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PREDICTORS OF STUNTING IN CHILDREN 0-59 MONTHS IN CHIMANIMANI DISTRICT, MANICALAND: AN ANALYTIC CROSS-SECTIONAL STUDY

BY

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Abstract

Stunting is a public health problem affecting millions of children globally. Stunting has persisted in Chimanimani over the years from 35% in 2014 to 35.8% in 2018 during the National Nutrition Survey and the problem is attributed to factors such as inadequate access to food, poor feeding patterns and or low household socioeconomic status. It results in individuals having low cognition, low wages in adults and poor reproductive outcomes. This study aimed to establish the predictors of stunting in Chimanimani and its prevalence. The study followed an analytical cross sectional study design and enrolled 357 caregivers while 351 under-fives were measured for length/height. The study had 99.2% female respondents as caregivers and 0.8% males. Chimanimani has a low-birth-weight rate of 6.5%. The prevalence of stunting in children below 5years was 25.1%. A total of 72.2% boys and 77.2% girls were of normal height for age in the study. Two tailed bivariate analysis was done on all variables and age of child [r_s = -0.123 (p-value= 0.021< 0.05)] had an effect on stunting. Month of first ANC visit had a small to moderate negative significant association with stunting at 0.05% confidence level (r_s = -0.105, p = 0.049). Type of residence had a spearman's correlation coefficient of -0.196 at 95% CI (p = 0.022). Household main source of income and treating of drinking of water both had a small to moderate significant correlation with stunting at 0.05 confidence level [r_s = 0.110 (p= 0.039)]. The spearman's rho correlation coefficient (r_s = -0.122) was significant at 95% CI (p= 0.023). Breastfeeding children under 2years had a small to moderate significant positive association at 0.05 confidence interval [r_s = 0.125 (p= 0.125)]. Stepwise multiple regression was performed for confounding in the significant variables. On performing the ordered logistic regression, type of residence was found to have significant independent association with stunting. There is high prevalence of stunting in Chimanimani in children below the age of 5years. A multi-sectorial approach is needed to address the issue as factors range from socioeconomic factors, WASH, infant and young child feeding patterns and food security.

Keywords: Infant and young child feeding; Low birth weight; Stunting; Under-fives; Height/Length; Chimanimani District

Declaration

I, _Tafadzwa Chipato_, student number 192014, do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Dedication

This work is dedicated to my family and me. It has been a fulfilling journey. My family and friends were a support system in this quest for knowledge.

Acronyms and Abbreviations

Agritex	Agriculture technical extension
ANC	Antenatal care
BFHI	Baby friendly hospital initiative
CRDC	Chimanimani rural district council
Covid-19	Corona virus of 2019
DHE	District health executive
DHIS 2	District health information system 2
EBF	Exclusive breastfeeding
EED	Environmental enteric dysfunction
EPI	Expanded programme on immunization
HDDS	Household dietary diversity score
HIV	Human Immune virus
IFA	Iron and folic acid
IYCF	infant and young child feeding
LBW	Low birth weight
LMICs	Low and middle income countries
MICS	Multiple indicator cluster survey
MIYCN	Maternal, infant and young child nutrition
MNH	Maternal and neonate health
MOHCC	Ministry of Health and Child Care
NAC	National AIDS Council
NNS	National Nutrition Survey
PEM	Protein Energy Malnutrition
PMTCT	Prevention of mother to child transmission

RWIMS	Rural WASH Information and Services Management Systems
SDGs	Sustainable Development Goals
SSA	Sub Saharan Africa
UBVIP	Upgradeable Blair Ventilated Improved Pit
UN	United Nations
UNICEF	United Nations Children Education Fund
VAS	Vitamin A Supplementation
VHW	Village Health Worker
WASH	Water Sanitation and Hygiene
WFP	World Food Programme
WHO	World Health Organization
ZIMVAC	Zimbabwe Vulnerability Assessment Committee

Definition of key terms

Caregiver	A person who often takes care of a child, sick, elderly or disabled individual (Oxford, 2021)
Exclusive breastfeeding	Infant receives only breast milk with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines (WHO, 2019)
Food security	Is a state where all persons, at all times have physical, social and economic access to adequate, safe and nutritious food which meets their nutritional requirements and food inclinations for an active and healthy life (FAO, 2003)
Infant	A young baby from birth to 12 months (Davis, 2021)
Minimum acceptable diet	The percentage of breastfed children aged 6-23months with the minimum dietary diversity (MDD) and minimum meal frequency during the previous day and the proportion of non-breastfed children aged 6-23 months who received at least the MDD excluding milk feeds and minimum meal frequency during the day before (WHO, 2021)
Minimum meal frequency	is a proxy for a child's energy needs by examining the number of times a child 6-23 months ate solid/semi solid times children received foods other than breast milk in children 6-23months (WHO, 2021)

Stunting	Is when the height for age of a child is below more than -2 WHO mean standard deviations on growth median for a child

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CHAPTER 1 INTRODUCTION

1.1. Introduction

Malnutrition is one of the critical health and wellbeing problems among under-fives in Zimbabwe. Globally, one in every four children is stunted (Clark, 2018). According to WHO (2020), malnutrition is defined as deficiencies or excesses or imbalances in a person's intake of energy and or nutrients. Malnutrition can be over nutrition or under nutrition and for the purposes of this study it will refer to under nutrition (stunting). UNICEF, (2021) reports that nearly half of all deaths in children under-five are attributable to under nutrition as it puts children at greater risk of dying from common infections, increased frequency and severity from such infections and delayed recovery.

The major forms of malnutrition include protein energy malnutrition (PEM), iron deficiency disorders, vitamin deficiency and iron deficiency anaemia. PEM is measured in terms of underweight (low weight for age), stunting (low height for age) and wasting (low weight for age). Micronutrient deficiency is a form of chronic malnutrition which is sometimes called "hidden hunger." Stunting is a form of under nutrition which not only affects a child's health by being prone to disease and infections, but also impairs their cognitive and physical development. It is mainly caused by inadequate nutrition and recurrent infections or chronic or diseases which cause poor nutrient intake, absorption or utilization (WHO, 2015).

Stunted growth is an indicator of poor nutritional status over an extended period of time usually 2-3 years and stunted children are generally shorter than their comparable age group. Children are defined as stunted if their height for age is more than two standard deviations below the WHO child growth standards median. The

World Health Assembly has set the ambitious goal through the sustainable development goals (SDGs) of reducing stunting among under-fives by 40% by 2025. The determinants of malnutrition are classified under the categories of environmental factors including the physical and social environment, behavioral factors, health care service related and biological factors (Bhutia, 2014). This study will explore socio-economic determinants and feeding patterns in stunting.

1.2. Background to the study

Stunting is a significant public health concern affecting some estimated 159 million under-fives worldwide (WHO, 2020). It is responsible for more than a third of child mortalities globally (Seid & Egata, 2021). The acceptable threshold for stunting is 20% and WHO considers it a public health problem when prevalence among children less than 5 years of age exceeds this level (Brown, Rivera, Bhutta, Gibson, King & Lonnerdal, 2004).

In developing countries it affects a third of under-fives and contributes to 14% of childhood deaths (Danaei, 2016). Africa and Asia are estimated to harbor 90% of the stunted children and more than 40% are in Sub Saharan Africa (Tariku, Biks, Derso, Wassie & Abebe, 2017) including countries such as Ethiopia (40% in rural areas and 25% urban areas) and Zimbabwe (Bazie, Seid & Egata). Stunting is prevalent in children of low and middle income countries due to exposure of the foetus and or young child to nutritional deficiencies and infectious diseases (Black & Heidkamp, 2018). These countries face hurdles ranging from food insecurity, poor sanitation, limited prenatal or neonatal care which influence healthy growth of babies. Zimbabwe has over a quarter of children below five years of age being stunted (UNICEF, 2016).

Stunting has persisted in Zimbabwe with Zimvac (2020) reporting a national prevalence of 29.4%. Chimanimani is one of the districts nationally with high rates of stunting. The National Nutrition Survey (NNS) (2018) found the prevalence at 35.4% in the district which is above the acceptable level making it a public health issue both at national and district level. Child malnutrition and low birth weight are common contributors to under-five morbidity and mortality in sub-Sahara Africa (Zoleko-Manengo *et al,* 2021) due to greater susceptibility to infections and slow recovery from illness. Chimanimani has been recording an increase in incidences of LBW babies of 6.2%, 7% and 7.8% in 2018, 2019 and 2020 respectively (DHIS2). In a bid to reduce the burden of stunting, World Health Assembly has endorsed global nutrition targets including reduction of chronic malnutrition in under-fives by 40% by 2025 as enshrined in the SDGs 2.2. SDG 2 target 2 aims by 2025 to end all forms of malnutrition including the attainment of the internationally agreed targets on stunting and wasting in children less than five years of age and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons (UN, 2015).

Stunting reflects long term outcomes such as frequent and high disease burden, limited access to food supply, poor feeding practices and or low household socioeconomic status in the target population (MEASURE Evaluation, 2021). Concerted efforts are being made to reduce this crippling condition through promotion of breastfeeding, complementary feeding and measures against child infections. Stunting has decreased steadily since 2000 and its reduction is crucial for development. It is associated with several short and long term health and social conditions with the process of becoming undernourished starting during the prenatal period. Under nutrition during pregnancy can restrict foetal growth making it

necessary to focus on maternal risk factors such as childhood marriages and poor nutrition before and during pregnancy (Haschke, Binder, Huber-Dangl & Haiden, 2019). Treatment and secondary prevention of nutrition related chronic diseases and associated disabilities have an ever rising cost in industrialized countries which is far beyond the means of the still fragile economies of developing countries (Maire, Lioret, Gartner & Delpeuch, 2002).

Children can become prenatally disposed to growing poorly postnatally with low birth babies shown to have poor weight and linear growth in early childhood than those with normal birth weight (Christian, 2009). Low birth weight (LBW) babies are those born with birth weight below 2500g and are prone to develop diseases and death and or remain undernourished (Abbas, Kumar, Mahmood & Somrongthong, 2021). Moreover, motor and cognitive impairments or delays are often seen in LBW babies (Oudgenoeg-Paz, Mulder, Jongmans, van der Ham & Van der Stigchel, 2017).

1.3. Statement of the problem

Malnutrition in Zimbabwe is typified by chronic malnutrition in children 6-59 months rather than acute malnutrition and Chimanimani district is no exception. Stunting is prevalent in the district according to the 2010 National Nutrition Survey (NNS) which was at 35%, 2014 World Food Programme (WFP) exploratory food and nutrition security analysis with stunting ranging between 30% - 39% and the 2018 NNS at 35.3% which is above the acceptable threshold of 20%. It persists despite interventions implemented by government and partners. Malnutrition is attributed as a major cause of morbidity and mortality in children under five with both long and short term effects detrimental to growth and development of children (Rahman, Howlader, Masud, & Rahman. 2016).

Stunting is a reflection of poor nutrition over a period of 2-3 years and is associated with functional consequences including poor cognition, low educational performance, low wages in adults and poor reproductive outcomes (Haile, Azage, Mola, & Rainey. 2016). These effects not only affect individuals but families, communities and even a nation. This study will establish care practices of mothers and caregivers so as to inform nutrition programming in the district. Understanding the contributors to chronic malnutrition can help reduce stunting which can increase economic productivity by 4-11% in Africa through nutrition interventions (Shekar. *et al,* 2016).

1.4. Research objective

The purpose of the study was to investigate the predictors of childhood (0-59 months) stunting in Chimanimani District in 2021

1.4.1. Research specific objectives

The study specifically sought to:

i. determine prevalence of stunting in Chimanimani district in children 0-59 months in 2022
ii. determine prevalence of LBW in stunted children 0-59 months in Chimanimani district in 2022
iii. determine predictors (care patterns water, sanitation and hygiene and infant and young child feeding patterns (WASH and IYCF pattern) by mothers/caregivers and history of illness) in stunted children (0-59 months)) in Chimanimani District in 2022

1.5. Research questions

I. What is the prevalence of stunting in Chimanimani?

II. What is the prevalence of low birth weight in stunted children 0-59 months in Chimanimani?

III. What are the predictors (caregivers' infant and young child feeding patterns, and what is the intensity, frequency and type/s of illnesses/conditions experienced by stunted children (0-59 months) in Chimanimani?

1.6. Hypothesis

H_0: There is high prevalence of stunting in children 0- 59 months in Chimanimani

H_1: There is no high prevalence of stunting in children 0-59 months in Chimanimani

1.7. Significance of the study

Study findings can be used to inform program managers on maternal and child nutrition for better programming whilst also contributing towards the body of the knowledge. Findings can also help policy makers formulate a policy on infant and young feeding covering topics on stunting, low birth weight and underweight in women especially of child bearing age.

1.8 Delimitation of the study

The study was limited to households with children (0-59 months) in Chimanimani District and study results will only be applicable to this district. The study was conducted in Chimanimani district and focused on households with children under five years of age.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter focuses on literature relevant to the study and provides the useful insight for the interpretation of findings. Several literatures relevant to the study will be reviewed to give a detailed account of stunting basing on different studies done globally, regionally and locally.

Each year worldwide, an approximated 5.9 million children die before their fifth birthday (You, Ejdemyr, Idele, Hogan, Mathers. 2015). Degrees of malnutrition are associated with increased risk of all-cause mortality and increased risk of death due to diarrhorea, pneumonia and measles (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, Rivera., & Maternal and Child Under nutrition Study Group, 2008). Chronic malnutrition is due to inadequate dietary intake or absorption of nutrients over a long period of time. It is measured through stunting which is short stature for age. It is commonly used to monitor public health and nutrition programme effectiveness (Perumal, Bassani & Roth, 2018). Prevalence ranges used to classify stunting are shown below:

Table 1: Prevalence thresholds for stunting in children below 5 years

Labels	**Prevalence (%) for stunting**
Very low	<2.5
Low	2.5- <10
Medium	10- <20
High	20- < 30
Very high	≥ 30

(WHO-UNICEF, 2018)

Prevalence thresholds are vital for communicating the severity of stunting and monitoring progress. This is the percentage of children under five whose height for

age is below more than 2 standard deviations below the median for the reference population. Percentage of stunting is a reflection of cumulative effects of undernutrition and infections before and after birth (MEASURE Evaluation, 2021). Children below 24 months have recumbent length measured while in older children it is measured by stature while standing. Zimvac (2020) shows a high national stunting prevalence of 29.4% among under-fives. This is above the acceptable global threshold of 20%. This has implications on the development of the nation as stunting is associated with impaired growth and development.

