THE RELATIONSHIP BETWEEN INFANT FEEDING PRACTICES, CAREGIVERS' NUTRITION KNOWLEDGE AND NUTRITIONAL STATUS OF INFANTS AGED BETWEEN 6 TO 12 MONTHS IN A RURAL COMMUNITY IN ZIMBABWE

Dissertation submitted in fulfilment of the requirements of the Master of Applied Science in Food and Nutrition in the Department of Food and Nutrition: Consumer Sciences in the Faculty of Applied Sciences at the Durban University of Technology

BY:

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SUPERVISOR: PROFESSOR C. NAPIER

DECLARATION

I, Lynn Pfumvuti, Student Number 21750630 declare that this study entitled: **Relationship between infant feeding practices and caregivers' nutrition knowledge, and the nutritional status of infants aged between 6 to 12 months in a rural community in Zimbabwe** presents my original work and it has not been submitted in any form to another academic institution. Where use was made of the work of others it was duly acknowledged in the text. The research described in this dissertation was carried in the Department of Food and Nutrition: Consumer Sciences, Faculty of Applied Sciences, Durban University of Technology, South Africa under the supervision of Professor Carin Napier.

29 August 2022

Signature of student Date

29 August 2022

Signature of supervisor Date

This work has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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This dissertation is being submitted in fulfilment of the requirements for the degree of Master of Applied Science.

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This dissertation is the result of my own independent work and investigation except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended. I hereby declare that I did not commit plagiarism.

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I hereby give consent for my dissertation, if accepted, to be available for photocopying and interlibrary loan, and for the title and summary to be available to outside organisations.

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DEDICATION

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ABSTRACT

Introduction

Undernourishment affects a child's potential lifespan from the beginning according to United Nations International Children's Emergency Fund (UNICEF) 2014: 18), and the International Food Policy Research Institute (IFPRI 2014: 7) noted at the time that 11% of African Gross Domestic Product (GDP) was lost to malnutrition, thereby justifying the urgent need to fight it. Malnutrition in the early stages of growth of an infant could cause irreversible damage to their metabolism, which would cause their health to deteriorate especially when children consumed high-energy, low-nutrient diets later in life which was common in developing countries, and this could result in adults being susceptible to non-communicable diseases like hypertension, cardiovascular diseases, and Type 2 diabetes (Prendergast and Humphrey 2014: 250).

Globally, 150.8 million children were recorded to be affected by stunting in 2017 (UNICEF/WHO/World Bank 2018: 1) and the United Nations stated that sub-Saharan Africa accounted for one-third of stunted children (UNICEF/WHO/World Bank 2020: 3). Child malnutrition is at a high level in sub-Saharan Africa (Akombi, Agho, Merom, Renzaho and Hall 2017: 1) and it is one of the main health issues especially in low–medium income countries (UNICEF 2015: 3).

Poor infant feeding practices have been an endemic problem in sub-Saharan Africa for many years and this has led to malnutrition (Onyango, Borghi, De Onis, Casanovas and Garza 2013:1975). These practices have stemmed in part from the lack of nutrition knowledge on the part of caregivers and have resulted in improper weaning which has been one of the contributing factors to the persistence of malnutrition (Bewket, Welday, Mehretie and Abebe 2017: 10). Thus, poor feeding practices have significantly contributed to the high levels of malnutrition, diarrhoea and poor growth of infants, even leading to death. In Zimbabwe, only eight percent of children aged 6-23 months eat an acceptable diet (Zimbabwe Demographic Health Surveys 2015: 200).

Multiple factors could cause infant malnutrition such as poverty, food insecurity and drought but this study looked specifically at the role that caregivers play in the feeding of infants in the village of Munjinga North (Ward 14) in Mashonaland West Province in Zimbabwe.

Methods

This was a cross-sectional study conducted in a rural community in Zimbabwe. The participants in this study included a sample of 100 purposively selected caregivers caring for infants between the ages of 6–12 months. The study was descriptive and quantitative in nature with different measuring instruments used to measure the sample population. The research tools used included a socio-demographic questionnaire, where the multi-dimensional poverty index (MPI) was calculated; anthropometric measurements (weight, length and Mid Upper Arm Circumference (MUAC)) were collected to give the Z-scores of the infants. A validated infant and young child feeding module and caregiver's nutrition knowledge questionnaire were also completed. The food security coping strategy questionnaire was completed to find out about the mechanisms that the community used to adapt feeding practices during periods of food shortage in their households. Data was captured by the researcher on Excel® spreadsheets and analysed using descriptive statistics using the Statistical Package for the Social Sciences (SPSS) for Windows version 25. The anthropometrics data was analysed using WHO Anthro version 3.2.2

Results

The sampling technique used in this study resulted in n=100 participants, and as the participants' number of 100 is equal to the percentage, the percentages are not presented separately. All the caregivers were female and responsible for 37% (n=37) female infants and 63% (n=63) male infants. Most of the caregivers (90%) were the mothers of the infants whilst the remaining 10% were the grandmothers. The room density was 0.47, which showed that at least two members of the household shared a room. A significant number of the households (27%) had no toilet facilities, which compromised sanitation. Most of the women (55%) indicated that they had attained a secondary education but 98% of them were unemployed during the period of study with 55% doing piece jobs, which resulted in 92% of the families having a monthly income of between US$1 – US$100 and surviving below the Food Poverty Line for one person, which was recorded at US$31.20 per person in Zimbabwe in 2017. When measuring this community against the Multi-dimensional Poverty Index, health contributed 24.4%, education contributed 16.4% and standard of living contributed 59.2% to the poverty index. The final MPI score was 40.9%, which was well above the cut-off point of 30% and this indicated that the community of Munjinga North is living in poverty.

The anthropometric measurements indicated that there is a prevalence of stunting (55%), wasting (7%), and underweight (33%) in the infants. MUAC was used to determine the level of malnutrition in the community and 23% of the infants were found to have a MUAC below -2 and -3 on the Z-score. The Z-scores for MUAC and length-for-age had a statistical significance of (p=0.01). All the infants were breastfed at birth and 95% were still breastfeeding at the time of the study. The infants were timeously introduced to solids, semi-solids and soft foods (96%) and those who received a minimum meal frequency made up 81%. Minimum dietary diversity was accomplished by 36% of the participants, with 25% receiving the minimum acceptable diet.

Most of the caregivers (78%) had not received training on infant nutrition hence 95% of them did not know the importance of complementary feeding. Those who had partial knowledge on the importance of breastfeeding made up 51% whilst 62% knew what exclusive breastfeeding meant. The level of training was compared to the MUAC, and a statistical significance (p=0.05) was established. The most commonly used coping strategy was to restrict the consumption by adults for children to eat with a mean score of 8.88(SD±8.572); the second most common strategy was to reduce the mothers' consumption for the sake of the children with a mean score of 7.16 (SD±6.15), followed by buying food on credit with a mean score of 2.11 (SD±3.066).

Conclusion

The average age of the infants who participated in this research was nine months. The MPI score calculated showed that the Munjinga North Ward 14 community is living in chronic poverty. They are deprived of basic necessities such as electricity and safe water to drink. The health score signified a risk of raising malnourished children in the community and it was already manifesting as 23% of the infants were found to be malnourished. The majority of the households are living on an income below the poverty datum line.

All the infants were breastfed at birth and the majority were still being breastfed at the time of the research; however, it was shown that only a few of the caregivers knew about the importance of breast milk and why they were breastfeeding their infants. Many caregivers were breastfeeding their infants simply because they were told to do so by their elders. This indicated a lack of nutrition knowledge which would have significant repercussions when they weaned their children. The majority of the infants were being timeously introduced to complementary feeding, which, statistically, was a good sign as it showed that they were

following the WHO guideline of exclusive breastfeeding for the first six months even though the majority of the mothers were unaware why they were encouraged to do so. The majority of infants were given two meals a day (thin porridge in the morning and in the evening) and since they were also being breastfed according to the WHO guidelines it indicated an ideal meal frequency, hence the high percentage of minimum meal frequency in the community. Although the meal frequency was high, the minimum dietary diversity and minimum acceptable diet statistics were low, signifying that the infants were being introduced to foods with compromised quality. The food lacked variety and indicated deficiency in some macronutrients and many micronutrients. The poor diet quality consumed by the infants would inevitably affect their growth and development. In this study, the signs were already visible with more than half of the infants being stunted and several wasted and malnourished.

Although there could be other factors that contributed to malnutrition, the research findings confirmed that there was a relationship between infant feeding practices and caregivers' nutrition knowledge, but knowledge was not a significant predictor of MUAC (nutrition health status) of the infants aged between 6-12 months. More attention needs to be given to the training of the caregivers on infant nutrition so that they can understand the need for healthy infant feeding practices, especially considering that the first 2,000 days of an infant's life are the most critical.

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LIST OF ABBREVIATIONS

AIs	-Adequate Intakes
ARA	- Arachidonic acid
BMI	- Body Mass Index
cm	- centimetre
CS	- Coping strategies
CSI	- Coping strategy index
DHA	- Docosahexaenoic acid
DNA	- Deoxyribonucleic acid
DRI	- Dietary Reference Intake
DUT	- Durban University of Technology
EARs	- Estimated Average Requirements
EER	- Estimated Energy Requirements
FGDS	- Food Group Diversity Score
FRC	- Faculty of Applied Sciences Research Committee
g	- grams
GDP	- Gross Domestic Product
LAZ	- Length for age
HIV	- Human Immunodeficiency Virus
HPM	- Health Promotion Model
IFPRI	- International Food Policy Research Institute

IMAM	- Integrated Management of Acute Malnutrition
IOM	- Institute of Medicine
IREC	- Institutional Research Ethics Committee
IYCF	-Infant and Young Child Feeding
Kg	- Kilograms
Km	- Kilometre
LCPUFAs	- Long Chain Polyunsaturated fatty acid
m	- metres
m^2	- metre squared
mcg	- microgram
MAM	-Moderate Acute Malnutrition
mg	- milligrams
ml	- millilitre
MOHCW	- Ministry of Health and Child Welfare
MPI	-Multi-dimensional Poverty Index
MUAC	- Mid-upper-arm circumference
n	- number
NGO	- Non-Government Organisation
ORS	- Oral Rehydration Solution
PCM	- Protein Calorie Malnutrition
PEM	- Protein Energy Malnutrition

PMTCT	- Prevention of Mother to Child Transmission
RDAs	- Recommended Dietary Allowances
RDP	- Reconstruction and Development Programme
RNA	- Ribonucleic acid
SAM	-Severe Acute Malnutrition
SD	- Standard Deviation
SDGs	- Sustainable Development Goals
SHINE	- Sanitation, Hygiene, Infant Nutrition Efficacy Project
SPSS	- Statistical Package for Social Sciences
U.S	- United States
UL	- Tolerable Upper Intake Level
UN	- United Nations
UNDP	- United Nations Development Programme
UNICEF	- United Nations Children's Fund
WAZ	- Weight for age
WB	- World Bank
WHO	- World Health Organisation
WHS	- World Health Statistics
WHZ	- Weight for Length/Height
ZDHS	- Zimbabwe Demographic Healthy Surveys

LIST OF SYMBOLS

%	- Percent
>	- Greater than
≥	- Greater than or equal to
<	- Less than
≤	- Less than or equal to

CHAPTER 1: THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

Nutrition is the process by which living organisms obtain and utilize food to support all the processes required for their survival (McGuire and Beerman 2013: 3). The World Health Organization (WHO) stated that nutrition is acknowledged as one of the key determinants of good health and enhances human performance and capability (WHO 2017: 10). The most prominent aspect in an infant's first 12 months of life is their rapid growth and development. The high nutrient needs of infants as they develop is met by choosing appropriate foods that are most suitable to meet their needs at each stage for optimal growth and development (McGuire and Beerman 2013: 3), and the growth of an infant directly reflects nutrient intake and is a key factor in evaluating the nutritional health of infants (Whitney and Rolfes 2016: 509).

In 2015 the United Nations described infant feeding practices as choices given to caregivers to feed their infants so that they can meet their nutritional demands. The Infant and Young Child Feeding Module offered by the WHO gives basic and optional measures that need to be followed when feeding children 6-23 months. Feeding choices incorporated in this module include breastfeeding, complementary feeding, micronutrient intake, and bottle feeding (WHO 2003: 1).

The value of breastfeeding is now globally understood (Victora, Bahl, Barros, França, Horton, Krasevec, Murch, Sankar, Walker and Rollins 2016: 475), as it improves maternal and child health and fosters economic development. The World Health Organization recommends that infants should be given breast milk exclusively for the first six months and then complementary feeding should be introduced whilst breastfeeding for the next two years and above (Prell and Koletzko 2016: 436). Caregivers should have access to comprehensive information about appropriate feeding practices without any commercial influence. They need to comprehend the WHO recommendations, especially on the proper timing to introduce complementary foods. There are many different types of foods recommended for infants and so, how much, how often, and how to safely give these foods to the infants is very important. Moreover, infants' food should be selected to provide good variety, balance and moderation (Whitney and Rolfes 2016: 509). "Infant feeding practices are multidimensional and are prone to changes" (WHO 2010: 1). Exclusive breastfeeding

can be summarised in one indicator but feeding options encompass assessing several aspects of feeding at the same time. These several aspects include continued breastfeeding, the timing of introducing complementary foods, and the ideal amounts of foods to be consumed (WHO 2010: 1). Hence, the main purpose of this study was to investigate the relationship between infant feeding practices and caregivers' nutritional knowledge as well as the nutritional status of infants.

1.2 BACKGROUND OF THE PROBLEM: THE GLOBAL PERSPECTIVE

According to Pivoz and Preble (2005), poor feeding of infants is directly or indirectly responsible for 60% of the 10.9 million annual deaths among children under the age of five, and a third of the deaths of infants within their first year of life, and it was estimated that globally the mortality rate could be reduced significantly with appropriate infant and young child feeding (Black, Allen, Bhutta, Caulfield, De Onis, Ezzati, Mathes and Rivera 2008: 256). Children who died in 2011 because of malnutrition were estimated to constitute 45% of the total deaths of children. De Onis and Branca (2016: 12) estimated that globally around 161 million children were stunted (low length-for-age), hindering cognitive and physical development, and increasing the risk of progressive debilitating diseases (WHO 2018a: 9). Acute malnutrition accounted for 51 million wasted children in the same year, risking morbidity, especially from measles and diarrhoea. In 2014 an estimated 159 million stunted children and 50 million wasted children were recorded (UNICEF, WHO, and World Bank 2015: 1). According to Smith and Haddad (2015: 184), one in every five children under the age of five was stunted, and Development Initiatives in 2018: 30 indicated that half of the deaths in children under five globally were caused by undernutrition, and of those about 87 million lived in South Asia. According to the WHO, in 2017 stunting affected roughly 150.8 million children, and they were mainly in sub-Saharan Africa and Asia (UNICEF/WHO/World Bank 2018: 1), and in 2019 an estimated 149 million children were recorded as being stunted, 49 million were wasted, and over 40 million infants were recorded as being overweight worldwide (UNICEF/WHO/World Bank 2020: 2).

Undernourishment affects a child's potential lifespan from the beginning (UNICEF 2014: 18), hence the urgent need to fight against it. Many factors influence a child's nutritional status, and include adequate access to nutritional service facilities (Vollmer, Bommer, Krishna, Harttgen and Subramanian 2016: 313), and if these are not provided it leads to the deterioration of the population's health including the physical and cognitive development of

children (Development Initiatives 2018: 31). Malnutrition in the early stages of the growth of an infant can cause irreversible damage to their metabolism, which will cause their health to deteriorate especially when children consume high-energy, low-nutrient diets later in life which is common practice in developing countries. This can result in children being susceptible to non-communicable diseases like hypertension, cardiovascular diseases and type 2 diabetes later in adulthood (Prendergast and Humphrey 2014: 250).

Stunting is at its peak from the infant's conception until the age of two years in India as it often goes unrecognised in communities where short stature is the norm (De Onis and Branca 2016: 16) and it can affect several generations of the same family. Mothers who were stunted during their early childhood are believed to bear infants with low birth weight. (De Onis and Branca 2016: 17). Childhood stunting was anticipated to have on average the per capital income penalty of 10% of the gross domestic product (GDP) in sub-Saharan Africa and South Asia (Galasso, Wagstaff, Naudeau and Shekar 2016: 18).

The United Nations (2020: 9) stated that 16% of children globally aged between 6 and 23 months eat a minimally acceptable diet and only half eat the minimum required number of meals per day, showing that a poor-quality diet is being provided to infants. Young children are more vulnerable to the effects of poor dietary diversity, with the age group 6–11 months recording low rates for minimum diet diversity and relatively few eating nutrient-dense animal source foods rich in iron and other essential nutrients (UNICEF 2016: 10). It was recorded globally that one in every six children was benefiting from a minimum acceptable diet, and the role of the caregivers in infant feeding is as important as the food consumed itself (UNICEF 2016: 10).

Looking at the Sustainable Development Goals set to be achieved by 2030, 12 out of 17 goals have indicators which are relevant to nutrition, and this indicates the vital role of nutrition if these goals are to be attained. Consequently, 2016–2025 was declared “United Nations Decade on Nutrition” at the second International Conference on Nutrition in 2014. Investing in nutrition is investing in human development as well as in the fundamental rights of women and children to health, education, employment and dignity of life (Sengupta, Singh and Prasanna 2016: 20).

1.3 BACKGROUND OF THE PROBLEM: THE AFRICAN PERSPECTIVE

Improper infant feeding practices have been a persistent problem in Africa for many years now and it has led to malnutrition (Onyango, Borghi, De Onis, Casanovas and Garza 2013:1975). Child malnutrition is at a high level in sub-Saharan Africa (Akombi, Agho, Merom, Renzaho and Hall 2017: 1). It is one of the main health problems seen especially in low- and medium-income countries (UNICEF 2015: 3). The International Food Policy Research Institute (IFPRI 2014: 7) noted that 11% of African GDP was lost to malnutrition as per the Development Initiatives (2018), and 40 countries in Africa recorded stunted levels, with Eastern and Middle Africa estimated at 50% and 42%, respectively. The increase in infant malnutrition in Africa has been attributed to inappropriate complementary foods being introduced, especially during weaning, and it has contributed to half of the child mortality cases in Africa.

The United Nations reported that sub-Saharan Africa accounted for one third of stunted children globally in 2019 (UNICEF/WHO/World Bank 2020: 3). The WHO added that the prevalence of stunting is high in the African continent where one child in every three was found to be stunted (WHO 2018a: 1). The modelled malnutrition estimates in September 2016 showed that the stunting occurrence among children had decreased from 32% but the number of affected children had increased from 50.4 million to 58.5 million between 2000 and 2015 (WHO/UNICEF/World Bank estimates 2016: 5).

The WHO (2017: 14) revealed that in African countries infants who received the minimum acceptable diet made up 8.6%, with Guinea recording the lowest percentage of 3.7%; 15 countries recording 10% and Kenya was the only country recording above 20% (at 21.8%), while six countries recorded percentages below 5%. Regardless of the global endorsement of the infant and young child feeding (IYCF) policy, about 35% of children die every year because of malnutrition and this is directly linked to poor feeding practices in most developing countries (WHO 2012: 1).

A study showed that West and Central Africa recorded the highest instance of child wasting. Moreover, in the whole region of sub-Saharan Africa, 7.9 million children were estimated to be wasted in 2018 (UNICEF, WHO & World Bank 2019: 7).

1.4 BACKGROUND OF THE PROBLEM: THE ZIMBABWEAN PERSPECTIVE

In 2005, the Ministry of Health and Child Welfare (MOHCW) in Zimbabwe defined an undernourished infant as a child with weight-for-age under the third percentile on the Zimbabwe Child Health Nutrition Card. The Ministry of Health and Child Welfare (MOHCW) (2005: 2) further argued that when a child is growing and developing, a balanced nutritious diet is needed hence it is necessary to feed infants a variety of foods according to their weight and length. Portion sizes should be increased as the child grows, and infants should be fed at least 5-6 times in a day including healthy snacks such as fruits. Nutrient-dense foods are recommended, and caregivers are encouraged to enrich the food they give infants, especially including peanuts or beans to enhance nutrition (MOHCW 2005: 2).

The estimated HIV prevalence amongst adults in Zimbabwe was estimated at 14%; this high percentage coupled with a weak health system, bad economic performance and persistent drought could lead to children being exposed to poor feeding and hence malnutrition (MOHCW 2009: 3). Child growth has been universally accepted as a vital indicator of nutritional status in infants (WHO 2010: 3).

Between January and May 2009, the Parirenyatwa Group of Hospitals in Harare, Zimbabwe, recorded 12 infant deaths, 134 infants were admitted, and 122 infants were sent to the outpatients department due to malnutrition (Parirenyatwa Quarterly Report 2009: 24). The government has since put in place infant feeding policies as a strategy to fight against malnutrition but infants are still dying every year due to malnutrition.

The Zimbabwe Demographic and Health Surveys (ZDHS 2015: 24) found that stunting is caused by the failure of children to receive adequate nutrition over a prolonged period. Approximately 27% of Zimbabwean children were found to be stunted, with 39% being children aged between 24 and 35 months and 13% being children aged between 6 and 8 months. Between 2000 and 2015 the results showed that boys (30%) were more prone to stunting than girls who recorded a 24% prevalence. Children who lived in rural areas had a 29% prevalence which was higher than children staying in urban areas who recorded 22%. The Zimbabwe Demographic and Health Surveys (ZDHS 2015: 186) explained before the survey that wasting is the failure of infants to receive enough nutrition, and this might have been caused by "an illness, especially diarrhoea in infants, or it could be that the food supply had been depleted or become low during the time of the survey". Figure 1.1 below illustrates

the trends in the nutritional status of infants in Zimbabwe from 1999 up to 2015 and it shows that there had been a slight improvement in the health status of infants but the numbers of affected children were still high, and more effort needed to be made to improve their nutritional health status (ZDHS 2015: 24).

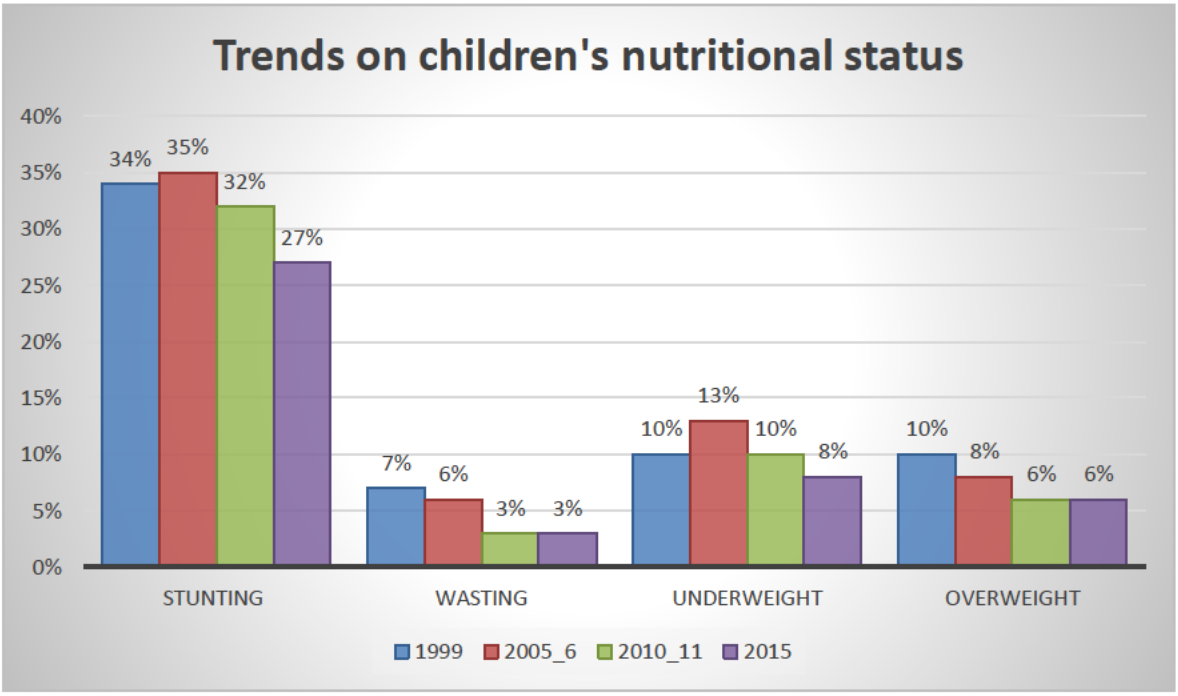

Figure 1.1: Children's nutritional status trends in Zimbabwe (1999 - 2015) (ZDHS 2015).

Three percent of Zimbabwean children were recorded to be wasted in 2015. Children aged between 9 and 11 months (9%) recorded the highest levels of wasting. At this stage children are more vulnerable to disease as complementary feeding is being introduced. In terms of underweight, about eight percent of Zimbabwean children were found to be underweight with peak levels found among children aged between 12 and 23 months (Zimbabwe Demographic Health Surveys, 2015: 200).

The same survey revealed that only eight percent of children aged 6-23 months ate an acceptable diet as illustrated in Figure 1.2 and children aged 12-17 months tended to eat an acceptable diet more than other age groups (10%).

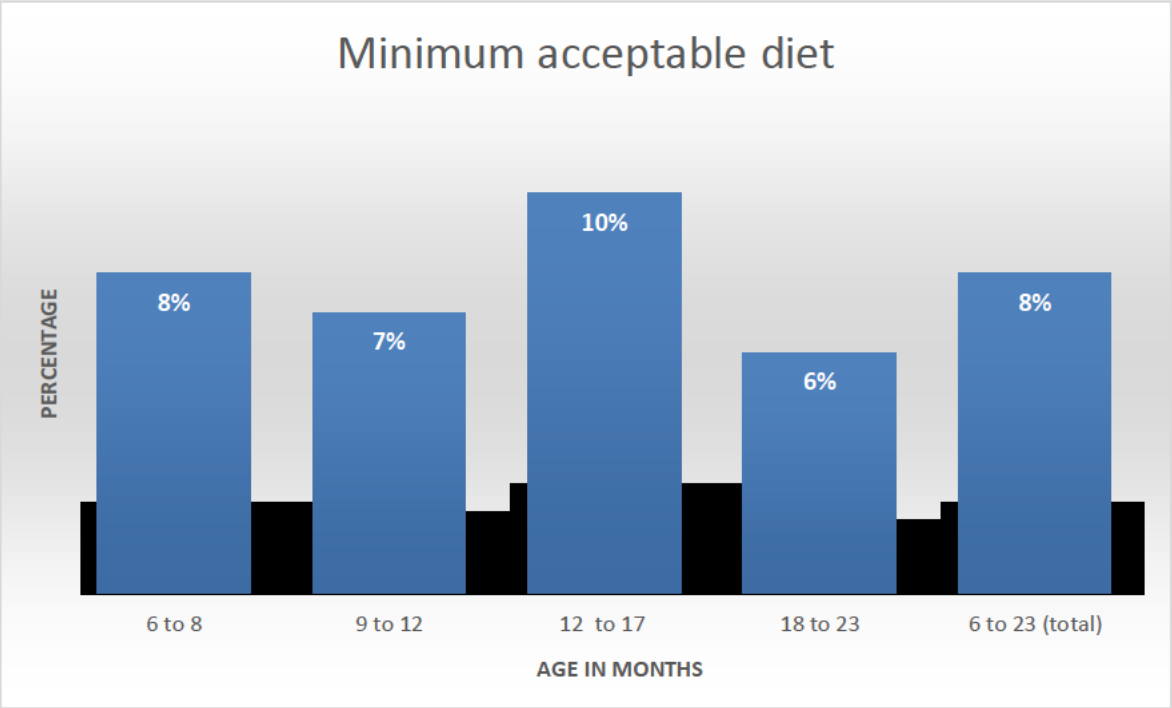

Figure 1.2: Minimum acceptable diet by age in Zimbabwe 2015 (ZDHS 2015).

Breastfeeding is a tradition in Zimbabwe, and it is the focal supplier of nutrition for infants in their first 365 days (Nduna, Marais and Van Wyk 2015: 69).

This study aimed to identify the type of nutrition knowledge that caregivers had and the feeding options they practised to ensure the growth of the infants in their care. The researcher wanted to evaluate the connection between nutrition knowledge and infant feeding practices with reference to the nutritional health status of infants.

