							
Name of Principal Investigator	**Dr. Sukoluhle Khumalo**							
Names of Co- Investigators	N/A							
Names of steering committee members in the case of clinical trials	N/A							
Names of Data and Safety Committee members in the case of clinical trials	N/A							
Level of risk (Tick appropriate box)	Minimal	X	**More than minimal**		High			
Initial study Approval information	**Approved Approval date**	X 21/06/2022	**Study completion date**	31/12/2023	**Certificate expiry Date**	21/06/2023		
Study renewal approval information	**Renewal date**	11/04/2023			**End date**	11/04/2024		
Study amendment approval information	**Amendment date**							
Study extension approval information	**Extension date**				End date			
Signature of Chairperson								
Signing date	**11/04/2023**							
Secretariat Contact Details	Name of contact officers		**Babazile Shongwe**					
	Email address		es@ehhrrb.org.sz					
	Telephone no.		**(00268) 2404 7751/9553**					

11 APR 2023

APPROVAL CONDITIONS

Ref.	Conditions	Indication of conditions (tick appropriate box)				
1	Implementation of approved version of protocol	√				
2	Submission of progress reporting for multi-year studies	**Yr 1** √	**Yr 2** √	**Yr 3** √	**Yr 4** √	**Yr 5** √
3	Submission of end of project report (Hard copy)	√				
4	Submission of end of project report (Soft copy)	√				
5	Submission of data sets	N/A				

LIST OF REVIEWED DOCUMENTS

Ref.	Documents	Reviewed documents (tick appropriate box)
1	Completed application form	✓
2	Cover letters	✓
3	Evidence of administrative permission to conduct the research by involved institutions/sites (where applicable)	N/A
4	Detailed current resume or curriculum vitae of Principal Investigator/s including Principal investigators declaration	✓
5	Summary resume or biography for other investigator(s)	✓
6	Evidence of approval/rejection by other Ethics Committees, including comments and requested alterations to the protocol, where appropriate.	N/A
7	Research protocol (see outline in Annex 1)	N/A
8	Questionnaires and interview guides (with back-translated versions where applicable)	N/A
9	Case report forms (CRFs), abstraction forms and other data collection tools	N/A
10	Participant/subjects Information Statement(s) (where applicable)	N/A
11	Informed consent form(s) including photographic and electronic media consent statements.	N/A
12	Advertisements relevant to the study (where applicable)	N/A
13	Source of funding and detailed budget breakdown including material and incentives to participants if applicable	N/A
14	Notification form for adverse effects/events	N/A
15	Proof of payment	✓
16	Proof of insurance cover for research subjects in clinical trials or where applicable	N/A
17	Any other special requirements should be stated, if applicable	N/A

ANNEXURE C: SISWATI PARTICIPANT INFORMATION SHEET

LIKHASI LELICHAZA KABANTI NGALOLUCWANINGO/LWELWATI

Sihloko salolucwaningo: Tintfo letitsikameta kukhula kwebantfwana labaneminyaka lesukela ku 0-59 wetinyanga esifundzeni sakaManzini, Eswatini.

Siyakwemukela

Libito lami ngingu SUKOLUHLE KHUMALO lowenta lucwaningo Kanye naProfessor Lizeth Roets losebentala iUniversity of South Africa, Department of Health Sudies. Ngifundzela kuphotfulwa ngesicu seMasters in Public Health kuyona lenyuvesi. Uyacelwa kutsi ungenele lucwaningo loluhlose kwati kabanti ngetintfo letitsikameta kukhula kwebantfwana labaneminyaka lesukela ku 0-59 wetinyanga esifundzeni sakaManzini, Eswatini. Kute lusito lwetimali lolukhona kwesekela inchubo yalolucwaningo. Ngikunika siciniseko kutsi ngeke wehlulelwe ngendlela lokhulisa ngayo umntfwana nome lomupha ngayo kudla futsi timphendvulo lotosipha tona timcoka kakhulu kulolucwaningo.

YINI INHLOSO YALOLUCWANINGO?

Ngenta lolucwaningo kwati kabanti ngetintfo letitsikabeta kukhula kahle kwemnfwana.

UKHETFWE NJANI KUTSI UNGENELE LOLUCWANINGO?

Lolucwaningo lucondzene nabomake labaletse bantfwana labete kutogoma nekukala kukhula kwabo, lenawe uyincenye yabo kungako ukhetsiwe. Kungenela nobe kuba yincenye yalolucwaningo kuselungelweni lakho leliphelele kutsi utikhetsele ngaphandle kwekuphocelelwa ngumuntfu futsi uvumelekile kutsi wale sanhlobo kuba yincenye yalolucwaningo ngaphandle kwenkinga. Kodvwa-ke, bekungaba yintfokoto lenkhulu kimi kutsi ulungenele lolucwaningo kute sitewutfola lwati lolwanele lolutosita kutfutfukisa lwati netinhlelo tekhukhula kwebantfwana.

YINI LICHAZA LOLIDLALAKO KULOLUCWANINGO?

Lengcogco itawutsatsa imizuzu lengemashumi lamatsatfu kuya kulangemashumi lasitfupha lekusikhatsi sakho lesicela usiphe sona. Sitawucela kukala wena kanye nemntfwana sisindvo, budze nebukhulu bemkhono. Umntfwana utawucelwa kutsi ahlubule tonkhe timphahla nome kusale kwekucalela kute kutsatfwe sikali lesingiso. Utawubutwa nje imibuto lengetihloko letehlukahlukene letimbalwa mayelana nemphilo yemntfwana nenhlalakahle yakho nemndeni wakho ngekutemnotfo. Konkhe loku kutawentelwa egumbini lelingavakaleli kulomunye umuntfu kute kube yimfihlo nawe ukhululeke. Imininingwane yakho nemntfwana itawugcinwa ifihlakele kute kungabi melula kubona kutsi letimphendvulo takho.

UYAKHONA YINI KUSHIYA EKHATSI UMA BOSOVUMILE KUNGENELA LOLUCWANINGO?

Kungenela nobe kuba yincenye yalolucwaningo kuselungelweni lakho leliphelele kutsi utikhetsele ngaphandle kwekuphocelelwa ngumuntfu. Uma uvuma kungenela lolucwaningo utawuniketwa likhasi lwelwati lelitoba lakho bese unikwa lifomu lawutawushicilela khona kukhomba kutsi uyavuma. Uvumelekile kutsi wale sanhlobo kuba yincenye yalolucwaningo. Uma uvuma kuba yincenyenye yalolucwaningo, uvumelekile kulushiya nobe ngusiphi sikhatsi noma sigaba. Uma ungavumi kuba yincenye yalolucwaningo moma ukhetsa kuphuma esigabeni tsite, ngeke ujeziswe ngaleso sincumo futsi kute lokutakulahlekela.

YINI INZUZO YEKUNGENELA LOLUCWANINGO?

Ungahle ulutfole lulusito lolucwaningo ngekutsi kube nalococisana naye ngekukhula kwemntfwana wakho. Kungenela kwakho lolucwaningo lutawusita nalabanye ngandlela tsite kutsi bati kabanti lokubangengela bantfwana kutsi bangakhuli kahle ngalokubhekekile. Lolwati lolu lutawuphindze lusite tinshaya mtsetfo kutsi tente tincumo letitawuzuzwa ngibo bonhke bantfu kute kusitakale bantfwana.