The majority of children suffering from undernutrition are the mild and moderate forms which go unnoticed and the early ages are affected more and makes the process irreversible (Bhutia, 2014). Road to health charts are plotted during growth monitoring of children under five at health clinics to track growth of the child. Child growth is recognized internationally as an important indicator of nutritional status and health in populations (MEASURE Evaluation, 2021) However, quality of clinic based growth monitoring is not up to standard in most local health facilities. It results in missed opportunities and also compromises the quality of data produced. In the country there is shortage of health care professionals so that untrained personnel can be assigned to carry out growth monitoring.

2.2. Malnutrition conceptual framework

The conceptual framework is a collection of interrelated concepts. The importance of this is to clearly show how the research ties in with already existing literature and how the research makes a contribution to the field of study.

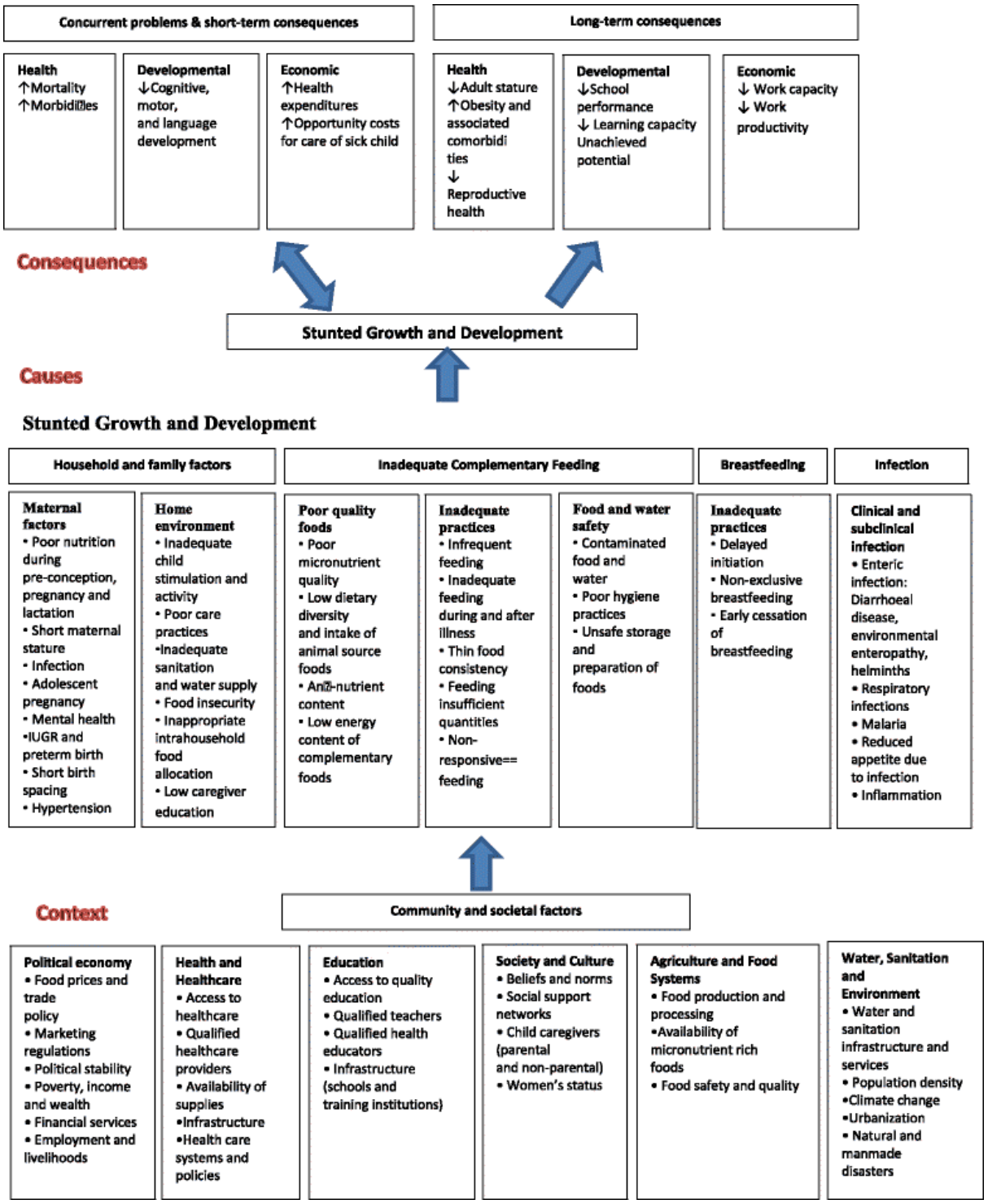

Figure 1: Conceptual framework of determinants of malnutrition (UNICEF, 2013)

A conceptual framework is a theoretical structure of assumptions, principles and rules which are used to make conceptual distinctions and organize ideas. Stunting has numerous interrelated immediate, underlying and basic causes that need to be identified in order to be addressed effectively. Causes of stunting can affect an

individual directly but others act indirectly through a longer casual pathway as shown in the figure below. This framework helps to understand the determinants of stunting.

The causality framework for malnutrition was agreed to have the following characteristics:

I. Show a hierarchy of causes of malnutrition
II. Include all categories of causes
III. Multisectoral but reducible
IV. Facilitate interdisciplinary dialogue
V. Facilitate training and mobilization (Jonsson, 1997)

Figure 2: Conceptual framework for stunting

2.3. Causes of stunting

2.3.1. Diseases

Stunted children have lower resistance to infection and are more likely to die from common childhood ailments such as diarrhoeal diseases and respiratory infections. Frequent illness saps the nutritional status of those survivors, locking them into a vicious cycle of recurring sickness and faltering growth (UNICEF, 2013). There is a vicious cycle between malnutrition and infection called “the malnutrition infection” cycle. Immunity can be suppressed by a poor nutritional status causing an increased risk and poor prognosis of infections and continued infections can lead to declining nutritional status. Stunting is the most prevalent form of malnutrition and is an indicator of children’s well-being and an accurate reflection of social inequalities (de Onis & Branca.2016).

Diarrhea and acute respiratory infections contribute significantly to high prevalence of PEM. There is synergism between diarrhea and dietary intake, a child with high energy intake can grow well even when affected by diarrhea and a child with relatively lower energy intake can also grow well if diarrhoea is prevented (Jonsson, 1997). Increased severity and frequency in poorly nourished children lead to growth impairment (Nkurunziza, *et al*. 2017). Chimanimani district has high prevalence of Malaria, HIV, acute respiratory infections and diarrhoeal diseases. Intervention studies indicate that malaria control measures are associated with improved nutritional status in children (Wilson, Bradley, Kandeh, Salami, D’Alessandro, Pinder & Lindsay. 2018). The district carries out indoor residual spraying yearly to reduce the burden of Malaria. A study by Kang, *et al*. (2013) showed the risk of stunting increasing by 0.32 for every Malaria episode.

Environmental enteric dysfunction (EED) is a generalized disturbance of small intestinal structure and function found at high prevalence in children living under poor sanitary conditions. The subclinical condition is as a result of faecal oral contamination and its clinical impact is being recognized in the context of failure of nutritional interventions and oral vaccines in low income countries (Syed, Ali & Duggan. 2017). It has been implicated to cause stunting (Owino, Ahmed, Freemark, Kelly, Loy, Manary & Loechi. 2016). Intestinal leakiness in EDD, gut inflammation, gut permeability and nutrient malabsorption contribute to growth failure.

Management therefore requires a multifaceted approach due to the multiple casual pathways and these include reduction of exposure to faeces and animals through WASH programs, breastfeeding, introduction of enteropathogen vaccines (for example rotavirus) and enhanced dietary diversity and nutrient supplementation including zinc (Owino, *et al*. 2016). Zinc is useful for sufficient growth and generally supplements with a mixture of micronutrients have been successful in preventing stunting (Penny, 2012). The ministry of health is distributing micronutrient powders to all children 6-59 months and some food products are being fortified. Again in Zimbabwe, the extended programme for immunisaton (EPI) is one of the key interventions aiming at reducing incidents of pneumonia and diarrhea which are third and fourth leading causes of mortality in children under five years of age respectively through Pneumococcal and rotavirus vaccination. Despite the efforts in prevention and therapy for childhood diarrhoea, it has not translated to a reduction in rates of childhood under nutrition in under-fives in low resourced countries (Syed*, et al*. 2017).

2.3.2. Inadequate dietary intake

2.3.2.1. Malnutrition in the life cycle

Postnatal care is important for both mother and baby after birth. Low birth weight (LBW) remains a significant public health problem in many developing countries and poor nutrition both before and during pregnancy is recognized as an important cause (Ramakrishnan, U., 2004). Poor maternal nutrition affects the foetal developmental schedule as the foetus limits its size to conserve the little energy available leading to irreversible changes and slow growth. Being mildly underweight increases the risk of death and perpetuates the problem across generations as malnourished women are more likely to have low birth weight babies as shown in the figure below.

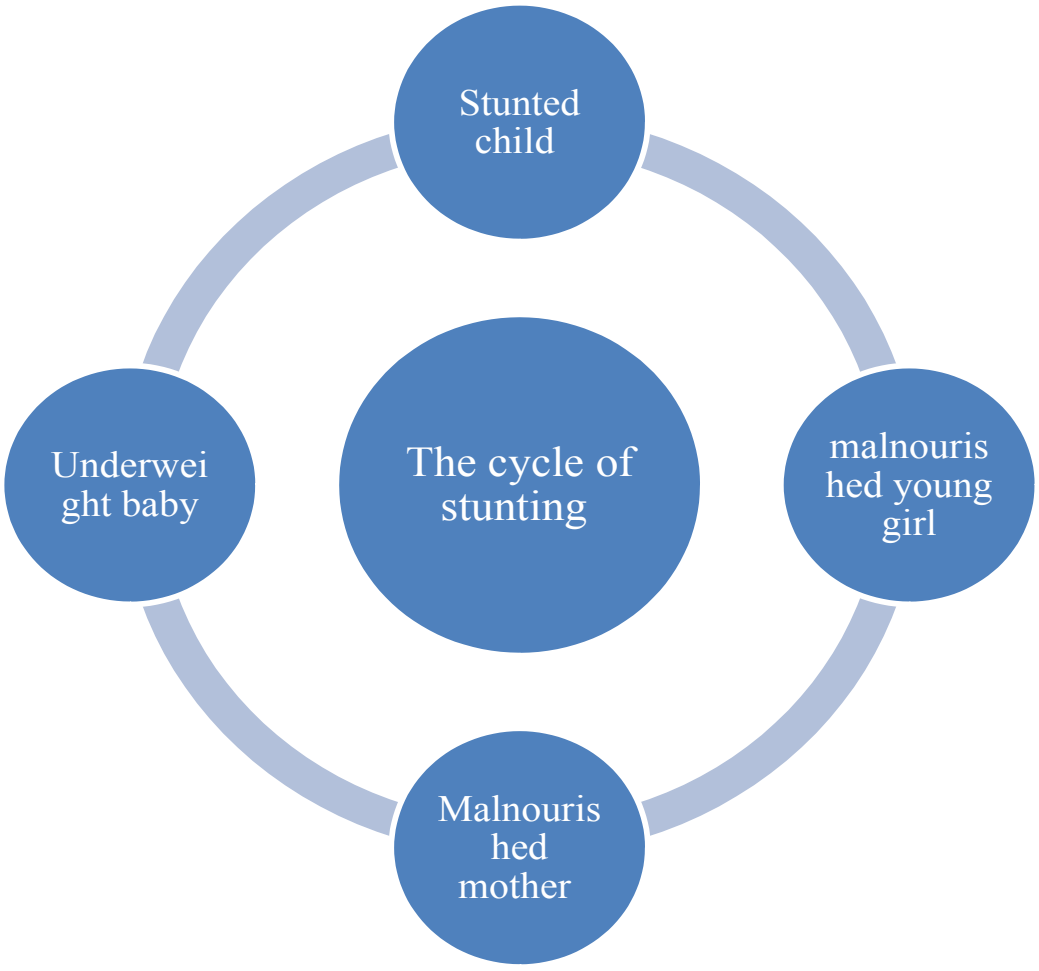

Figure 3: Vicious cycle of stunting

One of the maternal, infant and young child nutrition (MIYCN) targets in the country is to reduce children born with low birth weight from 12.6%. LBW makes babies susceptible to diseases, death and or remain undernourished (Abbas, *et al*. 2021). It manifests as a result of poor nutrition and health status of the mother during her pregnancy, her health status during her pregnancy, and her health status during adolescence and a possible premature birth of the child (WHO, UNICEF, 2005). Stunting is a strong predictor for less schooling and reduced economic productivity in adults both of which are risk factors for childhood stunting resulting in a vicious cycle (Nkurunziza, *et al*, 2017).

In order to address this problem, measures are targeted on the first 1000 days between pregnancy and a child's second birthday. It provides a window to ensure the healthy development of children. The government has placed high priority on infant and maternal health programmes to address stunting. The Ministry of Health has rolled out a number of programme initiatives for maternal and neonate health (MNH). MNH services are offered free of charge at public health facilities and these include nutrition health education, iron and folate supplementation, family planning service and reorienting traditional birth attendants. MoH is promoting Kangaroo Mother Care, the Baby Friendly Hospital Initiative and comprehensive prevention of mother to child transmission (PMTCT).

2.3.2.2. Iron and folate supplementation

Deficiencies in key vitamins and minerals mostly in women and children in low- and middle-income countries (LMICs) in pregnancy worsen due to increased energy and nutritional demands (Oh, Keats & Bhutta. 2020). Micronutrient deficiencies in vitamin A, zinc, iodine iron and folate are the most common contributors to poor growth, intellectual impairments, perinatal complications and increased risk of

morbidity and mortality (Bailey, West & Black. 2015). In order to curb these undesirable outcomes, WHO recommends iron and folate (IFA) supplementation as part of the antenatal care package. The antenatal care (ANC) protocol in Zimbabwe encourages women to have 8 ANC visits by birth and during these visits women receive supplies of IFA for free at health facilities. Not only does IFA supplementation improves iron stores and prevent anemia during pregnancy but also improves other maternal and birth outcomes. Maternal iron deficiency is associated with low birth weight. An increase in IFA intake is associated with a reduction in risk of LBW.

IFA supplementation is hindered by beliefs about when to first attend ANC and preferences for disclosing pregnancy status. The Chimanimani community is deeply rooted in the Ndau culture and it is taboo to disclose the pregnancy status. Negative attitudes, effects of oral medications and forgetfulness are also stated as reasons for poor consumption of IFA in a study by Mabuza, Waits, Nkoka & Chien (2021) in Eswatini. These reasons also resonate with the locals in the district and it may be that the mothers lack knowledge on the benefits of the supplements compared to the side effects. The Ministry of Health in the country has tasked village health workers to refer pregnant women for early booking and also for IFA supplements during devolution.