1.5 STUDIES CONDUCTED

The researcher found three studies on infant nutrition/feeding conducted in Zimbabwe over the last 20 years which had a close relationship with the research being conducted. The first study was conducted in an urban set-up with caregivers who had access to health facilities but 51.0% of the infants were not receiving breast milk even though they were between the ages of six and twelve months (Tugwete 2013). The second study was about community perceptions on infant feeding and HIV, and many caregivers had the misconception that breastfeeding could prevent mother-to-child HIV transmission (Sibanda, Ncube and Madzima 2004). The third study was on the effects of maternal knowledge on infant feeding; it was a trial intervention which only led to temporary changes (Desai, Smith, Mbuya,

Chigumbura, Fundira, Tavengwa, Malaba, Majo, Humphrey and Stoltzfus 2015). Table 1.1 provides a summary of the studies:

Table 1.1: Studies conducted in Zimbabwe on infant nutrition

Author and reference	Study population	Measuring instrument	Summarized results
Tugwete **2013** **Relationship between knowledge on infant nutrition and infant feeding practices among mothers aged 15 to 40 years with infants seven months to one-year at Marondera's three urban health centres**	Eighty mothers who came to the health clinic with children aged between 7 and 12 months.	A questionnaire divided into three sections was used. Data was collected using interviews.	About 48% of the infants were still receiving breast milk with others having progressed to cow's milk, goat's milk or formula feeding. A small number (1.3%) of caregivers were heating the milk. Approximately 54% of the mothers had been educated and had received counselling on infant feeding practices with a majority (71%) providing a meal frequency of 5–6 meals per day. A small minority had low nutrition knowledge but the majority recorded a moderate understanding of infant nutrition. The relationship between feeding practices and nutrition knowledge was found to be weak and it was concluded that it was not only nutrition knowledge that influenced feeding options but other influencers needed to be investigated.
Sibanda, Ncube and Madzima **2004** **Community perspectives on infant feeding and HIV in the context of Pmtct in Zimbabwe**	421 women with babies below one year of age.	Questionnaires and focus group discussion	Seventy-eight percent of the participants in Makoni district had heard about the pmtct programme and 45% in Tsholotsho. In both districts participants had learned from the health centre in Makoni (86%) and Tsholotsho (88%), and a few participants had learned about counselling on infant feeding options as part of the package offered in the programme. Tsholotsho recorded a lower number of women who knew about the different infant feeding practices than in Makoni. Exclusive breastfeeding was low in Tsholotsho (58%) and in Makoni (30%) and in Tsholotsho (35%) of participants had the misconception that breastfeeding protected a baby from getting HIV.
Desai, Smith, Mbuya, Chigumira, Fundira, Tavengwa, Malaba, Majo, Humphrey and Stoltzfus	Nineteen mothers of infants aged 7–12 months	A mixed methods approach was used to assess maternal knowledge and a 24-hour recall was used to assess infant nutrient intake.	Energy needs were met by many infants (63%) but the majority lacked sufficient iron, zinc, calcium and folate. Post intervention, infants received sufficient macronutrients which contributed to the energy requirement and there was an increase in infants receiving iron, folate, calcium, and zinc.

Author and reference	Study population	Measuring instrument	Summarized results
2015 **Effects on maternal learning and infant diet quality in rural Zimbabwe**			The trial intervention led to short term improvements.

1.6 RATIONALE AND MOTIVATION

Good nutrition is essential for the optimal health and growth of infants (Branca, Piwoz, Schultink and Sullivan 2015: 27). It is common practice that every caregiver should strive to achieve this goal since early childhood feeding experiences affect both the health and psychological wellbeing of children. It was found that poor feeding behaviour in infants was accountable for 60% of the 10.9 million annual deaths in children, and a third of the deaths of infants within their first year of life (WHO 2003: 5).

In sub-Saharan Africa, poor infant feeding practices have been a pervasive challenge for many years, with about a third of all children under five being stunted, and micronutrient malnutrition recorded in more than half of the children under the age of five (UNICEF/WHO/World Bank 2020: 3). Even in cases where mothers exclusively breastfeed their babies for six months before weaning them, many of the babies are hospitalized as a result of malnutrition. Thus, poor feeding options have led to malnutrition and deaths in children (UNICEF 2015: 6). Such ramifications are influenced mainly by the amount of knowledge the caregivers have with regard to infant nutrition and feeding practices, raising a cause for concern in respect of infant health. The Global Strategy for Infant and Young Child Feeding Intentions (WHO 2003: 9) were aimed at boosting the nutritional status and overall health of infants through optimal feeding.

The infant mortality rate in Zimbabwe was estimated to be at 60 per 1,000 live births, according to the United Nations Children's Fund (UNICEF 2009: 27). The infant malnutrition rate is high in Zimbabwe, and several factors have been identified as the main reasons for the choices made in feeding infants, causing improper feeding practices and hence malnutrition. These factors include but are not limited to food availability, accessibility and affordability, gender roles and relationships, time and energy constraints in preparing food, nutrition knowledge and customs and beliefs.

The World Bank discussion paper by Gillespie, Creed-Kanashiro, Sirivongsa and Galloway (2004: 14) suggested that caregivers were concerned that their infants might be too young to digest solid foods hence the delay in introducing complementary feeding. Caregivers' attitudes do indeed affect the selection of foods given to infants. Culture, social norms, and economic variables are also important factors influencing the infant feeding choices made by caregivers.

According to World Health Statistics (WHS 2010: 5), the 2010 statistics for Zimbabwe showed: early initiation of breastfeeding at 68.1%, continued breastfeeding at one year at 89.9%, the introduction of infants to solids, semi-solids and soft foods at 91.5%, minimum dietary diversity at 21.6%, minimum meal frequency at 55.2%, and minimum acceptable diet at 12.7%. The number of children who had ever received breast milk stood at 98.2% and 6.2% had been bottle-fed.

Infant growth and development are of paramount importance; therefore, the minimum acceptable diet required by infants for optimal growth and development should be ensured, as this will assist in eradicating malnutrition and reduce morbidity and mortality in infants by providing adequate diversity and correct meal frequency (WHO 2010: 18). The integrated management of acute malnutrition (IMAM 2017: 23) in Zimbabwe provided guidelines and treatment protocols for malnutrition and the findings from the study could be used to develop nutritional interventions that would benefit rural communities. The results should, therefore, have an impact on public health policy regarding the prevention and treatment of malnutrition and nutrition-related diseases using available resources within the community.

This study was conducted in a rural setting of Munjinga village located in the Hurungwe district, which is approximately 200km north-west of Harare the capital city of Zimbabwe. It is largely an agricultural village and tobacco is the main crop grown. Therefore, information from this research will be able to advise on the nutritional status of all infants in rural settings, such as this one in Zimbabwe, and recommend how best to improve their health.

1.7 RESEARCH AIM AND OBJECTIVES

This study aimed to find the relationship between infant feeding practices and caregivers' nutrition knowledge and the nutritional status of infants and provide information on the relationships between food intake, nutrition knowledge, socio-economic status, feeding

practices and the nutritional status of infants aged between 6 to 12 months in a rural community in Zimbabwe.

1.7.1 RESEARCH OBJECTIVES

The objectives of the study were to:

• Determine the socio-demographic profile of the families by means of a socio-demographic questionnaire.

• Determine the anthropometric status of the infants by measuring weight, length and mid-upper arm circumference (MUAC) using anthropometric measurements.

• Determine the infants' dietary intake and food variety by completing the infant and young child feeding questionnaire.

• Determine the food practices of the participants by completing an infant feeding practices questionnaire.

• Determine the caregivers' knowledge of infant nutrition by completing an infant nutrition knowledge assessment questionnaire.

• Determine the food security profile of the households by completing a coping strategy questionnaire.

• Determine the relationship between nutrition knowledge and infant feeding practices.

1.7.2 STUDY FRAMEWORK

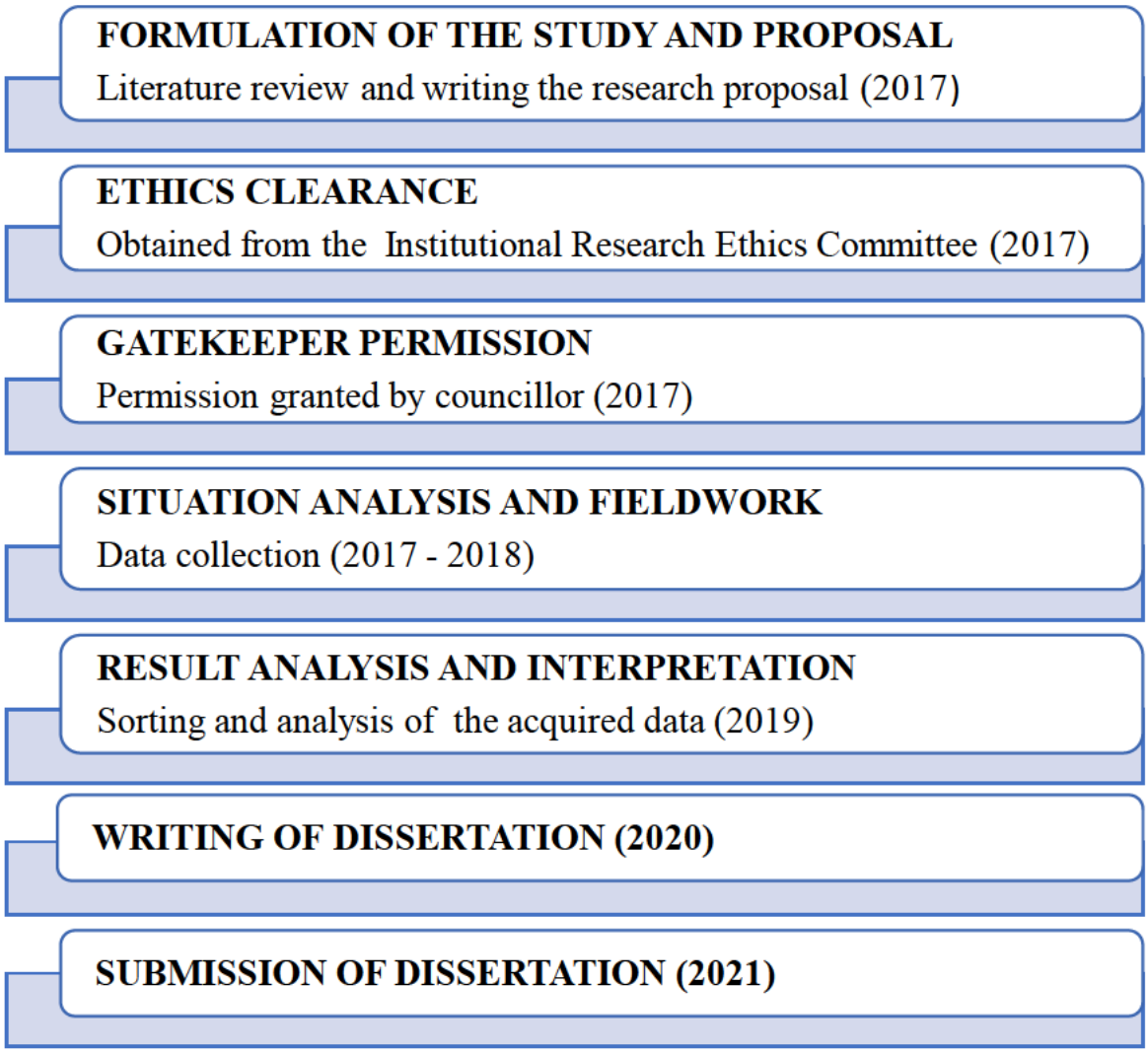

Figure 1.3: Study Framework

1.7.3 DISSERTATION STRUCTURE

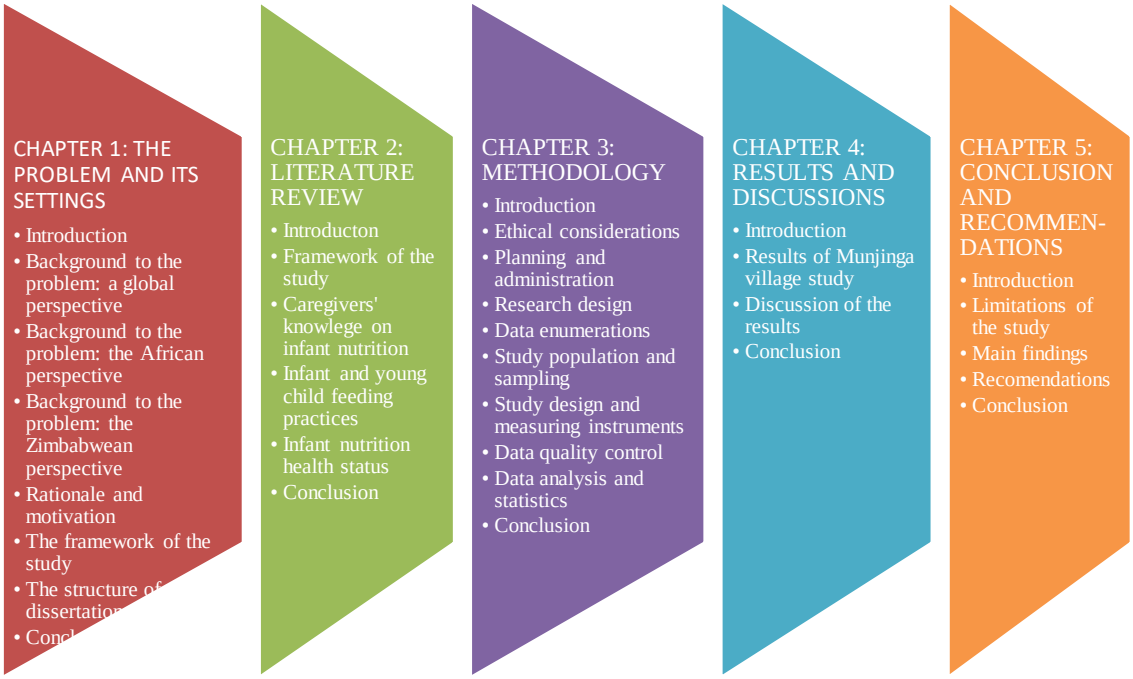

Figure 1.4: Dissertation structure

1.8 CONCLUSION

As shown above, poor infant feeding practices have been a pervasive challenge for many years, and there are multiple reasons for malnutrition amongst infants. This research intended to explore the relationship between feeding practices and caregivers' nutrition knowledge and their contribution to infant nutritional health. Chapter 2 will discuss in detail the literature review of malnutrition in infants, infant feeding practices, caregivers' nutrition knowledge, and growth indicators.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter a selection of relevant literature is reviewed. Studies undertaken by several researchers are examined to enable a more detailed understanding of how infant feeding practices and caregivers' nutrition knowledge affect the nutritional status of infants. Sub-Saharan Africa is a region with high levels of under-nutrition and makes up 45.0% of the child-under-five mortality rate (WHO 2018a: 10). Most women and children who live in rural areas where agriculture serves as the principal source of livelihood are undernourished (Gillespie, Van den Bold, Hodge and Herforth 2015: 464). The Zimbabwean Ministry of Health and Child Welfare (MOHCW) (2005) described a malnourished child as a child whose MUAC-for-age is below the third percentile on the Zimbabwe Child Health Nutrition Card or – 3 Standard Deviation (SD) to – 4 Standard Deviation (SD).

2.2 FRAMEWORK FOR THE STUDY

To steer this study the Health Promotion Model (HPM) by Pender (1996: 51-73) was applied. In this model health promotion is intended to improve the level of well-being and self-actualisation of a given group and this includes promoting a healthy lifestyle, making sure there is a supportive environment for health, and strengthening community actions to promote healthy public policies. In this study the activities in health promotion refer to the nutrition given to the infants by caregivers to promote growth and development. The HPM is an approach-oriented model and does not use threats or fear tactics as a source of motivation for behavioural change but attempts to illustrate the multidimensional nature of persons interacting with their environment as they engage in healthy living (Pender 1996: 53).

The HPM combines several constructs from the expectancy-value theory and the social learning theory to make up a social cognitive theory and in this study these constructs represent the process an individual goes through during infant feeding practices. In the expectancy-value theory it is accepted that behaviour is rational and economic, which means an individual will participate in each action and will continue using the action if the outcome of the stated action has positive personal value and includes available information about the desired action, showing how the desired outcome is likely to be achieved. The social

cognitive theory shows the interaction between environmental events, personal factors and behaviour as well as how they interact as a reciprocal determinant of each other (Pender 1996: 53).

In the social cognitive theory, human functioning is greatly influenced by self-observation and self-reflection, which are part of self-beliefs. These self-beliefs include self-attribution, self-evaluation and self-efficacy. The latter belief is seen as being important as it is a judgement of one's ability to carry out a particular course of action and it is developed through experience, learning, verbal persuasion and somatic responses to situations. The framework is divided into two phases. The first phase is the nutrition knowledge level phase where caregivers put together their acquired knowledge to formulate their actions and improve their choices in infant feeding practices thereby preventing malnutrition, and the second phase is the infant feeding practice phase (Pender 1996: 66). Three variables that interrelate with each other are used in the HPM: individual characteristics and experiences, behaviour specific cognition and affect, and behavioural outcomes.

2.2.1 INDIVIDUAL CHARACTERISTICS AND EXPERIENCES

Pender (1996) stated that every individual has a unique character and experience that can affect their actions. This gives flexibility to the HPM to capture variables that might be highly relevant to a particular health behaviour in a targeted population. These individual characteristics and experiences are grouped into two categories, and they provide caregivers with the background and the basis for decision-making concerning their lifestyles.

Prior related behaviour

This is behaviour that has been retained from the past and the frequency of the same or similar behaviour from the past is the best predictor of behaviour and has both a direct and an indirect effect on the likelihood of individuals engaging in behavioural change. It affects HPM through perceptions of self-efficacy, benefits, barriers and activity-related effects (Pender 1996: 67).

Personal factors

The demographic factors of this study represent these factors, and they are grouped into three categories: biological, psychological and sociocultural. Personal biologic factors include variables such as the age of the caregiver, and the caregiver's nutrition health status which influences decisions made on infant feeding practices, hence helping in assessing the nutritional status of infants in the community. Personal psychological factors include the self-esteem, the self-competence and the perceived health status of the caregiver and how they define the term health. Personal sociocultural factors include variables such as education, income and socioeconomic status. A study done by Jill and Jill (2003) using the HPM proposed by Pender (1996) showed that in all health programmes it is important to provide health education because it offers a foundation for individual health choices and that is why it is important for caregivers to have infant nutrition knowledge so that they can make informed choices and this was supported in a study by Olorunfemi and Dudley (2018: 7) where maternal nutrition knowledge is perceived as a determinant of infant feeding options. Some personal factors cannot be changed and are therefore rarely included in the health behavioural change interventions but most of the factors influence specific cognition, which influences the behavioural outcomes like exclusive breastfeeding and continued breastfeeding, and timely introduction to complementary feeding determines the nutritional status of infants.

2.2.2 BEHAVIOUR SPECIFIC COGNITION AND EFFECT

In this category variables are seen as being of major motivational significance and make up the core for interventions as they are subject to modification. These variables include:

Perceived benefits of action: This is where an individual engages in a particular behaviour depending on the anticipated outcome based on personal experience and learning from others engaging in the behaviour. This includes behaviours like timely weaning where caregivers perceive that thick porridge gives their infants energy (Pender 1996: 68).

Perceived barriers of action: These are barriers that prevent individuals from engaging in certain behaviours and these barriers can be either imagined or real. These include finances, lack of knowledge, poverty, beliefs and poor feeding practices.

Perceived self-efficacy: This is a judgement of one's ability to carry out a particular course of action developed through experience, learning, verbal persuasion and somatic responses to situations.

Activity related affect: This refers to subjective feelings of an individual's prior, during, and after behaviour based on the stimulus properties of the behaviour itself. For instance, if the caregivers felt good about breastfeeding their infants it meant they would likely follow the recommended breastfeeding guideline for two years.

Interpersonal influence: These are behaviours, beliefs and attitudes gained from other people, and caregivers acquire nutrition knowledge from various sources like family, peers and healthcare workers who influence their norms, social support and modelling. The interaction of caregivers and healthcare providers can influence acceptance of the behaviour being promoted.

Situational influence: These are perceptions of the options available, as well as available knowledge on infant nutrition to increase the quality of nutrition knowledge by caregivers. The study found that individuals prefer a compatible and safe environment (Pender 1996: 69).

2.2.3 BEHAVIOURAL OUTCOMES

When individuals commit to carrying out a specific action at a given time and place it is commitment to a plan of action in terms of the Health Promotional Model (HPM). There are immediate competing demands and preferences which could disrupt an action plan for positive health action such as last-minute urges built on one preference hierarchy, and this could be work or family care responsibilities. The action outcome of the HPM is called the Health Promoting Behaviour and, in this study, it was infant and young child feeding practices, and the Health Promoting Outcome was the infant feeding practices (Pender 1996: 71).

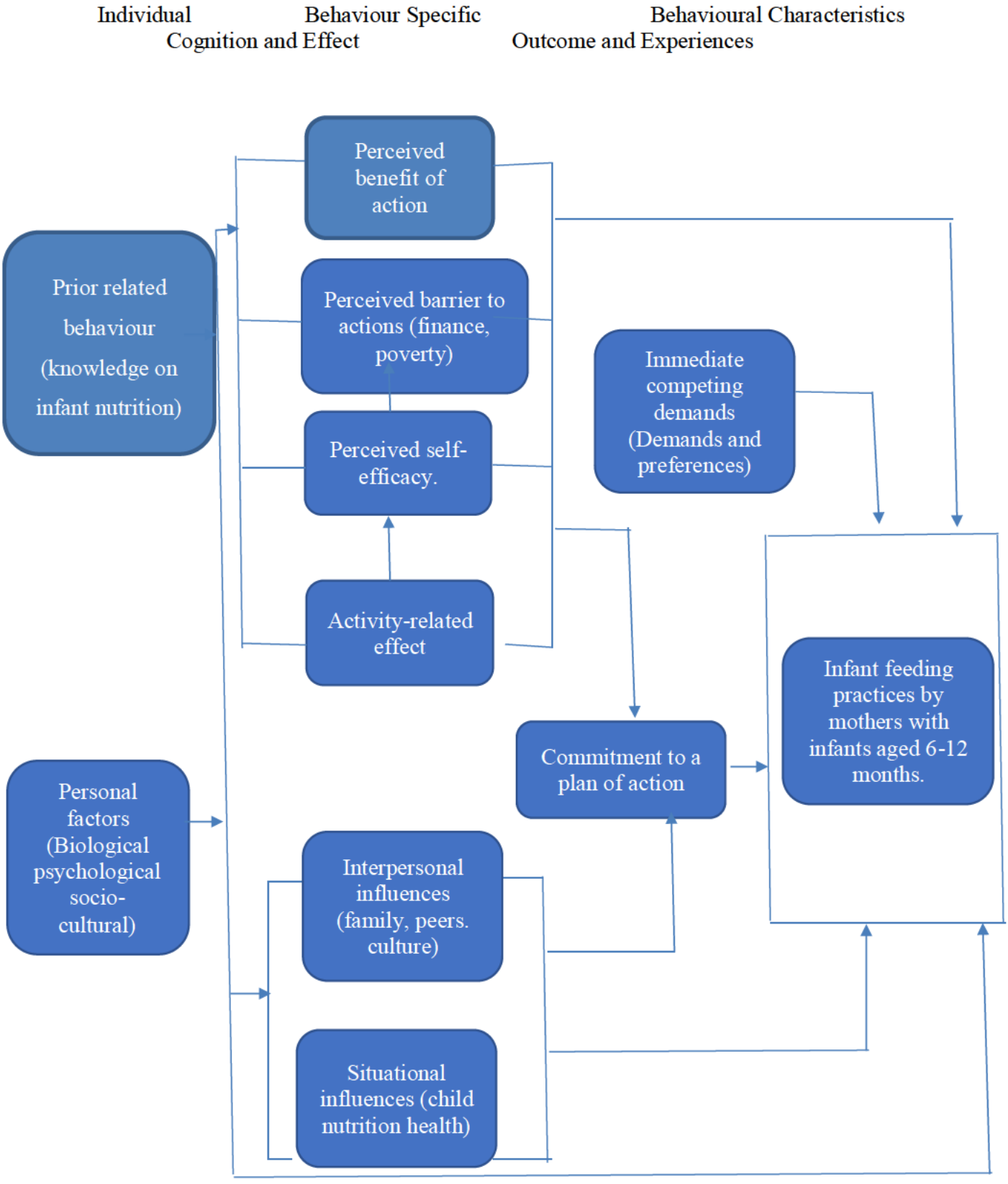

Figure 2.1: Health Promotion Model on Infant Nutrition (Source: Pender 1996: 67).

2.3 INFANT NUTRITION

Infancy is a time of rapid growth, especially in the first year of life when a child is developing physically and mentally from being completely dependent on the mother to having the ability to speak and express themself, and good motor skills to hold objects, and to start walking (Sohi 2013: 171). Nutrition refers to the science of nutrients in the foods they eat and their actions within the body (Whitney and Rolfes 2016: 3). McGuire and Beerman (2013: 3) stated that when living organisms acquire and utilize food to support processes required for existence it is called the science of nutrition. It has always played a significant role in life and every day we select foods that influence our body's health (Whitney and Rolfes 2016: 3). Nutrient needs of infants reflect growth rates, energy expended in activity, basal metabolic needs, and interaction of the nutrients consumed (Mahan and Raymond 2017: 301). The South Africa Department of Health (2016: 10) defined nutrient deficiency as the inadequate absorption of the necessary nutrients by the body that can lead to malnutrition.

Full term infants can digest simple proteins (which are made by joining only amino acid subunits by peptide bonds) and carbohydrates, and as they grow their digestive ability increases. Filtration of the kidney is very low during the early months and infants find it difficult to excrete a high level of solutes but by the end of one year the kidney's functional capacity is fully developed. Brain cells develop rapidly during the first six months and that is why malnutrition during this stage can cause mental retardation (Sohi 2013: 171). That is why Prado and Dewey (2014: 267) stated that it is important for infants to have adequate nutrition which is crucial for brain development, and a strong immune system build-up as deprivation might cause lifelong irreversible effects.

2.3.1 DIETARY REFERENCE INTAKE (DRI)

Nutrition experts have come up with a set of standards from many research studies to define the amount of energy, nutrients, other dietary components, and physical activity that support good health. These standards, or values, are called Dietary Reference Intake (DRI) and they are used in planning and assessing diets (Institute of Medicine (IOM) 2006: 6). DRI comprises of: Estimated Average Requirements (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI) and Tolerable Upper Intake levels (UL) (Whitney and Rolfes 2016: 18).

2.3.2 ESTIMATED ENERGY REQUIREMENTS (EER)

This is the average dietary energy intake that maintains energy balance in a healthy individual (kcalories per day) (IOM 2006: 7). To sustain a healthy and active life we need food energy, but if we consume too much food energy it could result in weight gain and no upper-level limit has been determined (Whitney and Rolfes 2016: 20).

2.3.3 ESTIMATED AVERAGE REQUIREMENTS (EAR)

The lowest continuous intake of nutrients to maintain a specified criterion of adequacy was reviewed (Whitney and Rolfes 2016: 18). Different criteria for each nutrient based on its role to support various activities in the body and reduce disease risks were reviewed and it was found that every individual's body is different, and nutrient needs differ due to individual physiology and biological make-up (Whitney and Rolfes 2016: 18). Men differ from women and nutrient needs change as people grow and develop from infancy through to old age. Nutrient experts grouped the recommendations based on gender and age and came up with an EAR for each nutrient, which is the average amount that appears to be sufficient for half of the population (IOM 2006: 10).

2.3.4 RECOMMENDED DAILY ALLOWANCE (RDA)

Once the nutrient requirement was established, the nutrition experts had to decide on the recommended intake for the whole population, which was the Recommended Daily Allowance (RDA). EAR is an average closest to every individual's needs but if people took the average requirements given each day, half of the population might develop deficiencies, hence RDA recommendations are set higher than the EAR to meet the needs of most healthy people. Small amounts higher than the EAR do not do any harm, whilst lesser amounts might result in health problems (Whitney and Rolfes 2016: 19)

2.3.5 ADEQUATE INTAKE (AI)

For some nutrients, like Vitamin K, there was not enough scientific evidence to develop an EAR needed to develop the RDA. In these scenarios nutrition experts established Adequate Intake (AI), which is the average amount of a nutrient that a group of healthy people need and use to set individual nutrient goals. RDA and AI both serve as individual nutrient intake goals, but the difference is that RDAs are recommended based on proven scientific evidence

through research studies, whilst AI relies mainly on scientific judgements because there is a lack of scientific evidence (Whitney and Rolfes 2016: 19). For infants the AI is based on the average amount of the nutrient provided by 0.6 L/day of human milk and the average amount of nutrient provided by the weaning foods consumed by the infant at that age (IOM 2006: 14).

2.3.6 TOLERABLE UPPER INTAKE LEVELS (UL)

Tolerable upper intake level is the maximum amount of a nutrient that can be consumed before it becomes toxic to the body. Therefore, it is recommended not to exceed this amount nor to consume it often as tolerance levels for high doses vary in individuals. Upper levels are useful in guarding against overconsumption of nutrients especially when individuals are using dietary supplements and fortified foods regularly (Whitney and Rolfes 2016: 19).

2.3.7 ENERGY

If infants are breastfed to satiety or fed a standard infant formula, they can adjust their intake to meet their energy needs provided caregivers are sensitive to the infants' hunger and satiety cues (Mahan and Raymond 2017: 301). An infant's birth weight can triple by the age of one year and requires approximately 100 calories per kilogram of body weight (Whitney and Rolfes 2016: 510). An infant's energy adequacy intake can very effectively be determined by carefully monitoring gains in weight, length, head circumference and weight-for-length, and plotting this data on WHO growth charts (Mahan and Raymond 2017: 301). The energy recommendations for infants in the second six months of life reflect intakes of solid foods as well as breast milk (Whitney and Rolfes 2016: 510). The energy nutrients are carbohydrates, fats and proteins.

Table 2.1: Dietary reference intakes for Energy (IOM 2005).