BUNGOTI LOBUNGAHLE BUBEKHONA UMA NGINGALUNGENELI LOLUCWANINGO?

Kute bungoti lobukhona nome kuhlukubeteka lokukhona uma ungafisi kungenela lolucwaningo. Uma uva ungaphatseki kahle emoyeni nome ukhatsatekile ngemuva kwekube uphendvule imibuto, utawuchunyaniswa naloyo lofundziselekile ngekweluleka wakhona lapha emtfolamphilo ngaphandle kwenkhokhelo.

KUGCINEKA NJANI KUYIMFIHLO KUNGENELA KWAMI LOLUCWANINGO KANYE NETIMPHENDVULO TAMI?

Letingcogco ngeke titfwetjulwe ngesitfwebula mavi futsi loko lokutobe kubhalwe phansi ngeke kufake imininingwane yakho lefaka ekhatsi ligama kanye nenombolo yamatisa wakho. Nulabo labasebenta kulolucwaningo kuphela labatawati kutsi wena ulungenele. Unikiwe ligunya lekutikhetsela kungenela lolucwaningo ngaphandle kwekuphocelelwa ngumuntfu. Ukhululekile kutsi ungayekela nome ngabe ngunini kuchubeka nalolucwaningo, tonkhe timphendvulo takho titawulahlwa tingasasebenti kulolucwaningo. Lokuphendvulwe nguwe kutawunikwa inombolo letsite lehlukanisa bonkhe labaphendvulile ngaso sonkhe sikhatsi. Letimphendvulo tingahle tinikwe labo labenta siciniseko kutsi lucwaningo lwentiwa ngendlela lefanele kufaka ekhatsi likomidi lekutsiwa yi Research Ethics Review Committee. Lolwati lolutawutfolakala kulolucwaningo lutawusentjentiswa ngetindlela letehlukahlukene kepha kukho koknhe loko, ngeke livetwe ligama lakho.

KUTAWUGCINWA KANJANI KUPHEPHILE LOKUSETJENTISWA KULOLUCWANINGO?

Emafomu lagcwalisiwe atawugcinwa nguloyo lochuba lolucwaningo iminyaka lesihlanu ekhabetheni lelikhiyekako endzaweni lekhetsiwe kute akhone kusebenta esikhatsini lesitako uma kwentiwa lolunye lucwaningo, bese loko lokugcinwe kubongcondvomshina kutawufakwa nakhona sikhiya lesisetjentiswa khona lokutsiwa yiPassword ngesilungu. Kusetjentiswa kwalolwati lolutfolakele kuyawuba ngekuvuma kwelikomidi leResearch Ethics Review. Ngemuva kwalesikhatsi lesibekiwe lamafomu ayawudzatjulwa naloko lokukubongcondvomshina kucinywe ngalokuphelele ngendlela yakhona.

KUKHONA YINI INKHOKHELO NOMA SINCEPHETELO LENGISITFOLAKO KUNGENELA LOLUCWANINGO?

Kute inkhokhelo noma sincephetulo sanome nguluphi luhlobo lotasitfola uma ungenela lolucwaningo. Kute tindleko lotawuhlangabetana nato ngekuba yincenye yalolucwaningo ngaphandle kwesikhatsi sakho nje kuphela.

LUSEMTSETFWENI YINI LOLUCWANINGO?

Lolucwaningo lutfole imvume lwaphindze lwashicilelwa yiCollege Research Ethics Committee of the Human health sciences, UNISA. Lochuba lengcongco angakupha lencwadzi lesifakazelo.

UTAWATISWA NJANI NGEMIPHUMELA YALOLUCWANINGO?

Uma ufisile kutfola imiphumela yalolucwaningo nome kutfola lunye lwati ungachumana naSUKOLUHLE KHUMALO on +268 78326945 or drsukoluhle@gmail.com.

Uma kukhona lokunye lofise kukubika noma kukuveta lokumayelana nenchubo yalolucwaningo ungachumana naProfessor Lizeth Roets

Lucingo: +2712 429 2226

Likheli langcondvomshina: roetsl@unisa.ac.za.

Lokukanye, ungachumana nasihlalo lobukete Alternatively, contact the research ethics chairperson of the University of South Africa Research Ethics committee: Prof MA Antwi at: antwima@unisa.ac.za.

Ngiyabonga kutsi ufundze phindze uvume kungenela lolucwaningo.

Ngiyabonga.

SUKOLUHLE KHUMALO

ANNEXURE D: ENGLISH PARTICIPANT INFORMATION SHEET

Title of research study: Factors associated with stunting in children 0-59 months in the Manzini Region, Eswatini.

Dear Prospective Participant.

My name is SUKOLUHLE KHUMALO and I am doing research with Professor Lizeth Roets, a Professor, in the Department of Health Studies at the University of South Africa (UNISA). I am studying towards a Master of Public Health, at this institution. We are inviting you to participate in a study with the title: Factors associated with stunting (low height for age) in children 0-59 months in the Manzini Region, Eswatini. We are not receiving any external funding for this study. Please note that you will not be judged for your feeding practices and sharing your current practices is of great value in the study.

WHAT IS THE PURPOSE OF THE STUDY?

I am conducting this research to find out about the possible factors that are associated with the growth of your child.

WHY ARE YOU BEING INVITED TO PARTICIPATE?

You have been selected to take part in this study because all mothers who brought their children to monitor their growth are asked to take part. You are free to choose to take part in the study or you can choose to refuse without any negative effects if you choose not to take part. I will however appreciate your willingness as I hope to get more mothers to take part in the study to enable me to come up with valid conclusions.

WHAT IS THE NATURE OF YOUR PARTICIPATION IN THIS STUDY?

This research will take between 30 minutes to an hour of your time. During this time, measurements will be taken from you and your child. The measurements will include weight, height, and measurement around your arm. Your child will have to be partially /fully undressed to ensure that we are able to collect accurate measurements. You will be interviewed on a number of topics that are related to the nutrition of your child, including the social and economic circumstances of your family. The interviews and measurements will be conducted in a private room at this facility to ensure privacy. You and your child's individual information will be kept confidential (a secret) and will not be linked to your name and therefore nobody will link your information with you as an individual.

CAN YOU WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is free of choice and you are under no obligation to agree to take part in the study. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason for it and you will not be penalized in any way.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

You may also find the interview to be rewarding, as you will have an opportunity to discuss important aspects about your child's growth milestones. By participating in this research, you may also indirectly benefit others by helping people to better understand the causes of lower-than-expected height for age, as well as its impact on children in Eswatini. The information from the study can be used by policymakers in order to come up with ways of helping to avoid this problem.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

There are no foreseen risks or discomforts related to this research. If for any reason you feel uncomfortable or distressed, you will be referred to a counselor or healthcare worker in the facility, free of charge.