2.4 Infant and young child feeding patterns

Proper infant and young child feeding patterns are vital to tackling nutritional problems and to prevent irreversible consequences among children. How, when and what children are fed especially in the first 1000 days is important for development, health and survival (Band, Nyirenda, Mapoma & Bwalya, 2021). During the critical times of linear growth in children (6-24 months), WHO recommends implementation

of infant and young child feeding (IYCF) guidelines (WHO, 2003). IYCF patterns that contribute to stunting include suboptimal breastfeeding (specifically non-exclusive breastfeeding) and complementary feeding that is limited in quality, quantity and variety.

2.4.2. Breastfeeding

Zimbabwe is a breastfeeding nation. Breast milk is critical for combating stunting in babies born into poverty as it provides a number of benefits. Not only is it readily available, nutritious but it also strengthens their immune system. It is recommended in Zimbabwe that babies are exclusively breastfed from birth to 6 months with continued breastfeeding to 24 months as complementary feeds are introduced. Early initiation of breastfeeding that is within the first hour of birth is associated with significantly lower risk of infant mortality.

According to the Multiple Indicator Cluster Survey (MICS) 2019, 2 in 5 infants under the age of six months were being exclusively breastfed. Early initiation to breastfeeding, exclusive breastfeeding, duration of breastfeeding and vitamin A supplementation (VAS) are associated with preventing stunting and previous research indicates a relationship with stunting between supplementation to breastfeeding during the first four months (Gordon & Halileh. 2013). A modeling approach has shown that the numerous interventions to prevent childhood growth faltering such as vitamin A and zinc supplementation, complementary feeding, breastfeeding promotion and prenatal micronutrient supplementation would only reduce the global prevalence of stunting at 36 months by about a third (Syed, et al. 2017).

2.4.3. Complimentary feeding

In developing countries, poor feeding and healthcare for children is a major determinant of under nutrition (Ijarotimi, 2013). Almost half of the growth retardation occurs during the complementary feeding phase (Dewey & Huffman, 2009). The Zimbabwe National Nutrition Strategy promotes appropriate IYCF patterns that contribute to improvements in early childhood nutrition, reduce under nutrition and contribute to improved health outcomes (Food and Nutrition Council, 2014). MICS (2019), every 9 out of 10 infants between 6 and 8 months were receiving solid or semi-solid foods. Solid foods should be introduced at 6 months. As solids and semi solids foods are introduced, there may be contamination during preparation or feeding and is responsible for much diarrhoeal disease in children infants. Health education to mothers and caregivers on food preparation under hygienic conditions is critical.

While the amount of food is important, a diversified diet is equally important. The diet which is an environmental factor has a pivotal role in stunting as it should meet the nutrient requirements of the young child. Household dietary diversity score (HDDS) is a proxy for household food security, a qualitative measure of food consumption that reflects household access to a variety of foods. Suboptimal breastfeeding practices, mixed feeding and monotonous cereal-based diets have been associated with PEM. Implementation of strategies such as nutritional counselling, food supplements, agricultural programmes that increase access to nutritious foods and cash transfers are said to substantially diminish malnutrition among food insecure households through dietary improvements (Ickes, Baguma, Brahe, Myhre, Bentley, Adair & Ammerman. 2017). The district Agritex department is practicing nutrition sensitive agriculture and some partners in the district have collaborated with government departments to establish nutrition gardens. Climate induced events that

is droughts and cyclones have frustrated these efforts making the community vulnerable to food insecurity. .

2.4.4. Hygiene

Sanitation is a challenge in Zimbabwe. Water, sanitation and hygiene (WASH) are frequently implemented to reduce infectious diseases and is linked with improved nutrition outcomes in children. Exposure to faecal pathogens vis-à-vis inadequate WASH has been implicated in the aetiology of child stunting, highlighting the need to integrate WASH with nutrition sensitive interventions to comprehensively address this complex problem (Jacob Arriola, Ellis, Webb-Girard, Ogutu, McClintic, Caruso & Freeman. 2020). Chimanimani district water and sanitation coverage is currently at 33%, CRDC (2021), with the district water coverage lowly at 26%, (RWIMS, 2021). This situation has been worsened by the 2019 cyclone Idai which left a trail of destruction of WASH infrastructure. WASH is recognized as a key component of health systems and its improvement has great and sustainable impact on health.

Safe drinking-water, sanitation and hygiene are crucial to human health and well-being. Assurance of drinking water quality has been a pillar of primary prevention for more than 150 years and continues to be the foundation of the prevention and control of water borne diseases, (WHO 2012). Drinking unsafe water impairs health through water related diseases such as diarrhoea, cholera, dysentery. Untreated excreta contaminate ground water and surface water used for drinking, irrigation, bathing and household purposes creating a heavy burden of continued prevalence of diarrheal diseases. In 2020, 3358 cases of diarrhoea in adults and 2475 in children whilst 469 adults and 152 under-fives cases of dysentery were recorded in Chimanimani, (MOHCC 2020). This is an immediate contributor to malnutrition which was found to be 2.4% global acute malnutrition (Zimvac, 2020). A study by

Aguyo, *et al.* (2016) in Maharashtra table child's birth weight, feeding practices, women's nutrition status and household sanitation and poverty as significant predictors of stunting in children below 2 years.

2.5. Socio-economic causes of stunting

The most consistent factors of malnutrition either stunting or wasting in Sub-Sahara Africa (SSA) from previous studies included low mother's education, mother's age (<20 years), wealth index and low birth weight and place of residence (rural) (Akombi, Agho, Hall, Wali, Renzaho & Merom, 2017). Chimanimani is mostly rural, with few employment opportunities.

Maternal education, mothers' age at birth and water supply are associated with stunting (Age, District & Zone, 2016). Chimanimani has arrested education opportunities and teen pregnancies are a common feature. Covid-19 has further exacerbated the situation as schools have been closed for the greater part of the year Early child bearing has repercussions as it is associated with increased maternal deaths, LBW, preterm births, still births and neonatal deaths. Adolescent girls are more likely than older mothers to be malnourished and have a LBW who is more likely to become malnourished and be at greater risk of illness and death than those born of older women. In 2020, teen pregnancies accounted for 21% of the pregnancies in the district (Chimanimani NAC report, 2020). This age group may also lack sufficient care practices such as responsive feeding heightening the risk of chronic malnutrition.

Prolonged poverty can lead to chronic inadequate food intake and poor health conditions from which stunting can result. The socio economic status of the residence is linked to stunting as it is an enabler to accessing nutritious foods and health services. Zimbabwe offers health services free of charge for maternal and

child health. However, in Chimanimani some of the health facilities are not easily accessible as mothers have to travel long distances. VHWs conduct malnutrition screening and refer undernourished children to the health facility.

Low-income families tend to consume food in inadequate quantities, quality and variation (Krisnana, Pratiwi, Cahyadi. 2020). Most households in Chimanimani depend on subsistence farming to produce their food restricting quality and variety of diet. Their most common source of income is casual labour earning on average ZW$2592 (Zimvac, 2020) which was below the poverty datum line though it surpassed their household expenditure.

CHAPTER 3 METHODOLOGY

3.1. Introduction

The chapter explains the methodology of the study. The researcher summarizes the study design, study population, site, sampling procedure, sample size, data collection techniques, instruments, plan for data analysis, plan for data organization, timeline, budget and study ethics

3.2. The research design

An analytical cross-sectional study was conducted. A cross sectional study provides a snapshot of situations as they naturally occur and was the most suitable for the study which examined factors contributing to stunting in Chimanimani.

3.3 Study settings

Chimanimani District is situated in the southern part of the Zimbabwean Eastern Highlands, in the Province of Manicaland. The area of 354,800 ha is projected to have 167 303 people at an annual growth rate of 1.15% (Chimanimani MOHCC, 2021). The study site were households in Chimanimani district. There are 23 wards in total in Chimanimani district. Of these 23 wards, one is urban, one growth point, 2 estate wards and the rest are rural settlements. The study was conducted in Ngangu which is Chimanimani urban, Nhedziwa a growth point and the rest were communal wards that is Shinja, Mhakwe, Mutsvangwa and Nyanyadzi.

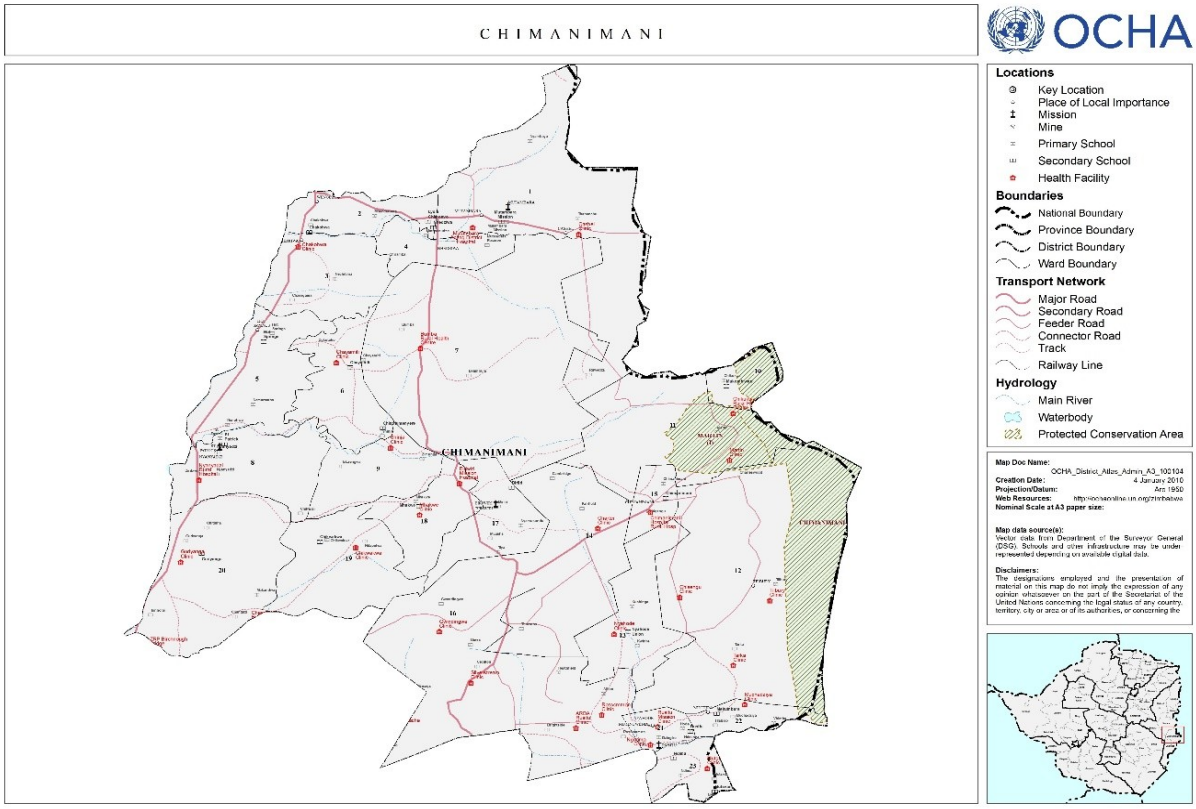

Figure 4: Map of Chimanimani District

3.4 Study population and sampling

The study population were households in Chimanimani district with children below the age of five years.

3.4.1. Inclusion criteria

The study included mothers/caregivers of children below five years who were resident in Chimanimani district and height measured for the under-fives.

3.4.2. Exclusion criteria

I. Mothers/Caregivers with disabled children were excluded due to reliability of anthropometric measurements in these children. Biomedical makers would have been appropriate but are very expensive. Households with children over 5 years were excluded from the study

3.5. Sample size

According to the 2018 National Nutrition Survey, prevalence of stunting was 35.3%.

Based on the Dobson's formula for sample size calculation

$$n = \frac{z^2 \times p(1-p)}{d^2}$$

Where N=sample size z^2= 1.96 (Statistic corresponding to level of confidence)

P= 35.3% (proportion of stunting in children less than 5 years in Chimanimani)

d^2= 0.05 (margin of error)

$$n = \frac{1.96^2 \times 0.353 . (1-0.353)}{0.05^2}$$

$$n = \frac{(3.8416 \times 0.228391)}{0.05^2}$$

n= 350.95474624

minimum sample size (n) = 351

therefore the maximum sample size was 351/0.9 = 390

A sample size of 357 respondents and 351 children below 5years was obtained.

3.5.2. Sample per cluster

The district was divided into 5 clusters according to agro ecological regions and Chimanimani urban was purposively included. A total of 179 participants were drawn from the communal areas, 103 urban area and 75 from the only growth point in Chimanimani.

3.6. Sampling procedure

The researcher employed multi cluster random sampling method. The district wards were clustered according to the agro-ecological regions. There are 5 agro ecological regions. Chimanimani urban was purposively selected as it the only urban ward in

Chimanimani district. Once the wards were stratified, villages within the strata were randomly selected. Names of villages within each strata were put in a hat and one was picked. Once the village was picked, systematic random selection of households with under-fives was done. The sampling frame was determined by dividing number of households in the village by the sample size per cluster. The village head provided the household list and the first household was randomly selected that is within the sampling interval. The next household was determined by adding the sampling interval to the first household and so on until all 59 participants were enrolled per cluster.

3.7. Data collection instruments

A structured interviewer administered questionnaire was used to collect information from the study participants. The questionnaire was sectioned to enable the researcher to obtain relevant data. The sections included demographic or individual characteristics, care patterns that is infant and young child feeding patterns and hygiene, iron and folate supplementation, household food security and socio-economic status. The various sections on the questionnaire were to help the researcher to identify if there is an association between the aspects under study and stunting. The questionnaire was translated into vernacular language for the study participants to understand the questions and give appropriate answers.

3.8 Study variables

3.8.1. Dependent variable

The dependent variable was stunting in children below the age of 5 years.