Equations for calculating Estimated Energy Requirements (EER) for infants	
Age	**Calculation**
0 – 3 months	(89 X weight of infant [kg] – 100) + 175
4 – 6 months	(89 X weight of infant [kg] – 100) + 56
7 – 12 months	(89 X weight of infant [kg] – 100) + 22

2.3.7.1 Protein

Infants' protein requirements are higher per kilogram of weight than those of older children and adults because of their rapid growth (Mahan and Raymond 2017: 301). The functions of protein in our bodies include tissue replacement and build-up of lean body mass and are essential for growth. Infants require a larger percentage of total amino acids like histamine for premature infants, and tyrosine, cystine and taurine that might be essential (Mahan and Raymond 2017: 301). In the first 12 months of an infant's life, human milk and formula provide the larger portion of protein needed and are sufficient for the first six months of the infant's life, and from six months of age on the diet should be supplemented with additional sources of high-quality proteins, such as yogurt, strained meat, or cereal mixed with formula or human milk (Mahan and Raymond 2017: 301). According to a study done in Ghana the protein intake gap of infants in sub-Saharan African countries could be closed by increasing the availability of legumes in their diet as it was already considered as "the meat for the poor" (De Jager, Borgonjein-Van den Berg, Giller and Brouwer 2019: 2). Some authors have suggested that for infants who are given a vegetarian diet the DRIs should be increased by 10%-15% because of the lower digestibility of plant protein (Agnoli, Baroni, Bertini, Ciappellano, Fabbri, Papa, Pellegrini, Sbarbati, Scarino, Siani and Sieri 2017: 1039). Formula might not provide enough proteins for infants if it is excessively diluted over a lengthy period, or if the infants have multiple food allergies and are placed on a restricted diet without proper medical or nutritional supervision (Mahan and Raymond 2017: 301) and it could have effects such as limiting brain function, weakening the immune system, and disrupting digestion and absorption (Whitney and Rolfes 2016: 510). Excess protein in the diet stresses the liver and kidney and the signs that there is an overload of protein include acidosis, dehydration, diarrhoea, fever, elevated blood ammonia and urea. These problems are not common but when infants are fed inappropriate foods, such as fat-free milk or concentrated formulas, they could manifest.

Table 2.2: Protein Dietary Reference Intake (IOM 2006: 144)

Protein Dietary Reference Intakes (DRIs) for infants (6 – 12 months)		
Gender	**Grams/Day**	**Grams/kilogram/Day**
Male	11	1.52
Female	11	1.20

2.3.7.2 Fats

Most of the energy in breast milk is provided by fats and its high-density energy supports the rapid growth of infancy (Whitney and Rolfes 2016: 510). Infants who are 12 months of age and below should eat a minimum of 30g of fat per day and if an infant consumes normal human milk and an infant formula intake, they will have enough energy per day (Mahan and Raymond 2017: 302). Linoleic acid and alpha-linoleic acid are essential fatty acids found in human milk, as are the longer derivatives arachidonic acid (ARA) and docosahexaenoic acid (DHA) (Mahan and Raymond 2017: 302). The maternal diet plays an important role in providing the wide range of fatty acids in human milk. Infant formulas are supplemented with linoleic acid and alpha-linoleic acid, from which ARA and DHA are derived (Mahan and Raymond 2017: 302). Linoleic acid, which is essential for growth and dermal integrity, provides three percent of the infant's total energy intake, or 4.4g/day for infants younger than six months of age and 4.6g/day for infants seven months to twelve months, and the current recommendation for alpha-linoleic acid is 0.5g/day during the first year of life (Mahan and Raymond 2017: 302). DHA and ARA are the major omega-3 and omega-6 long-chain polyunsaturated fatty acids (LCPUFAs) of neural tissues (Mahan and Raymond 2017: 302). DHA is the most abundant fatty acid in the brain and is also the major photoreceptor for membranes of the retina, contributing to neural visual development (Whitney and Rolfes 2016: 510).

Table 2.3: Total fat Adequate Intake (IOM 2006: 122)

Total fat Adequate Intake (AI) for infants (6 – 12 months)			
Gender	**Total fat (g/day)**	**Linoleic Acid (g/day)**	**Linolenic Acid(g/day)**
Male Female	31 31	4.4 4.4	0.5 0.5

2.3.7.3 Carbohydrates

An energy intake of 30% to 60% during infancy should be supplied by carbohydrates and about 40% of the energy in human milk is derived from lactose and other carbohydrates (Mahan and Raymond 2017: 302). Lactose is the principal carbohydrate in human milk and is responsible for the constant osmotic pressure in human milk; other carbohydrates in

human milk are monosaccharides such as glucose and galactose, and some oligosaccharides (Gridneva, Reg, Tie, Lai, Kugananthan, Ward, Murray, Hartmann and Geddes 2019: 2). Carbohydrates provide energy to all cells in the body but cells in the brain depend on glucose to fuel activities. The infant's brain constitutes about 12% of their bodyweight and thus uses more glucose and about 60% of the daily intake (Whitney and Rolfes 2016: 510). Infants who cannot tolerate lactose require a modified formula in their diet (Mahan and Raymond 2017: 302). When infants ingest *Clostridium botulinum,* the spores germinate and produce a toxin in the bowel called lumen causing botulism. Infant botulism has been linked to the carbohydrate found in honey that contains the bacterial spore. It is recommended that infants below the age of 12 months should not be fed honey or corn syrup as they would not yet have developed the immune system required to fight botulism spore development (Mahan and Raymond 2017: 302). The relative weight of infants (both fat and lean mass) has been associated with the amounts of glucose consumed (Fields and Demerath 2012: 307).

Table 2.4: Carbohydrates Dietary Reference Intake (IOM 2006: 102)

Carbohydrates Dietary Reference Intakes (DRIs) for infants (7 – 12 months)		
Gender	**Grams/Day**	**Total fibre (g/day)**
Male	95	-
Female	95	-

2.3.8 GROWTH

Growth rate slows a little after six months but energy saved is spent on increased activity (Whitney and Rolfes 2016: 510), therefore when there is a decrease in the infant's rate of gaining weight, or when they do not gain weight at all, or when they start losing weight, it is important to start evaluating their energy and nutrient levels (Mahan and Raymond 2017: 301). When an infant's length growth rate decreases or stops, potential malnutrition or an undetected disease, or both, should be investigated thoroughly. If the weight gain proceeds at a much more rapid rate than growth in length, the energy concentration of the formula, the quantity of the formula consumed, and the type of semisolid and table foods offered should be evaluated (Mahan and Raymond 2017: 301). A study by Matthews, Wei and Cunningham (2017: 928) showed that growth patterns in the early life of infants have implications for future risk diseases like obesity. "*Failure to thrive"* was a term widely used to describe problems caused by protein deficiency in infants (Whitney and Rolfes 2016: 510). Feeding behaviour in infants is brought about by the maturation of the nervous system,

mainly the one controlling muscular coordination. At birth infants can coordinate sucking, swallowing and breathing whilst their eyes cannot yet focus. Infants should be sucking with an up-and-down movement of the tongue until about three months and because of this movement, if solid foods are introduced it is pushed outside, and by four months this tongue movement changes and infants are able to swallow, and by six months they should be able to chew (Sohi 2013: 171). Typical infants develop head control, the ability to move into and sustain a sitting posture, and the ability to grasp during the first year of life. They develop mature sucking and rotary chewing abilities and progress from being fed to feeding themselves using their fingers (Mahan and Raymond 2017: 308).

2.3.9 WATER

Water is one of the essential nutrients for infants and it constitutes the greater percentage of body weight (Whitney and Rolfes 2016: 511). A small amount of water is needed for infant growth therefore the requirement for infants includes the amount needed for growth plus the amount lost through the skin, lungs, faeces and urine. Based on the DRIs, the recommended total water intake for infants is 0.7l/day for infants up to six months and 0.8l/day for infants six to twelve months of age. All water contained in foods, beverages and drinking water contributes to the total water intake. The renal concentration capacity of young infants might be less than older children and adults and they might also be vulnerable to water imbalances (Mahan and Raymond 2017: 302). In normal circumstances human milk and correctly prepared formula provide adequate amounts of water; however, when formula is boiled the water evaporates and the solute becomes concentrated, therefore boiled milk or formula is inappropriate for infants. In a very hot, humid environment, infants might require additional water. Loss of water could be high in infants due to vomiting and diarrhoea therefore infants should be monitored carefully for fluid and electrolyte imbalances during this condition. Water deficit results in hypernatremic dehydration and its associated neurological consequences like seizures and vascular damage. Water intoxication might occur when water is provided as a replacement for milk or the milk is excessively diluted, or when bottled water is used instead of an electrolyte solution in the treatment of diarrhoea. This might result in hyponatremia, restlessness, nausea, vomiting, diarrhoea and polyuria or oliguria and seizures might also occur (Mahan and Raymond 2017: 302).

Table 2.5: Fluid requirement for infants (IOM 2006: 157).

Maintenance fluid requirements for infants and children	
Body weight	**Fluid requirement**
0 – 10kg	100ml/kg
11 – 20kg	1000ml + 50ml/kg for each kg >10kg
>20kg	100ml + 20ml/kg for each kg >20kg

2.3.10 Minerals and Vitamins

2.3.10.1 Calcium

Breastfed infants retain approximately two thirds of the calcium intake, and the recommended adequate intake (AI) for infants 0–6 months of age is 200mg/day and for infants 6–12 months of age it is 260mg/day (Mahan and Raymond 2017: 302). Breast milk has an ideal calcium content for infant bone growth (Whitney and Rolfes 2016: 513). Calcium-rich foods like milk and milk products are important for strong and healthy bones throughout childhood.

2.3.10.2 Fluoride

Fluoride plays an important role in the formation of teeth and the prevention of dental caries (McGuire and Beerman 2013: 262); however, excessive fluoride might cause dental fluorosis, ranging from white lines to entirely chalky teeth (Mahan and Raymond 2017: 302). The acceptable upper intake level of fluoride has been set at 0.7mg/day for infants up to six months and 0.9mg/day for infants between 6–12 months of age (Mahan and Raymond 2017: 303). Breast milk has a low fluoride content and infants who drink too much formula reconstituted with fluoridated water might develop mild fluorosis. Other dietary sources of fluoride during infancy include commercially produced infant cereals and wet pack cereals processed with fluoridated water. Fluoride supplementation is not recommended for infants younger than six months and after six months it is only recommended when an infant is at high risk of developing dental caries and drinking insufficiently fluoridated water (Mahan and Raymond 2017: 303).

2.3.10.3 Iron

Full-term infants are considered to have adequate stores of iron for growth at approximately 4–6 months when they double their birth weight and much earlier for prematurely born infants. Increases are recommended according to age, growth rate and iron stores at 4 to 6

months of age for infants who are breastfed only and those at risk for developing a negative iron imbalance and might deplete their reserves by 6 to 9 months, and the recommended daily allowance for infants 6 to 12 months is set at 11mg/day (Mahan and Raymond 2017: 303). Complementary foods high in iron include strained meats, fish, poultry and whole grains, and iron-fortified infant cereals should be introduced in the infant diet. In addition, one serving of vitamin C-rich food per day should be included in the diet of infants six months of age and above to enhance iron absorption from nonheme sources (Mahan and Raymond 2017: 303). Cow's milk should not be given to infants below the age of one year as it is a poor source of iron. Common health concerns for infants between the ages of 6 to 24 months are iron deficiency and iron deficiency anaemia and because of their rapid growth, iron requirements per kilogram of body weight are higher than at any other stage of life (Mahan and Raymond 2017: 303). Risk factors associated with a high prevalence of iron deficiency anaemia include low birth weight, low intake of iron-rich complementary foods, and risk factors associated with a high intake of cow's milk are low socioeconomic status and immigrant status. There is a consistent association between iron deficiency in infancy and long-lasting neurofunctional effects (Domellöf, Braegger, Campoy, Colomb, Decsi, Fewtrell, Hojsak, Mihatsch, Molgaard, Shamir and Turck 2014: 123). It is vital to monitor the iron status in infants because of the long-term effects it could have thus it is crucial that information and support on dietary iron reaches high-risk groups to avoid these significant long-term effects (Mahan and Raymond 2017: 303).

2.3.10.4 Zinc

Zinc plays a role in major metabolic pathways, specific enzymes and their catalytic function and has an impact on the immune system (Mehta and Mehta 2014: 166). New-born infants are immediately dependent on a dietary source of zinc, human milk and infant formula to provide adequate zinc (0.3 to 0.5 mg/100kcal) for the first year of life (Mahan and Raymond 2017: 303). Zinc deficiency causes persistent diarrhoea, defects in the ability of the infant's vision to adapt to a dark environment, delayed wound healing, altered immune function, candida super infections, abnormal taste sensations, irritability, dwarfism, anaemia and acrodermatitis enteropathica (inborn error in respect of zinc metabolism) (Mehta and Mehta 2014: 166).

2.3.10.5 Vitamin B12 (Cobalamin)

Vitamin B12 plays a critical role in protein and DNA synthesis and is present in foods of animal origin like liver, meat, eggs and milk according to Mehta and Mehta (2014: 161). If a mother follows a strict vegan diet before and during pregnancy the human milk produced might be deficient in Vitamin B12. Deficiency results in megaloblastic anaemia, peripheral neuropathy and memory loss and in severe cases paralysis might occur (Mehta and Mehta 2014: 161). The symptoms of vitamin B12 deficiency include lethargy, hypotonia, developmental regression, vomiting and diarrhoea (Mahan and Raymond 2017: 303).

2.3.10.6 Vitamin D

The vitamin D content of breast milk is allied directly to the vitamin D status of the mother, and currently the recommended RDA for vitamin D for lactating mothers is 600IU per day and the tolerable upper limit is 4000IU per day (Mahan and Raymond 2017: 303). Good sources of vitamin D include exposure to ultraviolet light for at least 20 minutes to activate synthesis of vitamin D from cholesterol in the skin, liver, fish, egg yolk, milk and milk products (Mehta and Mehta 2014: 159). Excessive vitamin D intake could cause nausea and vomiting, loss of appetite, excessive thirst, frequent urination, constipation, abdominal pain, muscle weakness, muscle and joint aches, confusion, fatigue or damage to the kidneys (Mahan and Raymond 2017: 303). Lack of Vitamin D causes rickets in infants which is a disorder that leads to weakening of the bones during periods of rapid growth (Mehta and Mehta 2014: 158).

2.3.10.7 Vitamin K

Human milk contains 2.5 mcg/l of vitamin K whilst the AI for infants under six months of age is 2mcg/day and 2.5mcg/day for infants between 6 and 12months (Mahan and Raymond 2017: 303). For breast-fed infants vitamin K supplementation is necessary to reduce the risk of haemorrhagic disease and most hospitals require infants to receive an injection of vitamin K as a prophylactic measure shortly after birth (Mahan and Raymond 2017: 304).

2.3.11 CAREGIVERS NUTRITION KNOWLEDGE

Semahegn, Tesfaye and Bogale (2014) observed that maternal infant nutrition knowledge has a beneficial effect on the initiation of complementary feeding as well as the quality of

the complementary feeding (Fahmida, Kolopaking, Santika, Sriani, Umar, Htet and Ferguson 2015). Fathers have been found to have limited knowledge on infant nutrition (Aubel 2012), and this could be because many fathers are not involved in child feeding. Ombogo (2017: 16) emphasised that caregivers who are nutritionally educated raise their children in a healthy way as knowledge increases their capability to engage in improved feeding practices. Ombogo (2017: 16) established that inadequate nutrition knowledge on suitable foods to feed infants with and appropriate feeding methods is often a bigger determining factor of malnutrition than lack of food itself. Caregivers were seen to have more knowledge on recommendations regarding breastfeeding in comparison to complementary feeding. Evidence by Bimpong, Cheyuo, Abdul-Mumin, Ayanore, Kubuga and Mogre (2020) in Ghana showed that children from developing countries do not meet the core indicators for appropriate complementary feeding. In a study done in Ghana, 68.0% of the mothers knew about the recommendation for continued breastfeeding. Ninety-two percent practised continued breastfeeding. The percentage meeting the requirement for dietary diversity was 10.5%, for minimum meal frequency it was 39.5% and finally, the minimum adequate diet requirement was met by 8.0%. That is why it is necessary to give caregivers information on infant nutrition through suitable nutrition programmes that are culturally sensitive.

2.4 INFANT AND YOUNG CHILDREN FEEDING PRACTICES

Adequate nutrition is critical to a child's health and development. The period from birth to two years of age is particularly important because of the rapid growth and brain development that occurs during this time. The Infant and Young Child Feeding Module, (WHO 2008a) provides indicators for children aged 6-23 months. Feeding practices included in this update relate to breastfeeding practices, feeding solid and semi-solid foods to breastfed and non-breastfed children, micronutrient intake and feeding during diarrhoea. In this study the researcher wanted to identify the feeding practices commonly used by mothers living in the rural area of Munjinga in Zimbabwe after breastfeeding for six months. Poor feeding practices such as those that provide insufficient nutritional balance or contribute to diarrhoea are a major cause of low weight, morbidity and mortality in children (Iliyasu, Galadanci, Iliyasu, Babashani, Gajida, Nass and Aliyu 2019: 597). It is important to note that the practice that impedes or facilitates exclusive breastfeeding begins in the health facility where the infant is delivered and also depends on infant feeding counselling and this was shown by

the fact that most hospitals took up the Baby Friendly Hospital Initiative stance, which recommends initiating breastfeeding within half an hour of birth.

2.4.1 CORE INDICATORS FOR ASSESSING INFANTS AND YOUNG CHILD FEEDING (IYCF) PRACTICES

2.4.1.1 Early initiation of breastfeeding

Breastfeeding should be introduced as soon as possible after birth (30 minutes after normal delivery and four hours if the birth was by caesarean section) and the infant should not be given anything before this initiation (Sohi 2013: 172). The infant and young child feeding practices module covers the proportion of children born in the last 24 months who were put to the breast within one hour of birth. This indicator is based on historic recall. The denominator and numerator include living children and deceased children born within the past 24 months (WHO 2008a: 5).

2.4.1.2 Exclusive breastfeeding under six months

Nature's gift and the first food of infants is mother's milk and Sohi (2013: 172) stated that even malnourished mothers could nurse their child and meet their needs in the first few months of their life. It has been recorded in many studies that it is beneficial for child growth to give infants only mother's milk in the first six months. Breast milk is enough to nourish infants under six months, as it provides all the needed nutrients, antibodies and immune factors (Kumwenda 2017: 9) without the need for supplements or water even in the hottest summer. In this feeding practice, only breast milk was given to infants although medicine, vitamins or mineral drops could be given when recommended and in the infant and young child feeding practices module it was the proportion of infants 0–5 months of age who were fed exclusively with breast milk. This indicator includes breastfeeding by a wet nurse and feeding with expressed breast milk. This was the first in a series of current status indicators based on recall of the previous day and included living infants (WHO 2008a: 5). A study on the challenges and opportunities of optimal breastfeeding practices by Marinda, Chibwe, Tambo, Lulanga and Khayeka-Wandabwa (2017: 11) suggested that educating caregivers on the overall benefits of breast milk empowers mothers affected by HIV to evaluate the risks and benefits of breastfeeding and still makes the choice of exclusive breastfeeding possible.

Advantages of breastfeeding

Breastfeeding is a simple and natural method of feeding; there is no need for any preparation, and it is convenient for both mother and child as it is readily available. Breast milk is an unbeatable food that provides nutrients that meet all the nutritional requirements in all different stages of growth and development for infants under the age of six months (Sanchez, Franco, Regal, Lamas, Cepela and Fente 2021: 1). It contains enough fat which is highly emulsified, which means it can be digested easily. Natural sweetness is provided by lactose and it helps in the absorption of calcium and iron. Breast milk has a lower protein content than cow's milk, making it more appropriate as it reduces pressure on the infant's kidneys. It provides adequate amounts of Vitamin C; the iron present has a higher bioavailability and the calcium in breast milk is better absorbed (Sohi 2013: 173). It is the first food that is consumed by infants and it is safe and sustainable (Domenici and Vierucci 2022: 1) making it a hygienic method of feeding. Breast milk contains an antistaphylococcal factor which prevents the growth of bacteria in infants' intestines; it also contains a bifidus factor which promotes the growth of lactobacilli and inhibits the growth of *E. coli*, thus preventing the occurrence of diarrhoea in infants. It has been noted that the gastric juices of breastfed infants are more acidic therefore microorganisms that might enter the stomach are destroyed (Sohi 2013: 173), thus breastfeeding has been associated with reduced viral and bacterial infection (Domenici and Vierucci 2022: 1). When consuming breast milk there is no threat of developing allergies as it contains anti-allergic properties compared to consuming cow's milk which contains *lacto globulin* and *serum bovine albumin* which might cause allergies. A yellowish liquid known as colostrum is produced from the mother's breast and this is the first milk that the infant will consume. It contains antibodies which develop natural immunity in the infant and protect it against various infections. Colostrum also contains nutrients over and above the antibodies. Moreover, an emotional, healthy and happy relationship is formed between a mother and her breastfeeding infant. A mother achieves a feeling of satisfaction when breastfeeding her own child and the infant develops emotional security. High levels of prolactin are produced during breastfeeding and this prevents ovulation in lactating mothers thus helping in the natural spacing of children. Breastfeeding assists in the normal involution of the reproductive organs and it also helps to prevent breast cancer (Sohi 2013: 173).

Breastfeeding is recommended for infants but there are circumstances where mothers cannot breastfeed their infants for various reasons. These reasons include serious illnesses like active tuberculosis or mental disorders, or it could be that the mother has cracked nipples or breast abscesses. Infants might also not be able to breastfeed due to extreme prematurity or congenital malformation like cleft palate or gastrointestinal tract obstruction. In consideration of the above reasons, alternate feeding is to be given to infants to provide nourishment (Sohi 2013: 174).

2.4.1.3 Continued breastfeeding at one year

This indicator includes breastfeeding by a wet nurse and feeding expressed breast milk. The title of this indicator on continued breastfeeding reflects the proportion of children 12–15 months of age who were fed breast milk (WHO 2008a: 6).

2.4.1.4 Introduction of solid, semi-solid or soft foods

This indicator was one of the two parts of the previous composite indicator for timely complementary feeding, which also included continued breastfeeding. It was the proportion of infants 6–8 months of age who received solid, semi-solid or soft foods (WHO 2008a: 6).

Complementary feeding is defined as the timely introduction of solid and semi-solid foods to infants above six months in addition to breast milk and this has been linked to good nutritional status and adequate growth in infants, which equates to weaning, which was defined by Sohi (2013: 175) as the process of gradually introducing foods other than breast milk to the feeding schedule of the infant. This process starts when the infant is introduced to food other than breast milk and ends when the child has been completely weaned from consuming breast milk. Weaning ensures the nutritional fulfilment of infants as well as gradually introducing infants to the family eating patterns. According to Mehta and Mehta (2014: 64) there are two types of weaning:

Natural weaning – this happens when the infant starts accepting increased amounts of complementary feeding whilst still breastfeeding on demand. When natural weaning starts, the complete weaning process could take up to four years.

Planned weaning – this happens when the mother decides to stop the infant from breastfeeding without sending signals that they need to stop breastfeeding. Reasons for

planned weaning could include painful feeding/ mastitis, a new pregnancy, concerns about the baby's growth (not getting enough milk), and baby teeth beginning to come out (Mehta and Mehta 2014: 65).

To maintain the adequate growth of infants, dense energy concentrated complementary feeding should be introduced to infants (Sohi 2013: 175) in a form acceptable to the infant; food should be easy to cook and store and not be easily perishable and should conform to cultural and religious needs (Mehta and Mehta 2014: 63). Caregivers should decide what the infants should eat, when they should eat, and how much they should eat based on a complex interaction of genetic, behavioural or social factors rather than on just an awareness that nutrition is important to the infant's health. Some of the factors that could affect caregivers' choices for their infants are preferences, habits, ethnic heritage and regional cuisines, social interactions, availability, convenience, economy, positive and negative associations, emotions, values, nutrition and health benefits (Whitney and Rolfes 2016: 4).

Infant cereals are fortified with iron and four level teaspoons of cereal provide approximately 5mg of iron, which is about half the amount the infant requires, therefore infant cereal is usually the first food added to the infants' diet (Mahan and Raymond 2017: 307).

Improving infant and young child feeding practices in children 0–23 months of age is therefore critical for good nutrition and the health and development of children. Infants should be held and cuddled during feeding until a feeding rhythm has been established, and although they can become fussy or cry when they are hungry, they smile and fall asleep when they are satisfied. Infants and not the caregivers should establish their eating schedules (Mahan and Raymond 2017: 307). Table 2.6 shows some of the hunger and satiety behaviours of infants.

Table 2.6: Hunger and satiety behaviours in infants (Mahan and Raymond 2017: 307)

HUNGER AND SATIETY BEHAVIOURS OF INFANTS		
Approximate age	**Hunger cue**	**Satiety cue**
Birth through 5 months	• Wakes and tosses • Sucks on fist • Fusses or cries • Open mouth whilst feeding to show he wants more	• Falls asleep • Turns head away • Seals lips together • Decreases rate of sucking or stops sucking • Purses lips, bites nipple, or spits nipple out • Smiles and lets go of nipple
4 months through 6 months	• Fusses or cries • Smiles, coos, gazes at caregiver during feeding • Moves head towards spoon • Tries to swipe food towards mouth	• Distracted or pays more attention to surroundings • Turns head away • Bites nipple or spits it out • Decrease rate of sucking • Obstructs mouth with hand
5 months through 9 months	• Reaches for food • Points for food	• Rate of feeding slows down • Pushes food away • Changes posture • Uses hands more actively
8 months through 11 months	• Reaches for food • Points for food • Gets excited when food is presented •	• Clenches mouth shut • Pushes food away • Rate of feeding slows down • Shakes head to say no • Plays with utensils
10 months through 12 months	• Expresses desire for specific food with words or sounds.	• Hands bottle or cup to caregiver • Shakes head to say no • Splutters with tongue and lips

Principles of weaning

The introduction of solids into an infant's diet begins the weaning process in which there is a transition in the infant's diet from only breast milk or formula to a more varied one. Weaning should progress gradually and be based on the infant's rate of growth and developmental skills, and the weaning foods should be selected carefully to complement the nutrient needs of the infant, promote nutrient intake and maintain growth (Mahan and Raymond 2017: 310). Many infants start the process of weaning at approximately six to nine months of age and complete the process when they can ingest adequately the required amount of milk from a cup at 18 to 24 months of age. Children prefer simple uncomplicated foods and infants should be offered foods that vary in texture and flavour because if they are accustomed to many kinds of foods, they are unlikely to limit their variety of food choices

later. To add variety vegetables and fruits should be added to cereal feedings for infants (Mahan and Raymond 2017: 310). Germinated cereals can be used in combination with legumes to formulate weaning mixes that have desirable nutritional qualities as well as sensory properties (Pandey and Singh 2019: 9). Weaning of infants is a process that requires that certain stages should be followed for the proper introduction of foods and these points are discussed below:

- One single food ingredient should be introduced at a time to enable caregivers to identify any allergic responses or food intolerances and introducing vegetables before fruits might increase vegetable acceptance (Mahan and Raymond 2017: 309).
- Strained/pureed complementary foods should be introduced first with their consistency gradually thickening to semi solid then solid with the advancing age of the infant.
- Small amounts of food should be given in the beginning and the amount increased as the infant develops a liking for the food.
- An infant should never be forced to eat certain types of food they do not like. If the child does not like the food, it should be removed from their diet for some time and re-introduced later, and if they continue to dislike it, it should be removed from their diet completely and other substitutes given.
- Spicy and fried foods should not be included in an infant's diet.
- A variety of foods should be introduced; caregivers who thoughtfully offer a variety of nourishing foods are more likely to provide a balanced diet and help their children accept more flavours (Mahan and Raymond 2017: 309). Table 2.7 shows some of the weaning foods recommended for infants.
- The colour, texture, flavour and shape of the food offered should be considered as the child grows older.
- Hygienic conditions should be maintained when preparing and storing infant food to avoid contamination. Utensils and hands should be washed thoroughly before preparing and feeding the infant (Sohi 2013: 176).

Developmental readiness and nutrient needs are used as the criteria that determine appropriate times for the addition of various foods. According to Mahan and Raymond (2017: 309), during the first four months of the infant's growth this would be shown by the beginning of a mature sucking pattern, and pureed foods introduced during this phase would be consumed in the same manner as liquids, with each suck being followed by a tongue-thrust swallow.

When the mature sucking movement is refined to allow munching movements to begin, the introduction of strained food is then appropriate, starting with infant cereal to support developmental progress, and offered to the infant using a spoon and not combined with the formula in a bottle (Mahan and Raymond 2017: 309). As oral-motor maturation proceeds, an infant's rotary chewing ability develops, indicating readiness for more textured foods such as pasta and well-cooked vegetables from the family menu. Infants can approximate their lips to the rim of a cup and can drink if the cup is held to them during the last quarter of their first year (Mahan and Raymond 2017: 310).

Young children should not be served a large plateful of food; the size of the plate and the amount should be in proportion to their age. At one year of age infants can eat one third to half the amount an adult normally eats. Children should not be forced to eat but, instead, the cause of the unwillingness to eat should be determined. If a child refuses to eat, the family meal should be completed without comment and the plate removed. At the next mealtime, the child will be hungry enough to enjoy the food presented but this procedure is usually tougher for the parent than the child (Mahan and Raymond 2017: 310).