WILL THE INFORMATION THAT YOU CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

The interviews will not be recorded with any audio equipment. The information written down will not contain any mentioning of your name, and any identifying information from the interview will be removed. Only the researcher and identified members of the research team, will know about your involvement in this research. Your participation in this research is completely free of choice (voluntary). However, you may withdraw from the study at any time for any reason. If you do this, all information from you will be destroyed. Your answers will be given a code number and your data will be referred to in this way in any publications, or at conferences. Your information, but without a name attached to it, may be reviewed by people responsible for making sure that the research was done properly, including members of the Research Ethics Review Committee. The results from this study will be presented in writing in research journals. The results may also be presented in person to group of people who work in healthcare. At no time, however, will your name be used or any identifying information revealed.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA (INFORMATION)?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet at a chosen location for future research or academic

purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies will be shredded and copies will be permanently deleted from the computer hard drive as well from cloud storage using the relevant soft- ware programs.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

You will not receive any form of payment or reward for participating in this research. Apart from the time that you will spend with us, you will not incur any cost by your involvement in the study.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received ethical approval from the College Research Ethics Committee of the Human health sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL YOU BE INFORMED OF THE RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, or should you require any further information please contact SUKOLUHLE KHUMALO on +268 78326945 or drsukoluhle@gmail.com.

Should you have concerns about the way in which the research has been conducted, you may contact Professor Lizeth Roets Tel: +2712 429 2226 .E-mail: roetsl@unisa.ac.za.

Alternatively, contact the research ethics chairperson of the University of South Africa Research Ethics committee: Prof MA Antwi at: antwima@unisa.ac.za.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

SUKOLUHLE KHUMALO

ANNEXURE E: INFORMED CONSENT DOCUMENT

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname…… (please print)

Participant Signature……..Date……

Researcher's Name & Surname……(please print)

Researcher's signature……..Date……

SIFAKAZELO SEKUVUMA KUNGENELA LOLUCWANINGO

Mine, _____ (libito lalophendvulako), Ngiyafakaza kutsi ngichazeleke ngalokwanele ngekungenela kwami loluchwaningo kutsi kuluhlobo luni, kwentiwani, inzuzo lekhona, nekuphatamiseka kweluhlelo lwami.

Ngifundzile (ngichazelekile) ngacondzisisa kahle ngalolucwaningo ekhasini lwelwati lenginikwe lona.

Ninikwe sikhatsi lesanele kubuta imibuto lebenginayo kungako sengilungele kuba yincenye yalolucwaningo.

Ngicondza kahle kutsi kungenela kwami lolucwaningo kuselungelweni lami futsi ngingakhetsa kuphuma kunoma ngusiphi sigaba kulengcogco.

Njengobe loko lokutawutfolakala kulolucwaningo kutawubhalwa, kushicilelwe phindze kukhangiswe ngako, nginikiwe siciniseko kutsi ngeke livetwe libito lami.

Nilitfolile lifomu lesivumelwano lelisayininiwe

Ligama nesibongo salophendvulako……(bhala ngalokuphelele)

Kusayina lophendvulako……..Lusuku……

Ligama nesibongo salochuba ingcogco…….(bhala ngalokuphelele)

Kusayina lochuba ingcogco……..Lusuku……

ANNEXURE F: DATA CAPTURING SHEET

Checklist for Anthropometric measurements

This form will be filled in by the research assistant

FACILITY: DATE:

PARTICIPANT CODE:

Instructions for the measuring Length/ Height:

For measuring length in a child less than 2 years of age:

1. Place the measuring board on a hard, flat, surface.

2. Place the footboard firmly against the heels of both of the child's feet.

3. Ensure that the child's legs are straight at the knees and that the knees are positioned correctly. Mother to position the child.

4. Check the child's position to ensure that she/he is lying straight just before taking length measurement.

5. Read, record, and plot measurements carefully. Measurements to be made to the nearest 0.1cm

For Children more than 2 years and adults

1. Place the measuring board on a hard, flat (level) surface

2. Ensure that the person's feet and knees are in the correct position.

3. Ensure that the person is standing straight by assessing the mid-axillary line.

4. Ensure that the person is lifting his/her chin properly and looking straight ahead.

5. Read, record, and plot measurements carefully. Measurements will be made to the nearest 0.1cm

For measuring weight:

Children who cannot stand:

1. Hang the scale securely.
2. Do not let the child hold onto anyone else.
3. Remove footwear and all clothing except clean/dry diapers or underpants.
4. Wait until the child is still and the needle is steady before reading the weigh
5. Read, record, and plot measurements carefully. Measurement to the nearest 0.1kg.

Children who can stand and adults:

1. Place the scale on a hard, flat (level) surface.
2. Remove the child's footwear and all clothing, except clean/dry diapers or underpants.
3. Properly tare the scale.
4. Wait until the child is still and the weight is not fluctuating before reading the weight. 5.
5. Read, record, and plot measurements carefully. Measurement to be made to the nearest 0.1kg

Measuring Mid upper arm circumference

1. Use the correct MUAC tape for the age group of the person being measured.

2. Carefully identify the midpoint of the upper arm.

3. Pull the tape flat against the skin, not too tight or loose.

4. Read and record measurements carefully

Checklist for each Mother, child pair.

Code:

Child

Date of Birth:

Sex :

	1	**2**	**3**	**Average**	**Z score**

Height					
Weight					
MUAC					

Mother

Date of birth:

	1	**2**	**3**	**Average**
Height				
Weight				
MUAC				
BMI				

NB: Z scores will be calculated using the WHO Antho survey analyser found at

:http://www.who.int/childgrowth/software/en/

ANNEXURE G: ENGLISH QUESTIONNAIRE

Questionnaire

Interviewer to read to participant:

Dear participant

Thank you for agreeing to participate in this research study. Please try to answer all questions as honestly as you can.

Questionnaire Number:_____ *For office use*

PLEASE ANSWER ALL QUESTIONS WITH A TICK IN THE APPLICABLE SPACE OR WRITE IN THE SPACES PROVIDED

INFORMATION ABOUT THE CHILD.

1. What is the gender of your child?

Gender	**Answer**
1.1. Male	1
1.2. Female	2
1.3. Other	3

2. How old is your child?

Age	**Answer**
2.1. < 6	1

2.2. 6-11	2
2.3. 12-23	3
2.4. 24-35	4
2.5. 36-48	5

Birth History

3. How many weeks were you pregnant when you gave birth?

Gestational age	**Answer**
3.1. Term ≥ 37 completed weeks	1
3.2. Preterm <37 weeks	2

4. What was your child's weight at birth?

Weight	**Answer**
4.1. <2500g (Low Birth weight)	1
4.2. 2500-4000g (Normal Birth weight)	2
4.3. >4000g (High Birth weight)	3

5. Have you visited a healthcare facility in the past year because this child was sick?

Healthcare facility visit	**Answer**
5.1. Yes	1
5.2. No	2

If you answered 'NO' to question 5 above, please go to Question 9.

6. If you answered yes in Q5 above, how many times did you go?

Number of visits	Answer
6.1 1	1
6.2 2-3	2
6.3 >3 visits	3

7. What were the reasons for the visit? (Tick all applicable)

Reason for healthcare facility visit	Answer
7.1 Diarrhea	1
7.2 Vomiting	2
7.3 Fever	3
7.4 Cough	4
7.5 Other	5

8. If you indicated “Other” in question 7 above, please indicate the reason for the visit:

_____
_____
_____

9. Does your child have any chronic medical condition?

Medical Condition	**Answer**
Yes	1
No	2

If you answered 'no' to question 9 above, skip questions 10 and 11 and move to question 12.