3.8.2. Independent variables

The independent variables are described in the table below

Table 2 Independent variables

Variable	Description	Code

Birth weight	Weight of the baby at birth in grams	≥ 2500g - 1 <2500g - 2
Care patterns (IYCF and WASH)	Household dietary diversity score	< 3 – Low 4 – 5 – Medium > 5 – Acceptable
	Minimum meal frequency is a proxy for a child's energy requirements by examining the number of times children received foods other than breast milk in children 6-23months	Proportion of children 6-8 months who received solid, semi-solid or soft foods for breastfed infants and 3 times for breastfed children 9-23 months and four times for non-breastfed children 6-23months.
	Minimum acceptable diet measures percentage of children 6-23 months of age who received foods from ≥4 (out of the 7) food groups during the previous day	1. ≥4 out of 7 food groups consumed in the previous day 2. <4 out of 7 food groups consumed in the previous day
	Exclusive breastfeeding infants less than 6 months who received breast milk only	1 = EBF 2 = mixed feeding
Sanitation	Type of sanitary facilities used	1= UBVIP 2= pit latrine 3= pour flash/flush system 4 = open defecation
Water	Sources of water for drinking	1 = borehole 2 = tap 3 = protected spring 4 = protected well 5 = sand abstraction 6 = surface water 7 = unprotected spring 8 = unprotected well
	Water treatment for drinking	1 = does not treat 2 = boiling 3 = use aquatablets 4 = let it settle
History of illness	Type of illness	
	Frequency	Never = 1 Rarely = 2 Often = 3 Very often = 4
	Severity	Requires hospitalization = 1 Severe = 2 Mild = 3
Level of education	Level of education of the mother/caregiver	1= no education 2 = primary education 3 = secondary education 4 = higher or tertiary education
Income	Source of income of parent/caregiver	1 = casual labour 2 = food crop production/sales 3 = formal salaries/wages 4 = remittance within 5 = remittance outside

	6 = small scale mining/ selling 7 = skilled trade/artisan

3.9 Pretesting of instruments

Alsuhaibani & Alaqeel (2020) states that data collection tools should be pretested before being used to collect data. Questionnaires were pretested at Tilbury estate. The questionnaires were administered to caregivers who were not participants of the study in order to ensure that the questions are relevant and clearly articulated. Pretesting is done so as to:

I. To refine the questionnaire.
II. To assess the question's validity'
III. To assess reliability of the collected data
IV. To check the research methods used.
V. To avoid problems in recording the data.

The pretesting was carried out with a sample of 40 respondents (10% of the maximum sample size) from Chimanimani population and their comments served to modify the final questionnaire.

3.9. Data collection procedure

A pretested interviewer administered questionnaire was used for data collection. The researcher trained 2 research assistants to administer the questionnaire so as to reduce errors. An interviewer administered questionnaire improves response rate. The households with children below five years were selected for the study and booked for an interview at a place which was convenient and confidential. Anthropometric measurements that is length or height of children under five were taken. The researchers asked permission from study participants to view their child's health card to consolidate findings from the interviews.

3.10. Data management

Completed questionnaires in Kobo were checked for completeness, errors and inconsistencies ensued by data cleaning. The cleaned questionnaires were placed under lock and key and later entered into SPSS 20 and Stata.

3.11. Analysis and organization of data

Data cleaning was done prior to data analysis having checked for completeness, verification, coding and editing. SPSS 20 and Stata were used to present descriptive statistics in graphs, charts, frequencies and percentages. Spearman's rho correlation and cross tabs were used for assessment of association, magnitude and direction of the relationship. Stepwise multiple logistic regression was performed to check for confounding. Multivariate ordered logistic regression was performed to investigate the predicted and predictor variables.

Table 3 : Data analysis plan

Variables	**Classification of variables**	**Statistical test**	**Statistical Package**
Dependent variable (stunting)	Categorical	Chi-square, Spearman's test Bivariate and Multivariate logistic regression	SPSS 20
Independent variable (Low birth weight)	Categorical	Bivariate analysis	Stata
Independent variable(Age of child)	Numerical	Bivariate/Multivariate logistic regression Cross tabs	SPSS 20 Stata
Independent variable (Month of first ANC visit)	Numerical	Bivariate/Multivariate ordered logistic regression, Cross tabs	SPSS 20 Stata
Type of residence	Categorical	Multivariate ordered logistic regression, cross tabs	SPSS 20 Stata
Treatment of drinking water	Categorical	Spearman's rho correlation, ordered logistic regression Cross tabs	SPSS 20 Stata

Main source of income	Categorical	Bivariate/Multivariate ordered logistic regression	SPSS 20 Stata
Household food security	Categorical	Cross tabs, Spearman's rho correlation. Ordered logistic regression	SPSS 20 Stata
Number of meals child had the previous day	Numerical	Cross tabs, bivariate and multivariate ordered logistics regression	SPSS 20 Stata
Breastfeeding	Categorical	Spearman's correlation, ordered logistics regression	SPSS 20 Stata

3.12. Dissemination of findings

The researcher will disseminate the information through presentations at DHE meeting. Fliers with relevant information will also be issued at clinics in Chimanmani district to mothers and caregivers of under-fives. The findings will be disseminated through reports, seminars, conferences, staff wellness programs and publication in peer reviewed journals.

3.13. Ethical consideration

Ethical guidelines are used in research involving humans. Research ethics are guidelines that safeguard against any harm and protection of human right in research. The researcher was cognizant that ethical issues such as respect, informed consent, beneficence, non-maleficence and justice should be adhered to during the study. The following section gives a summary of these ethical considerations that this research abided to.

3.13.1. Ensuring participants will be given informed consent

The researcher furnished the study participants with information describing the research process. A consent and assent form was handed out and study participants retained the right to assent and consent voluntarily without force, coercion nor

exploitation. The interviewees were required to sign voluntarily the consent form (appendices 1).

3.13.2. Ensuring confidentiality and anonymity

Identity of the study participants was protected as the completed questionnaires carried no identifying information. The completed interviews were number coded for confidentiality of data and for easier data analysis. These were kept safe under lock and key in cabinets with restricted access to the research team only. The study participants had the right to withdraw from the research and this was made explicit and verbally reiterated during the data collection process.

3.13.3. Ensuring no harm to participants

The ethical principle of non-maleficence safeguarded against harm to study participants. The researcher was mindful that the interview could bring up past painful experiences as the researcher dealt with health related issues. Thus the researcher regularly monitored stress levels by asking now and then participants if they were comfortable with the interview and where necessary recourse to counselling.

3.13.4 Ensuring that permission is obtained

Official channels were aware of the study as formal permission was sought from them. For this study, permission to carry out the study was sought from Chimanimani DMO, and Africa University Faculty of Health Sciences and the Africa University Research Ethics Committee.

3.14. Summary

The chapter gives a summary of the study methodology that was utilized in determining the causes of malnutrition in Chimanimani.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

In this chapter, the researcher presents the results of the study. Descriptive statistics on socio-demographic characteristics of the study participants will be presented. The researcher also presents the results of analytical statistics done in form of tables and graphs. Results will also be interpreted to give meaning to the outcomes of the statistical analyses.

4.2 Data analysis and presentation

4.2.1 Household socio-demographic and socio-economic characteristics

A total of 357 participants were recruited for the study. These were mostly females 99.2% (n=354) and only 0.8% (n=3) were males. Majority of the households are headed by males 86.8% (n=310) and 13.2% (n=47) are female headed. Table 4 gives a summary of the household socio-demographic characteristics of the study participants. Age range of respondents was from 15 to 48 years and the median age was 25 years. Responses on marital status ranged from never been married 3.6% (13), widowed 2.2% (n=8), divorced 4.2% (n=15) and married 89.9% (n=321) which was the great proportion.

A total of 256 of the household heads were employed and only 101 were not. Income sources varied among participants. Casual labour (34.2%) was the most common amongst respondents followed by formal employment, crop farming and petty/informal trading 22.4%, 20.7% and 13.8% respectively. Other sources were remittances (1.7%), self-employment (2.4%), fishing, welding, craft making and timbre selling each 0.6%.

Participants were of diverging religious beliefs. A total of 51.6% belonged to orthodox churches, 39.1% to the apostolic sects, 8.7% to Pentecostals and 0.6%

reported to be non-religious. A total of 50.1% respondents reside in the communal areas, 28.9% urban and 21% from the only growth point in Chimanimani. Monthly income ranged from US$5 to US$1200 among households and the modal incomes were US$20 and US$50.

Table 4: Household socio-demographic and economic characteristics

Demographic characteristic N = (357)		**n = (%)**
Sex of respondent	Female	354 (99.2)
	Male	3 (0.8)
Sex of household head	Female	47 (13.2)
	Male	310 (86.8)
Marital status	Never been married	13 (3.6)
	Widowed	8 (2.2)
	Divorced	15 (4.2)
	Married	321 (89.9)
Formal employment status	Yes	256 (71.7)
	No	101 (28.3)
Main source of income	Casual labour	122 (34.2)
	Formal employment	80 (22.4)
	Crop farming	74 (20.7)
	Petty/informal trade	49 (13.8)
	Other	32 (8.9)
Religious beliefs	Orthodox	184 (51.6)
	Apostolic sect	140 (39.1)
	Pentecostal	31 (8.7)
	Non-religious	2 (0.6)
Type of residence	Communal	179 (50.1)
	Urban	103 (28.9)
	Growth point	75 (21.0)

The respondents were of differing educational levels. A proportion of 2.8% (n=10) had never been to school, while 26.6% (n=95) had a primary education. A further

64.1% (n=229) ended at secondary level and only 6.4% (n=23) had obtained a tertiary education. The figure below shows the levels of education of respondents.

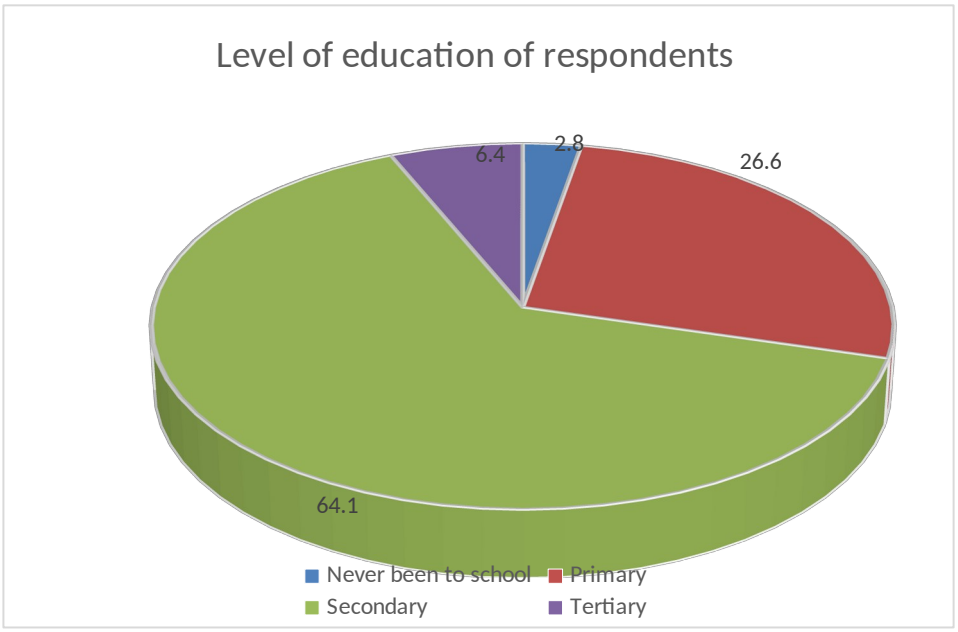

Figure 5: Level of education of respondents

4.2.3 Prevalence of stunting in Chimanimani

Although 357 households were interviewed, only 351 children were available for height/length measurement. The incidence of stunting was found to be 25.1% (n= 88). Stunting was more common among females (53.8%) compared to males (46.2%) among stunted children. The figure below illustrates prevalence of stunting by gender.

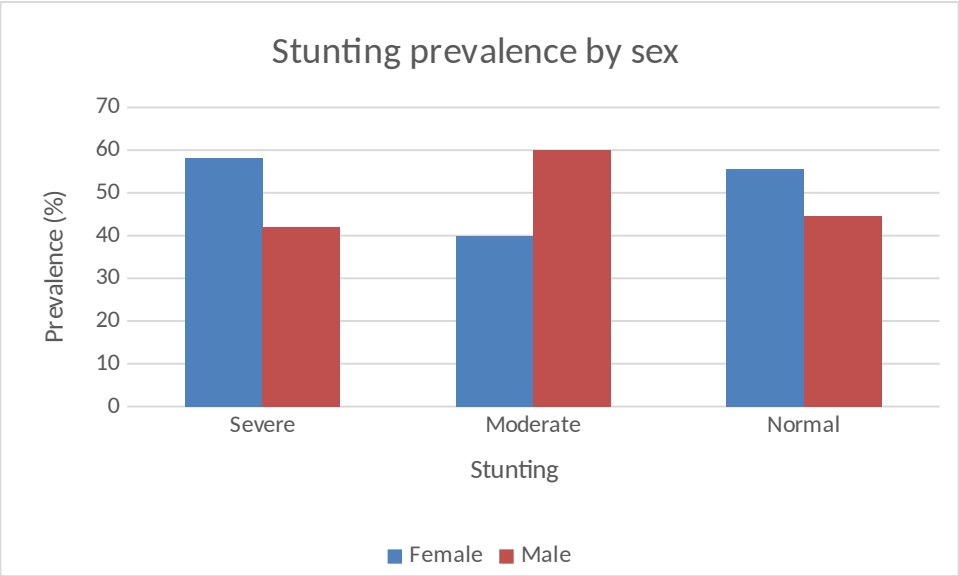

Figure 6: Stunting prevalence by sex

However, stunting within gender was common amongst boys as 72.2% (n=117) was normal against 77.2% (n=146) in girls. Table below illustrates prevalence of stunting within sex.

Table 5: Prevalence of stunting within sex

	Sex	
Stunting	Female (%)	Male (%)
Moderate	18 (9.5)	27 (16.7)
Severe	25 (13.2)	18 (11.1)
Normal	146 (77.2)	117 (72.2)

Stunting was classified according to WHO guidelines using the child health card and characterized as normal, moderate and severe stunting. Normal children were those whose height for age was ≥-2 mean standard deviation on the child health card, moderate stunting was between -2 and -3 mean standard deviations while severe stunting was ≤-3 mean standard deviation. The below table displays stunting in under-fives by sex.

4.2.4 Prevalence of low birth weight in stunted children

Of the 357 participants, prevalence of low birth weight was 6.5% (n=23). One child had no birth card hence birth weight could not established. The figure below is of

birth weights of under-fives in the study. Normal birth weight was birth weight from 2500grames and those below 2500grammes had a low birth weight.