Table 2.7: Weaning foods for infants (Sohi 2013: 175)

Infant's age	Food stuff	Form in which given	Amount	Frequency
6 - 8 months	Dal soup	Clear soup with little salt	For soups and gruel start with 2 spoons then increase gradually to 40ml	Once per day
	Green leafy vegetable soup	Clear soup with little salt		
	Rice/ maize meal gruel	With salt	2 teaspoons in a cup of water	2 times per day
	Cereals (cereal)	Cooked in water or milk	2 teaspoons and increase gradually to 50g.	Once a day
	Banana	Mashed banana with curd/milk	One teaspoon and increase gradually to 50g	Once a day
	Egg yolk	Half boiled egg with yolk		
	Pumpkin/butternut	Strained/pureed		
9 – 10 months	Starchy vegetables	Mashed boiled potato	One teaspoon and gradually increase to 50g.	Once a day
	Cereal and pulses	Semi solid	Start with small amounts and increase gradually	Once a day
	Vegetables	Mashed boiled vegetables		Once a day
11- 12 months	Egg	Soft boiled	One egg	Once a day
	Custard	Semi solid	½ cup	Once a day
	Potatoes	Mashed with a little salt	½ cup	Once a day
	Fruits	Apple, mango, melon, banana	½	Once a day
	Soft biscuits	Soaked in milk.	One to two biscuits	Once a day

Feeding problems of infants

Regurgitation and colic pain – many infants regurgitate small amounts of food and it should not be a cause for concern but when they start vomiting, it means they might be

swallowing air during feeding and a paediatrician should be consulted. Burping should be done after each feed as colic happens due to overfeeding.

Constipation – this is a result of insufficient fluid and excessive intake of fats and proteins. To relieve constipation the amount of fluid in infant feeding should be increased and more sugar added to the milk (Sohi 2013: 177).

Diarrhoea – several factors can cause diarrhoea in infants; it could be because of bacteria or viral infection, malabsorption syndrome, allergy, lactose intolerance, severe acute malnutrition (SAM) or moderate acute malnutrition (MAM). If diarrhoea persists it can be life threatening to a child. In case of mild diarrhoea, Oral Rehydration Salts (ORS) can be given at home but when it is severe, hospitalisation is important.

Allergy – some infants are lactose intolerant, so changing the form of milk is important to improve tolerance, but an infant who has a real lactose allergy will immediately be affected after consumption. This could lead to irritability, colic, regurgitating, diarrhoea and respiratory disorders. Allergy can be a designated and fundamental medical condition (Abu Naser and Alawar 2016: 79).

Bottle mouth syndrome – this happens when infants are given sweets or milk with sugar at night. When they sleep, their teeth are covered with the liquid containing fermented carbohydrates. It usually occurs in infants who are bottle-fed. In severe cases milk teeth can be destroyed.

Obesity – this happens when infants gain more weight than normal and it might be due to overfeeding by caregivers. The weight of infants should be checked every month. The incidence of overweight and obesity among children has increased dramatically in recent decades, with about one-third of children in the U.S. currently being either overweight or obese (Pulgaron and Delamater 2014).

Anaemia – deficiency in iron, folic acid, and vitamin B_{12} can cause anaemia but it is rare in breastfed infants.

Growth failure – many factors can cause growth failure such as metabolic disorders, malnutrition, and a poor physical and emotional environment at home. Treatment can range from consuming a high protein diet to surgical treatment.

Some of the symptoms of feeding problems in infants include:

- Lack of attentiveness during feeding
- Refusing to eat food and drink fluids as well as various textures of food
- Extremely long feeding times
- Chewing problems
- Difficulty with bottle and/or breast feeding
- Coughing during feeding times
- Extreme drooling
- Complexity in coordinating breathing with eating and drinking
- Augmented nasal staleness during meals
- Frequent pneumonia or respiratory infections
- Slow weight gain or development (Abu Naser and Alawar 2016: 80).

2.4.1.5 Minimum dietary diversity

In this indicator the quality of the complementary food in the infant's diet is measured. Breast milk is not counted in this indicator and it is the proportion of children 6–23 months of age who receive foods from four or more food groups. Seven food groups have been devised by WHO (2008a: 7) and used for the tabulation of this indicator and these are:

i. grains, roots, and tubers
ii. legumes and nuts
iii. dairy products (milk, yogurt, cheese)
iv. flesh foods (meat, fish, poultry, and liver/organ meats)
v. eggs
vi. vitamin-A rich fruits and vegetables
vii. Other fruits and vegetables.

Consumption of any amount of food from each food group is enough to count. The cut-off of eating from four or more groups was selected because it is linked to a better-quality diet as there is a high probability of consuming at least one animal food source and at least one fruit or vegetable in addition to a staple food, which is usually a grain, root or tuber, in a day (WHO 2008a).

In this study the above indicators were used but WHO (2021: 35) added breast milk as a group hence there are now eight food groups to calculate minimum dietary diversity, not the seven that were used for this study.

2.4.1.6 Minimum meal frequency

The number of times that the infant is given food is calculated in this indicator. It is the proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods including milk feeds for non-breastfed children. The minimum in this indicator is defined as: two meals per day for breastfed infants 6–8 months, three meals per day for breastfed children 9–23 months, and four meals per day for non-breastfed children 6–23 months. Feeding frequency for breastfed children includes only non-liquid feeds (WHO 2008a: 7). The World Health Organisation recommended that for the average healthy infant, meals should be provided 4 to 5 times per day, with additional nutritious snacks (such as pieces of fruit or bread) offered 1-2 times a day as desired. Also, the appropriate number of feeds depends on the energy density of the local foods and the usual amounts consumed at each feeding. MOHCW (2005) stated that feeding the infant frequently, for example, 5-6 times a day with healthy snacks like bread with peanut butter, fruits and milk, provides the infant with adequate nutrition.

2.4.1.7 Minimum acceptable diet

This indicator assesses both the quality and quantity of complementary feeding given to the infant. It could be defined as the proportion of children who have received both minimum dietary diversity and minimum meal frequency the previous day (WHO 2008a: 8).

2.4.1.8 Consumption of iron-rich or iron-fortified foods

The critical aspect of nutrient adequacy of food intake is assessed in this indicator. It is measured as the proportion of children aged 6–23 months of age who have consumed iron-rich foods like flesh foods or iron fortified foods designed for infants (WHO 2008a: 9).

2.4.2 OPTIONAL INDICATORS FOR ASSESSING IYCF PRACTICES

Optional indicators were put in place to ensure continuity in monitoring previously observed indicators, but they could be left out in data collection as they have been deemed to be not as critical as the eight indicators discussed above.

2.4.2.1 Children who were ever breastfed

Based on historic recall, this indicator looks at children born in the last 24 months who were ever breastfed. It does not matter for how long the infants were breastfed; it only considers if at some point they received breast milk (WHO 2008a: 10).

2.4.2.2 Continued breastfeeding at two years

It was recommended that children should be breastfed for two years, and this indicator measures how many children are still being breastfed at 24 months. It is the proportion of children 20-23 months of age who are being breastfed (WHO 2008a: 10).

2.4.2.3 Age-appropriate breastfeeding

In this indicator it is the proportion of children aged 0-23 months who are being breastfed.

2.4.2.4 Predominant breastfeeding under six months

In some populations the number of infants who are exclusively breastfed might be low, so in this indicator infants who receive other fluids but with breast milk as the main source of nourishment are identified. These fluids include water-based drinks, fruit drinks or ritual fluids (WHO 2008a: 10).

2.4.2.5 Duration of breastfeeding

The current status of data among children aged between 0 and 36 months who are still breastfeeding is used to calculate the median during breastfeeding among the children.

2.4.2.6 Bottle feeding

Infants who are being bottle-fed were assessed in this indicator. It has been said that bottle feeding has the potential to interfere with optimal breastfeeding, and there is an association between bottle feeding and increased diarrhoeal disease, morbidity and mortality, and that is why it is important to understand and record data about bottle feeding. Bottles with nipples are prone to contamination, therefore they should be thoroughly washed before and after use by the children (WHO 2008a: 11).

2.4.2.7 Milk feeding frequency for non-breastfed children

A minimum of two milk feeds is recommended for non-breastfed children. These milk feeds include liquid milk products such as infant formula, cow's milk or any other animal milk (WHO 2008a: 11).

Humana (2003: 26) established that caregivers who attended a healthcare facility were exposed to intensive counselling and adopted the safer practice of exclusive breastfeeding than the riskier practice of mixed feeding. Results of this study indicated that all mothers were moving away from mixed feeding towards giving breast milk exclusively for the first six months. Early cessation of breastfeeding and feeding exclusively by replacement remained low.

The Zimbabwe Ministry of Health and Child Welfare (2007: 4) in the Zimbabwe PMTCT guideline described exclusive breastfeeding, exclusive breastfeeding with early cessation, expressing, and heat-treating breast milk as some of the practices in under-one-year nutrition. Also, replacement feeding during the first six months of life, exclusive home modified animal milk, and exclusive commercial infant formula were some of the feeding options described. WHO (2016: 3) recommended that mothers living with HIV should breastfeed for at least 12 months and may continue breastfeeding for up to 24 months or longer (similar to the general population) while being fully supported for ART adherence and also that national and local health authorities should actively coordinate and implement services in health facilities and activities in workplaces, communities and homes to protect, promote and support breastfeeding among women living with HIV. Practices like hand washing before expressing breast milk and the use of clean cups were also highlighted as some of the good practices. Exclusive breastfeeding included ensuring that the baby was well attached to the breast to prevent breast problems, seeking medical care quickly when problems occurred, and practising safe sex during the breastfeeding period (Levine and Huffman, 2005: 30).

Nabwera, Moore, Mwangome, Molyneux, Darboe, Camara-Trawally, Sonko, Darboe, Singhatek, Fulford and Prentice (2018: 10) stated that improvement of the quality of water used in feeding and washing infant feeding utensils has a positive effect in reducing diarrhoea in infants, which has been implicated as one of the major causes of malnutrition. However, the SHINE trials done in Zimbabwe showed that there is no significant effect of

basic water intervention on childhood diarrhoea (Pickering, Null, Winch, Mangwadu, Arnold, Prendergast, Njenga, Rahman, Ntozini, Benjamin-Chung, and Stewart 2019: 1144). These were some of the good practices which promoted infant feeding. According to Tlou and Shapiro (2000: 54), heat-treating breast milk is culturally unacceptable, which prevents the mothers from using this option predisposing the infant to HIV. Coutsoudis (2005: 13) identified that the components of the safer breastfeeding package should encourage the following: exclusive breastfeeding up to six months and good lactation management (early initiation, attachment, positioning, frequent feeds and learning to express).

2.5 INFANT NUTRITIONAL HEALTH STATUS

Nutrition is crucial in the growth and development of infants. The assessment of nutritional status can be done by evaluating dietary factors, clinical assessment, anthropometric measurement, biochemical parameters, morphological parameters, radiological parameters and epidemiological data regarding morbidity and mortality (Mehta and Mehta 2014: 139). In this study the researcher used dietary factors and anthropometric measurements to assess the nutritional status of the infants.

2.5.1 DIETARY FACTORS

Food eaten by infants is directly related to their nutritional status. A good understanding with caregivers is important for correct responses to the questions in the questionnaire. A 24-hour recall method is used to assess breastfeeding practices, weaning practices and food intake preceding illness, and an average of three days recall during the week is recommended. A food frequency table is used to record the frequency of intake of each food item (Mehta and Mehta 2014: 139). The infant and young child module developed by WHO (2008b: 7-10) embeds both the 24-hour recall method and food frequency table in its questionnaire.

2.5.2 ANTHROPOMETRIC ASSESSMENT

Sohi (2013: 251) defined anthropometry as the physical measurement of an individual obtained and related to standards that reflect the growth and development of the individual, for example, weight, length and MUAC. The average birth weight of infants is 2500grams – 4000grams and they double their birth weight by five months and triple their birth weight to about nine kilograms in one year. For length, infants measure approximately 50cm at birth, 60cm at three months, at nine months they measure about 70cm and at the age of one

year their length will be approximately 75cm. The head circumference at birth is approximately 35cm and can increase to about 40cm at one year. Chest circumference is usually three centimetres less than the head circumference at birth, but they would be approximately the same at one year (Sohi 2013: 171).

Poor growth is currently defined as inadequate length and weight, and weight in proportion to length, based on the growth standards recommended by WHO in 2006 (Calder and Kulkarni 2018: 84). Terminology used is stunting, wasting and underweight, which describes length-for-age, weight-for-age and weight-for-length at or greater than two standard deviations (SD) below the median of the relevant standard. Growth failure at or greater than three SD below the median of the relevant standard is termed severe stunting or severe wasting (Calder and Kulkarni 2018: 84). The entire spectrum of growth deficits in practice are expressed as Z-scores, which is the difference between the observed values and the growth standards as a fraction of the mean values of the standard weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WHZ). Negative values in WAZ, LAZ and WHZ reflect growth deficit in children and values of -2 or more represent underweight, stunting and wasting (WHO 2008d: 14).

Globally, more children are stunted than wasted and in 2017 stunting affected roughly 150.8 million children and they were mainly in sub-Saharan Africa and Asia (UNICEF/WHO/World Bank 2018: 30). Due to the high prevalence of stunting, Prendergast and Humphrey (2014: 250) reviewed the complexity of the interaction of the environment's adverse influences in terms of a "stunting syndrome." This was a cyclic process connecting maternal nutrition to an intergenerational cycle of growth failure.

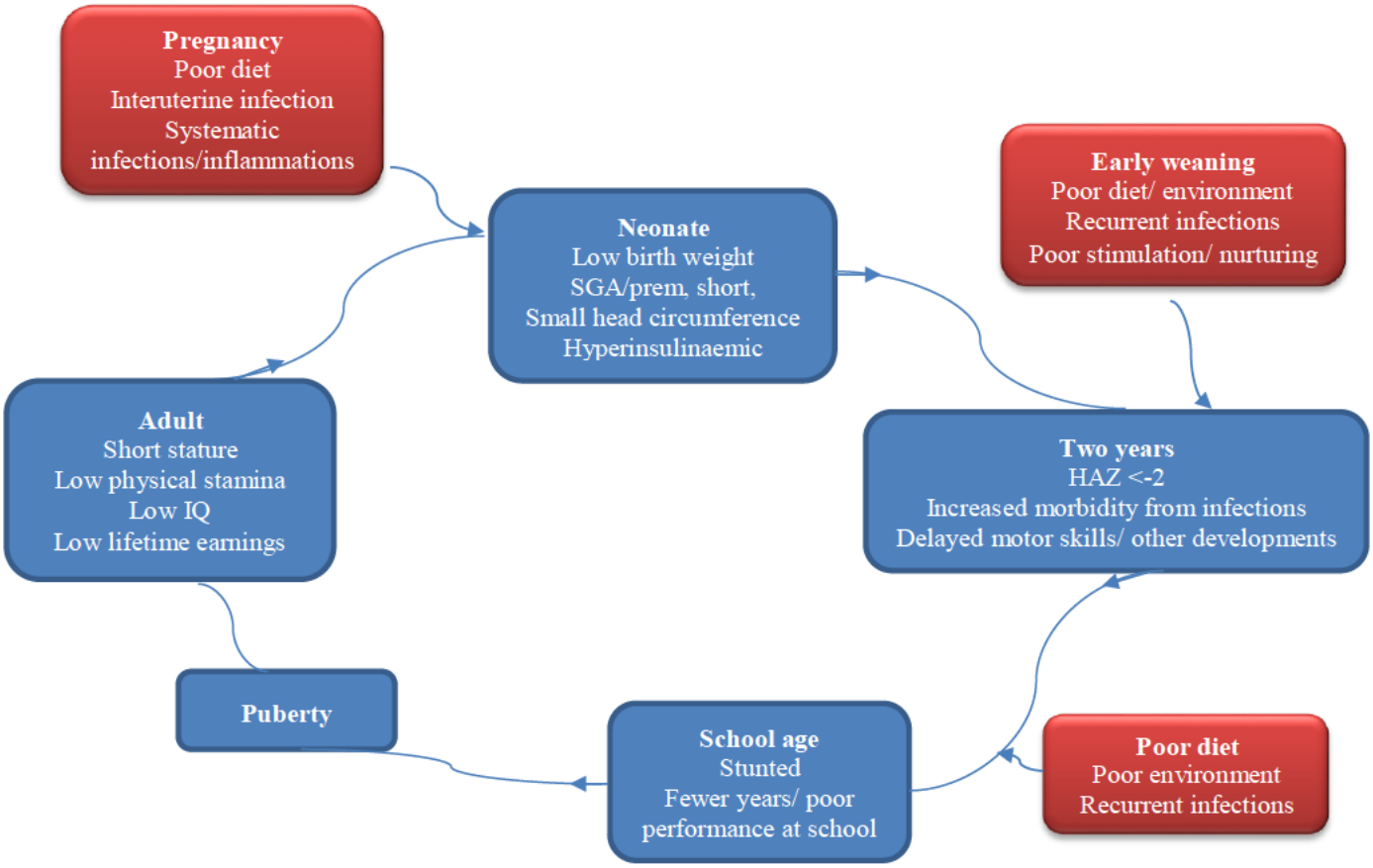

Figure 2.2: The stunting syndrome (Modified from Prendergast and Humphrey 2014: 34)

In an exploratory study by Ntini (1998) at Mpilo Central Hospital, Zimbabwe of caregivers' characteristics, infant nutritional knowledge, practices and resources which influence the nutritional status of children under five years, the results showed that more than eighty-four percent of children weighed 2500 grams and above at birth, and at the time of the study almost all of them (98.3%) were below weight-for-age. Most of the children (58.6%) were admitted to a health institution for the first time. Many of the children (70.7%) were no longer being breast fed, which emphasised the need for increased mothers' knowledge to improve the nutritional status of children.

2.5.2.1 Weight-for-age

This is the most sensitive method used for monitoring and supervising growth and it is used to identify nutrition and health problems (WHO 2008d: 14). Weight-for-age indicates a child's body weight appropriate for their age and sex relative to the reference population. It is an important indicator of a child's nutritional status, such as underweight or overweight

in young children aged less than two years old (WHO 2016). Weighing is quick and easy, and the tools needed are only a scale and charts. The weight can be expressed as a percentage of the median value (Mehta and Mehta 2014: 140).

2.5.2.2 Weight-for-length

This is the comparison of an infant's weight to the expected weight of a healthy reference infant's length. Weight-for-length indicates a child's weight status independent of their height relative to a reference population, typically in children under two years of age. This combination is used to assess the degree of wasting and to understand the dynamics of malnutrition and to distinguish between current and chronic malnutrition (Mehta and Mehta 2014: 141).

2.5.2.3 Length-for-age

This is when the infant's length is compared to the expected length for a healthy reference infant of the same age. Length-for-age indicates a child's height (or supine length in children less than two years old) for their age and sex relative to the reference population. It is used in clinical practice to monitor a child's growth and is influenced by genetic potential (parents' heights), nutritional factors, and the "tempo" of growth, which is a measure of the rapidity or slowness in timing to achieve final adult height and is closely related to puberty timing (WHO 2016). Changes in length occur relatively slowly compared to changes in weight. (Mehta and Mehta 2014: 140)

2.5.2.4 Mid upper arm circumference (MUAC)

MUAC is a useful method during nutritional emergencies where a large number of infants are to be screened. Any infant with a MUAC less than 12.5cm is classified as undernourished (Mehta and Mehta 2014: 140).

2.5.3 NUTRITIONAL DISORDERS IN INFANTS

Malnutrition is described as a disorder that happens when nutrition is not maintained properly, especially during infancy and two types of malnutrition are present, which are hypoalimentation, which is the effect of an inadequate consumption of nutrients in the diet and causes disorders like acute malnutrition, vitamin deficiencies, micronutrient and mineral deficiency disorders, and hyperalimentation, which is the effect of overconsumption of

nutrients and can lead to disorders like obesity, hypervitaminosis, and hemosiderosis (iron excess) (Mehta and Mehta 2014: 147).

Pfute, Mpeta, Mabaera and Rusakanuko (2007) studied factors contributing to malnutrition and weight-for-age was the nutrition indicator used. In the above-mentioned study the researchers were not concerned about the caregivers' knowledge on the factors contributing to malnutrition despite identifying them. In this study the researcher reasoned those mothers and caregivers would benefit from the knowledge and guard against those factors to prevent malnutrition. Therefore, this study sought to investigate the relationship between knowledge on malnutrition and infant feeding practices.

2.5.3.1 Hypoalimentation malnutrition

A reduced intake of protein over an extended period can lead to loss of weight, anaemia, nutritional oedema, compromised immunity and poor healing of wounds. Acute malnutrition is common in infants because their demand for protein is greater. Acute malnutrition has been identified as a public health problem in sub-Saharan Africa. It is one of the major causes of morbidity and mortality in children and it causes permanent physical and mental impairment (Sohi 2013: 65). It is caused by factors such as poverty, natural disasters, political problems and war (Mehta and Mehta 2014: 147).

Malnutrition occurs when infants do not have enough food to eat and this could be because of an inadequate or unbalanced diet, problems with digestion or absorption, or certain medical conditions like diarrhoea and tuberculosis. It usually occurs in association with poor energy consumption, and its manifestation depends on the duration of deprivation (Mehta and Mehta 2014: 148). General symptoms of malnutrition include:

- Infants do not grow at the expected rate in terms of both weight and length.
- Behaviour changes, with a tendency to be sluggish, irritable or apathetic
- Hair and skin colour changes
- Protuberant abdomen
- In severe malnourished infants swelling of the legs can be observed.

Acute malnutrition pertains to a group of disorders that include marasmus and kwashiorkor (Fisher, Walker-Lamberti, Adair, Guerrant, Lescano, Martorell, Pinkerton and Black 2012) and these micronutrient deficiencies have alarming effects on young children and can

increase the risk of mortality and morbidity (Rodamo, Fiche, Geleto, Abebe and Dangiso 2018:48). Deficiencies in iron, iodine, vitamin A and zinc are manifestations of malnutrition and usually occur during the crucial transitional phase when infants are weaned from liquid to semi-solid foods (Pandey and Singh 2019: 5).

Marasmus – this is a severe deficiency of protein and calories in a diet. It is more prevalent than kwashiorkor and it results in both wasting and stunting of infants. Its signs and symptoms include muscle wasting, severe loss of subcutaneous fat, a monkey-like face and diarrhoea, and sometimes the child is quiet and apathetic.

Kwashiorkor – this is caused by a deficiency in protein (Sohi 2013: 65) but Mehta and Mehta (2014: 148) argued that kwashiorkor is the result of oxidant damage and free radical injuries to the tissues, and if not treated properly it has a mortality rate of 60.0%. Its signs and symptoms included oedema, moon face, poor appetite, diarrhoea, hair easily pulled out, skin pigmentation, mental apathy and a large protuberant belly due to an enlarged liver.

Micronutrient deficiencies – this is common in malnourished infants; a single deficiency can be relatively easily identified but frequently the deficiencies are multiple and need laboratory assessment. Deficiencies are caused by an inadequacy in the intake of one or more vitamins and minerals essential for the prevention of malnutrition in all its forms and to reduce the prevalence of disease especially during pregnancy and early childhood (WHO 2019b). General symptoms of micronutrient deficiencies are skin problems, swelling and redness of the tongue, poor vision in dim light, tiredness, buzzing in the ear and pallor inside the mouth or eyelids (Mehta and Mehta 2014: 156). Vitamin A, iodine and iron deficiency are detrimental to the health of young children as they can cause blindness, anaemia and rickets, hence most children will become malnourished and less likely to advance academically than their counterparts (Mbarathi, Mthembu and Diga 2016: 19).

Malnutrition can be detected as shown in Table 2.8 using weight for length, MUAC and oedema. Oedema is a build-up of fluid in the body which causes the affected tissue to become swollen. Undernutrition is the insufficient intake of energy and nutrients to meet an individual's needs to maintain good health. Moderate Acute Malnutrition (MAM) is defined when there is moderate weight loss, also known as wasting and if left untreated it can lead to Severe Acute Malnutrition (SAM).

Table 2.8: Detecting malnutrition (Mehta and Mehta 2014: 151)

	Under nutrition	Moderate acute malnutrition	Severe acute malnutrition
Weight for length	Normal - -2Z score	-2 - -3 Z score	Below -3 Z score
MUAC	12.5-13.5 cm	11.5-12.5 cm	Less than 11.5cm
Oedema	None	None	Pedal oedema

2.6 CONCLUSION

In this chapter relevant literature was reviewed, providing further insight into the infant nutrition knowledge which caregivers should have, infant and young child feeding practices, and how the two parameters affect the overall nutritional status of infants. Research articles support the need for proper infant feeding practices as they affect the growth development of infants. Poor nutritional status of infants' causes malnutrition which results in high rates of morbidity and mortality in infants, therefore nutritional education should be provided to caregivers to promote a healthy infant population, which in turn will ensure a healthy human asset for the community.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the research design and methodology used in this study. The processes of the research and the data analysis of the study are described. To obtain reliable data, the research design and appropriate planning were carefully considered and deemed to be crucial to the success of the field study. Calibrated scales were used to provide accurate and valid results.

Child feeding practices are multidimensional and they change rapidly within short age intervals in the first years of life (WHO 2010: 1). The research methods were prudently chosen to satisfy the research objectives and to reflect this statement by the WHO.

The rationale of the study was to determine the relationship between infant feeding practices and the nutrition knowledge possessed by the caregivers and its effect on the overall nutritional health status of the infant. The study would provide information on the relationships between the food intake, socio-economic conditions, nutrition knowledge, feeding practices and the nutritional status of infants aged between six to 12 months. The main objectives of the study were to determine the socio-demographic profile, infant feeding practices, dietary intake, depth of food insecurity and the nutrition health status of 100 infants in Munjinga North village. In addition, the nutrition knowledge of the caregivers was crucial to this study. The measurements chosen for the study included a socio-demographic questionnaire, anthropometric measurements, a coping strategy questionnaire, a nutrition knowledge questionnaire, and the infant and young child feeding practices questionnaire. This chapter also summarises the ethical considerations, planning and administration, study design, data analysis and statistics.

3.2 ETHICAL CONSIDERATIONS

The research proposal was submitted and approved in 2017 by the Institutional Research Ethics Committee (IREC 047/17) at the Durban University of Technology (DUT) prior to the start of the study (Annexure A). A meeting was then held with members of the village to explain the research study; it was also explained that participation was voluntary, and it was made clear to the participants that although their cooperation was vital to the success of the study, they had the right to withdraw from the research at any time during the study should

there be a need. The respondents were informed verbally about the study and the confidentiality of all information collected and also by way of an information letter in both languages, English and Shona (Annexure B and Annexure C). All the caregivers were informed about signing an informed consent agreement (Annexure D) and it was emphasized that no financial compensation would be offered. Consent was obtained from 100 caregivers approached by the researcher. They were informed that all the information including data collected was to be locked away in the DUT Department of Food and Nutrition archives for a period of five years and thereafter it would be disposed of by shredding; electronic data would be password protected and would be deleted after this period. In addition, only the researcher and the supervisor would have access to this information. All 100 participants were requested to sign the consent form after the information session and before the commencement of the data collection.

3.3 PLANNING AND ADMINISTRATION

The researcher approached the Ward 14 councillor to obtain permission (Annexure E) to conduct research in the Munjinga North village community and permission was granted (Annexure F) in April 2017. From the village meeting seven members of the village were selected to form a formal forum/focus group who assisted in reformulating the existing questionnaires. The focus group was convened by the researcher to verify the validity of the modified questionnaires and it was made up of 14 village members and they were asked to sign the participants' register (Annexure G). The caregivers who participated in this focus group discussion were not part of the overall study.

3.4 STUDY DESIGN

This was a descriptive, quantitative study with a correlational aspect to it. Correlational research is research that explores the relationships among variables of interest without any active intervention on the part of the researcher (Leedy and Ormrod 2010). Questionnaire-based data was collected through interviews and the infants were measured using health-related measurements.

A caregiver is defined as any person who provides unpaid help or care to anyone in the home (Family Caregivers Alliance 2016). For this study, a caregiver was identified as the person in the household solely responsible for the upbringing of the infant.

3.5 SETTING

Zimbabwe, officially known as the Republic of Zimbabwe, is a landlocked country located in southern Africa and located between the Zambezi and the Limpopo rivers. It has 10 provinces, and the study was done in one of the provinces called Mashonaland West. Mashonaland West province is sub-divided into seven districts and the study was conducted in the Hurungwe/Karoi district. The Hurungwe district is a farming district with tobacco being the main cash crop grown. The district is sub-divided into towns and this study was conducted in Munjinga, which is a village located in Tengwe town, a farming town south-west of Karoi. It is comprised of several sub-villages and the researcher focused on four sub-villages, namely Gwiwa, Tengwe, Chinhere and Kavaya because they were represented by the councillor who gave permission to conduct the study in his area, which was Munjinga North Ward 14. The villages are farming plots with families living relatively far apart from each other. Each farming plot is about 20 hectares in size and there are no proper roads linking the plots so the researcher had to walk from one household to the other since a vehicle could not be used. Data was collected in December 2017 when all the villagers were at home busy planning for the farming season and were available to participate.

3.6 STUDY POPULATION AND SAMPLING

3.6.1 SAMPLING STRATEGY

In this study the investigator used a purposive sampling design. The study focused on infants and caregivers in rural households of four sub-villages in Munjinga North Ward 14 in Zimbabwe. The caregivers in each household with an infant between 6 to 12 months of age were requested to participate so as to get accurate information about their feeding practices. The researcher enquired about households with infants aged between 6 to 12 months, and the villagers were helpful in pointing out households which met the inclusion criteria. After completing the questionnaires, the caregivers in those households would give the researcher names of other households where infants within the same age group could be found. The researcher therefore used word of mouth to recruit participants.