10. If you said yes to Q9 above, please specify.Tick all applicable.

Specific medical condition	Answer
10.1. HIV	1
10.2. TB	2
10.3. Congenital condition	3
10.4. Other	4
10.5 Prefer not to say	5

11. If you answered 'other' to Q10 above, please specify the disease.

_____
_____
_____

MATERNAL DATA

Demographic data

12. How old are you?

Age	Answer
12.1. <18	1
12.2 18-24	2
12.3 25-30	3
12.4 31-39	4
12.5 ≥ 40	5

For office use

Parity

13. How many children do you have who are alive and well?

Number of children	Answer
13.1 1-2	1
13.2 3-4	2
13.3 >4	3

14 What is the age gap in years between this child and the sibling who is just older?

Time in years	Answer
14.1 < 1	1
14.2 1-2	2
14.3 ≥2	3
14.4 Not applicable	4

15. What is the gap in years between this child and the younger sibling, if applicable?

Time in years	Answer
15.1 <1	1
15.2 1-2	2
15.3 3-4	3
15.4 Not applicable	4

16. At what age did you have your **first** child?

Age	Answer
16.1 ≤16	1
16.2 17- 24	2
16.3 25-35	3
16.4 >35	4

17. How many times did you visit the clinic for antenatal care when you were pregnant with this child you brought to the clinic today?

Number of ANC visits	Code
17.1 0	1
17.2 1-3	2
17.3 ≥ 4	3

Education

18. Have you ever attended school?

School attendance	Answer

18.1 Yes	1
18.2 No	2

19. If you answered 'Yes' to the above, Q18, what is your highest level of education?

Education level	**Answer**
19.1 Primary School	1
19.2 Secondary School	2
19.3 Tertiary	3

Employment and income

20. Are you working outside your home?

Work status	**Answer**
20.1 Yes	1
20.2 No	2

21. What is your monthly household income?

Amount	**Answer**
21.1 <1000 E	1
21.2 1000-3000 E	2
21.3 >3000E	3

General Health.

22. Do you have any chronic medical conditions?

22.1 Yes	1
22.2 No	2

If you answered 'No' to Q22 above, move to question 25

23. If you answered 'Yes' to Q22 above, please specify the medical condition/s.Tick all applicable.

Condition	**Answer**
23.1 Diabetes	1
23.2. Hypertension	2
23.3. HIV	3
23.4 TB	4
23.5 Other	5
23.6 Prefer not to say	6

24. If you answered 'Other' to question 23 above, please name the medical condition.

_____
_____
_____

<u>Breastfeeding practices.</u>

25. Did you breastfeed this child that you brought to the clinic today?

	Answer
25.3 Yes	1
25.4 No	2

If you answered 'No' to question 25 above, please skip question 26 27 and 28 and move to question 29.

26. If you answered 'yes' to question 25 above, when did you start breastfeeding him/he after birth?

	Answer
26.1 Within the first two hours	1
26.2 After 2 hours but within the first 6 hours after birth	2
26.3 More than 6 hours after birth	3

27. At what age did you start giving your child any type of fluids other than breastmilk?

	Answer
27.1 <6 months	1
27.2 ≥6 months	2

28. Is there a particular reason why you started giving fluids at that point in time?

_____
_____
_____

29. Please indicate what you gave your child when you started giving other fluids.

Please tick all relevant responses.

	Answer
29.1 Plain water	1
29.2 Tea	2
29.3 Milk	3

29.4 Juice/Drinks	4
29.5 Other	5

30. If you indicated milk in question 29, what type of milk did you give?

Milk type	**Answer**
30.1 Infant formula	1
30.2 Cow's milk	2
30.3 Both	3
30.4 Other	4

31. At what age did you start giving your child solid foods?

Timing	**Answer**
31.1. < 6 months	1
31.2. ≥6 months	2

32. Please mention the types of solid food you gave your child when you started with solids.

_____

_____

33. Are you still breastfeeding this child?

	Answer
33.1 YES	1
33.2 NO	2

34. If you answered 'No' to question 33, at what age did you stop breastfeeding?

Age in months	**Answer**
34.1 < 6 months	1
34.2 6-18 months	2
34.3 >18 months	3

35. If you answered 'yes' to question 33, at what age do you plan to wean your child?

Age in months	**Answer**
35.1 <18 months	1
35.2 >18 months	2

Nutritional Knowledge.

36. At what age do you think it is recommended that a mother continue breastfeeding?

Age in months	**Answer**
36.1 <6months	1
36.2 6-11 months	2
36.3 12-23 months	3
36.4 24 months or older	4
36.5 Don't know	5

37. At what age should babies start eating solid food as a supplement to breast milk?

Age in months	**Answer**

37.1 At 6 months	1
37.2 6-12 months	2
37.3 >12 months	3
37.4 Don't know	4

38. Do you think exclusive breastfeeding (breastmilk alone) is sufficient for babies from birth up to 6 months?

	Answer
38.1 Yes	1
38.2 No	2
38.3 Don't know	3

39. If you answered 'No' or 'Yes' to question 38 above, please motivate your answer:

_____
_____
_____

40. Please indicate which of the following reasons explains why food in addition to breastmilk is needed from the age of six months and above?

Reason	**Answer**
40.1 Breastmilk alone cannot supply all the nutrients needed for growth from six months	1
40.2 The baby needs more food in addition to breastmilk	2
40.3 Other	3
40.5 Don't know	4

41. If you indicated ‘Other’ in Question 40 above, can you explain your answer?

_____
_____
_____

42. Many mothers give their children porridge or pap. Please tell me what you would add to porridge to make it more nutritious or better for your baby’s health (Please wait for the participant’s response and tick all mentioned) .

Answer	Code
42.1 **Animal:** source foods (meat, poultry, fish, liver/organ meat, eggs, etc.)	1
42.2 **Pulses and nuts:** flours of groundnuts and other legumes (peas, beans, lentils, etc.), sunflower seed, peanuts, soybeans	2
42.3 **Vitamin A rich:** fruits and vegetables (carrot, orange-fleshed sweet potato, yellow pumpkin, mango, papaya, etc.)	3
42.4 **Green leafy vegetables** (e.g. spinach,)	4
42.5 **Oils** (vegetable, olive, butter, ghee)	5
42.6 Other	6
42.7 Don’t know	7

43. If you answered ‘Other’ in question 42 above, what would you put?

_____
_____
_____

44. How many meals do you think a two-year-old child should have per day?

Number of meals per day	Answer
44.1 1	1
44.2 2-3	2
44.3 >3	3

45. What do you are the signs and symptoms of malnutrition? Please tick all applicable

Signs	Answer
45.1 Low or falling weight	1

45.2 Swelling of the feet with a rash	2
45.3 Low height	3
45.4 Don't know	4
45.5 Other	

46. If you mentioned 'Other' in Question 45 above, please indicate what other signs you are aware of.

_____
_____
_____

THE FEEDING OF THIS CHILD

47. How many meals per day do you give your child?

Number of meals	Answer
47.1 ≤1	1
47.2 2-3	2
47.3 >3	3

48. Please motivate your answer to question 46, above

_____
_____
_____

49. Do you think it is good to feed your child more than 3 times a day?

	Good
49.1 Good	1
49.2 Not good	2
49.3 Don't Know	3

50. Please motivate your answer to Question 48, above.

_____
_____
_____

Dietary Diversity (for children >6 months)

51. I want to know what types of foods or liquids your child ate in the last 24 hours. I will read a list of foods or liquids for you and if you gave your child any of the items in the list please say yes. It does not matter whether the type of food was mixed within other foods or porridge. If your child ate or drank that type of food or liquid in any form in the last 24 hours, just indicate and say yes. Please do not include any food used in a small amount for seasoning or condiments (for example, herbs , spices or fish powder).