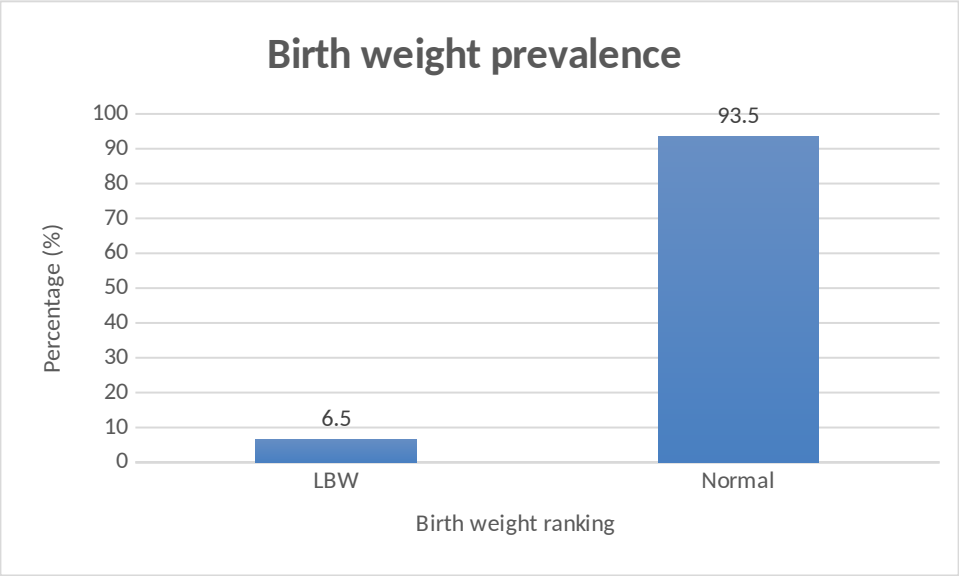

Figure 7: Prevalence of low birth weight

Cross tabs were done to further explore proportions within LBW and stunting as shown below.

Table 6: Cross tabulations of LBW and stunting

			Cases and Controls		
			Normal	Stunted	Total
Birth Weight Ranking	LBW	Count	17	6	23
		Expected Count	17.2	5.8	23.0
		% within Birth Weight Ranking	73.9%	26.1%	100.0%
		% within stunting	6.5%	6.8%	6.6%
	normal	Count	246	82	328
		Expected Count	245.8	82.2	328.0
		% within Birth Weight Ranking	75.0%	25.0%	100.0%
		% within stunting	93.5%	93.2%	93.4%
Total		Count	263	88	351

	Expected Count	263.0	88.0	351.0
	% within Birth Weight Ranking	74.9%	25.1%	100.0%
	% within stunting	100.0%	100.0%	100.0%

From Table 6, proportion of stunting and normal within those of LBW were almost the same 6.8% in those who are normal and 6.5% in those who are stunted. In those who are of normal birth weight 93.5% are normal and 93.2% of those who are stunted were of normal birth weight.

Table 7: Chi-square of LBW

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.014[a]	1	.007
N of Valid Cases	351		

From the Chi-square test, there is an association between birth weight and stunting as shown by the p-value = 0.007 < 0.05 (2-sided).

4.2.5 Predictors of stunting

Data was tested for normality using the Shapiro-Wilk normality test. The Shapiro-Wilk normality test for predictor variables for stunting, as seen from the table below are all p-values (Prob>z) are less than 0.05 hence significant. This therefore means all the variables in the table 9 below were not normally distributed hence the researcher adopted non- parametric tests to explore the relationships between the variables.

Table 7: Shapiro normality test

	Shapiro-Wilk		
	Statistic	df	Sig.
Stunting	.678	351	.000

Age of Child	.943	351	.000
Month of ANC visits during pregnancy	.907	351	.000
Times child eat solid, semi-solid and soft foods yesterday during the day and night	.883	351	.000
Type of Residence	.735	351	.000
Main source of income	.882	351	.000
Treatment of Drinking Water	.458	351	.000
household food secure over 12month period	.630	351	.000
Child still being breastfed	.635	99	.000

On bivariate analysis using Spearman's rho correlation, age of child, month of ANC visits, type of residence, main source of income, household food security, number of times child ate solid, semi-solid foods yesterday, treatment of drinking water were associated with stunting. For those below 24 months, whether the child was still breastfeeding was also associated with stunting. Table 10 illustrates association of stunting and the above variables.

Table 8: Bivariate analysis of stunting

Variables	**Rho correlation cofficient**	**p-value sig (2-tailed)**	**n**
Age of child	-.123	.021*	351
Month of first ANC visit during pregnancy	-.105	0049*	351
Type of residence	-.196	.002*	351
Household main source of income	.110	.039*	351
Household food security	-.136	.011*	351
Treatment of drinking water	.110	.039*	351
Number of meals child had the previous day	-.122	.023*	351
Breastfeeding	.125	.125	218

* indicates significance at 0.05

4.2.5.1 Associating stunting and age of child

The rho Pearson correlation coefficient is significant at 0.05 (2-tailed) from table 9. Stunting had a small to moderate negative relationship with age of child (correlation

coefficient -0.123, p-value = 0.021<0.05). This means that age of child was statistically significant at 0.05 level.

In order to confirm predictors of stunting, further investigations using cross tabs to establish different proportions within age was done as below in Table 11. Amongst stunted children, the 12-23 months age group had a large proportion 44.4% of moderately stunted children and in severe stunting the age groups 24-59 months and below 6 months had the highest proportions 32.6% and 27.9% respectively from cross tabs. The table below illustrates these findings.

Table 9: Cross tabulation of stunting by age group

Stunting		Child Age Group				Total
		Below 6 Months	6-12 Months	12-23 Months	24-59 Months	
Moderate	Count	4	3	20	18	45
	Expected Count	7.3	7.4	12.7	17.6	45.0
	% within Stunting	8.9%	6.7%	44.4%	40.0%	100.0%
	% within Child Age Group	7.0%	5.2%	20.2%	13.1%	12.8%
	% of Total	1.1%	0.9%	5.7%	5.1%	12.8%
Normal	Count	41	48	69	105	263
	Expected Count	42.7	43.5	74.2	102.7	263.0
	% within Stunting	15.6%	18.3%	26.2%	39.9%	100.0%
	% within Child Age Group	71.9%	82.8%	69.7%	76.6%	74.9%
	% of Total	11.7%	13.7%	19.7%	29.9%	74.9%

severe	Count	12	7	10	14	43
	Expected Count	7.0	7.1	12.1	16.8	43.0
	% within Stunting	27.9%	16.3%	23.3%	32.6%	100.0%
	% within Child Age Group	21.1%	12.1%	10.1%	10.2%	12.3%
	% of Total	3.4%	2.0%	2.8%	4.0%	12.3%
Total	Count	57	58	99	137	351
	Expected Count	57.0	58.0	99.0	137.0	351.0
	% within Stunting	16.2%	16.5%	28.2%	39.0%	100.0%
	% within Child Age Group	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	16.2%	16.5%	28.2%	39.0%	100.0%

4.2.5.2 Relating ANC visits and stunting

Month of first ANC visit and stunting had a small to moderate significant negative relationship as seen by correlation coefficient -0.105, p-value =0.049<0.05 as shown in table 9. This means that the month of first ANC visit during pregnancy had a small to moderate negative influence on stunting. Figure illustrates prevalence within stunting against ANC visits during pregnancy. Generally there was an increase in stunting as the month of first of ANC increased.

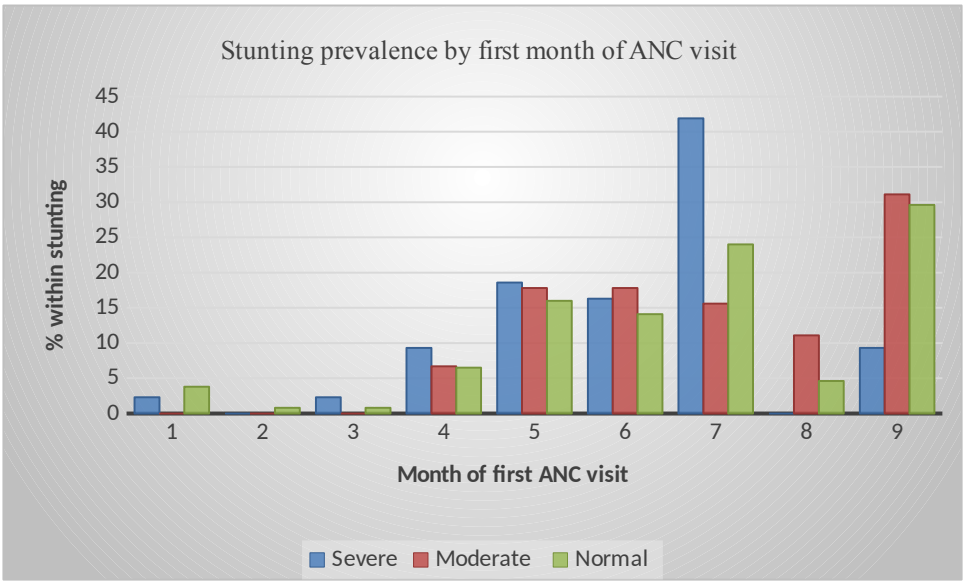

Figure 8: Prevalence within stunting by first month of ANC visit

4.2.6.3 Type of residence

There was a small to moderate significant negative relationship between area of residence and stunting. This was shown by a correlation coefficient -0.196 at 95% confidence interval. The p-value=0.002<0.01 shows that the type of residence is statistically significant 95% confidence level.

Type of residence was classified as urban, growth point, communal and timber estate. The cross tabulation below shows that 7.9% of moderately stunted children from communal areas, 20.5% from the growth point and 15.8% from Chimanimani

urban. In severe stunting, 18.1% were from communal areas, 6.8% from the growth point and 5.9% from urban. This shows that the greater proportion of stunted children are from the communal areas.

Table 10: Cross tabulation of stunting by type of residence

Stunting		Type of Residence			Total
		Communal	Growth point	Urban	
Moderate	Count	14	15	16	45
	Expected Count	22.7	9.4	12.9	45.0
	% within Stunting	31.1%	33.3%	35.6%	100.0%
	% within Type of Residence	7.9%	20.5%	15.8%	12.8%
	% of Total	4.0%	4.3%	4.6%	12.8%
Normal	Count	131	53	79	263
	Expected Count	132.6	54.7	75.7	263.0
	% within Stunting	49.8%	20.2%	30.0%	100.0%
	% within Type of Residence	74.0%	72.6%	78.2%	74.9%
	% of Total	37.3%	15.1%	22.5%	74.9%
severe	Count	32	5	6	43
	Expected Count	21.7	8.9	12.4	43.0
	% within Stunting	74.4%	11.6%	14.0%	100.0%
	% within Type of Residence	18.1%	6.8%	5.9%	12.3%
	% of Total	9.1%	1.4%	1.7%	12.3%
Total	Count	177	73	101	351
	Expected Count	177.0	73.0	101.0	351.0

	% within Stunting	50.4%	20.8%	28.8%	100.0%
	% within Type of Residence	100.0%	100.0%	100.0%	100.0%
	% of Total	50.4%	20.8%	28.8%	100.0%

4.2.5.4 Household income

The Rho Pearson correlation coefficient was significant at 0.05 level. Household main source of income and stunting had a small to moderate positive relationship (r_s = 0.110, p-value= 0.039<0.05). This means that household main source of income had an effect on stunting.

Using table 14, those involved in casual labour accounted for 44.4% (n=20) moderately stunted and 33.1% (n=87) as normal. This was the most common source of income among respondents. For those severely stunted, the prevalent source of income was crop farming 32.6% (n=14). The following cross tabs show these proportions.

Table 11: Stunting by main source of income

	Main source of income						Total
	Artisinal mining	Casual labour	Crop farming	Formal employment	Other	Petty/ informal trading	
Count	3	20	6	11	3	2	45
Expected Count	1.3	14.9	9.5	10.0	3.5	5.9	45.0
% within Stunting	6.7%	44.4%	13.3%	24.4%	6.7%	4.4%	100.0%
% within Main source of income	30.0%	17.2%	8.1%	14.1%	11.1%	4.3%	12.8%
% of Total	0.9%	5.7%	1.7%	3.1%	0.9%	0.6%	12.8%
Count	5	87	54	59	23	35	263
Expected Count	7.5	86.9	55.4	58.4	20.2	34.5	263.0
% within Stunting	1.9%	33.1%	20.5%	22.4%	8.7%	13.3%	100.0%
% within Main source of income	50.0%	75.0%	73.0%	75.6%	85.2%	76.1%	74.9%
% of Total	1.4%	24.8%	15.4%	16.8%	6.6%	10.0%	74.9%
Count	2	9	14	8	1	9	43
Expected Count	1.2	14.2	9.1	9.6	3.3	5.6	43.0
% within Stunting	4.7%	20.9%	32.6%	18.6%	2.3%	20.9%	100.0%
% within Main source of income	20.0%	7.8%	18.9%	10.3%	3.7%	19.6%	12.3%
% of Total	0.6%	2.6%	4.0%	2.3%	0.3%	2.6%	12.3%
Count	10	116	74	78	27	46	351
Expected Count	10.0	116.0	74.0	78.0	27.0	46.0	351.0
% within Stunting	2.8%	33.0%	21.1%	22.2%	7.7%	13.1%	100.0%
% within Main source of income	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
% of Total	2.8%	33.0%	21.1%	22.2%	7.7%	13.1%	100.0%

4.2.5.5 Household food security

The Rho Pearson Correlation coefficient between household food security and stunting was -0.136 at 0.05 level (2-tail). There was a small to moderate significant negative relationship between household food security and stunting as shown by p-value = 0.011<0.05. This means that household food security is statistically significant. A total 56.7% (n=152) reported to be food secure over the last months compared to 43.3% (119) who were not.

4.2.5.6 Treatment of drinking water

There was a small to moderate positive relationship between treating drinking water and stunting. The correction between treating drinking water and stunting was significant at 0.05 level (2-tailed). An $r_s = 0.110$ and p value=0.039<0.05 show that treating drinking water is statistically significant. A proportion of 82.6% did not treat their drinking water while 17.4% treated their drinking water.

Within those moderately stunted from Table 15, 13.4% treat their water and 9.8% do not as illustrated in the cross tabulation below. In the severely stunted category, 8.5% do not treat their drinking water against 3.7% who drink treated water.