Sample size

A convenient sample of 100 was used since the population size of all the infants between the ages of 6 and 12 months living in Munjinga village was unknown and the households were spread over a large area which presented a logistical challenge.

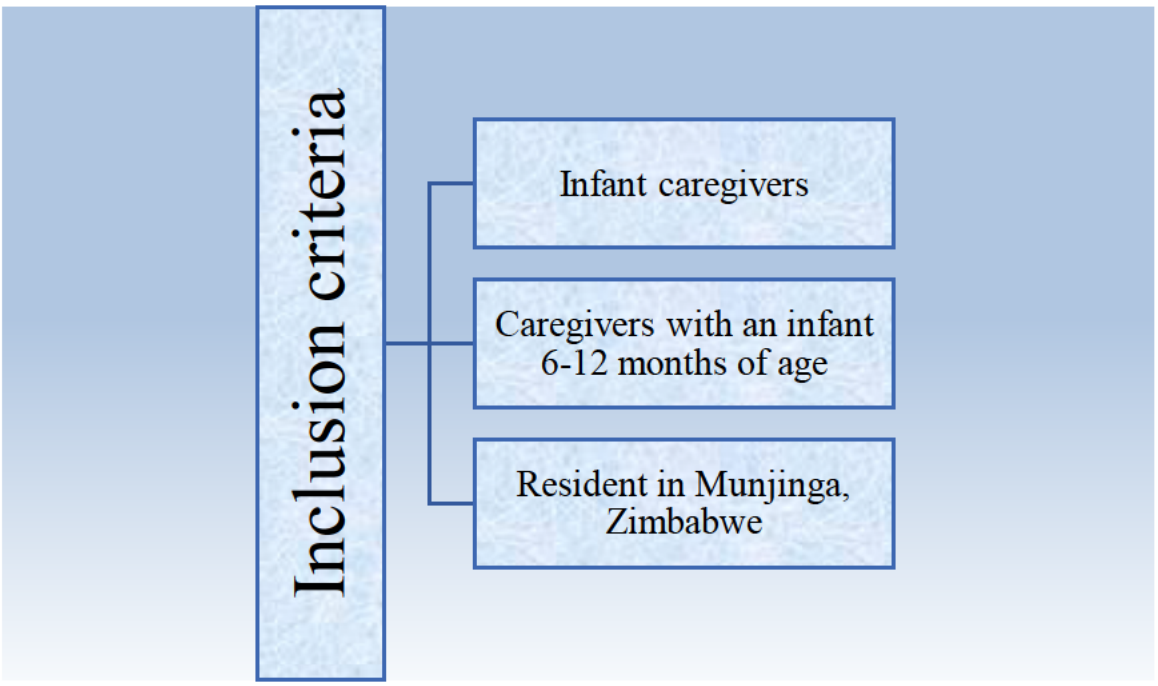

Figure 3.1: Inclusion criteria

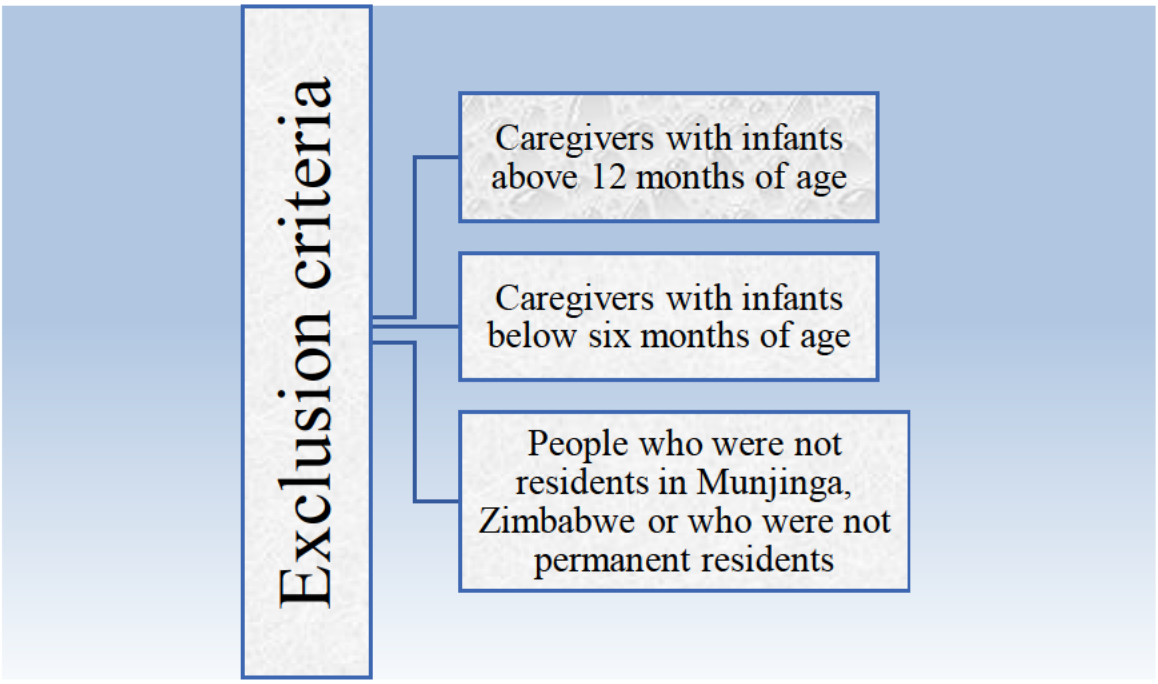

Figure 3.2: Exclusion criteria

3.6.2 VARIABLES

According to Connaway and Radford (2017), a variable is a characteristic or feature that changes during a study. In this study, the design assisted in describing the variables and correlating the relationship between the dependent variables and the independent variables.

Dependent variable

The dependent variable is the variable thought to be changed or influenced by the independent variable (Connaway and Radford 2017: 73). It is the outcome variable of interest, the variable that is hypothesized to depend on or be caused by another variable. In this study, it is infant feeding practices and the infants' nutrition health status.

Independent variable

The variable that stands alone in a study is called the independent or grouping variable. It is the variable that is believed to cause or influence the dependent variable (Connaway and Radford 2017: 73).). Knowledge on infant nutrition is the independent variable in this study.

3.7 DATA ENUMERATION

Four young village women were approached and trained to assist in data collection in the study. All the fieldworkers were fluent in both Shona and English. Consent forms were signed by the fieldworkers as a sign of their agreement to assist in the research and served as a confidentiality agreement (Annexure H). Two training sessions for the fieldworkers were held in both English and Shona, and fieldworker training manual guidelines were printed in English (Annexure I). The training sessions consisted of a discussion of the general guidelines on how to approach homesteads, the code of conduct, and the correct administration of the questionnaires. The fieldworkers were also trained, using role-play, on how to obtain the anthropometric measurements of the infants. The importance of the study was discussed with the fieldworkers so that they could understand the objectives of the study and how important their role was in obtaining accurate results.

3.8 ADMINISTRATION OF MEASURING INSTRUMENTS

The measurements chosen for the study included a socio-demographic questionnaire, anthropometric measurements, a coping strategy questionnaire, a nutrition knowledge questionnaire, and the infant and young child feeding questionnaire.

The different kinds of questionnaires used to collect data were set up in separate stations to help in the collection of data.

Figure 3.3: Data collection by fieldworkers

3.8.1 SOCIO-DEMOGRAPHIC QUESTIONNAIRE

The socio-demographic questionnaire developed and validated by Napier (2006) was used by the researcher in this study. The socio-demographic questionnaire was developed in English and tested and adapted to suit the local context in a focus group of 14 community participants not included in this study (Annexure J). One-on-one interviews were administered by the researcher and the fieldworkers. Participants were addressed in Shona where it was necessary to do so. The purpose of the socio-demographic questionnaire was to measure the socio-economic status of the families. Information on sensitive topics such as personal information, accommodation and family composition, work status and income, education and language, food practices, pests and assets were collected. The information from this questionnaire was further used to calculate the Multidimensional Poverty Index (MPI) to determine the level of poverty using cross-dimensional cut-off points of indicators

and weighting (Alkire and Santos 2010). A total of one hundred questionnaires were completed.

3.8.2 ANTHROPOMETRIC MEASUREMENTS

The anthropometric measurements of the infants include weight, length and mid upper arm circumference (MUAC). Among other things, anthropometric data can be used to calculate the body mass index (BMI) (Annexure K). The researcher measured and recorded the weight, length and MUAC of all the infants to ensure consistency.

3.8.2.1 Weight

A standardized calibrated hanging hook scale (S0145555 scale, infant, spring type, 25kg x 100g) was used with measurements being recorded to the nearest 0.1kg. All measurements were taken twice and the average recorded.

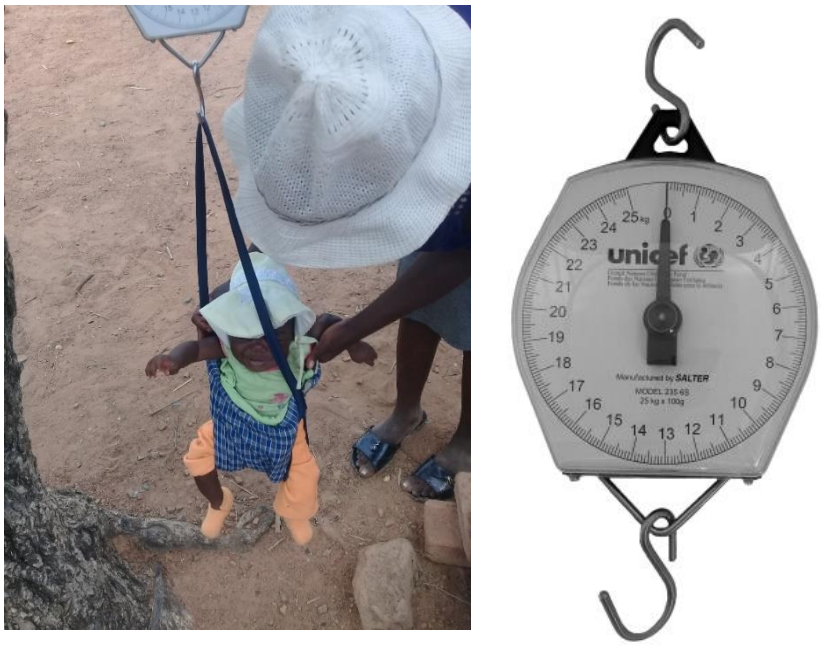

Figure 3.4: Weighing an infant using a calibrated scale

The United Nations (1986: 11-12) guidelines were followed whilst taking the infants' weight. Weight measurements were conducted as follows:

- The researcher hung the scale from a tree branch and asked the caregiver to remove the outer layers of clothing, or any heavy item of clothing, from the infant, leaving only a diaper/nappy. (The researcher checked that the diaper or nappy was clean before weighing.)

- The researcher attached a pair of the empty weighing pants to the hook of the scale and adjusted the scale to zero and then removed it from the scale.

- The researcher asked the caregiver to hold the infant as she put her arms through the leg holes of the pants, grasped the infant's feet and gently pulled the legs through the leg holes, making sure that the strap of the pants was in front of the infant.

- The researcher attached the strap of the pants to the hook of the scale and gently lowered the infant and allowed them to hang freely.

- The researcher checked the infant's position, making sure that the infant was hanging freely and not touching anything.

- The researcher held the scale and read the weight to the nearest 0.1kg. The measurement was taken when the baby was still, and the scale needle was stationary.

- The measurement was immediately recorded by the fieldworker who was assisting the researcher to take measurements. The infant was measured twice and an average of the two measurements was used.

- As the fieldworker recorded the measurement, the researcher held the infant using one arm and gently lifted the infant by the body and released the strap from the hook using her free hand.

- The researcher checked the recorded measurement on the recording sheet for accuracy and legibility.

3.8.2.2 Length

According to WHO (2008b: 21-22), a child's length is measured lying down (recumbent). In this study measurements were conducted whilst the child was lying down using a wooden recumbent length board (S0114540 portable baby/child/adult L-H mea. syst/ SET-2) positioned on the floor. The length board is also called an infantometer and comprises a fixed headboard and movable footboard. Length measurements were conducted according to WHO (2008b: 21-22) guidelines as follows:

- Length measurement was done immediately after weighing whilst the infant was not wearing foot gear.

- Caregivers were asked to help with the measurement by calming and comforting the infant.

- Caregivers were asked to place the infant on the length board on their back with the infant's head against the fixed headboard and compressing the hair.

- Positioning of the head was done so that an imaginary vertical line from the ear canal to the lower border of the eye socket was perpendicular to the board (the child's eyes should be looking straight up). The caregiver was asked to move behind the headboard and hold the head in this position.

- The infant was checked to see that they continued to lie straight along the board and had not changed position, that the shoulders touched the board, and the spine was not arched. The caregiver was to inform the researcher if the child arched the back or moved out of position.

- The child's legs were held down with one hand and the footboard moved with the other. Gentle pressure was applied to the knees to straighten the legs as far as they could go without causing any discomfort or injury.

- When an infant was agitated and both legs could not be held in position, the measurement was taken with one leg in position.

- Whilst holding the knees, the footboard was pulled against the child's feet. The soles of the feet were placed flat against the footboard with the toes pointing upwards.

- The measurement was read and recorded in centimetres. The infant was measured twice and an average of the two measurements was used.

3.8.2.3 Mid Upper Arm Circumference

A step-by-step method of how to measure the Mid Upper Arm Circumference (MUAC) was provided by UNICEF (2020: 1), MUAC measurements were conducted as follows:

- The researcher took the measurements whilst the caregiver was sitting down, holding the infant on her lap, and she was asked to remove any clothing covering the infant's left arm.

- The researcher calculated the midpoint of the infant's left upper arm by locating the tip of the infant's shoulder with her fingertips, bent the infant's elbow to make a right angle, placed the MUAC tape at zero on the tip of the shoulder and pulled the tape straight down past the bend of the elbow. She then read the number at the bend of the elbow to the nearest centimetre. The number was divided by two to estimate the midpoint and the researcher marked the point on the infant's arm.

- The researcher straightened the infant's arm and wrapped the MUAC tape around the arm at the midpoint with the numbers right-side up, making sure the tape was held flat against the skin.

- The researcher inspected the tension of the MUAC tape on the infant's arm, making sure that the tape was neither too loose nor too tight.

- The researcher read and called out the measurement to the fieldworker who was assisting and the measurement was recorded to the nearest 0.1cm. The infant was measured twice and an average of the two measurements was used.

- The researcher loosened the MUAC tape on the infant's arm and checked the recorded measurement on the questionnaire for accuracy and legibility.

Figure 3.5: MUAC tape (S0145600 MUAC, child 11.5 Red)

3.8.3 INFANT AND CHILD FEEDING MODULE

The validated infant and child feeding module (WHO 2008a) was adapted for this study (Annexure L) in a focus group discussion with the 14 caregivers not included in the study so that it was applicable to the Munjinga North community. Questions on the module covered the infant's age, whether the infant had breastfed the previous day, any medication the infant was taking, and the food they had consumed the previous day. The frequency of the meals was also noted. This module was administered to the caregivers with infants who were part of the study. The module was completed in a one-on-one interview set-up by trained fieldworkers.

3.8.4 NUTRITION KNOWLEDGE QUESTIONNAIRE

A nutrition knowledge questionnaire developed by Chege (2013) of Kenyatta University was modified and adapted for the study by the researcher and the focus group to suit the Zimbabwean population and the targeted population. Permission was granted by Dr Peter Chege in the Food, Nutrition and Dietetic department of Kenyatta University (Annexure M) to use the nutrition knowledge questionnaire (Annexure N). The questionnaire was completed in a one-one-one interview set-up by a trained fieldworker. The questionnaire assessed the quality of nutrition knowledge the caregiver had. The questions asked were:

- Where did the caregiver receive training on infant feeding practices?
- Did the caregiver know what the duration of exclusive and continued breastfeeding should be?
- What are the advantages of breastfeeding?
- Why are both exclusive and continued breastfeeding recommended?
- What are the disadvantages of early complementary feeding?

3.8.5 COPING STRATEGY QUESTIONNAIRE

The Coping Strategy Index developed by Maxwell, Watkins, Wheeler and Collins (2003) was modified and adapted for the Munjinga North community (Annexure O) in a focus group discussion with 14 caregivers not included in the study to include the coping strategies used by the community in times of food scarcity. During the focus group discussions, caregivers

were asked whether in the past 30 days there had been times when there was not enough food or money to buy food, and if so, what strategies had been applied by the community and how often did the households have to use a specific coping strategy. The relative frequency scores used varied from 7 (all the time, every day), through to 4.5 (often, 3-6/weeks), 1.5 (occasionally, 1-2/week), 0.5 (hardly at all, <1/week) and 0 (never). In this discussion the coping strategies were ranked according to their severity, scoring from one to four, with one being the least severe and four the most severe. The results from the questionnaire will be discussed in chapter four. Scoring was calculated by severity weight (1 to 4) multiplied by 14 strategies = maximum score; thus, the higher the score, the more food insecure the community was.

The purposively selected 100 caregivers completed the adapted Coping Strategy Questionnaire with the assistance of the trained fieldworkers through one-on-one interviews. The questionnaire covered sensitive topics such as the availability of food and the distribution of food among the family members either by limiting portion sizes, limiting the number of meals per day, or by sending household members to go and eat with neighbours, or going through the whole day without food. The second question was about the availability of money to purchase food either by buying on credit, buying cheap food, or selling their belongings. Table 3.1 presents an example of one of the coping strategies developed and the frequency score questionnaire.

Table 3.1: Coping Strategies Index Questionnaire for Munjinga village

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	**All the time Every day**	**Quite often 3-6 */week**	**Once in a while 1-2 */week**	**Hardly at all <1* /Week**	**Never**	**Raw score**	**Severity weight**	**Score = Relative Frequency x weight**
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a. Ask for food from neighbours.							**3**	

3.9 DATA ANALYSIS AND STATISTICS

The socio-demographic, coping strategy and the nutrition knowledge questionnaires as well as the infant and child feeding module were captured on an Excel® spreadsheet by the researcher and then analysed for descriptive statistics using the Statistical Package for the Social Sciences (SPSS) version 25. Anthropometric measurements were recorded using WHO Anthro version 3.2.2. The infant and child feeding module was analysed using the calculation guidelines provided by the WHO (WHO 2008c).

In this study Pearson's Products Moment Correlation Coefficient (r), ANOVA, independent sample t-test and chi-square were used to analyse the relationship between knowledge on infant nutrition and infant feeding practices among mothers with infants 6 months to 12 months following exclusive breastfeeding.

3.9.1 SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Data collected by the socio-demographic questionnaire were sorted and checked for completeness by the researcher and n=100 were usable. Descriptive statistics including frequencies, percentages and mean and standard deviations were determined. Results were tabulated in tables of frequencies and percentages for various categories. The data collected was used to calculate the Multidimensional Poverty Index (MPI).

Calculation of MPI:

The calculation of the total MPI for Munjinga village was based on the Alkire and Santos (2010) cross-dimensional cut-off points of indicators and weighing. Deprivation was divided into three dimensions and identified as follows:

Education:

a. If no household member had completed five years of schooling

b. If any school-aged child was not attending school in years 1 to 8

Health:

a. If any child had died in the family

b. If the infant involved in the study was malnourished

Standard of living:

a. If the household had access to electricity

b. If the household had sanitary facilities (toilets)

c. If the household had access to safe, clean water for drinking, or the source of clean water for drinking was more than 30 minutes walking distance from home.

d. If the household had a dirt, sand or dung floor

e. If the household cooked using dung, wood or charcoal

f. If the household did not own more than one radio, TV, telephone, bike or motorbike or refrigerator, and did not own a car or tractor.

The above indicators were given percentages according to the socio-demographic results obtained and multiplied by the relative weights between the dimensions.

A household was considered to be multi-dimensionally poor if the weighted indicators in terms of which they were deprived amounted to 33.3%.

Each dimension was comprised of equal amounts of weight in calculations. Three dimensions were measured, which meant that each dimension was comprised of 1/3 (3.33) of the weights.

Weight of Education

The education dimension had an overall weight of 1/3 and had two indicators to be measured.

Therefore, weight of education = 1/3 divided by 2 indicators
= 1/6 for each indicator

Weight of Health

The health dimension had an overall weight of 1/3 and had two indicators to be measured.

Therefore, weight of health = 1/3 divided by 2 indicators
= 1/6 for each indicator

Weight of Standard of living

The standard of living dimension had an overall weight of 1/3 and had six indicators to be measured.

Therefore, weight of standard of living = 1/3 divided by 6 indicators
= 1/18 for each indicator

The 6th indicator of the assets had 6 variables, so the weight was divided within the variables
= 1/18 divided by 6 variables
= 1/108 for each variable

Calculation of MPI

MPI = H x A

H: multidimensional headcount ratio

A: intensity of poverty

3.9.2 ANTHROPOMETRIC MEASUREMENTS

The weight, length and MUAC of all infants (n=100) was captured on the WHO Anthro version 3.2.2. The results for weight and length were presented in four categories, weight-for-length, weight-for-age, length-for-age, and body-mass-index (BMI)-for-age. Line graphs were used to show the results of the anthropometric measurements recorded.

Table 3.2: Z-score and growth indicators (WHO 2008d: 14)

Z-score	GROWTH INDICATORS				
	Length for age	Weight for age	Weight for length	BMI for age	MUAC
Above 3	See note 1	See note 2	Obese	Obese	
Above 2			Overweight	Overweight	
Above 1			Possible risk of overweight (See note 3)	Possible risk of overweight (See note 3)	
0 (median)					
Below -1					
Below -2	Stunted (See note 4)	Underweight	Wasted	Wasted	Malnourished
Below -3	Severely stunted (See note 4)	Severely underweight (See note 5)	Severely wasted	Severely wasted	Severely malnourished

Notes:

1. A child in this range is very tall. Tallness is rarely a problem unless it is so excessive that it might indicate an endocrine disorder such as a growth-hormone-producing tumour or an error in the measurement. Refer a child in this range for assessment if you suspect an endocrine disorder (e.g., if parents of normal height have a child who is excessively tall for their age).
2. A child whose weight-for-age falls in this range might have a growth problem, but this is better assessed from weight-for-length/height or BMI-for-age.
3. A plotted point above 1 shows possible risk. A trend towards the 2 Z-score line shows definite risk.
4. It is possible for a stunted or severely stunted child to become overweight.
5. This is referred to as very low weight in IMCI training modules (WHO 2005).

3.9.3 INFANT AND CHILD FEEDING MODULE

Data collected by the infant feeding module was sorted and checked for completeness by the researcher and n=100 were usable. The data collected was captured on an Excel® spreadsheet and analysed using the SPSS for windows version 25 by the researcher. Calculations of indicator values were done using instructions given by WHO (2008c).

Indicator values calculated were:

3.9.3.1 Introduction of solids, semi-solids or soft foods

Definition: Proportion of infants 6–8 months of age who received solid, semi-solid or soft foods.

Infants 6–8 months of age who received semi-solid or soft foods during the previous day.
Infants 6–8 months of age

3.9.3.2 Minimum dietary diversity

Definition: Proportion of children 6–23 months of age who received foods from four or more food groups.

Children 6–23 months of age who received foods from ≥4 food groups the previous day.
Children 6–23 months of age

3.9.3.3 Minimum meal frequency

Definition: Proportion of breastfed and non-breastfed children 6–23 months of age who received solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more.

Breastfed children 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more during the previous day.

Breastfed children 6–23 months of age

3.9.3.4 Minimum acceptable diet

Definition: Proportion of children 6–23 months of age who received a minimum acceptable diet (apart from breast milk).

Breastfed children 6–23 months of age who had received at least the minimum dietary diversity and the minimum meal frequency during the previous day.
Breastfed children 6–23 months of age

3.9.4 NUTRITION KNOWLEDGE QUESTIONNAIRE

Data collected by the nutrition knowledge questionnaire were sorted and checked for completeness by the researcher and n=100 were usable. The data collected was captured on an Excel® spreadsheet and analysed for descriptive statistics and presented in tables and graphs using the SPSS for windows version 25 by the researcher.

3.9.5 COPING STRATEGY QUESTIONNAIRE

Data collected by the developed coping strategy questionnaire were sorted and checked for completeness by the researcher and n=100 were usable. The data collected was captured on an Excel® spreadsheet and analysed using the SPSS for windows version 25 by the researcher. The results were tabulated. The mean food security score for each coping strategy was calculated and the cumulative index of the Munjinga North community recorded. Mean food security was calculated by identifying how many people identified with the coping strategy. In this study there were 100 caregivers and in each coping strategy the number of people was calculated by multiplying the relative frequency score by the degree of severity.

Descriptive statistics including frequencies, means and standard deviation percentages were determined. A table was drawn up with different variables included in the questionnaires and was presented in terms of frequencies and percentages for the various categories.

Therefore, mean food security index:

$$= \frac{(nx7x3) + (nx4.5x3) + (nx1.5x3) + (nx0.5x3) + (nx0x3)}{100}$$

Cumulative Index is the total after adding the mean food security scores of all the coping strategies employed.

Table 3.3: Summary of objectives, tools, and methods used

Objectives	Tools used	Analytical methods
Determine the socio-demographic profile of the families by means of a socio-demographic questionnaire.	The socio-demographic questionnaire developed and validated by Napier (2006) - Multidimensional Poverty Index	Excel® spreadsheet Statistical Package for the Social Sciences (SPSS) version 25.
Determine the anthropometric status of the infants by measuring weight, length and mid-upper arm circumference (MUAC) using anthropometric measurements.	Anthropometric measurements	WHO Anthro version 3.2.2.
Determine the infants' dietary intake and food variety by completing the infant and young child feeding questionnaire.	The validated infant and child feeding module (WHO 2008a)	Excel® spreadsheet Statistical Package for the Social Sciences (SPSS) version 25.
Determine the feeding practices of the participants by completing an infant feeding practices questionnaire.	The validated infant and child feeding module (WHO 2008a)	Excel® spreadsheet calculation guidelines provided by the WHO (WHO 2008c).
Determine the caregivers' knowledge of infant nutrition by completing an infant nutrition knowledge assessment questionnaire.	A nutrition knowledge questionnaire developed by Chege (2013) of Kenyatta University was modified and adapted for the study	Excel® spreadsheet Statistical Package for the Social Sciences (SPSS) version 25.
Determine the food security profile of the households by completing a coping strategy questionnaire.	The Coping Strategy Index developed by Maxwell, Watkins, Wheeler and Collin (2003) was modified and adapted	Excel® spreadsheet Statistical Package for the Social Sciences (SPSS) version 25.
Determine the relationship between nutrition knowledge and infant feeding practices.		Excel® spreadsheet Statistical Package for the Social Sciences (SPSS) version 25.

3.10 RELATIONSHIPS TO BE ANALYSED

Variables were chosen by the researcher to be compared and they addressed the objectives of the study related to infant nutrition status, caregivers' nutrition knowledge or infant feeding practices; so, by comparing these variables it meant that the research questions would be answered. The Pearson statistical test was used for bivariate correlations. If there was no relationship r=0, negative association r=-1, while positive association r=1 (Gelman 2013). ANOVA, Chi-square and Independent sample t-test were used to determine the relationships between two variables. Regression analysis was done to determine if there was a significant effect of the nutrition knowledge on the dietary diversity, meal frequency and infant nutritional status (MUAC).

Table 3.3: Relationships to be analysed

	TEST USED	VARIABLES
1	ANOVA:	DD vs Education
2	Pearson's correlation	DD vs Income
3	Independent samples t-test	DD vs Training
4	Pearson's correlation	DD vs MUAC
5	Pearson's correlation	DD vs MPI
6	ANOVA	K1 VS DD
		K1 VS Meal frequency
		K2 vs DD
		K2 vs Meal frequency
		K3 vs DD
		K3 vs Meal frequency
		K4 vs DD
		K4 vs Meal Frequency
		K5 vs DD
		K5 vs Meal frequency
7	Pearson's chi-square	Knowledge on duration of exclusive breast-feeding vs nutrition training
		Knowledge on the duration of continued breast-feeding vs nutrition training
		Knowledge on why exclusive breastfeeding is recommended vs nutrition training
		Knowledge on importance of breast milk vs nutrition training
		knowledge on complementary feeding vs nutrition training
8	ANOVA	soft foods vs MUAC
	Pearson's correlation	Meal frequency vs MUAC
	Pearson's correlation	DD vs MUAC
9	ANOVA	K1 vs MUAC
	ANOVA	K2 vs MUAC
	ANOVA	K3 vs MUAC
	ANOVA	K4 vs MUAC
		K5 vs MUAC
10	Independent samples t-test	Nutrition training VS MUAC
11	Pearson's correlation	Income vs food money
12	Pearson's correlation	DD vs meal frequency

KEY

K1 - knowledge on duration of exclusive breast feeding
K2 - knowledge on the duration of continued breast feeding
K3 - knowledge on why exclusive breastfeeding is recommended
K4 - knowledge on importance of breast milk
K5 - knowledge on complementary feeding

3.11 CONCLUSION

This chapter has provided a blueprint for the methodology applied in this study to meet the objectives of the study. A detailed account of all the steps taken and the fieldwork done to obtain information was given, and the process used to collect, analyse and report data was specified. The following chapter will interpret the results of the study.