(Instruction to research assistant-Read the food lists. Underline the corresponding foods consumed and tick the column Yes or No depending on whether any food item on the list was finished. Consumption of any amount of food or beverage from a food group is sufficient to "count", i.e. there is no minimum quantity).

Group	Food lists	No	Yes
Group 1: Grains, roots and tubers	Porridge, bread, rice, noodles or other foods made from grains		
	White potatoes, sweet potatoes, madumbe cassava or any other foods made from roots		
Group 2: Legumes and nuts	Any foods made from beans, peas, lentils, nuts or seeds		
Group 3: Dairy products	Infant formula, such as **NAN, Lactogen, etc**		
	Milk, such as tinned, powdered or fresh animal milk		
	Yoghurt or drinking yoghurt		
	Cheese or other dairy products like cream or sour milk (amasi)		
Group 4: Flesh foods	Liver, kidney, heart or other organ meats		
	Any meat, such as beef, pork, lamb, goat, chicken or duck		
	Fresh or dried fish, shellfish or seafood		
	Grubs, snails or insects		

Group 5: Eggs	Eggs		
Group 6: Vitamin A fruits and vegetables	Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside		
	Any dark green vegetables like spinach, kale, or pumpkin leaves		
	Ripe mangoes (fresh or dried [not green]), ripe papayas (fresh or dried), musk melon ,apricots		
	Foods made with red palm oil, red palm nut or red palm nut pulp sauce.		
Group 7: Other fruits and vegetables	Any other fruits or vegetables. Please name them: _____		
Group 8: Breast milk	Breastmilk		
Others (not counted in the dietary diversity score)	Any oil, fats, butter or foods made with any of these.		
	Any sugary foods, such as chocolates, sweets, candies, pastries, cakes or biscuits		

	Condiments for flavour, such as chillies, spices, herbs or fish powder,salt		

Table adapted from WHO indicators for infant and young child feeding practices 2021 from https://apps.who.int/iris/rest/bitstreams/1341846/retrieve.

Number of groups with Yes responses in the above table	**Answer**
51.1 <5	1
51.2 ≥ 5	2

ENVIRONMENTAL FACTORS.

52. What are your primary sources of drinking water?

Water source	**Answer**
52.1 Piped Water	1
52.2 Borehole	2
52.3 Dug well	3
52.4 Other	4

53. Do you treat your water to make it safe to drink?

Water treatment	**Answer**

53.1 Yes	1
53.2 No	2

54. If you answered ‘yes’ to question 53 above, how do you ensure that the water you give your child is safe to drink? Mark all the applicable choices.

Method	**Answer**
54.1 Boil	1
54.2 Chlorinate	2
54.3. Strain through a cloth	3
54.4. Water filter	4
54.5. Let it stand or settle	5
54.6. Don’t know/ no answer	6

55. Do you think there are any benefits to treating water before you drink it?

Yes	1
No	2

56. Please motivate your answer to question 54 above.

_____
_____
_____

57. Which type of toilet (sanitation) facilities do you use?

Facility type	Answer
57.1 Flush	1
57.2. Blair	2
57.3 Pit latrines (dry/bucket)	3
57.4 Pour/Flash latrines	4
57.5. Other	5

58. If you answered ‘Other’ to Question 56 above, please indicate what type.

_____

Thank you very much for your time.

ANNEXURE H: SISWATI QUESTIONNARE

Luhla lwemibuto

Lochuba ingcongco ufundzela loyo lophendvulako:

Kuwe wena ongenela lolucwaningo.

Siyabonga kutsi uvume kuba yincenye yalolucwaningo. Sicela kutsi uphendvule imibuto ngeliciniso leliphelele.

Inombolo yelucwaningo_____ *Kwelihhovisi kuphela*

<u>GCWALISA TIMPHENVULO NGALOKUPHELELE KULETIKHALA LONIKWE TONA NOMA UBHALE KULETIKHALA LONIKWETONA</u>

IMININGWANE LEBALULEKILE YEMNTFWANA.

1. Ubulili buni umthwanakho?

Bulili	**Imphendvulo**

1.1. Wesilisa	1
1.2. Wesifazane	2
1.3. Lobunye bulili	3

2. Mdzala kangakanani umntfwana?

Umnyaka	**Imphendvulo**
2.1 < 6	1
2.2. 6-11	2
2.3. 12-23	3
2.4. 24-35	4
2.5. 36-48	5

Imininingwane yekutalwa

3. Bewunamangakhi emaviki ukhulelwe uma ubeleka lomntfwana?

Sigaba sekukhulelwa	**Imphendvulo**
3.1. Kugcwele emaviki langu 37 nome ngetulu	1
3.2. Ngephansi kwemaviki langu 37	2

4. Washaya sisindvo lesinganani umntfwana uma abelekwa?

Sisindvo	**Imphendvulo**
4.1. <2500g (Ngephansi kwesikali lesifanele)	1

4.2. 2500-4000g	2
4.3. >4000g	3

5. Ngabe uke wavakashela yini emtfolamphilo kumikisa lomntfwana ngobe agula noma aphatsekile?

Uvakashele yini emtfolamphilo?	**Imphendvulo**
5.1. Yebo	1
5.2. Cha	2

Uma imphendvulo itsi 'Cha' kumbuto 5 ngenhla, chubekel akumbuto 9.

6. Uma imphendvulo itsi 'Yebo' kumbuto 5 ngenhla, kube ngemahlandla lamangakhi?

Emahlandla ekuvakasha	**Imphendvulo**
6.1. 1	1
6.2. 2-3	2
6.3. Ngetulu kwa 3	3

7. Ngabe bekungutiphi tizatfu tekuvakashela emtfolamphilo kuleti? (Khetsa konkhe lokusizatfu sakho)

Tizatfu	**Imphendvulo**
7.1. Ngumsheko/Insheko	1

7.2. Kuhlanta	2
7.3. Kuva emakhata nekushisa sikhatsi sinye	3
7.4. Kukhwehlela	4
7.5. Lokunye	5

8. Uma imphendvulo itse ‘Lokunye’ kumbuto 7 ngenhla, chaza kabanti letizatfu.

_____

_____

_____

_____

9. Ngabe umntfwana unako yini lokunye kugula lokungalapheki?

Sifo	**Imphendvulo**
9.1 Yebo	1
9.2 Cha	2

Uma imphendvulo itse ‘Lokunye’ kumbuto 9 ngenhla, yendlula 10 na 11 uchubekele kumbuto 12.