12: Treatment of drinking water by stunting

Stunting		Treatment of Drinking Water		
		No	Yes	Total
Moderate	Count	39	6	45
	Expected Count	37.2	7.8	45.0
	% within Stunting	86.7%	13.3%	100.0%
	% within Treatment of Drinking Water	13.4%	9.8%	12.8%
	% of Total	11.1%	1.7%	12.8%
Normal	Count	221	42	263
	Expected Count	217.3	45.7	263.0
	% within Stunting	84.0%	16.0%	100.0%
	% within Treatment of Drinking Water	76.2%	68.9%	74.9%
	% of Total	63.0%	12.0%	74.9%
severe	Count	30	13	43
	Expected Count	35.5	7.5	43.0
	% within Stunting	69.8%	30.2%	100.0%
	% within Treatment of Drinking Water	10.3%	21.3%	12.3%
	% of Total	8.5%	3.7%	12.3%
Total	Count	290	61	351
	Expected Count	290.0	61.0	351.0
	% within Stunting	82.6%	17.4%	100.0%
	% within Treatment of Drinking Water	100.0%	100.0%	100.0%
	% of Total	82.6%	17.4%	100.0%

4.2.5.7 Minimum meal frequency

The Rho Spearman's coefficient was significant at 0.05% (2-tailed). The correlation coefficient between number of times a child ate solid/semi-solid and soft foods the previous day during day and night and stunting was -0.122. This means that there is a small to moderate significant negative relationship between stunting and number of times the child ate in the previous day (p-value=0.023<0.05). To compute MMF, children were categorized as breasting and not breastfeeding. The table below shows age appropriate MMF in the study.

Table 13: Age appropriate MMF by breastfeeding

			Times child eat solid, semi-solid and soft foods yesterday during the day and night									Total
Child Age Group			.0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	
Below 6 Months	Child still being breastfed	No	0	0	0	0	0	0				0
		Yes	41	1	15	1	1	2				61
	Total		41	1	15	1	1	2				61
6-11 Months	Child still being breastfed	No	0	0	0	0	0	1		0	1	2
		Yes	10	2	10	22	10	0		2	0	56
	Total		10	2	10	22	10	1		2	1	58
12-23 Months	Child still being breastfed	No	4	4	7	18	17	4	2			56
		Yes	9	2	6	16	9	1	0			43
	Total		13	6	13	34	26	5	2			99
24-59 Months	Child still being breastfed	No	13	3	14	36	16	5	1			88
		Yes	9	2	8	24	7	1	0			51
	Total		22	5	22	60	23	6	1			139
Total		No	18	9	32	70	43	11	4	0	2	189

	Child still being breastfed	Yes	36	5	34	64	23	4	0	2	0	168
	Total		54	14	66	134	66	15	4	2	2	357

From table 16, 32.8% (n=20) of those under 6months are not practicing EBF. For age appropriate MMF in the 6-8 months age group 78.5% (n=46) for those who were still breastfeeding and 100% for not breastfeeding had the acceptable MMF. 39.5% of those still breastfeeding in the 12-23months met the MMF while 60.5% did not.

4.2.5.8 Breastfeeding

There was a small to moderate significant positive relationship between a child below 24 months still breastfeeding and stunting. In Zimbabwe, the MoHCC recommends that children be breastfed until 24 months. A $r_s = 0.125$ at 0.05 (2-tailed) was significant. It means that breastfeeding has a positive effect on stunting in children below 24months (p-value=0.023 < 0.05). A total of 218 children were below 24 months and of these 73.4% were still being breastfed while 26.6% had been weaned off from table 16.

4.2.5.9 Multivariate analysis

4.2.5.9.1 Stepwise multiple regression for testing confounding variables

The stepwise multiple regression test was performed to test for confounders. Table 17 displays the results of the stepwise regression analysis.

The variable inflation factor (VIF) for all variables in the collinearity test is less than 5 hence there is no collinearity. In other words, the percentage difference of the B coefficients remains less than 10% with the addition of each variable to the regression equation hence there are no confounding variables.

Table 14: Stepwise logistic regression

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.162	.075		28.677	.000	2.013	2.310		
	Child Age Group	-.058	.024	-.126	-2.372	.018	-.106	-.010	1.000	1.000
2	(Constant)	2.315	.106		21.751	.000	2.106	2.525		
	Child Age Group	-.057	.024	-.125	-2.371	.018	-.105	-.010	1.000	1.000
	Number of ANC visits during pregnancy	-.027	.013	-.108	-2.037	.042	-.054	-.001	1.000	1.000
3	(Constant)	2.429	.111		21.814	.000	2.210	2.648		
	Child Age Group	-.051	.024	-.112	-2.134	.034	-.098	-.004	.993	1.007
	Number of ANC visits during pregnancy	-.020	.013	-.081	-1.521	.129	-.047	.006	.973	1.028
	Type of Residence	-.096	.031	-.165	-3.103	.002	-.156	-.035	.966	1.035
4	(Constant)	2.288	.127		18.061	.000	2.039	2.538		
	Child Age Group	-.051	.024	-.111	-2.134	.034	-.098	-.004	.993	1.007
	Number of ANC visits during pregnancy	-.020	.013	-.077	-1.463	.144	-.046	.007	.972	1.029
	Type of Residence	-.100	.031	-.172	-3.244	.001	-.160	-.039	.963	1.038

	Main source of income	.042	.018	.119	2.281	.023	.006	.078	.997	1.004
5	(Constant)	2.136	.152		14.086	.000	1.838	2.434		
	Child Age Group	-.048	.024	-.106	-2.034	.043	-.095	-.002	.990	1.010
	Number of ANC visits during pregnancy	-.020	.013	-.079	-1.513	.131	-.046	.006	.971	1.030
	Type of Residence	-.097	.031	-.167	-3.159	.002	-.157	-.037	.961	1.041
	Main source of income	.041	.018	.116	2.247	.025	.005	.077	.996	1.004
	Treatment of Drinking Water	.125	.069	.094	1.818	.070	-.010	.260	.993	1.007
6	(Constant)	2.216	.161		13.807	.000	1.900	2.532		
	Child Age Group	-.045	.024	-.098	-1.883	.061	-.092	.002	.981	1.020
	Number of ANC visits during pregnancy	-.018	.013	-.072	-1.369	.172	-.044	.008	.963	1.039
	Type of Residence	-.085	.032	-.146	-2.693	.007	-.147	-.023	.902	1.109
	Main source of income	.041	.018	.115	2.225	.027	.005	.077	.996	1.004
	Treatment of Drinking Water	.132	.069	.100	1.925	.055	-.003	.267	.988	1.012
	HH food secure over 12mth period	-.082	.055	-.082	-1.504	.133	-.190	.025	.908	1.102
7	(Constant)	2.264	.163		13.894	.000	1.944	2.585		
	Child Age Group	-.047	.024	-.102	-1.966	.050	-.094	.000	.978	1.022

	Number of ANC visits during pregnancy	-.019	.013	-.076	-1.449	.148	-.045	.007	.961	1.041
	Type of Residence	-.076	.032	-.130	-2.358	.019	-.139	-.013	.871	1.149
	Main source of income	.040	.018	.114	2.204	.028	.004	.076	.995	1.005
	Treatment of Drinking Water	.132	.068	.100	1.927	.055	-.003	.267	.988	1.012
	HH food secure over 12month period	-.069	.055	-.069	-1.256	.210	-.178	.039	.888	1.126
	Times chd eat solid, semi solid and soft foods yesterday during the day n night	-.027	.017	-.085	-1.594	.112	-.061	.006	.929	1.077
8	(Constant)	2.148	.185		11.589	.000	1.783	2.513		
	Child Age Group	-.040	.024	-.088	-1.657	.098	-.088	.008	.937	1.067
	Number of ANC visits during pregnancy	-.021	.013	-.084	-1.581	.115	-.047	.005	.950	1.053
	Type of Residence	-.074	.032	-.128	-2.314	.021	-.137	-.011	.870	1.150
	Main source of income	.039	.018	.110	2.135	.033	.003	.075	.993	1.007
	Treatment of Drinking Water	.125	.069	.094	1.814	.071	-.010	.260	.981	1.019
	HH food secure over 12month period	-.068	.055	-.068	-1.239	.216	-.177	.040	.888	1.126
	Times chd eat solid, semi-solid and soft foods yesterday during the day and night	-.023	.017	-.072	-1.317	.189	-.057	.011	.895	1.117

Child still being breastfed	.071	.055	.071	1.311	.191	-.036	.179	.897	1.114

a. Dependent Variable: Stunting

Table 15: Ordered logistic regression

Stunting	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
CN_Child	-.013	.008	-1.62	.104	-.029	.003	
MH_ANC	-.091	.062	-1.48	.138	-.212	.029	
Residenc	-.298	.151	-1.97	.049	-.594	-.001	**
Income_S	.159	.085	1.88	.06	-.006	.325	*
WASH_Wa0	.595	.321	1.86	.063	-.033	1.223	*
HFS_Food	-.497	.263	-1.89	.059	-1.013	.019	*
CF_Solid	-.075	.08	-0.94	.35	-.232	.082	
BF_Still	.351	.255	1.37	.169	-.149	.85	
Constant	-2.679	.84	.b	.b	-4.326	-1.032	
Constant	1.443	.825	.b	.b	-.173	3.059	
Constant	3.756	.907	.b	.b	1.979	5.533	

Mean dependent var	2.028	SD dependent var	0.560
Pseudo r-squared	0.055	Number of obs	357
Chi-square	31.853	Prob > chi2	0.000
Akaike crit. (AIC)	568.334	Bayesian crit. (BIC)	610.989

*** p<.01, ** p<.05, * p<.1

4.2.5.9.2 Ordered logistic regression

Bivariate analysis identified significant associations of predictors of stunting. Further analysis using Multivariate ordered logistics regression was performed to confirm the predictors of stunting among the significant variables. Table 18 below illustrates the ordered regression analysis.

Key

CN_Child : Age of Child
MH_ANC : Month of first ANC visit during pregnancy
Residenc : Type of Residence
Income_S : Main source of income
WASH_Wa0 : Treatment of Drinking Water
HFS_Food : Household food security over 12month period
CF_Solid : Times child eat solid, semi-solid and soft foods yesterday during the day and night
BF_Still : Child still being breastfed

The table reports the results of the Ordered Logistic Regression Model for stunting and its predictor variables; the annotation *** indicates results significant at 0.01%, **, at 0.05% and * at 0.10% levels of significance. Table 4.3 shows results of the overall significance of the model Prob > chi2 =0.044, suggesting that the eight variables that is age of child, month of first ANC visit, type of residence, household main source of income, household food security, treatment of drinking water, number of times child ate solid/semi-solid and foods and breastfeeding for children under 24 months together impact on stunting and account for about 5.5% (R^2 =0.055) of the variation in stunting.

From the model, type of residence has a significant negative relationship with stunting (β = -0.298, p =-1.97). This means that for every one unit increase in type of residence there is a 0.298 decrease in the log odds of being in a higher level of stunting given all variables in the model are held constant. In other words, type of residence has a significant independent association with stunting.

4.3 Chapter summary

The study showed that the prevalence of stunting in Chimanimani district in under-fives in 2022 was 25.1%. Type of residence was the independent variable of stunting in Chimanimani. Stunting was associated with treating drinking water and breastfeeding in children below 24months. Prevalence of low birth weight was at 6.5%.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the researcher gives a summary of the study process and findings and discussing whether study objectives were met by the study findings while giving any conclusions on the hypothesized phenomena. The researcher will go on to give recommendations to relevant authorities to address stunting in Chimanimani and also suggest areas of further study whilst at it.

5.2 Discussion

5.2.1 Prevalence of stunting

The prevalence of stunting in the study was anticipated though lower than expected. Stunting was at 25.1% which is high as it surpasses the 20% acceptable threshold. However, according to NNS from 2014 and 2018, the prevalence is above 30% which is very high. This could have been due to population growth and change in time so that the trend has changed.

In stunted under-fives, more females (53.8%) were stunted compared to males (46.2%). This may be because there were more girls (189) in the study compared to boys (162). On the other hand, stunting within gender was prevalent in males than in girls. This is synonymous with other studies such as the one done by Wamani, Astrom, Peterson, Tumwine & Tylleskar (2007) in Sub Saharan Africa and also a study by Bukusuba in South West Uganda. They obtained similar results for stunting by sex. Epidemiological evidence depicts boys to be biologically more vulnerable to morbidity.

5.2.2 Prevalence of low birth

The study found the prevalence of low birth weight to be 6.1%. There was no association between birth weight and stunting. This was contradictory to a study by

Aryastami et al Indonesia (2017) where low birth weight was the most dominant predictor associated with stunting. This was not the case in this study. This is may be because in the difference in the study population. Aryastrami et al (2017) included children aged 12-23 months unlike in this study where all children below five years were included.

Moreover, there are chances of remedying stunting in children before 2years. It is associated with external factors such as feeding practices, socioeconomic status and illness. This could be the reason why LBW had no effect on stunting as mothers and caregivers could have practiced the recommended IYCF practices.

5.2.3.1 Association of stunting and age of child

Stunting was prevalent in the age groups less than six months (21.1%) and in the 12-23 months (20.2%) age group. This may be attributed to feeding practices. In the less than 6months, it might have been due to mixed feeding. It is recommended to practice EBF for the first six months after birth. EBF is important for maintaining optimal growth (WHO, 2019). These findings are synonymous with findings by Mzumara, Bwembya, Halwiindi, Mugode, & Banda (2018) in Zambia and by Mulu & Mengistie (2017) in western Ethiopia. The age group 12-23 might have been as a result of early weaning. In the study breastfeeding for those under 2years had an effect on stunting. Between this age group, mother's breast milk is said to be contributing about 33% of the nutritional requirements of the child.

5.2.3.2 ANC visits

Month of first ANC visit had an effect on stunting. This determined the number of ANC visits by the pregnant mother. Similarly, a study in southern Ethiopia found number of ANC visits to be inversely related to stunting in the child (Yimer, 2000). This may be attributed to health education which mothers receive during the visits.

Moreover, stunting is also affected with maternal factors due to the malnutrition cycle. A malnourished mother may also result in growth restriction and development during pregnancy. During ANC visits mothers are screened for malnutrition. This may be one of the reasons why ANC visits are associated with stunting.

5.2.3.3 Type of residence

The study found that there is an association between type of residence and stunting. These were categorised as urban, growth point and rural. This was the significant variable. Results are relatable to a study in Bangladesh by Mistry, Hossain. Khanam. Akter, Parvez, Yunus, Afsana & Rahman (2018) where children from different divisions had differing odds of stunting. Children from urban slums were at higher risk of stunting than those from the rural areas. This is in contrast to this study where a greater proportion of stunted children were from the rural areas. The reason for this may be due to composition of the study population as most respondents were from the communal areas.

Moreover, type of residence may have been the most significant predictor of stunting as it can be linked to socioeconomic factors. The type of residence determined access to health services and health information, WASH facilities and type of housing which has a bearing on respiratory diseases. Exposure to infection such as diarrhoea which occurrence is WASH related and respiratory diseases has been associated with stunting in a study by Mistry *et al* (2018).

5.2.3.4 Household main source of income

Household main source of income was linked to stunting. This may be due to its effect on incomes obtained by the households. In this study, household income had no association with stunting. This can be attributed to consistent income for those formally employed so that they can afford to buy varied nutritious foods affecting

feeding practices. Some sources are seasonal for example crop farming and artisanal gold mining. As a result household income is affected.