CHAPTER 4: RESULTS AND DISCUSSION

This study aimed to determine the relationship between infant feeding practices and caregivers' knowledge on the nutrition status of infants. The sample of the Munjinga North Ward 14 community was investigated for socio-demographics, coping strategies, nutrition knowledge possessed by the caregivers', infant feeding practices, food diversity, nutritional adequacy, and the nutritional status of the infants within the households of rural Munjinga in Zimbabwe.

This chapter reports on the processed data, which have been tabulated, interpreted and evaluated. The findings include socio-economic factors, anthropometric results, health status, food frequency scores, dietary intake, nutritional adequacy and coping strategies, and nutrition knowledge possessed by the caregivers.

4.1 MUNJINGA VILLAGE STUDY

The sampling techniques resulted in n=100 participants who consented to participate, with all caregivers being female, and of the infants 37 were boys and 63 were girls aged between six to 12 months. Because the participant number of 100 is equal to the percent, the percentages are not presented separately.

4.1.1 SOCIO-DEMOGRAPHIC QUESTIONNAIRE

This tool was used to obtain data about the characteristics of the Munjinga North Ward 14 community which the researcher was investigating. Data collected included the age and gender of the caregivers, family size, education level, income level, child immunization in the families, and family meal frequency. Tables of frequencies and percentages were used to show the results.

4.1.1.1 Personal information

The information in Table 4.1 indicates that all the participants spoke Shona. The majority (90.0%) of these participants were mothers and 10.0% were grandmothers.

Table 4.1: The role of the caregiver in the family and language spoken

Variable	Number/% (n=100)
Language spoken in the house	
Shona	100
Role in the family	
Mother	90
Grandmother	10
Total	100

The results in Table 4.2 show that the majority (94.0%) of the participants lived in a rural village and the percentage who stayed on farms was 6.0%. Seventy-nine percent of the participants had full ownership of the houses they lived in; some (11.0%) lived with relatives and 10% stayed on their employer's property. Caregivers who had lived in the house for less than five years made up 57.0% and those who had lived in the house for more than five years made up 43.0%. Ninety-eight percent of the participants lived in brick houses and 1.0% lived in clay houses and wood houses. Forty-one percent had cement floors, 35.0% had sand/mud floors and 24.0% had floors covered in cow dung. Sixty-four percent of the households had one–two rooms, 26.0% had three–four rooms and 10% had more than five rooms and the room density was 0.47, signifying that at least two people shared a room.

Table 4.2: Living conditions of the household

Variable	Number/% (n=100)
House location	
Farm	6
Village	94
Total	100
Present living situation	
Living with relatives	11
Own house	79
Employer property	10
Total	100
Period of stay at the residence	
1-5 years	57
>5years	43
Total	100
The type of house `	
Brick	98
Clay	1
Wood	1
Total	100
The type of floor material	
Cement	41
Sand/mud	35

Variable	Number/% (n=100)
Cow dung	24
Total	100
The number of rooms per household	
1-2 rooms	64
3-4 rooms	26
>5rooms	10
Total	100
Other shacks within the yard	
Yes	65
Other people residing in your house	
Yes	66
Number of permanent residents in the house	
2-4	41
5-7	54
8-10	5
Total	100

Table 4.3 indicates that 25.0% of the participants fetched water from a well, and the majority (46.0%) used a borehole as a water source, while 29.0% of the households used dams and rivers as their source of water. None of the households had water directly piped to their houses. Blair toilets (a refinement of the pit latrine with improved ventilation) were used by 71.0% of the households while 29.0% of the homesteads had no toilet facilities. Sixty percent of the households dug holes at the edge of their homesteads as a system to remove human waste by burning it. All the households had gravel roads in front of their homesteads and 8.0% of households had access to electricity.

Table 4.3: Amenities

Variable	Number/% (n=100)
Water facilities	
Well	25
Borehole	46
River/dam/spring	29
Total	100
Toilet facilities	
None	29
Blair toilet	71
Total	100
Waste removal	
Yes	60
Tarred road in front of the house	
No	100
Gravel road in front of the house	
Yes	69
Access to electricity	
Yes	8

Pests were present in the households, with mice and rats causing problems in 36.0% of the households, cockroaches were found in 50.0% of the households, ants were found in 28.0% of the households, and mosquitoes were prevalent in 88.0% of the households as illustrated in Table 4.4.

Table 4.4: Pest problems

Variable	Yes/% (n=100)
Mice and rats	36
Cockroaches	50
Ants	28
Flies	18
Mosquitoes	88
Geckos	15
Frogs	24
Snakes	30
Bed bugs	16
Bats	13
Spiders	11
Lice	7

4.1.1.2 Income and expenditure

According to Table 4.5 most caregivers (98.0 %) were unemployed, while 2.0% were employed. During the same period 52.0 % of the caregivers had part-time jobs and 35.0% were in the process of looking for employment. Most of the households (92.0%) received an income ranging between US$1-US$100, while 5.0% were earning between US$101-US$200, and 3.0% were receiving an income above US$200.

Table 4.5: Work status and income

Variable	Number/% (n=100)
Status	
Employed	2
Unemployed	98
Total	100
Period of unemployment	
<6months	8
6–12 months	2
1–3 years	19
>3years	71
Total	100
Currently looking for employment	
Yes	35
Currently looking for a part time job	

Variable	Number/% (n=100)
Yes	52
Total household income per month	
US$1-US$100	92
US$101-US$200	5
>US$200	3
Total	100
Number of people that contributed to the household income	
0	50
1	34
2	16
Total	100

4.1.1.3 Food security and household assets

Table 4.6 depicts the different responsibilities performed by family members. It can be seen that the mothers performed most of the duties related to food preparation, scoring 76.0%, while fathers, siblings and aunties each scored 8.0%. Most of the food decision-making was performed by the fathers (44.0%), followed closely by the mothers (41.0%) and lastly the grandmothers (15.0%). According to Table 4.6, the role of feeding, or serving food to the infants, was dominated by the mothers (85.0 %), followed by siblings and aunties scoring 8.0% and 7.0%, respectively. Eighty-five percent of the analysed households were headed by the fathers and 15.0% by the grandmothers. The father decided how much money was spent on food in 52.0% of the households, with 32.0% of the mothers and 16.0% of the grandmothers also making this decision.

Table 4.6: Household duties

Variable	Number/% (n=100)
Person responsible for food preparation	
Father	8
Mother	76
Siblings	8
Aunty	8
Total	100
Who decides what type of food to buy?	
Father	44
Mother	41
Grandmother	15
Total	100
Who is responsible for feeding/ serving children?	
Mother	85
Siblings	8
Aunty	7

Variable	Number/% (n=100)
Total	100
Who is the head of the household?	
Father	85
Grandmother	15
Total	100
Who decides how much money is spent on food?	
Father	52
Mother	32
Grandmother	16
Total	100

Food security of the households was assessed and recorded in Table 4.7. Households who had two people contributing to the household income made up 16.0%, those with one person contributing made up 34.0% of the households, and in 50.0% of the households no one was contributing to the income. Households who bought food every day made up 8.0%, those buying food once a week made up 15.0%, those buying once a month made up 73.0%, and those who bought food once a year made up 4.0%. Participants who always experienced a shortage of money in their households made up 2.0%, those who often had a shortage of money made up 9.0% of the households, with 49.0% of the participants sometimes having a shortage of money, 25.0% seldom having a shortage of money and 15.0% never having a shortage of money. Food was purchased from tuck shops by 77.0 % of the households and 23.0% purchased food from supermarkets. Most of the participants walked to different places in the village (85.0%), and motorbikes were owned by 8.0% of the households with 7.0% using their cars. Ninety-five percent of the households spent between US$0- US$50 per month on food items, with 3.0% spending US$51-US$100 per month, and households who spent more than US$100 made up only 2.0%.

Table 4.7: Food security

Variable	Number/% (n=100)
How often do you buy food?	
Every day	8
Once a week	15
Once a month	73
Once a year	4
Total	100
How many times have you been short of money to buy food	
Always	2
Often	9
Sometimes	49
Seldom	25
Never	15
Total	100

Variable	Number/% (n=100)
Where food is purchased	
Tuck shop	77
Supermarket	23
Total	100
Type of transport used	
Own car	7
Motorbike	8
Foot	85
Total	100
Amount of money spend per month on food	
US$0-US$50	95
US$51-US$100	3
>US$100	2
Total	100

All the participants ate their food at home with 1.0% eating once a day, 21.0% eating twice a day, and the majority of the households (62.0%) eating three times a day (Table 4.8).

Table 4.8: Family meal consumption

Variable	Number/% (n=100)
How many meals are consumed per day?	
1	1
2	21
3	62
4	16
Total	100
Place used for consumption of meals	
Home	100

The results in Table 4.9 show that all the participants used wood as fuel to prepare food. The most-used cookware was stainless steel pots at 64.0% and 60.0% used aluminium pots.

Table 4.9: Fuel and pots material used for food preparations

Variable	Number/% (n=100)
Type of fuel used for food preparation	
Wood	100
Type of material used to make pots	
Aluminium	60
Stainless steel	64

Results for family assets in Table 4.10 indicate that 6.0% of the participants owned gas stoves, paraffin stoves were owned by 4.0%, cell phones were owned by 66.0%, radios by 41.0%, a bed with a mattress by 32.0%, a mattress only by 18.0%, lounge suites by 7.0%, and refrigerators by 5.0%; participants who owned cars made up 4.0%, bicycles were owned by 7.0%, and motorbikes were owned by 10.0%. Cattle were owned by 27.0%, while 53.0%

kept goats on their homesteads, with 21.0% having carts, and only 1.0% owned a tractor for farming.

Table 4.10: Family assets

Variable	Number /% (n=100)
Gas stove	6
Paraffin stove	4
Radio	41
Television	26
Refrigerator	5
Cell phone	66
Bed set	32
Mattress only	18
Lounge suite	7
Dining room suite	6
Car	4
Bicycle	7
Motorbike	10
Cattle	27
Goats	53
Cart	21
Tractor	1
Wheelbarrow	21

4.1.1.4 Education

As indicated in Table 4.12, a small percentage (2.0%) of the caregivers had not received any education; those who had attended primary school made up 35.0%, with the majority (55.0%) having attained a secondary school education and 8.0% had attended college.

Table 4.11: Education

Variable	Number/% (n=100)
Highest education level	
Primary school	35
Secondary school	55
College	8
None	2
Total	100

4.1.1.5 Multidimensional poverty index

This was an instrument used to summarize the degree of poverty in the community. Three dimensions were used to classify poverty: education, health and living standards as indicated in the table below.

Table 4.12 shows the MPI score of each indicator and the contribution of each dimension to the overall intensity of poverty in the community. Based on the available data, the health dimension, education dimension and standard of living dimension contributed 24.4%, 16.4% and 59.2% respectively.

Table 4.12: MPI Score and contribution

MPI dimensions and indicators	Weight	MPI score	Contribution (%)
Health		10	24.4
Child mortality	X 1/6	4.5	
Nutrition	X 1/6	5.5	
Education		6.7	16.4
Years of schooling	X 1/6	1.5	
Child enrolment	X 1/6	5.2	
Standard of living		24.2	59.2
Cooking fuel	X 1/18	5.6	
Drinking water	X 1/18	3.0	
Sanitation	X 1/18	1.7	
Electricity	X 1/18	5.4	
Floor type	X 1/18	3.2	
Assets	X 1/18	5.3	
Total		40.9	

The interpretation of Table 4.13 is that in this community, 74.0% of the people were recorded as being MPI poor. According to the MPI, this means that they were living in acute poverty. They were deprived in at least either a) all the indicators of a single dimension or b) a combination across dimensions such as being in a household with a malnourished person, no clean water, a dirt floor, or unimproved sanitation. It was also noted that, on average, the poor here were deprived of 47.0% of the weighted indicators.

Table 4.13: MPI Adjusting head count ratio by intensity

Village	H	A	MPI
Munjinga North	0.74	0.47	0.35

H-Headcount Ratio A- Intensity of Poverty

4.1.2 ANTHROPOMETRIC MEASUREMENTS

4.1.2.1 Introduction

Length, weight and MUAC were the physical properties of the infant's body used in this study to assess the nutritional health status of the infants. All the infants were weighed and measured. The length and weight were used to assess length-for-age, weight-for-age, and

weight-for-length. The data was arranged according to the Z-Scores from the WHO indicators.

4.1.2.2 Anthropometric findings

As indicated by Table 4.14 below, malnutrition was prevalent in the Munjinga community, with 23.0% of the infants having a MUAC below -2 or -3 on the Z-Score. Other anthropometric results showed that 55.0% of the infants were stunted, underweight was recorded among 33.0% of the infants, and 7.0% were wasted.

Table 4.14: Anthropometric results

Z Score	LAZ (%)	WAZ (%)	WLZ (%)	MUAC
Below -3	21 severely stunted	10 severely underweight	4 severely wasted	5 severely malnourished
Below -2	34 stunted	23 underweight	3 wasted	18 malnourished
Normal	45	67	76	77
Above +1			10 risks of overweight	
Above +2			7 overweight	
Above +3				

Figure 4.1 shows the results for weight-for-length in infants. The majority of the infants (76.0%) were within the normal range. However, a significant number (7.0%) indicated infants who were wasted and 17.0% were above the average weight and were at risk of being overweight if not monitored.

Weight-for-length (n=100)	
Mean	-0.11
SD	1.38

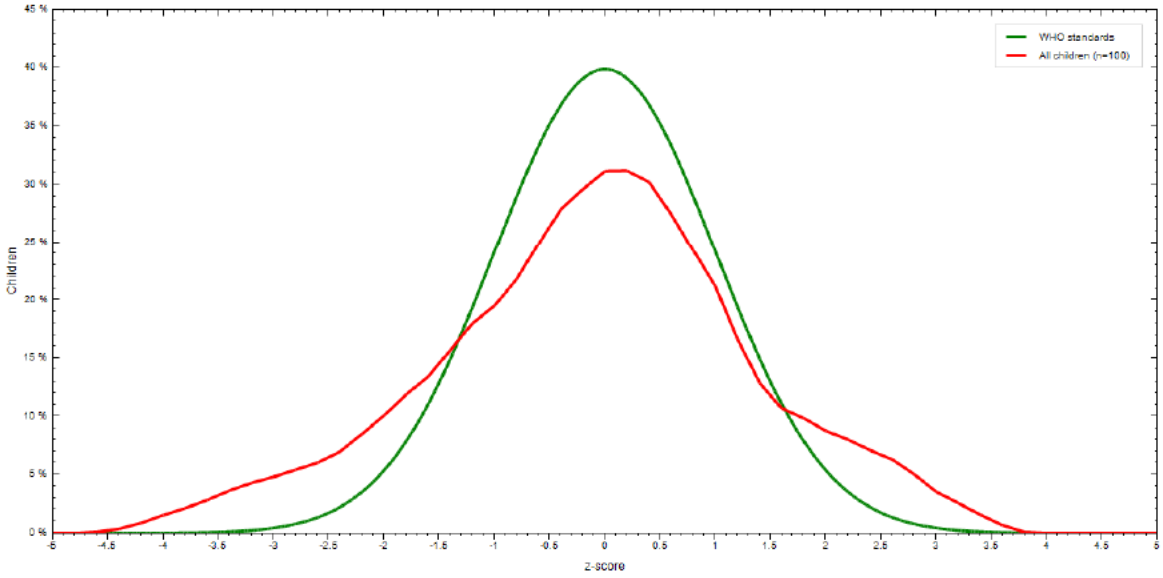

Figure 4.1: Weight-for-length/height

Weight-for-age is represented in Figure 4.2 and 33.0% of the infants had a weight below the prescribed weight for their average age and were classified as underweight. Those who fell within the normal range numbered 67.0%.

Weight-for-age (n=100)	
Mean	-1.37
Sd	1.32

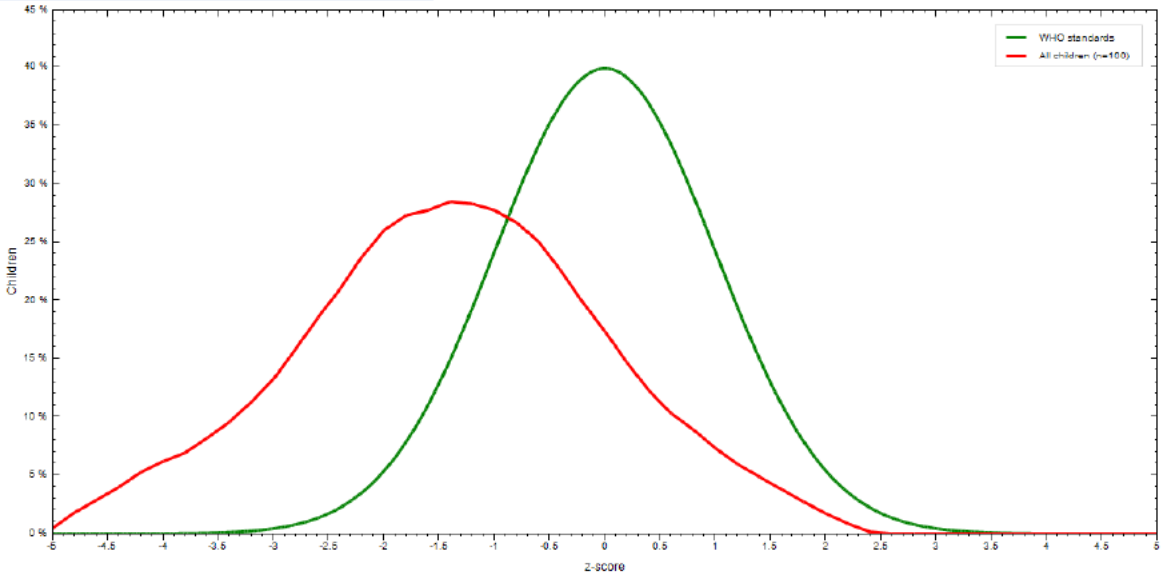

Figure 4.2: Weight-for-age

Results for length-for-age (Figure 4.3) indicated that 55.0% of the infants were stunted and those within the normal range made up 45.0%.

Length-for-age (n=100)	
Mean	-2.14
SD	1.26

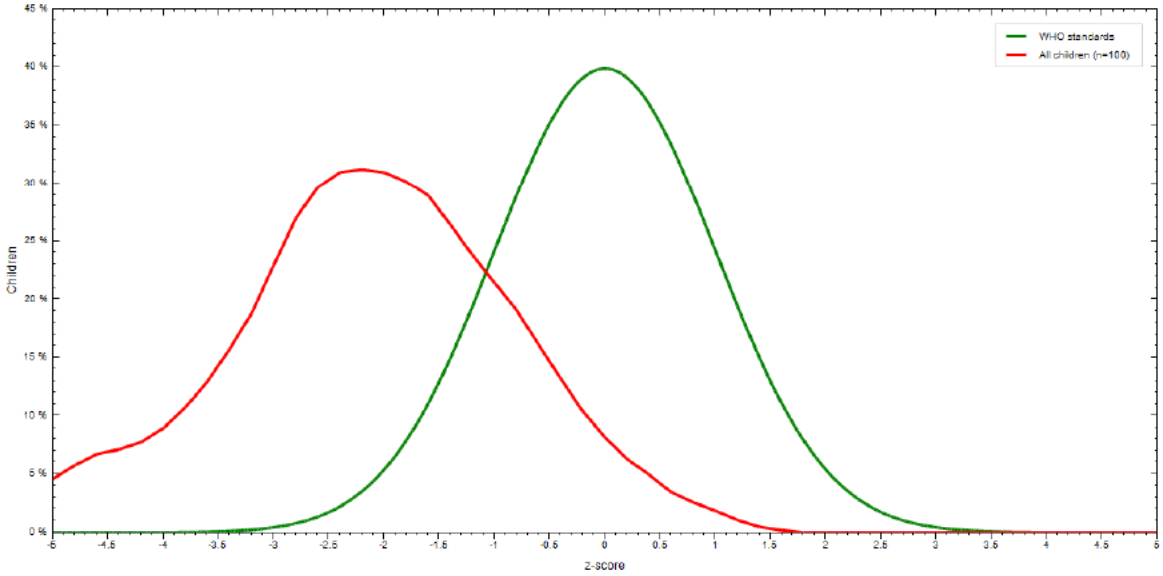

Figure 4.3: Length-for-age

As represented in Figure 4.4, 5.0% of the infants who recorded a Z-Score (<-3SD) were severely malnourished and needed hospitalisation and 18.0% were within the yellow zone of the MUAC tape, representing malnourishment. Seventy-seven percent had a standard MUAC recording.

MUAC-for-age (n=100)	
Mean	-1.13
SD	1.19

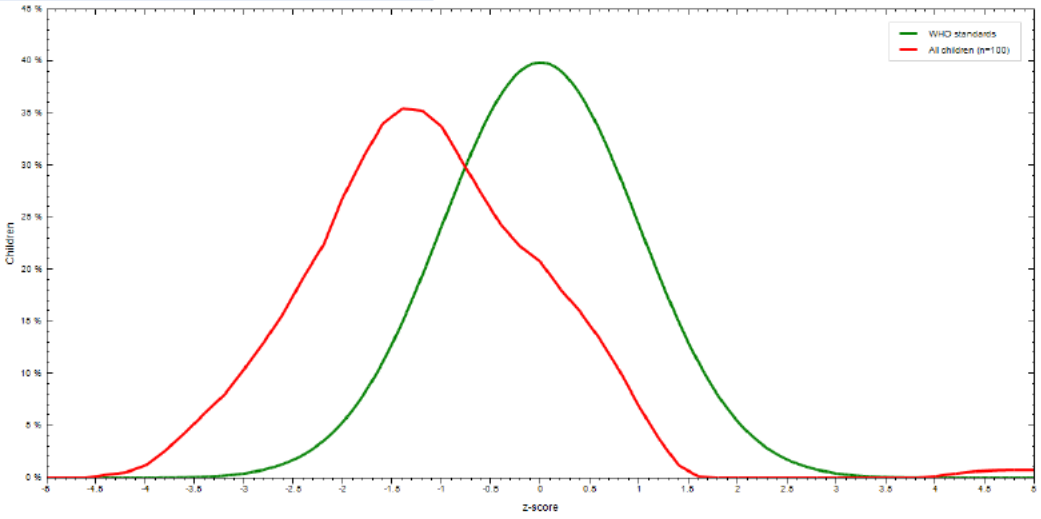

Figure 4.4: MUAC-for-age

4.1.3 INFANT AND CHILD FEEDING MODULE

4.1.3.1 Introduction

This tool collected data used to summarise the feeding practices of the infants according to WHO recommendations. Indicators included in this study were breastfeeding of infants, introduction to complementary feeding, type of foods given to infants including frequency as well as the quality of the food. This data was used to calculate different indicator values to show the quantity and quality of food the infants were exposed to.

4.1.3.2 Breastfeeding patterns

As summarized in Table 4.15, all the infants were breastfed at one point in their lives and 95.0% of them were still breastfeeding at the time this study was conducted. All the caregivers did not bottle-feed their infants, and 92.0% of the infants had never drunk from a bottle with a nipple. Infants who were given vitamin supplements made up 1.0% and those on ORS made up 6.0%.

Table 4.15: Summary of breastfeeding patterns

Variable	Yes/% (n=100)
Has the infant ever breastfed?	100
Was the infant breastfed yesterday?	95
Has the infant ever been bottle-fed?	0
Was the infant given vitamin supplements?	1
Was the infant given ORS?	6
Had the infant ever drunk from a bottle with a nipple?	8

4.1.3.3 Consumed foods and meal frequency

The frequency of meals consumed per day by the infants is recorded in Table 4.16. It shows that the majority of the infants 55.0% ate twice a day, those who ate three times a day made up 41.0%, and those who ate once a day made up 2.0% and it was noted that 2.0% of the infants were not yet receiving any complementary feeding even though they were above the age of six months.

Table 4.16: Frequency of meals per day

Age (months)	Number of times food was eaten by the infant per day	Number% (n=100)		Number% total(n=100)
6 – 8 months		**n=55**	**%**	**55**
	0	2	3.6	
	1	2	3.6	
	2	20	36.4	
	3	31	56.4	
9 – 12 months		**n=45**	**%**	**45**
	2	34	75.6	
	3	11	24.4	
	Total			**100**
Average Age = 8 months 23 days = 9 months				

As summarized in Table 4.17, most of the infants consumed starchy foods (98.0%), those who were given beans, peas, nuts and lentils made up 67.0%, those who were given oils and fats made up (63.0%), while dark green leafy vegetables were given to 37.0% of the infants. Vitamin A rich fruits were eaten by 33.0% of the infants. Both milk products and meat were consumed by a total of 15.0% of the infants, fish by 12.0%, eggs by 9.0%, and food from roots by 8.0%.

Table 4.17: Summary of solid foods consumed by infants

Food consumed	Yes/% (n=100)
Starchy foods	98
Beans, peas, nuts, lentils	67
Oils and fats	63
Dark green leafy vegetables	37
Vitamin A rich fruits	33
Any other fruits	23
Milk products	15
Meat	15
Fish	12
Eggs	9
Food from roots	8
Organ meat (offal)	3
Yellow/orange inside foods	1
Snails and insects	1

A summary of the fluids consumed by the infants daily is tabulated in Table 4.18. All the infants drank water and those who were given thin porridge were 95.0%. Mahewu, a fermented corn product, was drunk by 77.0% of the infants, fruit juice by (8.0%), yogurt by (5.0%) and milk by (1.0%).

Table 4.18: Summary of liquids drunk by the infants

Liquids	Yes/% (n=100)
Plain water	100
Thin porridge	95
Mahewu	77
Fruit juice	8
Yogurt	5
Milk (cow milk powder)	1

4.1.3.4 Feeding practices indicator values

It has been indicated that all the infants were breastfed at birth, and those who were receiving complementary feeding made up 96.4%. Thirty-six percent met the minimum dietary diversity, and those who met the minimum acceptable diet were 25.0%. Eighty one percent met the minimum meal acceptable diet (Table 4.19).

Table 4.19: Feeding practices indicator values

Variable	Percentage (%)
Infants breastfed at birth	100.0
Introduction of solids, semi-solids, and soft foods	96.4
Minimum dietary diversity	36.0
Minimum meal frequency	81.0
Minimum acceptable diet	25.0

4.1.4 NUTRITION KNOWLEDGE QUESTIONNAIRE

4.1.4.1 Introduction

In this questionnaire, the data obtained was used to summarise the number of caregivers trained in infant nutrition and to understand the quality of the nutrition knowledge they had.

4.1.4.2 Trained caregivers

According to Figure 4.5, a small number (22.0%) of the participants had received training in infant nutrition and they all reported that they had received the training at the nearest health clinic, but majority of the caregivers (78.0%) indicated that they did not receive any form of training on infant nutrition.

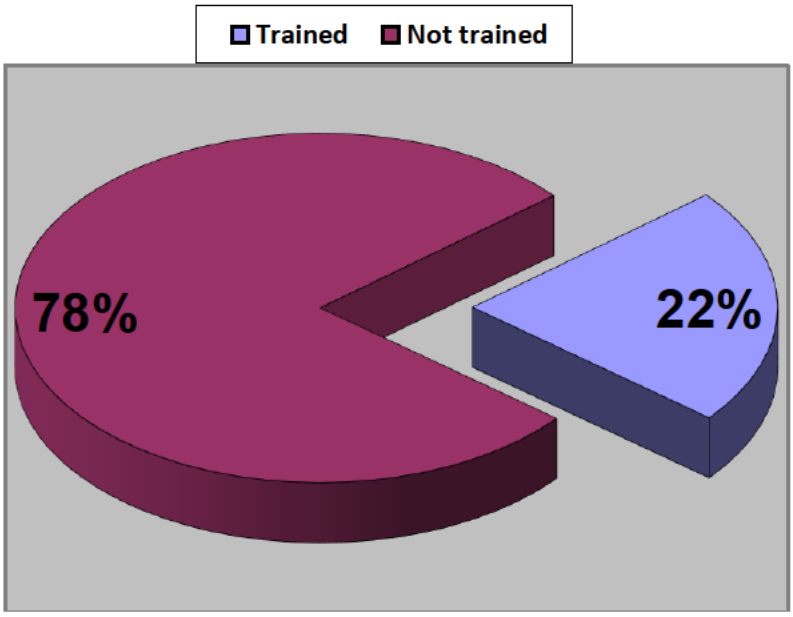

Figure 4.5: Caregivers trained

4.1.4.3 Caregivers' nutrition knowledge

Table 4.20 shows that caregivers with infants who had knowledge of exclusive breastfeeding made up 62.0%. Those who had knowledge on the importance of breastfeeding and the duration of continued breastfeeding made up 49.0%. Fifty-one percent had partial to full knowledge on the importance of breastfeeding. The disadvantages of early complementary feeding were not known by the majority of the participants (95.0%).

Table 4.20: Summary of the nutrition knowledge possessed by caregivers

Variable	Number/% (n=100)
Duration of exclusive breast feeding	
Yes	60
Duration of continued breast feeding	
Yes	49
Why exclusive breastfeeding is recommended	
None	62
Partial	38
Total	100
Importance of breast milk	
None	49
Partial	44
Full	7
Total	100
Disadvantages of early complementary feeding	
None	58
Partial	37
Full	5
Total	100

4.1.5 COPING STRATEGY QUESTIONNAIRE

In every society, people tend to adjust their behaviour according to their needs and what they have. Data collected from this questionnaire was used to summarise the different coping strategies used by the caregivers in Munjinga North to cope when they did not have enough food for the family. The minimum score that a household could achieve was 0, indicating a status of food security, and the maximum was 266, indicating total food insecurity.