10. Uma kungu ‘Yebo’ kumbuto 9 ngenhla, ngukuphi kuloku?

Luhlobo lwesifo	Imphendvulo
10.1. Ligciwane le-HIV	1
10.2. Sifuba sengati	2
10.3.Sifo latalwa naso	3
10.4 Lokunye	4
10.Unconota kungakuchazi/kungasho	5

11. Uma imphendvulo itse 'Lokunye' kumbuto 10 ngenhla, chaza luhlobo lwalesifo.

_____

_____

_____

IMININGWANE YAMAKE

Matisa wamake

12. Mingakhi iminyaka yakho?

Umnyaka	Imphendvulo
12.1. <18	1
12.2 18-24	2

12.3. 25-30	3
12.4. 31-39	4
12.5 ≥40	5

Kusetjentiswa lihhovisi kuphela

Luhlelembiso lwekutala

13. Bangakhi bantfwabakho labasekhona emhlabeni futsi labaphilile?

Inombolo yebantfwana	**Imphendvulo**
13.1 1-2	1
13.2 3-4	2
13.3 >4	3

14.Mingakhi iminyaka emkhatsini walona lote naye namuhla naloyo lakelamana naye lomdzala kuye nangabe ekhona?

Iminyaka	**Imphendvulo**
14.1 <1	1
14.2. 1-2	2
14.3 ≥2	3
14.4 Kute lomdzala kuye	4

15. Ngabe mingakhi iminyaka emkhatsini walona lote naye namuhla naloyo lomelamako uma akhona lomncane kuye, nangabe akhona?

Iminyaka	Imphendvulo
15.1 <1	
15.2 1-2	
15.3 3-4	
15.4 Kute lomncane kuye	

16. Beyimingakhi iminyaka yakho uma utfola umntfwana wekucala?

Iminyaka	Imphendvulo
16.1 ≤16	1
16.2 17- 24	2
16.3 25-35	3
16.3 >35	4

17. Ngabe uwuvakashele emahlandla lamangakhi umtfolamphilo kuyopopola sisu uma utetfwele lomntfwana lona?

Emahlandla	Imphendvulo
17.1 0	1
17.2 1-3	2
17.3 ≥4	3

<u>Imibuto lephatselene netemfundvo</u>

18. Ngabe wake wafundza yini esikolweni?

Ngabe ufundzile na?	Imphendvulo
18.1 Yebo	1
18.2 Cha	2

19. Uma kungu 'Yebo'ngenhla kumbuto 18, ngusiphi sigaba lesisetulu lofike kuso?

Sigaba	Imphendvulo
19.1 Libanga leliphansi	1
19.2 Libanga lekugcina	2
19.3 Imfundvo lephakeme	3

<u>Kusebenta lokunenzuzo</u>

20. Ngabe uyasebenta yini ngaphadle kwemisebenti yasekhaya?

Ngabe ucashiwe?	Imphendvulo
20.1 Yebo	1
20.2 Cha	2
20.3 Angikacashwa ndzawo	3

21. Ngabe ngumalini imali loyitfolako ngenyanga (*Emalangeni*)?

Linani lemali	Imphendvulo

21.1 <E1000	1
21.2 E1000-E3000	2
21.3 >E3000	3

Ingcongo ngetemphilo

22. Ngabe kukhona yini kugula lokungalapheki lonako?

22.1 Yebo	1
22.2 Cha	2

Uma imphendvulo itse 'Cha' kumbuto 22 ngenhla, yendlulela kumbuto 25.

23. Uma kungu 'Yebo' kumbuto 22 ngenhla, ngabe ngukuphi kuloku? Khetsa konkhe ngalokufanele

Inhlobo yesifo	**Imphendvulo**
23.1 Shukela	1
23.2 Ihayihayi	2
23.3 Ligciwane le-HIV	3

23.4 Sifuba sengati	4
23.5 Lokunye	5
23.6 Ungconota kungakuchazi/kungasho	6

24. Uma kungu 'Yebo' kumbuto 23 ngenhla, chaza luhlobo lwalesifo.

_____

_____

<u>Kumunyisa</u>

25. Usamunya yini lomtfwana lolemtse emtfolampilo lamuhla nome wake wamunya yini ngaphambilini?

	Imphendvulo
25.1 Yebo	1
25.2 Cha	2

Uma imphendvulo itse 'Cha' kumbuto 25 ngenhla, yendlula 26 27 na 28 uchubekele kumbuto 29.

26. Uma kungu ‘Yebo’ kumbuto 25 ngenhla, ngabe wacala kumunya ngemuva kwesikhatsi lesinganani atelwe?

	Imphendvulo
26.1. <2 hours	1
26.2. 2-6 hours atelwe	2
26.3 >6 hours atelwe	3

27. Umntfwana wamcala angakanani kumupha kumupha lokunye lokunatfwako ngaphandle kwelubisi lalumunyako?

Iminyaka	I**mphendvulo**
16.1 Ngaphansi kwetinyanga letisitfupha (<6 months)	1
16.2 Nakahlanganisa nome ngetulu kwetinyanga letisitfupha (≥6 months)	2

28. Ngabe sikhona yini sizatfu lenta kutsi ucale kumupha lolunye luhlobo lwalokuntfwako kulesigaba lacala ngaso?

_____

_____

_____

29. Ngabe ngukuphi lowamupha kona kulolokulandzelako? Khetsa konkhe ngalokufanele.

	Imphendvulo
29.1 Emanti odvwa	1
29.1 Litiya	2
29.2. Lubisi	3
29.3. Namnede	4
29.4 Lokunye	5

30. Uma atse ‘Lubisi’ kumbuto 29 ngenhla, ngabe nguyiphi inhlobo kuleti?

Inhlobo yelubisi	**Imphendvulo**
30.1 Lubisi lwebantfwana lolukhicitiwe	1
30.2 Lubisi lwenkhomo lwekusengwa	2
30.3 Kokubili lokungenhla	3
30.4 Lenye inhlobo	4

31. Abengakanani umntfwana uma ucala kumupha kudla lesekucinile?

Iminyaka	**Imphendvulo**
31.1 Ngaphansi kwetinyanga letisitfupha	1

31.2 Nakahlanganisa nome ngetulu kwetinyanga letisitfupha	2

32. Ngabe ngukuphi kudla lokucinile lowamupha kona umntfwana nawusacala kumupha?

_____

_____

_____

33. Ngabe usamunya yini lomntfwana?

Usamunya	**Imphendvulo**
33.1. Yebo	1
33.2. Cha	2

34. Uma utse 'Cha' ku 33 ngenhla, ngabe wayekela asanganani?

Budzala ngetinyanga	Imphendvulo
34.1. < 6 wetinyanga	1
34.2. 6-18 wetinyanga	2
34.3. >18 wetinyanga	3

35. Uma utse 'Yebo' ku 33 ngenhla, utomlumula nasekanganani?

Budzala ngetinyanga	Imphendvulo
35.1. <18 wetinyanga	1
35.2. >18 wetinyanga	2

Lwati ngekudla lokukahle lokuyimphilo

36. Ngekubuka kwakho engabe make kumele amunyise aze abe neminyaka lemingaki umntfwana?

Budzala ngetinyanga	Imphendvulo
36.1. <6 wetinyanga	1
36.2. 6-11 wetinyanga	2
36.3. 12-23 wetinyanga	3
36.4. 24 wetinyanga or kuya etulu	4