5.2.3.5 Household food security

Household food security determines access, availability and utility of food. It had an association in the study with stunting. Food insecurity affects nutritional status (stunting) negatively by limiting quality and quantity of dietary intake. Studies have shown contradicting results on this matter. A study in Ethiopia showed association between food insecurity and underweight but not with stunting and wasting (Mulu & Mengistie, 2017). Naser *et al*, (2014) also found an association between food insecurity and underweight, stunting and wasting.

Household hunger scale was assessed but was not associated with stunting. However, it had an association with food security. This affected household availability of food. Those in urban area do not practice much farming for consumption except kitchen gardens. This could also have affected their food security as they have to buy their food and prices have been on the increase.

5.4.3.6 Treatment of drinking water

There was a positive association between stunting and treatment of drinking water. a study in Ethiopia by Haidar, Kogi-Makau &Sorensen (2005) established strong links between stunting and land ownership and water quality. The former was not assessed in this study. This is because water quality helps reduce diarrhoeal incidences which has been established as a predictor of child nutrition. Diarrhoea affects nutrients absorption thus affecting nutritional status especially in acute malnutrition. Environmental enteric dysfunction which results due to poor sanitation transmitted via the faecal oral route can be reduced by treating water.

5.2.3.7 Minimum meal frequency

Minimum meal frequency had an association with stunting. In a study by Masuke, Msuye, Diarz, Stray-Pedersen, Jahanpour (2021) in Tanzania reported that children with low MMF had higher risk of stunting, wasting and underweight. Inappropriate complementary feeding practices predispose children to stunting. Age appropriate MMF is a proxy for a child's energy requirements. However, MMF can be affected by change in season. The study was conducted during the lean season and poor households could have reduced the number of meals.

5.2.3.8 Breastfeeding

The study also found that children 0-23 months who were still being breastfed were less likely to be stunted. Findings are similar to those by Nkhoma, Ng'ambi, Chipimo & Zambwe (2021) in Zambia. Reason for this observation could have been that breastfeeding promotes optimal growth, brain development and child survival and health (Khan, Zaheer & Safdar, 2019). Breastfeeding until 2years contributes towards the child getting the required nutrients for growth. Before 6 months, breast milk contains all the necessary nutrients for the child's growth and development.

5.3 Limitations of the study

Households with disabled children under the age of five years were not included in the study. This is due to reliability of measurements in these children. Biomarkers are the best to use for this but these are expensive and the researcher had a constrained budget.

5.4 Conclusion

From the study outcomes it can be concluded that stunting in Chimanimani among under-fives is high. Occurrence of stunting is high in males than females in the

district. The age groups less than 6 months and 12-23 are affected by stunting in comparison to other age groups.

Low birth weight was found to be 6.1%. Proportions of stunting and normal height in those of LBW were almost the same 6.8% and 6.5% respectively.

Socioeconomic factors that is main source of income and type of residence have an effect on stunting. Type of residence had a significant independent association with stunting ($\beta = -0.298$, $p = -1.97$).

MMF a component of IYCF had an effect on stunting as shown by Spearman's rho correlation coefficient of -0.122 (p-value=0.023<0.05).

5.5. Recommendations

The researcher recommends that a multi-sectorial approach be used in order to address stunting. The District Food and Nutrition Security Committee (DFNSC) needs to be strengthened so as to curb stunting. The committee has professionals from various ministries who can contribute meaningfully in their fields to address the predictors of stunting.

The researcher recommends that there be more nutrition gardens so as to address food security issues. Various crops for dietary diversity need to be grown. Moreover, food insecure households need to be assisted with food aid.

There are IYCF support groups in the community. These need support and strengthening as they play an active role in educating mothers and caregivers on good IYCF practices such as breastfeeding, complementary feeding and WASH issues.

From the findings, it is recommended that there is need for health education and behaviour change strategy with regards to ANC, IYCF and WASH. MoHCC and partners in the district implementing projects on the above areas can combine efforts.

5.6 Suggestions for further study

This study has raised unanswered questions which need exploring further. Month of first ANC visit was found to have an effect on stunting. The phenomena is attributed to external factors such as IYCF patterns, WASH and also maternal factors (internal). Maternal factors in relation to stunting need to be investigated.

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APPENDICES

Appendix 1: Predictors of stunting questionnaire - English version Household questionnaire

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS **Participant Code:** **Village name:**			
NO	**Question**	**Response**	**Code**
1	Sex of respondent	M=1 F=2	**[ ]**
2	Age of respondent		**[ ]**
3	Religion of respondent		
4	Marital status of respondent	Single=1 Married =2 Widowed =3 Divorced =4	**[ ]**
5	How many people live in this household?		**[ ]**
6	Number of under-fives in the household		**]]**
7	Place of residence	Communal = 1 Growth point = 2 Urban = 3 Timber Estate = 4	**[ ]**
8	Sex of household head	M=1	**[ ]**

		F=2	
9	Highest level of education of household head	1 Primary 2 Secondary 3 Tertiary 4 Never been to school	**[ ]**
10.	Employment status	Yes = 1 No = 2	**[ ]**
11	What is the main source of income?	Crop farming = 1 Informal /Petty Trade=2 Formal employment=3 Remittances = 4 Casual Labour= 5 Other = 6	**[ ]**
12	How much do you earn per month?		**[ ]**
SECTION B: Child nutrition			
I am now going to ask you questions about the child			
NO	**Item**	**Response**	**Code**
13	How old is the child in months		**[ ]**
14	Sex of the child	M= 1 F = 2	**[ ]**

15	Is the child living with any disability? If yes what kind?	Yes = 1 No= 2	[ ]
16	Does the child have a child health card	Yes = 1 No = 2	[ ]
17	What was the child's birth weight		[ ]
18	Can I measure the child's height or length	Yes =1 No = 2	[ ]
19	Child's height		[ ]
20	How many times has the child received Vitamin A doses in the past 12 months		[ ]
21	Has the child ever been breastfed	Yes = 1 No = 2	[ ]
22	How long after birth was the child put to breast	Less than an hour =1 In 24 hours = 2	[ ]
23	In the first five months after delivery, was the child given anythinh to drink	Yes=1 No=2	[ ]
24	If yes what was the child given		
25.	In the first five months after delivery, was the child given any semi-solid food to eat	Yes = 1 No = 2	[ ]
26	If yes, what was the child given		[ ]
27	Three days after the child was birthed , were you or the mother offered any practical support or advice to help start	Yes = 1 No = 2	[ ]

	breast feeding? If yes by who?		
28	Is the child still being breastfed	Yes = 1 No = 2	**[ ]**
29	Was the child breastfed yesterday?	Yes = 1 No = 2	**[ ]**
30	How many times was the child breastfed yesterday during daylight and night		**[ ]**
31	For how many months did the child breastfeed		**[ ]**
Section C: Complementary feeding			
32	Did the child have any other liquids even those consumed outside the home	Plain water =1 Juice or juice drink=2 Clear broth/soup=3 Milk such as tinned, fresh or powdered milk = 4 Infant formula = 5 Yoghurt =6 Any other liquids =7	**[ ]**
33	If yes how many times		**[ ]**
34	How many times did the child eat solid, semi solid and soft foods yeatserday during the day and night		**[ ]**
35	At what age did the child start taking		**[ ]**

	solids and other liquids?		
Section D: History of illness			
36	How often does the child fall sick		**[ ]**
37	What kind of illness does the child usually suffer from		
38	Where do you usually get treatment from	Health centre=1 VHW= 2 Traditional =3 Faith healer =4 Other = 5	**[ ]**
39	How severe is the sickness usually	Hospitalization=1 Severe = 2 Mild = 3	**[ ]**
Section E: WASH			
40	What is the main source of water used for this household for cooking and drinking	Piped into dwelling=1 Communal tap=2 Borehole with pump=3 Protected well =4 Unprotected well =5 Surface water =6 Spring = 7 Sand abstraction =8	**[ ]**
41	Do you do anything to the water to make it safe to drink	Yes =1 No =2	**[ ]**

42	If yes to Qn 41, what do you usually do to make it safe to drink		
43	How many litres can you access a day		
44	What type of toilet facility does this household use	Blair toilet =1 Pit latrine =2 Bush toilet =3 Flush system =4 Other specify	[ ]
45	Is there a handwashing station at the toilet facility?	Yes = 1 No = 2	[ ]
46	What do you use to wash your hands with	Soap = 1 Ash = 2 Other = 3	[ ]
Section F: Food security			
47	Do you produce surplus food crops for sale?	Yes = 1 No=2	[ ]
48	As a household, how many meals do you usually have per day?		[ ]
49	As a household are there days you go with too little or insufficient food?	Yes = 1 No = 2	[ ]
50	Which are the most important crops you cultivate? Mentioned? Maize Rice	No =1 Yes = 2	[ ]

	Wheat Pearl millet Sorghum Finger millet None of the above(Specify		
51	Is the household food secure over a 12 month period?	Yes = 1 No = 2	**[ ]**
52	Which were the months in the past 12 months during which your household did not have enough food from your harvests to meet your household needs? (Multiple responses: January 2021 February 2021 March 2021 April 2021 May 2021 June 2021 July 2021 August 2021 September 2021 October 2021 November 2021 December 2021	Adequate = 1 Inadequate = 2	**[ ]**
Section G: Household hungerscale			

53	In the past 30 days, was there ever a day where there was no food to eat of any kind in your house because of lack of resources to get food?	No = 0 Yes = 1 Never = 1 Seldom (1-3 days per month) = 2 Sometimes (1-2 days per week) =3 Often (3- days a week 5) = 4 Daily = 5	[ ]
54b	How Often did this happen in the past 30days?	1 Rarely (1-2 times) 2 Sometimes (3-10 times) 3 Often (more than 10 times)	[ ]
55a	In the past 30 days, did you or any household member go to sleep at night hungry because there was not enough food in the household?	No =1 Yes = 2	[ ]
55b	How Often did this happen in the past 30days?	Rarely (1-2 times) =1 Sometimes (3-10 times) = 2 Often (more than 10 times) = 3	[ ]
56a	In the past 30 days, did you or any	No = 1	[ ]

	household member go a whole day and night without eating anything at all because there was not enough food in the household?	Yes = 2	
56b	How Often did this happen in the past 30days	Rarely (1-2 times) =1 Sometimes (3-10 times) = 2 Often (more than 10 times) =3	**[ ]**
Section : Maternal health			
57	How old was the mother at the birth of the child?		**[ ]**
58	What is the highest level of education she attained		**[ ]**
59	How many ANC visits did the mother have during the pregnancy		**[ ]**
60	For how many months did she take iron supplements		**[ ]**
61	Did she experience any infection during the pregnancy?	No =1 Yes = 2	**[ ]**
Section : Household dietary diversity score			
63	Did thhe household consume any of the following foods yesterday during the day or night: a Cereals and grain, rice, pasta, bread,	Yes =1 No = 2	**[ ]**

	sorghum, millet maize, maize meal, corn-soya blend, super cereal		
60b	Roots and tubers: potato, yam, cassava, sweet potato, and/or other tubers	Yes = 1 No=2	**[ ]**
60c	Legumes: Sugar beans Cow-peas, peanuts, lentils, nut, soya beans, pigeon peas and/or other nuts.	Yes = 1 No = 2	**[ ]**
60d	Vegetables: Green leafy vegetables: spinach, broccoli, and/or other dark green leaves, cassava leaves, onion, tomatoes, cucumber, green beans, peas, lettuce	Yes = 1 No = 2	**[ ]**
60e	Fruits: banana, apple, lemon, naartjies, oranges, avocado, mango, plums, peach, paw paw	Yes = 1 No = 2	**[ ]**
60f	Eggs	Yes = 1 No = 2	**[ ]**
60g	Milk and other dairy products: fresh milk/ sour, yoghurt, cheese, other dairy products (exclude margarine/ butter or small amounts for tea/coffee)	Yes = 1 No = 2	**[ ]**
60h	Oil/ fat/ butter: vegetable oil, palm oil, butter, margarine, other fats/ oil.	Yes = 1 No = 2	**[ ]**
60i	Sugar, or sweet: sugar, honey, jam, cookies, cakes and other sweet sugary drinks.	Yes = 1 No = 2	**[ ]**

60j	Condiments/ spices: tea, coffee, cocoa, salt, garlic, spices, yeast/ baking powder, tomato sauce, meat or fish as a condiment	Yes = 1 No =2	**[ ]**

Appendix 2: Bepa rebvunzo rezvikonzero zvinoita vana vave vapfupi pane vezera ravo - Shona version			
NO	**Mubvunzo**	**Mhinduro**	**Code**
1	Munhu rudziyi	Murume = 1 Mukadzi = 2	**[ ]**
2	Makore ekuberekwa		
3	Chitendero		
4	Makawana/ Kuwanikwa here	Handina=1 Ndakawana=2 Ndakafirwa=3 Takasiyana=4	**[ ]**
5	Musha wenyu une vanhu vangani vanodya pachoto chimwe chete		**[ ]**
6	Musha wenyu une vana vangani vari pasi pemakore mashanu okuberekwa		**[ ]**
7	Kwamunogara	Maruwa =1 Dhorobha= 3 Mumamisha anoita zvemapuranga =4	
8	Musoro wemba munhu rudziyi	Murume =1 Mukadzi =2	**[ ]**
9	Musoro wemba akadzidza kusvika padanho ripi	Ku primary=1 Ku sekondari =2 Danho repamusoro kana dipuroma =3 Havana kumboyenda	**[ ]**

		kuchikoro = 4	
10	Munoenda kubasa here	Ndinoenda= 1 Handiende= 2	**[ ]**
11	Mari inoraramisa mhuri inowanzobvepi	Kurima =1 Kutengesa =2 Kubasa kunohorwa pamwedzi =3 Kutumirwa = 4 Marikicho =5 Zvimwe_____	**[ ]**
12	Munowana marii pamwedzi		**[ ]**

Chikamu chepiri:

Ndakumbokubvunzai mibvunzo nezvemwana

NO	**Item**	**Response**	**Code**
13	Mwana ane makore mangani (mwedzi)?		**[ ]**
14	Mwana munhu rudziyi	Mukomana =1 Musikana =2	**[ ]**
15	Mwana ari kurarama nehurema here?	Hongu =1 Kwete =2	**[ ]**
16	Mwana ane kadhi here rekuchipatara raanonyorerwa majekiseni nekuyeriwa?	Hongu =1 Kwete =2	**[ ]**
17	Mwana akazvarwa achirema		**[ ]**

	zvakadii?		
18	Ndingakwanisawo here kuyera mwana kuti akareba zvakadii?	Hongu =1 Kwete = 2	[ ]
19	Murefu hwemwana		[ ]
20	Mwana akadonhedzerwa kangani Vitamin A doses mumwedzi gumi neviri yapfuura?		[ ]
21	Akamboyamwiswa here mwana kubva achiberekwa?	Hongu =1 Kwete =2	[ ]
22	Mwana akatanga kuyamwa pazamu kwapera nguva yakareba zvakadii achizvarwa?	Muawa rekutanga=1 Mumaawa makumi mavire neina= 2 Maawa makumi maviri neina apfura =3	[ ]
23	Mumwedzi mishanu achangozvara, akambopihwa chimwe chokumwa here chisiri mukaka wamai?	Hongu =1 Kwete =2	[ ]
24	Kana mhinduro iri hongu, akapihwei mwana?		
25	Mumwedzi mishanu yokuberekwa, mwana akambopihwa zvimwe zvokudya zvakaita sebota?	Hongu = 1 Kwete = 2	[ ]
26	Kana mhinduro iri hongu,		[ ]

	akapihwei?		
27	Mumazuva matatu ekusununguka mwana, pane here akambokurukura namai mayererano nezvekuyamwisa mwana?	Hongu = 1 Kwete = 2	**[ ]**
28	Mwana achiri kuyamwa here?	Hongu = 1 Kwete = 2	**[ ]**
29	Mwana akayamwiswa here nezuro?	Yes = 1 No = 2	**[ ]**
30	Mwana akayamwiswa kangani nezuro kubva makuseni nemanheru?		**[ ]**
31	Mwana akayamwa kwemwedzi mingani?		**[ ]**
Chikamu chetatu: Zvekufidhwa kwevana			
32	Mwana ane here zvimwe zvaakamwa nezuro zvisiri mukaka? (Multiple response)	Mvura =1 Dhiringi =2 Muto =3 Mukaka wakaita sewemugaba, wepowudha = 4 Wemugaba wevana vadiki= 5 Yogati =6 Zvimwewo	**[ ]**

		zvimwiwa =7	
33	Kana mhinduro iri hongu kangani		**[ ]**
34	Mwana akadya kangani nezuro kubva makuseni kusvika nemanheru?		**[ ]**
Section D: Nhorondo yeurwere			
35	Mwana anowanza kurwara kangani?		**[ ]**
36	Anowanzorwara neurwere hupi?		
37	Paanorwara munowanzaowana rubetsero kupi?	Kuchipatara=1 Mbuya utano vemunharaunda= 2 Godobori =3 Kukereke =4 Kumwewo = 5	**[ ]**
38	Hurwere uhu hunowanzodzimba zvakadii?	Kudzimbwa zvekupinzwa muchipatara =1 Kudzimbwa manhingi = 2 Kudzimbwa zviri pakati nepakati= 3	**[ ]**
Section : Mvura nehutsanana			
39	Mvurayekumwa nekubikisa moichera kupi?	Pombi iri mumusha=1 Pombi	**[ ]**

		yemunharaunda =2 Pachibhorani chine pambu=3 Tsime yakawakirirwa =4 Tsime isina kuwakirirwa =5 Yemurwizi kana mudhamu =6 Chitubu = 7 Mupfuku =8	
40	Pane zvamunoita here mvura iyi musati mainwa kuti ive yakashambidzika?	Hongu =1 Kwete = 2	[ ]
41	Kana mhinduro iri hongu, munowanzoiita sei?		
42	Pazuva munowana marita mangani?		[ ]
43	Munoshandisa chimbuzi chakaita sei?	Yegomba ine mbongo neneti =1 Yegomba =2 Musango =3 Yekumvura =4 Other specify	[ ]
44	Pane here pekugezera mawoko?	Hongu =1 Kwete = 2	[ ]

45	Munoshandisei kugeza mawoko?	Sipo =1 Dota = 2 Zvimwe _____	**[ ]**
Section F: Mawanirwo ezvokudya			
46	Munorima chikafu chakawanda zvekutowana chekutengesa here?	Hongu = 1 Kwete =2	**[ ]**
47	Pazuva munowanzodya kangani?		**[ ]**
48	Semhuri pane here mazuva amunomboswera nenzara nekuda kwekusava nezvokudya zvakakwana kana kuti zvishoma?	Hongu = 1 Kwete = 2	**[ ]**
49	Ndezvipi zvirimwa zvamunowanzorima zvokudya? (Multiple response) 1. Chibabge 2. Mupunga 3. Gorosi 4. Mhunga/mungoza 5. Zviyo 6. Mapfunde		**[ ]**
50	Mune zvokudya zvakakwana here kwemwedzi gumi nembiri yadarika?	Hongu = 1 Kwete = 2	
51	Ndeipi mwedzi pane gumi nembiri yadarika pamanga musina zvokudya	1. Ndira 2021 2. Kukadzi 2021	**[ ]**

	zvakakwana kubva pane zvamakakohwa? (Multiple response)	3. Kurume 2021 4. Kubvumbi 2021 5. Chivabvu 2021 6. Chikumi 2021 7. Chikunguru 2021 8. Nyamavhuvhu2021 9. Gunyana 2021 10. Gumiguru 2021 11. Mbudzi 2021 12. Zvita 2021	
Section			
52	Pane here musi wamanga musina kana chokudya mumazuva makumi matatu apfuura?	Kwete = 0 Hongu = 1 Kashoma (1-3 mazuva pamwedzi) =2 Dzimwe nguva (1-2 mazuva pavhiki) =3 kazhinji (3-5 mazuva pavhiki)= 4 mazuva ese = 5	**[ ]**
52b	Zvakaitika kangani mumazuva makumi matatu apfuura?	1. Kashoma(kabodzi kana kaviri) 2. Dzimwe nguva	**[ ]**

		(katatu- kagumi) 3. Kakawanda (kanodarika gumi)	
53a	Mumazuva makumi matatu adarika, pane here pamakambonorara nenzara nekuti pakanga pasina zvokudya zvakakwana?	Kwete =1 Hongu = 2	**[ ]**
53b	Zvakaitika kanganimumazuva makumi matatu apfuura?	1. Kashoma(kabodzi kana kaviri) 2. Dzimwe nguva (katatu- kagumi) 3. Kakawanda (kanodarika gumi)	**[ ]**
54a	Mumazuva makumi matatu apfuura, pane here pamakambomuka mukaswera mukarara pasina chamadya?	Kwete = 1 Hongu = 2	**[ ]**
54b	Zvakaitika kangani mumazuva makumi matatu apfuura?	1. Kashoma (kabodzi kana kaviri) 2. Dzimwe nguva (katatu- kagumi) 3. Kakawanda (kanodarika gumi)	**[ ]**
Section :			

Maternal health			
55	Mai vakanga vane makore mangani pavakatanga kubara?		**[ ]**
56	Mai vakasvika danho ripi kuchikoro?	Ku primary=1 Ku sekondari =2 Danho repamusoro kana dipuroma =3 Havana kumboyenda kuchikoro = 4	**[ ]**
57	Kubva zvamaknyoresa mimba, makanowonekwa kangani kuchipatara musati mabara?		**[ ]**
58	Makamwa kwemwedzimingani mapiritsi anowedzera ropa?		**[ ]**
59	Makamboita hurwere here pamaive makazvitakura?	Kwete =1 Hongu = 2	**[ ]**
Section : Household dietary diversity score			
60	Nezuro kubva mangwanani kusvika manheru pano pakambodyiwawo here zvikafu zvinotevera? Sadza, mupunga, chingwa, nezvimwe zvakadaro zviri muboka iri?	Hongu = 1 Kwete =2	**[ ]**
60b	Zvikafu zvakaita sembambaira,	Hongu = 1	**[ ]**

	matapura, madhumbe nezvimwe zvikafu zviri muboka iri?	Kwete = 2	
60c	Zvikafu zvakaita sebhinzi, rupiza, nyemba, nzungu nezvimwe zvikafu zviri muboka iri?	Hongu = 1 Kwete = 2	**[ ]**
60d	Miriwo ine mashizha akasvibira egirini akaita sekovho, leaves, nezvimwe zvakaita se hanyanisi, madomasi, magaka	Hongu =1 Kwete = 2	**[ ]**
60e	Michero yakaita sema banana, mandimu, makotopeyo, mango	Hongu = 1 Kwete =2	**[ ]**
60f	Mazai	Hongu =1 Kwete =2	**[ ]**
60g	Mukaka nezvimwe zvikafu zvakagadzirwa nemukaka, mukaka wakakora	Hongu =1 Kwete = 2	**[ ]**
60h	Zvine mafuta zvakaita semagarini, mafuta okubikisa	Hongu = 1 Kwete =2	**[ ]**
60i	Zvinotapira zvakaita setsvigiri, uchi, jamhu, kana zvinwiwa zvinotapira	Hongu = 1 Kwete = 2	**[ ]**
60j	Zvekurungisa zvokudya zvakaita semunyu, tomato sosi, masipaisi,	Hongu = 1 Kwete =2	**[ ]**

Appendix 3: Consent form

Introduction

My name is Tafadzwa Chipato, a Master in Public Health student from Africa University. I am carrying out a study on the predictors of stunting in Chimanimani district. I am kindly asking you to participate in this study by responding to interview questions.

Purpose of the study

The purpose of the study is to establish the causes of stunting in Chimanimani district through responses from 351 respondents.

Procedures and duration

Should you decide to participate it will take between 20-25 minutes to conduct the interview and the child's height will be determined. Some of the questions involve personal and confidential information. Feel free to stop me at any question if you feel uncomfortable with the questions.

Risks and discomforts

There are no anticipated risks or discomfort during data collection. The collected data will be kept confidential and stored in a locked cupboard. No personal identifying information will be recorded on the tool. The interviews will be number coded used as identifiers.

Benefits and/or compensation

There are no financial benefits to responding to this questionnaire. Findings from the study can inform nutrition programming and policy makers to formulate policy on infant and young child feeding to address stunting.

Confidentiality

The data collected from the respondent will only be used by the researcher and will be kept under lock and key.

Voluntary participation

Participation in this study is voluntary and are free to withdraw from the study any time if you wish to do so. There are no consequences to the participant for deciding to withdraw from the study.

Offer to answer questions

Please feel free to ask any questions on any area of this study in which you need clarity. You are allowed to take your time to think over your decision before participating in the study.

Authorisation

If you have decided to participate in this study please sign this form in the space provided below as an indication that you have read and understood the information provided above and have agreed to participate.

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Name of Research Participant (please print) Date

Signature of Research Participant or legally authorised representative

Appendix 4: Informed consent form - Shona version

Nhanganyaya

Zita rangu ndinoitwa Tafadzwa Chipato. Ndiri mudzidzi wepa Africa University. Mukuzadzikisa zvidzidzo zvangu ndiri kuda kuitawo wongororo yezvikonzero zvinoita kuti vana vari pasi pamakore mashanu vave vapfupi pane vamwe vezera ravo.

Chinangwa cheongororo

Chinangwa cheongororo iyi ndechekuwana zvikonzero zvinoita kuti vava vari pasi pemakore mashanu vave vapfupi pane vamwe vezera vavo kubva mumhinduro dzandichawana kumisha 351 mudunhu reChimanimani.

Maitirwe eongororo

Muongororo muchabvunzwa mibvunzo ingatora chinguva chinenge minhasvi makumi matatu uye hurebu hwemwana huchayeriwa. Mibvunzo iyi inosanganisira zvimwe zvamunosangana nazvo nemagariro ekumba.

Mubairo

Kupinda muongororo iyi hakuna mubairo wemari kana chimwe chinhu. Zvichabuda muongororo zvinogona kushandiswa nevatungamiri vezvemutemo kuti zvibatsiridze nyaya dzezvekufidwa kwevana.

Tsindidzo

Humbowo huchabuda muongororo nenhaurwa dzose zviri pakati penyu neni. Hakuna mumwe munhu asiri muongororo ino achaona zvatataurirana. Gwaro nyorwa richabuda muongororo iyi harizoratidzi zvatataurirana izvi uye hapana chichanongedza kwamuri.

Kugoverwa kwezvichabuda muongororo

Zvichabuda muongororo zvichapiwa kuvatungamiri vedunhu reChimanimani kubazi rezveutano nevadzidzisi vekuAfrica University. Imi munogona kuziva zvabuda musarudzo pamunouya.

Kodzero yekuramba kana kubuda muongororo

Sekurehwa kwazvamboitwa kwekutanga kwegwaro rino mune kodzero yekuramba kupinda muongororo kana kubudira pamunoda. Hamuzombopiwa mhosva yekuramba kana kubuda muongororo.

Kana mukada wekutaura naye

Mukanzwa kuda kubvunza mimwe mubvunzo nyangwe mushure menhaurirano ino sunungukai kundibvunza kana kubvunza vana mazvikokota venyu vanokubatsirai. Kana pane zvimwe zvamungada kubvunza bvunzai zvenyu.

Chitupa chemvumo yekupinda muongororo

Mushure mekunge ndaziviswa nezveongororo iyi uye ndakumbirwa kupinda muongororo, ndaverenga mashoko akanyorwa pamusoro apo ndikaanzwisisa. Ndapiwa mukana wekubvunza pandanga ndisinganzwisise uye zvatsanangurwa zvandigutsa. Nekudaro ndinozvipira zvisina kumanikidzwa kupinda muongororo iyi.

Munobvuma here kupinda muurongwa uyu? ☐ ☐ Hongu Kwete

Kana pasina mvumo yapihwa wongororo haienderere mberi.

Rupawo rwomubatsiri……

Zuva……..

Rupawo

rwomudzidzi……...Zuva……

Appendix 5: Budget

Item	Description	Quantity	Unit Cost USD	Amount ($)
Stationery	Bond Toner Pens	2 Rims 1 Cartridge 1box	5.00 160.00 3.00	10.00 160 3
Fuel	Diesel	120 litres	1.35	162
Allowances	Research assistant fee	2	10/day	200
Other expenses				80
Total				615

Justification of the budget

The data collection tools which are the questionnaires need to be printed. Researchers need pens to fill out the questionnaires. The budget also makes provision for fuel which is needed so that the team can move from one health facility to the next. Other expenses that can be incurred include meals while in the field and are part of the budget. The research assistants also need field allowance.

Appendix 6: Time frame/Gnatt Chart

Below is a Gnatt chart that will assist the researcher to plan and schedule activities.

Activities	2021			2022				
	O	N	D	J	F	M	A	M
Concept development								
Proposal development								
Proposal submission								
Proposal defense								
Piloting tools								
Data Collection								
Data entry								
Data Analysis								
Thesis writing								
Presentation of findings								
Thesis submission								
Thesis defense								