Individual coping strategies, the mean cumulative food security index and ±SD were determined, and the results are shown in Table 4.21. The mean score of 50.81(±58.81) indicates that this community is relatively food secure with a low food insecurity index measured using the Coping Strategy Index (Maxwell *et al*. 2003). The highest commonly used coping strategy was 'Restrict the consumption of food by adults for children to eat' with a mean score of 8.85 (±8.534); the second highest was 'Reduce the mother's consumption of food for the sake of the children' with a mean score of 7.25 (±6.152), while other strategies were 'Buy food on credit', 2.11 (±3.066), 'Send household members to beg for food', 0.040 (±0.136), 'Skip meals for the entire day', 0.23 (±0.536), 'Consume seed stock held for next season or rent out the livestock', 2.43 (±3.144), 'Sell some belongings to get money to buy food', 1.24 (±1.429), 'Rely on less expensive and preferred food', 3.21 (±2.36), 'Do piece work for food/money', 5.30 (±6.520), 'Gather wild food, hunt', 0.79 (±1.254), Visit neighbours to eat', 0.26 (±0.537), and 'Ask for food from relatives or friends', 4.40 (±6.418) by the total group of n=100.

Table 4.21: Individual coping strategies and the cumulative food security index

Participants (n =100)	Scoring Minimum 0 - Maximum 266	Mean food security score	±standard deviation
Ask for food from neighbours and relatives	(0-7) ~x3 (max score 21)	4.425	±6.443
Rely on less expensive and less preferred food	(0-7) ~x4 (max score 28)	3.230	±2.368
Gather wild food	(0-7) ~x1 (max score 7)	0.790	±1.259
Send household members to beg for food	(0-7) ~x1 (max score 7)	0.035	±0.128
Limit portion sizes	(0-7) ~x2 (max score 14)	1.970	±2.500
Reduce number of meals eaten per day	(0-7) ~x3 (max score 21)	5.745	±7.324
Skip food for entire day	(0-7) ~x1 (max score 7)	0.225	±0.538
Restrict consumption by adults for children to eat	(0-7) ~x4 (max score 28)	8.880	±8.572
Sell goods to get money to buy food	(0-7) ~x2 (max score 14)	1.220	±1.425
Steal vegetables from other people's gardens	(0-7) ~x1 (max score 7)	0.035	±0.128
Do brick moulding and sell the bricks	(0-7) ~x1 (max score 7)	0.080	±0.184
Do piece jobs	(0-7) ~x3 (max score 21)	5.310	±6.552
Barter/ trade goods for food	(0-7) ~x4 (max score 28)	6.860	±8.477
Rely on seed stock	(0-7) ~x2 (max score 14)	2.440	±3.157
Reduce your own consumption for the sake of the children	(0-7) ~x3 (max score 21)	7.185	±6.151
Visit neighbours to eat	(0-7) ~x1 (max score 7)	0.265	±0.53
Buying food on credit	(0-7) ~x2 (max score 14)	2.11	±3.066
Scores achieved		**Mean score. 50.81**	**Mean ±SD. ±58.81**

Frequency scoring: 0 never (zero times per week); 0.5 hardly at all (once or fewer times per week); 1.5 once in a while (1 to 2 times per week); 4.5 fairly often (3-6 times per week); 7 (all the time/every day). ° Severity weight: Based on ordinal ranking by focus group respondents (1 least severe and 4 most severe).

4.2 RELATIONSHIP BETWEEN VARIABLES

To determine the relationship between two variables Table 4.22 below shows the relationship that was analysed and the different statistical test used; the significance is further explored in the discussion that follows.

Table 4.22: Relationship between variables

	Test used	Variables	Results	Conclusion
1	ANOVA:	DD vs Education	p =0.690	
2	Pearson's correlation	DD vs Income	r=-0.066, p=0.509	
3	Independent samples t-test	DD vs Training	p = 0.769	
4	Pearson's correlation	DD vs MUAC	r=0.071, p=0.485	
5	Pearson's correlation	DD vs MPI	r=0.188 p=0.059	Marginal weak positive correlation
6	ANOVA	K1 vs DD	p=0.412	
		K1 vs Meal frequency	p=0.244	
		K2 vs DD	p=0.873	
		K2 vs Meal frequency	p=0.883	
		K3 vs DD	p=0.316	
		K3 vs Meal frequency	p=0.856	
		K4 vs DD	p=0.963	
		K4 vs Meal Frequency	p=0.234	
		K5 vs DD	p=0.616	
		K5 vs Meal frequency	p=0.965	
7	Pearson's chi-square	knowledge on duration of exclusive breast-feeding vs nutrition training	p=0.343	
		knowledge on the duration of continued breast-feeding vs nutrition training	p=0.197	
		knowledge on why exclusive breastfeeding is recommended vs nutrition training	p=0.001	A significant proportion who have partial knowledge were trained.
		knowledge on importance of breast milk vs nutrition training	p=0.029	A significant proportion who have partial knowledge were trained.
		knowledge on complementary	p=0.003	A significant proportion who have

		feeding vs nutrition training		partial knowledge were trained
8	ANOVA	soft foods vs MUAC	P=0.550	
	Pearson's correlation	Meal frequency vs MUAC	r= 0.139, p=0.168	
	Pearson's correlation	DD vs MUAC	r=0.071, p=0.485	
9	ANOVA	K1 vs MUAC	p=0.755	
	ANOVA	K2 vs MUAC	p=0.734	
	ANOVA	K3 vs MUAC	p=0.173	
	ANOVA	K4 vs MUAC	p=0.013	Tukey's post hoc analysis shows that MUAC is significantly higher for those with partial knowledge than for those with no knowledge, p=.038.
		K5 vs MUAC	p=0.100	
10	Independent samples t-test	Nutrition training vs MUAC	P=0.008	Those with nutrition training (MUAC = 13.673) have a significantly higher MUAC score than those without training (MUAC = 12.828)
11	Pearson's correlation	Income vs food money	r=0.859 p<0.001	There is a strong positive correlation
12	Pearson's correlation	DD vs meal frequency	r=.518, p<.001.	There is a strong positive correlation between DD and meal frequency

*p<0.05 indicates statistical significance

KEY

K1 - knowledge on duration of exclusive breast feeding
K2 - knowledge on the duration of continued breast feeding
K3 - knowledge on why exclusive breastfeeding is recommended
K4 - knowledge on importance of breast milk
K5 - knowledge on complementary feeding

Regression analysis was done to see the effect of nutrition knowledge on dietary diversity, infant nutrition status and meal frequency. Table 4.23 shows the summary of the results obtained.

Table 4.23: Regression analysis

DV	IV	R^2	F	df1; df2	p-value	B (regression coefficient)	T	p-value	Conclusion
MUAC	K1	.039	.683	5; 85	.638	.066	.201	.841	Knowledge is not a significant predictor of MUAC
	K2					-.021	-.061	.952	
	K3					.233	.478	.634	
	K4					-.333	-.837	-.405	
	K5					.672	1.239	.405	
DD	K1	.032	.572	5;86	0.721	.297	.987	.326	Knowledge is not a significant predictor of DD
	K2					.029	-.0987	.927	
	K3					.563	1.291	.200	
	K4					-.326	-.893	.375	
	K5					.164	.335	.738	
Meal frequency	K1	.046	.832	5;86	.531	-.285	-1.912	.059	Knowledge is not a significant predictor of meal frequency
	K2					.149	.955	.342	
	K3					.038	.177	.860	
	K4					.073	-.402	.689	
	K5					.110	-.455	.651	

KEY

K1 - knowledge on duration of exclusive breast feeding
K2 - knowledge on the duration of continued breast feeding
K3 - knowledge on why exclusive breastfeeding is recommended
K4 - knowledge on importance of breast milk
K5 - knowledge on complementary feeding

4.3 DISCUSSION OF RESULTS

Data collected from this research demonstrated the knowledge that the caregivers had, the feeding patterns practised, and the nutritional status of infants living in a rural area in Munjinga North, Zimbabwe. The data collected also indicates poverty in the researched community and different strategies that the caregivers use to survive when they do not have enough food for the family.

Socio-economic status played a vital role in the quality of food choices made by caregivers and the food practices they adopted. The analysis of the results indicates that the community has a high unemployment rate, income inadequacy, poor eating practices, overcrowding and low level of secondary education, which has led to the poverty status of the community.

Women with low status in society tended to have weaker control over household resources in South Asia, according to Smith, Ramakrishnan, Ndiaye, Haddad and Mortorell (2003: 287). In this study, this statement was supported since in only 35.0% of the households were the mothers responsible for allocating money for food. Caregivers have less access to information and health services, and this was shown where only 22.0% of the caregivers had received training at the health facility. These factors are thought to be closely related to women's nutritional status and the quality of care they would give to their children. Women's status in society makes by far the most significant contribution to their children's nutritional status; thus, to improve the nutritional status of children, women's status should be improved.

The low status of the women could be due to low income or no income in the household. The community is living in poverty as 50.0% of the respondents do not have anyone in the household earning a monthly income. Still, they are surviving on day jobs that they can find, and 34.0% depend on one person's income, 75.0% reported that they bought food only once a month, with 60.0% of the households having a shortage of money to buy food and 95.0% spending between $0 - $50 per month. This was also supported by a study done in Marondera, Zimbabwe by Tugwete (2010: 67) that showed that 58.0% of the women had no income.

The majority of the households (98.0%) are surviving below the Food Poverty Line for one person, which was recorded at US$31.20 per person in Zimbabwe in 2017, with a possible increment each year due to poverty (ZimStats 2017: 38). This suggests that their infant

feeding practices are restricted due to a lack of money. The research done in the Munjinga North community showed that households are surviving on a low income. The calculated MPI proved that the community is living in poverty, which means that the villagers are resorting to various tactics so that their infants can have food to eat. This supports the study by Mtolo that found that during times of food shortage, the participants are forced to adopt drastic measures to cope (Mtolo 2016: 128).

The study showed a significant relationship between the household's total income and the money allocated to buy food items (p=0.001), and the above variables depended on the total household earnings. The household food security increased with the level of household income; in this study, 98.0% were unemployed, 92.0% of the households were surviving on an amount between $1 and $100 per month, and the majority had one person or no one contributing to the monthly household income, thus most families were food insecure and this was as a result of the collapse of the Zimbabwean economy, leaving people with poor levels of real income and, therefore, with household insecurity (Mtolo 2016: 129). Since many households had an income below the poverty datum line, it meant that the amount allocated for food would not be enough to purchase the food required for the family. Both the quality and quantity of the food items would thus be compromised by the limited financial resources of the family.

Beaumier, Ford and Tagalik (2015: 197-198) explained that the rate of food insecurity was fast increasing, and more people were experiencing food insecurity daily, and as a result, people skipped meals or let other family members, especially children, eat first, and women were usually the last to eat. In this study, the most-used coping strategy was restricting consumption by adults so that the children could eat, which had a mean food security score of 8.9 with a severity score of four and a maximum score of 28. The second most-used coping strategy was the restriction of the caregiver's own food to give their children food which had a mean food security score of 7.2. The above findings could be connected to the low income per month earned by the caregivers, which ranged between $1 - $100 per month; this money was very little for a household compared to the food prices in the market (Mothepu 2016: 141). The study showed that some of the households were limiting their portion sizes, which was also reported in a study done in Limpopo by Mbhenyane, Tambe, Phook-Rabodiba and Nesamvuni (2020: 15828).

Living standards factors such as sanitation, running water and the caregiver's education level contributes to nutrition (Ngure, Reid, Humphrey, Mbuya, Pelto and Stoltzfus 2014: 120) and this was supported by UNICEF (2009) when it stated that socio-economic conditions influenced the diet and poor communities tend to have poor consumption of essential nutrients. In this study the standard of living contributed 59.2% to the MPI score and the infants consumed mainly carbohydrates (98.0%) and protein (67.0%) and that meant that in this community 33.0% of the infants were at risk of developing kwashiorkor which concurred to the studies above.

Most (55.0%) of the women in the study indicated that they had attained a secondary school education. Some (35.0%) had only attained up to primary level. A few (8.0%) stated that they had attained up to college level and 2.0% said they had never had any schooling. This statistic showed that about 63.0% of the women were empowered in terms of literacy. Still, 98.0% of the women were unemployed. The question left to be asked is whether the secondary school level recorded indicated a qualified certificate or whether they had not completed their secondary education. This was also the case in the study done by Tugwete (2013: 67) where 76.0% of the women were recorded to have attained a secondary school certificate but 61.0% were unemployed.

The data showed that the Munjinga North community has poor sanitation with 54.0% of the caregivers fetching water from unreliable sources such as rivers and unprotected wells, 29.0% do not have toilets so they use the bush, and this is unhealthy as the faeces are washed away into the rivers which many families use as their source of water. This leads to the contamination of water and could lead to faecal-oral transmission of diseases such as diarrhoea, which is a main cause of stunted growth and malnutrition in children. Ngure *et al*. (2014: 120) reported that a good water source and good sanitation improves child growth.

Many caregivers in this study live in shared accommodation, with a minimum of two and a maximum of ten in each household. Five percent of the households have eight to ten permanent residents, 54.0% have between five to seven permanent residents and 41.0% have between two to four members in the household with the majority (64.0%) having one or two rooms for all members to live in and 65.0% have shacks outside the main house. When more than one person occupies a room, it is considered to be crowding (Schwartz 2014: 32) and this data show that the community was living in overcrowded conditions. This was also found in the study by Tugwete (2013: 68) where the majority of the participants (55.2%)

were living with more than three people in the household with one person or no one contributing to the food purchases. These living conditions explained some of the severe coping strategies like relying on less expensive and less preferred food (mean food security score −3.2); this was because a lack of resources limited consumers in terms of what they could buy, resulting in people adapting their diet as cheaper foods would be more favourable (Peyton, Moseley and Battersby 2015: 51). Restricting consumption by adults for children to eat (mean food security score −8.9), and bartering (mean food security score –6.9) as they did not have money to buy commodities could have a negative impact on the availability of food to feed to the infants in the household. Regardless of the knowledge on infant nutrition that the caregivers might have acquired, it became nearly impossible to meet the standard infant feeding practices when the food was inadequate and there was a large family to feed on a low income. Maxwell (1996: 294) advised that coping strategies with a higher severity weight should be avoided as they signify high levels of food insecurity.

In this community, basic services such as electricity, running water, proper shelter or tarred roads were not provided and this is supported by the study by Drimie, Faber, Vearey and Nunez (2013: 3) which stated that sub-Saharan Africa does not have proper infrastructure and has restricted access to electricity and safe water to drink.

The Multidimensional Poverty Index was calculated using the indicators collected by the socio-demographic questionnaire. In this index, the health dimension contributed 24.4% to the intensity of poverty among the participants due to the child mortality and poor nutrition amongst the infants. Education contributed 16.4% and it was noted that many caregivers had attended school and could read and write mainly in Shona, their home language. The standard of living dimension contributed 59.2% to the intensity of poverty, which shows that many are living under poor conditions with no electricity, the source of drinking water is not safe, the caregivers own few assets, and they use wood as their cooking fuel. Van der Berg (2014: 10) stated that the black population in SA suffer from an asset deficiency because they do not have inherited assets and have a low income, which means that they cannot save over a significant period of time. In this study only four households owned a car, and 10 households had a motorbike. Joshi, Tiwari, Roy and Dutt (2019: 93) stated that owning cattle is viewed as a status symbol in rural areas, and in this study only 27.0% of the families owned cattle and they were amongst the richest families in the community.

These findings were similar to the Human Development Report (UNDP 2015: 229), which showed that Zimbabwe's multidimensional index contribution from health was 24.4%, education's contribution was 16.4%, and living conditions contributed 59.2% to the deprivation cut-off point. Participants in this study who were deemed to be living in acute poverty made up 74.0%, which meant that they had been deprived of all the indicators from a single dimension or a combination across dimensions and the poverty intensity was 47.0%, while the MPI was at 35.0%, which was above the cut-off point of 33.3%, which meant that this community is living in poverty.

All infants were breastfed at birth and at the time of the research 95.0% were still breastfeeding, which was higher than the 81.0% recorded for Zimbabwe by UNICEF (2018: 67) and the 92.0% recorded in Ethiopia (Demilew, Tafere and Abitew, 2017: 4). The difference between the percentages for Zimbabwe and Ethiopia could be due to sociocultural differences. Most of the participants in this study are housewives, thereby increasing the chances of continued breastfeeding. This shows that many caregivers understand the importance of breastfeeding a child beyond six months. A high proportion of the infants (96.4%) were timeously introduced to complementary feeding compared to (71%) at national level (UNICEF 2018: 71), and lower than the 98.0% recorded in Ethiopia (Demilew, Tafere and Abitew 2017: 5). This might be due to different promotional methods used to improve complementary feeding by professionals and the mass media in different countries.

The recorded minimum dietary diversity for the Mashonaland West Province according to UNICEF (2018: 72) was at 15.0% for children aged 6–23 months and for this study group it was 36.0%. The results indicated that the infants were being given foods from four or more groups and the rest were being given food from three or fewer groups, which was below the standard for the recommended food group intake, which showed that the quality of foods introduced was not optimal for most of the children. The infants were mainly fed food items from the grains, roots, tubers, legumes and nuts groups, which constituted two groups from the seven groups used to calculate dietary diversity. Fifty-five percent of the infants were eating twice a day with the majority being within the of 6–8 months age group, making it an acceptable meal frequency since they were being breastfed as well, and 41.0% were eating three times a day, also making it a good meal frequency since they were between 9–12 months old and being breastfed as well.

The total minimum meal frequency for the whole study group was 81.0% compared to 64.3% for the whole district in 2018 (Zimbabwe Smart Survey 2019: 31), which reflected that many of the caregivers managed to give their infants food at the required time; however, the minimum acceptable diet was at 25.0%, which showed that the infants were being given food of questionable quality. Many caregivers were giving their infants maize meal porridge twice a day, and in terms of meal frequency, this was acceptable since the child would also be breastfeeding, but in terms of quality, this meal contained mainly carbohydrates with small amounts of salt and sugar, and this shows it does not contain all the required nutrients, therefore it was not an acceptable diet but because of poverty this is all the households had to offer to their infants. All the infants were given water to drink, which meant they were hydrated but the water source had questionable safety, which put the infants at risk for diseases like diarrhoea. They were given thin porridge and mahewu, with 95.0% and 77% consuming these items respectively and this was part of their meals. They contained carbohydrates as the main nutrient, which meant the infants were being deprived of other essential nutrients when they ate these meals, hence the low percentage in the minimum acceptable diet. In this study, it has been shown that meal frequency and the core food group had a significant relationship of (p=0.01). Thus, both the quality and quantity of the infants' meals are important for them to grow up well. For infants who were being breast fed, two meals a day would be sufficient to provide the extra nutrients required from 6–8 months; from 9–12 months it should be three times a day plus breast milk, and for non-breastfed infants it should be four times a day.

Anthropometric measurements were used to measure the infants' nutritional status. The MUAC measurement showed that 5.0% of the infants were severely malnourished and needed to be rehabilitated and this might have been because some mothers continued breastfeeding their infants up to nine months without introducing complementary feeding because they lacked food resources. In this study it was seen that two percent of the infants were not yet receiving complementary feeding, even though they were above six months of age. Eighteen percent were malnourished and needed supplements, and this was mainly due to the low income in the household leading to insufficient food money to satisfy the needs of the family. MUAC is one of the parameters used to measure the nutritional status of infants (UNICEF 2020: 2) and a significant relationship was found between MUAC and the caregivers who were trained (p=0.008) This showed that it was important for caregivers to

have a basic education to comprehend the nutrition knowledge that they were taught and put it into practice since both of these parameters affected the infants' nutritional status.

The infant's weight-for-age was assessed using Z-score classification (WHO 2008d:17). The mean Z-score of all the infants was –1.37 (SD) 1.32 and fell within the normal range. According to the weight-for-age Z-score (WAZ) classification, 33.0% of the infants had low WAZ, while 67.0% had normal WAZ. The majority (67.0%) of the infants had a normal WAZ but with a concerning number (33.0%) being underweight. Nutrient intake was not determined in this study because the infants were 12 months and below and the majority were still being breast-fed and quantifying the breast milk would have been challenging.

The length-for-age of the infants was assessed using the Z-score classification (WHO 2008d: 17). The mean Z-score for all the infants was – 2.14 (SD) 1.26 and fell outside the normal range. According to the length-for-age Z-score (LAZ) classification, 55.0% had low LAZ, and 45.0% had normal LAZ. Stunted growth in early life has many adverse consequences for the child, like poor cognition and education performance, and a risk of nutrition-related chronic disease in adult life. If stunted growth in infants goes unchecked, it can lead to communities remaining poor as they will mature into less productive adults. Stunting was documented in almost one out of two of the infants, indicating that stunting is of high public health significance in the community studied. A relationship between MUAC and LAZ was seen with a significance value of (p=0.05)

Weight-for-length was assessed using the Z-score for all the infants (WHO 2008d: 17). The mean Z-score for all infants was –0.11 (SD) 1.38 and fell within the normal range. According to the weight-for-length Z-score (WLZ), 7.0% had low WLZ, 76.0% had normal WLZ, while 17.0% had high WLZ (Table 4.15); this could be due to poverty, lack of adequate water sources, or poor living standards. The prevalence of wasting among infants in this study was much lower but it indicated that wasting is a medium public health problem in the community and action needs to be taken because wasting is a sign of acute malnutrition. These results were similar to those found in a study done in Limpopo, South Africa by Mushaphi, Mbhenyane, Khoza and Amey (2008: 36).

A nutritional knowledge questionnaire was used to investigate the nutrition knowledge that the caregivers had. Only 22.0% had received training on infant nutrition, which was similar to a study done in the Makoni and Tsholotsho districts in Zimbabwe where 20.0% and 6.0%

respectively had received training (Sibanda, Ncube and Madzima 2004: 20); however, this was in contrast to the study done by Tugwete (2013: 70) where the majority of the participants 53.8% had received training. This difference could be because the Tugwete study was done in an urban set-up where the majority of the mothers stayed within a 3km radius of the health facility, while in this study the nearest health facility was 10 km away.

Many of the caregivers who were not trained did not have enough knowledge to put the recommended feeding options into practice. When asked if they knew about the recommended duration of exclusive breastfeeding, only 60.0% knew the answer and this result was similar to the study done by Sibanda, Ncube and Madzima (2004: 17) where 68.0% of caregivers in Makoni and 58.0% in Tsholotsho knew the correct duration of breastfeeding. The remaining 40.0% in this study said they followed what their mothers-in-law or grandmothers had told them at home without asking questions, which might imply that they lacked education, or they were ignorant about breastfeeding.

Forty-nine percent of the respondents were knowledgeable about the duration of continued breastfeeding, and this is in contrast to the findings in the study done by Sibanda, Ncube and Madzima (2004: 17). In their study, only one percent of the respondents in Makoni and four percent in Tsholotsho were knowledgeable about the duration of breastfeeding and this difference could be attributed to the level of education of the mothers. When asked about the importance of breast milk only 49.0% of the caregivers in this study knew about the importance of breast milk, 44.0% had partial knowledge and seven percent had no knowledge at all on why breast milk was important, which was a higher percentage than in the study done in Makoni and Tsholotsho where 9.0% of the caregivers knew about the benefits of breastfeeding (Sibanda, Ncube and Madzima 2004: 23).

When asked why exclusive breastfeeding was being recommended, the majority (62.0%) admitted that were unaware of its benefits and said that they were just following established practices. When asked about the disadvantages of early complementary feeding, the majority (58.0%) did not know, with only five percent being able to respond correctly. Some of the trained caregivers were unable to respond to simple questions regarding nutrition. This meant that they would not be able to comprehend the educational material supplied to them to help them carry out their duties. This was similar to a study done in Zimbabwe where most of the caregivers had incorrect or inadequate information about improving the infants'

diets (Desai, Smith, Chigumira, Fundira, Tavengwa, Malaba, Majo, Humphrey and Stoltzfus 2015: 12).

4.4 CONCLUSION

This chapter presented the findings of this study, which set out to determine the relationship between infant feeding practices and the nutrition knowledge that caregivers had on the nutritional health status of infants aged between 6–12 months in a rural community in Zimbabwe. The next chapter will provide recommendations that could be instituted to improve the nutritional status of infants living in rural areas.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In this chapter the main aim of the study will be restated together with its limitations, and a summary of the main findings and conclusions, and recommendations based on the study's findings will be presented. In the previous chapter, the results were presented, discussed and analysed to formulate nutrition-focused recommendations needed to promote the improvement of the nutritional status of infants in Zimbabwe and the whole of sub-Saharan Africa.

The literature reviewed helped us to understand that poor infant feeding practices have been and still are a persistent problem in Africa, and have contributed to malnutrition in infants, which has led to a high rate of infant morbidity and mortality. Therefore, it was important to come up with informed interventions that would address this issue in an attempt to ensure a healthier infant population. As caregivers' nutrition knowledge on infant nutrition improves, their capability to engage in approved practices will also improve.

The main aim of the study was to investigate the possible relationship between infant feeding practices and caregivers' socio-demographic profile and nutrition. To achieve the above aim, a socio-demographic profile of the community was conducted, the level of knowledge about infant nutrition that the caregivers had was assessed, and the infants' anthropometric measurements were taken and compared to the infant feeding practices displayed by the caregivers. The researcher also assessed the intensity of poverty among the caregivers and the different coping strategies they used when faced with a shortage of food at home.

The results from the study could be used to develop nutrition education tools that would help caregivers to make more informed decisions on infant feeding and implement research-based community-friendly interventions that could be adopted.

5.2 LIMITATIONS OF THE STUDY

- The sample population consisted of caregivers from a rural area and there was no representation from an urban set-up; therefore, the results were biased towards rural caregivers and cannot be generalized for the whole population of caregivers in Zimbabwe.

- The data collection process was quite exhausting for both the field workers and the caregivers, because the researcher and field workers were very thorough and made sure that all the questionnaires were checked and completed fully before living the caregivers' households to avoid any missing data which might have impacted the outcome of the study. To find the required number of infants aged 6–12 months was quite challenging as the rural homesteads were located far apart and the researcher and the fieldworkers had to walk relatively long distances to find the selected homesteads.

5.3 MAIN FINDINGS OF THE STUDY

The research revealed that caregivers who were trained at health facilities about infant feeding practices had infants with significantly higher MUAC score (13.7cm) compared to infants of caregivers who were not trained (12.8cm) (p=0.008). Globally, the infant population is at risk of compromised growth and development. When physical and cognitive development is compromised during the first two years it becomes difficult to reverse the effects. The effects of malnutrition include vulnerability to diseases, delays in development, stunted growth and impaired vision that could lead to blindness. The above-mentioned effects of malnutrition can also lead to poor school performance, consequently preventing children from achieving success in school and pursuing meaningful work in adulthood, thus negatively affecting a country's human asset potential.

Infants cannot decide what to eat or when to eat; these behaviours are developed in response to their caregivers' feeding practices; therefore, caregivers need to instil good feeding practices that their infants can learn and make part of their everyday life. The quality of infant nutrition knowledge that caregivers have can be reflected on the infant feeding practices, even though in this study, knowledge was not a significant predictor of MUAC, dietary diversity or meal frequency. Most of the caregivers were the mothers of the infants and their roles were restricted to preparing and serving food to the children while the buying power rested with the fathers and grandmothers. Fathers tend to make decisions mainly based on the cost of the food items and the type of food to be purchased. This decision poses a challenge as the food items might not meet the nutrient requirement of the infants.

Poverty is a problem mainly found in the rural areas of developing countries where this research was conducted. The researcher is of the opinion that when caregivers are provided

with adequate informed knowledge on infant nutrition, they would be able to maximize nutrient intake with the limited resources available to them in order to improve the health of their children. The multidimensional poverty index calculated using health, education and standard of living dimensions showed that the community of Munjinga North is living in chronic poverty. They are deprived of necessities like electricity and safe water to drink, they possess few assets and mainly use wood as their fuel source. The health score signified a risk of raising malnourished infants in the community. The above results contributed to the community MPI score being above the cut-off point, indicating that the community is indeed living in poverty.

The majority of the participants of this study depend on an income below the poverty datum line. Most of the households are living in overcrowded conditions, meaning that between 2–10 people are living in one room, with most households having only one or two rooms. The relationship between total household income and availability of money for food is significant at p=0.01, with most of the households spending US$0-US$50 per month on food items. This is not enough to buy sufficient food for the whole family. The lack of sufficient money to buy food compels the caregivers to find various ways of overcoming the shortage. Many are resorting to reducing the food consumption of the adults to maximize food availability for their children, and bartering, or exchanging their clothes or household items for food items like tomatoes, vegetables, maize grains or any food item they may require. In some instances, caregivers even reduce their own food consumption for the sake of their children. The coping strategies mean score shows that the Munjinga community is relatively food secure but this is because most of the households have become relatively content with the little they have.

In this study several of the infants were found to be malnourished, with some being severely malnourished and needing hospitalization. This confirmed that it is essential for caregivers to have some basic education to enable them to comprehend the nutrition information given to them and to apply it in everyday life. Education is fundamental and without knowledge, people are left ignorant on important issues and rely on beliefs and customs that hinder the proper growth of infants.