36.5. Angati	5

37. Umntfwana kumele acale kudla lokunye kudla umanga sekanganani?

Budzala ngetinyanga	**Imphendvulo**
37.1. Uma sekanetinyanga letisitfupha	1
37.2. Uma sekanetinyanga letisitfupha ate ahlanganise umnyaka	2
37.3. Uma sekahlanganise umnyaka	3
37.4 Angati	4

38. Ngekubona kwakho engabe kwenele yini kutsi umntfwana amunye lubisi lwamake kuphela aze abe netinyanga letisitfupha

	Imphendvulo
38.1. Yebo	1
38.2. Cha	2
38.3 Angati	3

39. Uma atse ‘Cha’ noma ‘Yebo’ kumbuto 38 ngenhla, sekela imphendvulo yakho?

_____

_____

_____

40. Kumcoka ngani kutsi umntfwana acale kudla lokunye kudla uma sekangetulu kwetinyanga letisitfupha?

Sizatfu	**Imphendvulo**
40.1 Uma lomntfwana sekahlanganise tinyanga letisitfupha, lubisi lwamake lubese alusameneli ngetitsako letifanele kumsita kutsi akhule kahle	1
40.2 Umntfwana usuke asadzinga kudla lokucinile kwengeta elubisini lwamake	2
40.3 Letinye tizatfu	3
40.4 Angati	4

41. Uma utse 'Letinye tizatfu' kumbuto 40 ngenhla, tichaze letizatfu.

_____

_____

_____

42. Bomaka labanyenti bayaye basebentise indengane noma liphalishi uma sebapha umntfwana kudla lokucinile kwekucala. Engabe ngekubona kwakho ngutiphi tindlela tekwengeta titsako kuleyo ndengane letimcoka emphilweni yemntfwana? Khetsa konkhe ngalokufanele. (**Mela impendvulo yalophendvulako, bese umaka konkhe lakusho**).

Imphendvulo	Code	
42.1. **Kudla lokubuya etilwaneni** (inyama lebovu, inyama lemhlophe, imfishi, sibindzi nenso, emacandza, etc.)	1	
42.2 **Lokulinywa ngaphansi kwemhlabatsi**: emantongomane lasiliwe (tindlubu, emabhontjisi, tinhlumaya, etc.), bhekilanga, emantongomane	2	
42.3 **Vitamin-A** titselo netibhidvo (ticadze, bhatata, litsanga, mangoza, liphopho, etc.)	3	
42.4 Tibhidvo letinemacembe laluhlata (e.g. spinach)	4	
42.5 Emafutsa lanemphilo	5	
42.6 Lokunye	6	
42.7 Angati	7	

43. Uma utse ‘Lokunye ‘ kumbuto 42 ngenhla, kungaba yini lokunye.

_____

_____

_____

44. Kufanele adle kangaki ngelilanga umntfwana loneminyaka lemibili?

Emahlandla	Imphendvulo
44.1. Kanye	1
44.2. Kabili noma katsatfu	2
44.3. Katsatfu kuya etulu	3

45. Ubonakala njani nome ngani umntfwana longondleki kahle? Khetsa konkhe ngalokufanele.

Tinkhomba	Imphendvulo
45.1 Ukhula kancane noma ehle esikalini	1
45.2 Tinyawo tiyavuvuka tibe nekucubuka tsite	2
45.3 Uba mfisha kunalokutayelekile	3
45.4 Angati	4
45.5 Lokunye	

46. Uma utse 'Lokunye ' kumbuto 45 ngenhla, kungaba yini lokunye.

_____

_____

_____

KONDLEKA KWEMNTFWANA.

47. Lomntfwana umupha kangaki kudla ngelilanga?

Emahlandla	**Imphendvulo**
47.1 Kanye	1
47.2 Kabili noma katsatfu	2
47.3 Katsatfu kuya etulu	3

48. Sekela imphendvulo loyikhetsile ku 47, ngenhla. [ ]

_____

_____

_____

49. Ucabanga kutsi kukahle yini kupha umntfwana kudla emahlandla langetulu kwalamatsatsu ngelilanga?

	Imphendvulo
49.1 Kukahle	1
49.2 Akusiko kahle	2
49.3 Angati	3

50. Sekela loko lokuphendvule kumbuto 48 ngenhla. [ ]

_____

_____

_____

<u>Kwehlukahlukana kwekudla (bantfwana labanetinyanga letisitfupha kuya etulu).</u>

51. Nyalo ngitawucela kukubuta ngekudla nome lokunatfwe ngumntfwana wakho esikhatsini lesingendluli elangeni linye.

Nginesifiso sekwati kutsi engabe kukhona yini lakudlile kuletinhlobo tekudla letibekiwe nome ngabe betibhicwe nalokunye kudla. Kubekisa nje, uma umntfwana ake wadla indengane yemabele lefakwe lisobho letibhidvo tsite, ungaphendvula utsi 'Yebo' kuloko kudla. Uma kudla tsite bekusetjentiswe ngelinani leliphansi kakhulu kunonga kudla ungakubali kutsi ukudlile umntfwana.

(***Kuchushisa loyo lochuba lengcogco*** - fundza lokudla ngekwehlukana kwako. Dvwebela ngaphansi kwaloko lakudlile umntfwana bese uyamaka ngephansi kwa 'yebo' noma 'cha' ngalokufanele. Kute sikali lesibekiwe kutsi kumele akudle kangananai, yingci nje uma akudlile.

Tinhlobo	**Luhla lwekudla**	**Yebo**	**Cha**
Luhlobo lwekucala: Lokumimbila netimphandze	Indengane/liphalishi, sinkhwa, lilayisi, nalokunye kudla		
	Emazambane, bhatata, emathapha, umjumbula, nalokunye lokutimphandze lokulinywako		

Luhlobo lwesibili: Kwekhabo mabhontjisi nemantongomane	Emabhontjisi, tindlubu, tinhlumaya, emantongomane nalokunye		
Luhlobo lwesitsatfu: Lokukhiticwe elubisini	Lubisi lwebantfwana lolukhicitiwe, kungaba yi **NAN, Lactogen, etc**		
	Lubisi lolugcinwe isikoteleni tsite, loluyimphuphu nome lolusengiwe		
	Namnede lobitwa pheceleti ngekutsi 'yoghurt'		
	Lokwakhiwe ngelubisi lokufaka ekhatsi cheese nemasi		
Luhlobo lwesine: Tinyama tsite	Sibindzi, yinso, inhlitiyo, nalokunye		
	Inyama yenkhomo, yengulube, yemvu, yembuti, yenkhukhu neyelidada		
	Inhlanti lephelele nome leyomisiwe nalokunye lokudwetjwako		
	Tilwanakatana letehlukahlukene		

Luhlobo lwesihlanu: Emacandza	Emacandza		
Luhlobo lwesitfupha: Titselo netibhidvo letina Vitamin A	Litsanga. Licadze, bhatata lomtfubi mgekhatsi		
	Tibhidvo letinemacembe laluhlata (sipinashi, umbhidvo wetintsanga)		
	Mangoza lovutsiwe, liphopho, lihwaba (kungaba ngulokusha noma lokumisiwe)		
	Kudla lokunemafutsa latfolakala esihlahleni se-palm		
Luhlobo lwesikhombisa: Letinye titselo netibhidvo	Letinye titselo netibhidvo		
Luhlobo lwesiphohlongo: Lubisi lwamake	Lubisi lalumunya kumake		
Lokunye	Lokungaba mafutsa noma bhotela lowakhiwe ngaloku		

(lokungekho kuloku lesekubaliwe ngenhla)	Kudla lokunashukela lokufaka ekhatsi emaswidi, boshokolethi, emakhekhe, nemacebelengwane tsite	
	Tinongo tekudla tsite lokufaka ekhatsi pelepele, inhlanti leyomisiwe lesiliwe, luswayi	

Lelitafula litsetfwe kuncubo yekondla bantfwana yaka WHO yaka 2021 letfolakala ku https://apps.who.int/iris/rest/bitstreams/1341846/retrieve.

Inombolo yetinhlobo letitse 'yebo' langehla	**Imphendvulo**
51.1 <5	1
51.2 >or = 5	2

LOKUHAMBISANA NEMVELO

52. [ ]

Niwatfola njani emanti leniwasebentisako ekunatsa?

Umtfombo wemanti	**Imphendvulo**
52.1 Ladvonswa ngeliphayiphi	1
52.2 Lagujwa ngephansi kwemhlaba	2
52.3 Inkelebhu	3

52.4. Lokunye	4

53. Ngabe kukhona yini leniwafaka kona emanti kute kufe emagciwane?

	Imphendvulo
53.1. Yebo	1
53.2. Cha	2

54. Uma utse ‘yebo’ ku 53 ngenhla, nguyiphi indlela loyisebentisako kuciniseka kutsi umntfwana unatsa emanti lahlantekile? Khetsa konkhe lokusebentisako ngalokufanele.

Indlela lekhetsekile	**Imphendvulo**
54.1. Uyawabilisa	1
54.2. Afakwa iJik	2
54.3. Ahlutwa ngendwangu tsite	3
54.4. Aphuma esisefweni tsite	4
54.5. Uyawabeka aze athulele kungcola kuhlale ngephansi	5
54.6. Akati nome kute imphendvulo	6

55. Ngabe kumcoka yini kuhlanta emanti ngaphambi kwekube uwanatse?

	Imphendvulo
55.1. Yebo	1
55.2. Cha	2

56. Sekela imphendvulo yakho loyikhetsile ku 54 ngenhla.

_____

_____

_____

57. Nguluphi uhlobo lwemthoyi noma indlu yangansense loyisebentisako?

Luhlobo lwemthoyi	Imphendvulo
57.1 Lohanjiswa ngemanti longekhatsi endlini	1
57.2. Lovulekile	2
57.3 Umthoyi wangephandle nome libhakede	3
57.4 Lohanjiswa ngemanti longephandle	
57.5. Lolunye uhlobo	

58. Uma utse ‘Lolunye uhlobo’ ku 56 ngenhla, chaza lolo luhlobo?

_____
_____
_____

Ngiyabonga kakhulu kungipha sikhatsi sakho kuphendvula imibuto. Timphenvulo takho tibalulekile kakhulu, siyatitfoba ngekusipha tona.

ANNEXURE I: FACILITY PERMISSION

Telegrams: (+268) 25053902
Telephone: (+268) 25053902
: 2505 5632/ 9562
Fax: (+268) 25053902

KING SOBHUZA II PHU
P.O. BOX 90
MANZINI
ESWATINI

THE KINGDOM OF ESWATINI

The Nurse in Charge
King Sobhuza II Public Health Unit
Manzini
18/10/2022.

To whom it may concern.

Re: Permission for Dr Sukoluhle Khumalo to conduct data collection at the Child Health/EPI unit at KSII Clinic, Manzini.

This letter serves to give permission for Dr Sukoluhle Khumalo to conduct her research activities at the Child Health/EPI unit. She is conducting a study titled: **"Factors associated with stunting in children under 0-59 months in the Manzini region, Eswatini"** .

Please assist her as needed.

Regards

MINISTRY OF HEALTH
KING SOBHUZA II
PUBLIC HEALTH
MATRON II
18 OCT 2022
P.O. BOX 90
MANZINI M200

ANNEXURE J: FACILITY PERMISSION

11 July 2022

Sukoluhle Khumalo
UNISA

Dear Madam

RE: AUTHORIZATION TO DO RESEARCH IN THE HOSPITAL

Your request on the fore mentioned endeavors has been duly considered and permission granted on the following conditions please:

a). That confidentiality is strictly observed
b). That the hospital receives a copy of the report on the proposed research.

Yours Sincerely

Leonard S. Dlamini (Mr.)
HOSPITAL ADMINISTRATOR

CC: Matron 1
SMO

ANNEXURE K: TURNITIN DIGITAL RECIEPT

Congratulations - your submission is complete! This is your digital receipt. You can print a copy of this receipt from within the Document Viewer.

Author:
Sukoluhle KHUMALO

Assignment title:
Revision 1

Submission title:
Factors associated with Stunting in children 0-59 months in the Manzini region Eswatini

File name:
Sukoluhle Khumalo 64065200 30 November.docx

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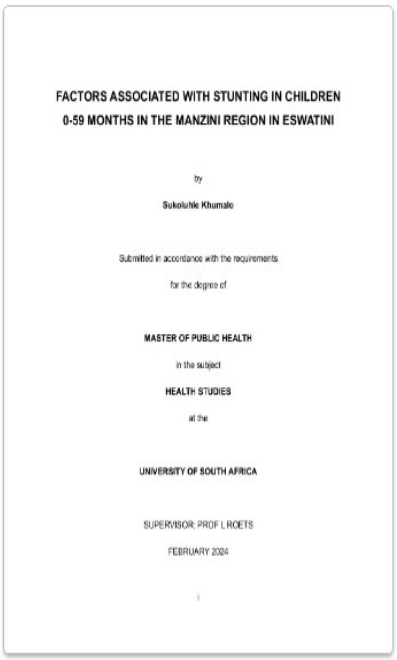
« Page 1 »



FACTORS ASSOCIATED WITH STUNTING IN CHILDREN
0-59 MONTHS IN THE MANZINI REGION IN ESWATINI

by

Sukoluhle Khumalo

Submitted in accordance with the requirements

for the degree of

MASTER OF PUBLIC HEALTH

in the subject

HEALTH STUDIES

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF L ROETS

FEBRUARY 2024

ANNEXURE L: LETTER FROM THE EDITOR

CERTIFICATE OF LANGUAGE EDITING

I, the undersigned, declare that I have edited the MPH (Health Studies) dissertation of Sukoluhle Khumalo titled:

FACTORS ASSOCIATED WITH STUNTING IN CHILDREN 0-59 MONTHS IN THE MANZINI REGION IN ESWATINI

regarding the correctness of the use of UK English and layout.

Editing stopped after the list of references. The annexures of the dissertation were not edited because they must remain like they were used in the research process.

As is usual, the editor is not responsible for the correctness of changes made to the dissertation after completion of editing and before submission or after possible changes suggested by the examiners were implemented.

Signed: 

Prof (emeritus) P.J. Botha

(Member of the South African Translators' Institute, member no. 1000048.)

Date: 27 November 2023.