This research was conducted with infants aged between six to twelve months of age, and the average age in this study was nine months. All the infants were breastfed from birth and the majority were still being breastfed at the time of the research; however, only a few of the

caregivers knew about the importance of breast milk and why they were still breastfeeding their infants. Many were breastfeeding their infants because they had been told to do so by their elders. This indicated their lack of nutrition knowledge which would have significant repercussions when they weaned their children. The majority of the infants were timeously introduced to complementary feeding, which statistically was a good sign as it showed that the caregivers were following the WHO guideline of exclusively breastfeeding for the first six months, even though the majority of the mothers did not understand what exclusive breastfeeding was. The majority of the infants were being given two meals a day (thin porridge in the morning and in the evening) and since they were being breastfed according to the WHO guidelines it was an ideal meal frequency, hence the high percentage found on minimum meal frequency for the community. Although the meal frequency was high, the minimum dietary diversity and minimum acceptable diet results were low, signifying that the infants were being introduced to foods with compromised quality. The food lacked variety and was deficient in some macronutrients and many micronutrients. The poor diet quality consumed by the infants will affect their growth and development. In this study, the signs are already evident that more than half of the infants are stunted, with several being wasted and malnourished. In this study, most of the caregivers had not received any training on how best to feed their infants and this could be the reason for the level of malnutrition in the community.

5.4 CONCLUSION

Most of the caregivers in the homesteads where the research was conducted are living in poverty, the unemployment rate is high, income levels are low, and they have questionable secondary education. The caregivers have inadequate knowledge on infant nutrition which is evidenced in the poor infant feeding practices. The progression of malnutrition, especially undernutrition, is high with some infants being severely undernourished and stunted. The infants consume a low food variety and as a result they are starved of some macronutrients and many micronutrients. Although there could be other factors contributing to the malnutrition, the research findings confirmed that there was a relationship between the infants' feeding practices and the nutrition knowledge of the caregivers who had been trained on infant nutrition, and Tukey's post hoc analysis shows that MUAC is significantly higher for those with partial knowledge than for those with no knowledge.

5.5 RECOMMENDATIONS

Infants are the future generation of our communities; therefore, the utmost care should be taken to implement feeding practices that promote healthy growth and development. The high prevalence of undernourishment and stunting found in this study has demonstrated the need for effective interventions to improve the caregivers' nutrition knowledge, which would positively influence their infant feeding practices.

5.5.1 RECOMMENDATIONS FOR POLICY MAKERS

5.5.1.1 Government

- The Zimbabwean Department of Health needs to develop Food Based Dietary Guidelines for infants and young children, which could be disseminated and made available to communities.
- Despite its good intentions, the IYCF policy has failed to deliver the intended results. Therefore, it is recommended that its management framework be reviewed, and the necessary capacity be provided to improve delivery.
- Ensure that Munjinga North village health workers are adequately trained and have full knowledge of infant nutrition to disseminate to their communities.
- Work closely and collaborate with NGOs to prioritise essential projects and create a conducive environment for both government and NGOs to cooperate in programme delivery to enhance the impact.

5.5.1.2 Non-Governmental Organizations (NGOs)

- Prioritize essential projects like drilling boreholes or protected wells to access safe water for the community to drink.
- Play a major role in disseminating information on infant nutrition knowledge and educating the communities by providing adequate and user-friendly information, applying methods that promote the easy acquisition of appropriate diet practices and promote good eating habits and behavioural change. Recommended food sources should include those that are available and accessible to the community.
- Empower communities with skills they could use to empower themselves and increase household income

5.5.1.3 International Development Agencies

- The legacy of passivity and failure to implement policies on the part of the government needs to be interrogated and measures put in place to build capacity for government to deliver. The international development community could ideally play a part in this role.

5.5.2 RECOMMENDATIONS FOR AGRICULTURAL INTERVENTIONS

- Even with climate change, Munjinga North still provides excellent agricultural opportunities since it has fertile soil, and farmers should be encouraged to plant food-giving crops like maize, soybeans, sugar beans, ground beans, round beans, sorghum and pumpkin during the rainy season instead of concentrating only on cash crops like tobacco.
- Farmers should be equipped with knowledge on preserving their crop produce to last until the next harvest. There is a direct link between improving the agricultural sector and improving nutritional health in communities, leading to food security.

5.5.3 RECOMMENDATIONS FOR THE COMMUNITY

- Government initiatives will take longer to be implemented and usually when they do, they tend to be poorly coordinated and monitored; therefore, people in the community need to work together to strengthen their coping strategies.
- The Munjinga North community has access to agricultural land, so they should take the initiative and implement projects that could improve their livelihoods at grassroots level.
- Caregivers could add nutritious food products such as beans, nuts, avocados (if available), and baobab powder to the thin porridge they prepare for the infants to increase its nutrient content.

5.5.4 RECOMMENDATION FOR FUTURE RESEARCH

- A replica of this study on a larger scale, including urban settings, would to be able to generalize the results of the study.
- Research on how the role of fathers could contribute to the infant and young child feeding practices could be undertaken.

- Research into developing a nutrient-dense cereal for infants using indigenous food products that would be cost-effective to the rural community could be undertaken.
- Research could be done on the methods of food preparation and nutrition education in respect of a balanced diet with reference to infant and young child feeding practices.

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ANNEXURES

Annexure A

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

22 November 2017

IREC Reference Number: **REC 60/17**

Ms L Pfumvuti
No 1958 Section 5
Kambuzuma Harare
Zimbabwe

Dear Ms Pfumvuti

Relationship between infant feeding practices, caregiver's nutrition knowledge and nutritional status of infants aged 6 to 12 months in a rural community in Zimbabwe.

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tools for review.

We are pleased to inform you that the data collection tools have been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedure's (SOPs).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2017 -11- 22
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

LETTER OF INFORMATION

Dear Participant

Thank you for giving me the opportunity to explain my research study for your consideration.
The title of my study is "Relationship between infant feeding practices and care givers' nutrition knowledge on the nutritional status of infants aged between 6 to 12 months in a rural community in Zimbabwe.

Principal researcher/investigator:

I Lynn Pfumvuti, (Master of Applied Science in Food and Nutrition student), will be the main researcher and I will be supervised by Professor Carin Napier (D Tech Food Service Management).

This study is important because it will inform which feeding practices per age are better and allow us to feed our babies food rich in nutrients for healthy growth and how as caregivers, we will obtain this valuable nutrition knowledge.

The aim of this study is to find the relationship between infant feeding practices and caregiver's nutrition knowledge on the nutrition status of infants aged between 6 to 12 months in a rural community in Zimbabwe. To develop nutritional educational material that would help to inform caregivers of the feeding practices available and how best to keep our infants healthy with the resources available to us.

The research study requires at least 100 caregivers with infants between the ages of 6 – 12 months to participate for the study to be valid.

What will it involve?

- The researcher will contact you to make an appointment to collect the information from the participants.
- Ethical clearance will be obtained from the DUT Ethics Committee.
- Participants will be asked to sign a letter of consent, indicating that they are willing to participate in the research study and that the researcher has clearly explained the study and procedures involved to them.
- The study will consist of six different questionnaires in an interview situation and this process could take up to 60 minutes to complete; we will assist you to complete the questionnaires.
- The questionnaires will include:

a. A Socio-demographic questionnaire to determine the socio-demographic profile of the families.
b. A Food Frequency questionnaire to determine food variety and dietary diversity.
c. Three 24-Hour recall questionnaires to determine the diet intake of infants.
d. A coping strategy questionnaire to determine the food security of the families.
e. An infant feeding practices questionnaire to determine the feeding practice patterns of the caregivers.
f. An infant nutrition knowledge assessment questionnaire to assess the nutrition knowledge of the caregivers.

- We will also weigh the infants and measure their length, and mid upper arm circumference in the presence of their respective caregivers.

Please note the following:

- Participation is voluntary and participants can withdraw at any time with no penalty.
- No pay will be given to any of the participants.
- There is no cost to the participants if they agree to partake in the study.
- Participants will be issued a number and no personal information such as names will be recorded**.**

The results of the study will be made available to your community after the study has been concluded; no personal information such as names will be mentioned. The study hopes that the results will help create interventions that could be implemented in the community for any of the identified problems. If you have any personal nutrition questions or concerns, we are prepared to come back to you after the data collection to assist you.

Research related injury:
No injuries are expected in this study.

For any questions or concerns please feel free to contact my supervisor or the Ethics Committee. Your participation will be greatly appreciated and thank you for allowing us the opportunity to explain the study to you.

Kind Regards

Lynn Pfumvuti
Researcher

Persons to Contact in the Event of Any Problems or Queries:

Supervisor: Prof. Carin Napier Researcher +27313732326, carinn@dut.ac.za
Researcher: Lynn Pfumvuti +263 716187002, +27623933570, lynnpfumvuti06@gmail.com
The Institutional Research Ethics administrator: +27313732900.
Complaints can be reported to the DVC: TIP, Prof S Moyo Moyos@dut.ac.za **or 031 373 2382.**

Annexure C

TSAMBA YERUZIVO

Kuna Mudzidzi

Ndinotenda nekundipa mukana wekuti ndikutsanangurirei nezvechidzidzo chandinoda kuita mutsvakurudzo yangu.
Musoro we ongororo yangu unoti "ukama uripo pakati pemaitiro edu pakupa vana zvokudya neruzivo rwatinaro sevabereki panyaya yechikafu chinoumba utano hwakanaka pautano hwevana vedu vanemwedzi nhanhatu yekuzvarwa kusvika mwedzi gumi nemaviri kumaruva eZimbabwe.

Muongorori:

Ini Lynn Pfumvuti, (Master of Applied Science in Food and Nutrition student), ndini ndichange ndiri muongorori uye ndichange ndichibatsira naProfessor Carin Napier (D Tech Food Service Management) murairidzi mukuru wangu.

Ongororo iyi yakakosha nekuti ichatipa ruzivo rwekuziva maitiro ekupa vana vedu zvokudya akanaka uye anokurudzirwa kuitira kuti vakure vaneutano hwakanaka, uyezve kuti isu sevachengeti vevana tive neruzivo rwezvokudya zvinokurudzirwa kupa vana vedu zvinovapa utano hwakana

Chinangwa cheongororo iyi kutsvaga ukama uripo pakati pemaitiro edu pakupa vana zvokudya neruzivo rwatinaro sevabereki panyaya yechikafu chinoumba utano hwakanaka pautano hwevana vedu vanemwedzi nhanhatu yekuzvarwa kusvika mwedzi gumi nemaviri kumaruva eZimbabwe. Kuitira kuti pagadzirwe magwaro anotidzidzisa nezvezvokudya zvinopa utano hwakanaka kuvana tichishanda zvokudya zvinowanikwa munharaunda medu.

Ongororo iyi inoda vanhu 100 varikuchengeta vana vacheche kubva pamwedzi 6 kusvika 12.

Zvichange zvichiitika paongororo iyi?

- Muongorori achauya kwamuri kuzobvunza ruzivo rwamuinaro.
- Ethical clearance will be obtained from the DUT ethics committee.
- Muchakumbirwa kuti mubvume kuva muongororwi nekunyora pabepa rechibvumirano, muchiratidza kuti kuda kwenyu kuti muve muongororo iyi, uye kuti muongorori anyatsokupai ruzivo ruzere maererano nezveongororo yaanoda kuita.
- Ongororo iyi ichange ine mapepa anokwana kuita matanhatu emubvunzo amunokumbirwa kuti mupindure, izvi zvichaitwa munemuongorori achikubatsirai.
- Mapepa emubvunzo anosanganisira:
    g. Bepa reSocio-demographic questionnaire rinoongorora magariro atakaita mudzimba dzedu.
    h. Bepa reFood Frequency questionnaire rinoongorora uhwandu uye kusiyana siyana kwechikafu chatodya mudzimba dzedu

i. Mapepa matatu e24-Hour recall questionnaires kuongorora kudya kwevana vedu vachechi mazuva matatu pavhiki
j. Bepa recoping strategy questionnaire kuongorora kuwana kwatinoita chikafu mudzimba dzedu
k. Bepa reinfant feeding practices questionnaire kuongorora maitiro edu pakupa vana vedu zvokudya.
l. Bepa reinfant nutrition knowledge assessment questionnaire kuongorora ruzivo rwatinarwo isu vabereki pamusoro pezvokudya zvinovaka muviri kuvana vedu.

- Tichazenge tichitora uremu hwevana venyu, kureba kwavakaita uyezve nekuona kuti rwoko rwemwana rwakatenderedzeka zvakadii, zvose izvi zvinoitwa pamberi penyu vabereki.

Zivai zvinotevera:

- Kuve mutsvagiridzo iyi chido chako, haumanikidzwi uye unotenderwa kusiya paunenge woda pasina kupihwa mhosva.
- Hapana muripo uchapihwa.
- Hapana mari inodiwa kuti uve mudzidzi mutsvakiridzo iyi.
- Vanhu vose vachapihwa manumber hapana mazita achashandiswa.

Zvose zvichabuda muongororo iyi zvichaitwa kuti imi vanhu vemuno mudunhu mukwanise kuzviona panopera ongororo iyi. Hapana mazita evanhu achashandiswa mukunyorwa kweongororo iyi. Tinovimba kuti zvichabuda muongororo iyi zvibatsire dunhu rino kuti paitwe matanho akanaka ekubatsira matambudziko anenge awonekwa. Kana muine mubvunzo mimwe inoenderana nezvokudya kwakanaka kunovaka muviri, tionei tikubatsirei kana tapedza basa iri.

Kukuvara panguva yeongororo:
Hapana kukuvara kwatinotarisira muongororo ino.

Kana muine mibvunzo sunungukai kuona kana kufonera supervisor wangu kana Ethics committee. Kuvepo kwenyu tinokutenda chaizvo

Maita basa.

Ndini wenyu

Lynn Pfumvuti
Muongorori

Vanhu vamungafonere kana mukasangana nedambudziko kana mimwe mibvunzo:
Supervisor: Prof. Carin Napier Researcher +27313732326, carinn@dut.ac.za
Researcher: Lynn Pfumvuti +263 716187002, +27623933570, lynnpfumvuti06@gmail.com
The Institutional Research Ethics administrator: +27313732900.
DVC: TIP, Prof S Moyo Moyos@dut.ac.za **or 031 373 2382**

Annexure D

CONSENT FORM

Statement of Agreement to Participate in the Research Study:

- I …….. hereby confirm that I have been informed by the researcher, Ms. L. Pfumvuti, about the nature, conduct, benefits, and risks of this study.
- I have also received, read, and understood the written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my gender and age will be anonymously processed into a study report.
- In view of the requirements of the research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent to and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

_____	_____	_____
Full Name of Participant	**Date**	**Time**

Signature / Right Thumbprint:

I, L Pfumvuti (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Lynn Pfumvuti		
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

Annexure E

LETTER OF INFORMATION

Dear Mr Mharadzi (The councilor) **7 March 2017**

Thank you for giving me the opportunity to explain my research study for your consideration.
The title of my study is "Relationship between infant feeding practices and care givers nutrition knowledge on the nutritional status of infants aged between 6 to 12months in a rural community in Zimbabwe".

Principal researcher/investigator:

I Lynn Pfumvuti, (Masters of Applied Science in Food and Nutrition student), will be the main researcher and I will be supervised by Professor Carin Napier (D Tech Food Service Management).

This study is important because it will inform which feeding practices, per age, are more effective and feasible considering the different dynamics of infant care. It will also go a long way in educating caregivers and identifying where training of healthcare professionals should or can be strengthened, to ensure correct information is passed to caregivers. Such research is of invaluable significance in the well-being and health of children from a very young but critical age. Research has shown that Zimbabwe has a high rate of introducing infants to complimentary feeding but these feedings have a low dietary diversity and the minimum acceptable diet prevalence is also very low, these statistics shows that infants are at risk of malnutrition.

The aim of this study is to find the relationship between infant feeding practices and care giver's nutrition knowledge on the nutrition status of infants aged between 6 to 12months in a rural community in Zimbabwe in order to develop nutritional educational material that would help to inform care- givers of the feeding practices available and how best to keep our infants healthy with the resources available to us.

The research study requires at least 100 care givers with infants between the ages of 6 – 12 months to participate in order for the study to be valid.

What will it involve?

- The researcher will contact you to make an appointment to collect the information from the participants.
- Ethical clearance will obtained from the DUT ethics committee
- Participates will be asked to sign a letter of consent, indicating that they are willing to participate in the research study and that the researcher has clearly explained the study and procedures involved to them.
- The study will consist of six different questionnaires in an interview situation and this process could take up to 60 minutes to complete, we will assist you to complete the questionnaires.
- The questionnaires will include:
    a. A Socio-demographic questionnaire to determine the socio-demographic profile of the families

b. A Food Frequency questionnaire to determine food variety and dietary diversity.
c. Three 24-Hour recall questionnaires to determine the diet intake of infants
d. coping strategy questionnaire to determine the food security of the families
e. infant feeding practices questionnaire to determine the feeding practice patterns of the care-givers
f. infant nutrition knowledge assessment questionnaire to assess the nutrition knowledge of the care-givers

- We will also weigh the infants and measure their height, and mid upper arm circumference in the presence of their respective caregivers

Please note the following:

- Participation is voluntary and participants can withdraw at any time with no penalty.
- No pay will be given to any of the participants.
- There is no cost to the participants if they agree to partake in the study.
- Participants will be issued a number and no personal information such as names will be recorded.

The results of the study will be made available to your community, after the study has been concluded; no personal information such as names will be mentioned. The study hopes that the results will help create interventions that could be implemented in the community for any of the identified problems. If you have any personal nutrition questions or concerns, we are prepared to come back to you after the data collection to assist you.

Research related injury:
No injuries are expected in this study.

For any questions or concerns please feel free to contact my supervisor or the Ethics committee. Your participation will be greatly appreciated and thank you for allowing us the opportunity to explain the study to you.

Kind Regards

Lynn Pfumvuti
Student

Prof C Napier
Supervisor

Persons to Contact in the Event of Any Problems or Queries:
Supervisor: Prof. Carin Napier Researcher +27313732326, carinn@dut.ac.za
Lynn Pfumvuti +263 716187002, +27623933570,

DURBAN UNIVERSITY OF TECHNOLOGY
Department: FOOD AND NUTRITION CONSUMER SCIENCES
PO BOX 1334
DURBAN
4000

Hurungwe Rural District
Council
P O Box 46
Magunje

14 April 2017

To whom it may concern

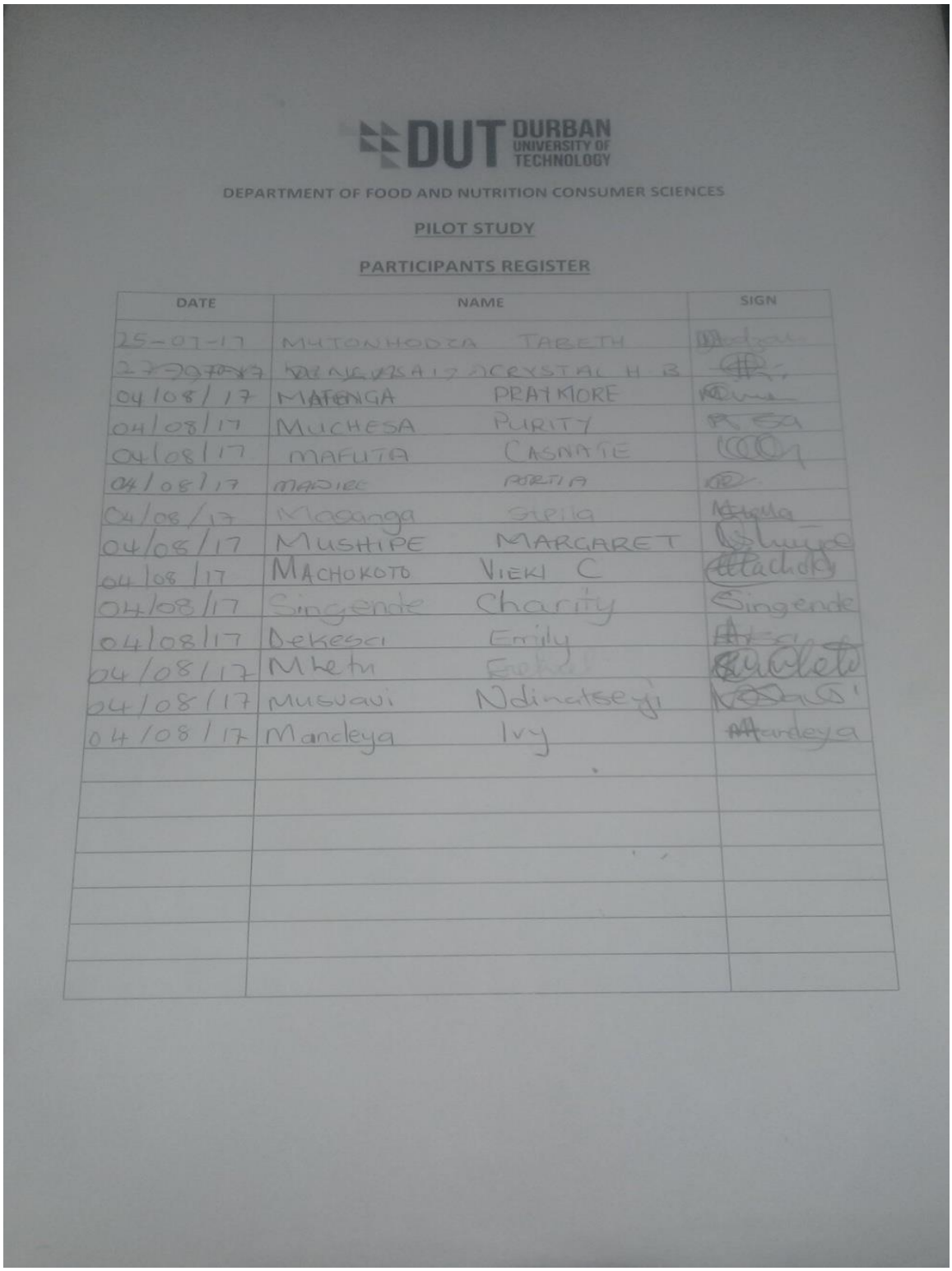
I do hereby allow Lynn Pfumvuti to carry out her research in my area, Hurungwe ward 14. She will meet participants from the following villages/areas; Gwiba, Chimusimbe, Chinhere and Kavaya.

I hope her research will assist my community.

Yours sincerely

Mharadzi F (Ward 14 Councilor).

District Council



DUT DURBAN UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF FOOD AND NUTRITION CONSUMER SCIENCES

PILOT STUDY

PARTICIPANTS REGISTER

DATE	NAME		SIGN
25-07-17	MUTONHODZA	TABETH	
27/07/17	[illegible]	CRYSTAL H B	
04/08/17	MATENGA	PRAYMORE	
04/08/17	MUCHESA	PURITY	
04/08/17	MAFUTA	CASNATE	
04/08/17	MADIEC	PORTIA	
04/08/17	Maganga	Sipila	
04/08/17	MUSHIPE	MARGARET	
04/08/17	MACHOKOTO	VIEKI C	
04/08/17	Singende	Charity	
04/08/17	Dekesai	Emily	
04/08/17	Mketu	[illegible]	
04/08/17	Musvavi	Ndinatsegi	
04/08/17	Mandeya	Ivy	

Annexure H

CONSENT FORM

Statement of Agreement to be a fieldworker in the Research Study:

- I ……. hereby confirm that I have been informed by the researcher, Ms. L. Pfumvuti, about the nature, conduct, benefits, and risks of this study.
- I have also received, read, and understood the written information (Fieldworker Letter of Information) regarding the study.
- I am aware that I must undergo training before I start helping with the research. In view of the requirements of the research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to be a fieldworker in the study.

_____	_____	_____
Full Name of fieldworker	**Date**	**Time**

Signature / Right Thumbprint:

I, L. Pfumvuti (name of researcher) herewith confirm that the above fieldworker has been fully informed about the nature, conduct and risks of his/her work on this study.

Lynn Pfumvuti	_____	_____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

Annexure I

LETTER OF INFORMATION
Dear Fieldworker

Thank you for giving me the opportunity to explain my research study for your consideration.
The title of my study is "Relationship between infant feeding practices and care givers' nutrition knowledge on the nutritional status of infants aged between 6 to 12months in a rural community in Zimbabwe".

Principal researcher/investigator:

I Lynn Pfumvuti, (Master of Applied Science in Food and Nutrition student), will be the main researcher and I will be supervised by Professor Carin Napier (D Tech Food Service Management).

This study is important because it will inform which feeding practices per age are more effective and feasible considering the different dynamics of infant care. It will also go a long way in educating caregivers and identifying where training of healthcare professionals should or can be strengthened, to ensure correct information is passed to caregivers. Such research is of invaluable significance in the well-being and health of children from a very young but critical age. Research has shown that Zimbabwe has a high rate of introducing infants to complementary feeding, but these feedings have a low dietary diversity, and the minimum acceptable diet prevalence is also very low; these statistics show that infants are at risk of malnutrition.

The aim of this study is to find the relationship between infant feeding practices and caregivers' nutrition knowledge on the nutrition status of infants aged between 6 to 12 months in a rural community in Zimbabwe. Secondly, to develop nutritional educational material that would help to inform caregivers of the feeding practices available and how best to keep our infants healthy with the resources available to us.

The research study requires at least 100 caregivers with infants between the ages of 6 – 12 months to participate for the study to be valid.

What will it involve?

- The researcher will contact you to make an appointment to collect the information from the participants.
- Ethical clearance will be obtained from the DUT ethics committee.
- Participants will be asked to sign a letter of consent, indicating that they are willing to participate in the research study and that the researcher has clearly explained the study and procedures involved to them.
- The study will consist of six different questionnaires in an interview situation and this process could take up to 60 minutes to complete; we will assist you to complete the questionnaires.
- The questionnaires will include:

m. A Socio-demographic questionnaire to determine the socio-demographic profile of the families.
n. A Food Frequency questionnaire to determine food variety and dietary diversity.
o. Three 24-Hour recall questionnaires to determine the diet intake of infants.
p. A coping strategy questionnaire to determine the food security of the families.
q. An infant feeding practices questionnaire to determine the feeding practice patterns of the caregivers.
r. An infant nutrition knowledge assessment questionnaire to assess the nutrition knowledge of the caregivers.

- We will also weigh the infants and measure their length, and mid upper arm circumference in the presence of their respective caregivers.

Please note the following:

- Participation is voluntary and participants can withdraw at any time with no penalty.
- No pay will be given to any of the participants.
- There is no cost to the participants if they agree to partake in the study.
- Participants will be issued a number and no personal information such as names will be recorded**.**

The results of the study will be made available to the community after the study has been concluded; no personal information such as names will be mentioned. The study hopes that the results will help create interventions that could be implemented in the community for any of the identified problems. If you have any personal nutrition questions or concerns, we are prepared to come back to you after the data collection to assist you.

Research related injury:
No injuries are expected in this study.

What is expected of you as a fieldworker?

- To assist the researcher to collect data from the participants.
- Help participants undertaking the study.
- To undergo training to be conducted by the researcher to inform you about the study and your expected duties.

For any questions or concerns please feel free to contact my supervisor or the Ethics Committee. Your participation will be greatly appreciated and thank you for allowing us the opportunity to explain the study to you.

Kind Regards

Lynn Pfumvuti	Prof C Napier
Researcher	**Supervisor**

Persons to Contact in the Event of Any Problems or Queries:
Supervisor: Prof. Carin Napier Researcher +27313732326, carinn@dut.ac.za
Researcher: Lynn Pfumvuti +263 716187002, +27623933570, lynnpfumvuti06@gmail.com
The Institutional Research Ethics administrator: +27313732900.
Complaints can be reported to the DVC: TIP, Prof S Moyo Moyos@dut.ac.za **or 031 373 2382.**

Annexure J

Food and Nutrition Consumer Sciences

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

This questionnaire covers certain aspects of your life, including work and personal details, health and illness, lifestyle and social life that is relevant to health. The answers to these questions will be kept strictly confidential and the information will not be identifiable on any reports or publications.

1. GENERAL INFORMATION

Participant number……. Date: ……

Fieldworker name: ……

Please answer all questions by marking the correct answer with **X,** except where otherwise indicated.

Where do you live?

.....

2. PERSONAL INFORMATION

2.1 Your role in the family

Mother	Grandmother	Father	Grandfather	Other, specify……

2.2 When were you born? Year: Month: Day:

2.3 How old are you? _____years

2.4 Gender:

Male	Female

3. ACCOMMODATION AND FAMILY COMPOSITION

3.1 Do you live in?

Town/City	Farm	Squatter camp	Rural village	Hostel	Township	Other, specify……..

3.2 How are you currently living?

Homeless	
Living with relatives	
Living with friends	
Hostel accommodation	
Squatter home	
Rented house	
Own house	
Employee's property	
Other, specify……	

3.3 Do you live in the house with you?

Yes	No

3.4 How many people are permanent residents living in the house with you? (Only if these people eat and sleep in this house at least 4 days a week.)

3.5 How long have you been staying permanently in this house?

< 1 year	1-5 years	>5 years

3.6 In what type of house are you staying?

Brick	Clay	Grass	Wood	Zinc/shack

3.7 How many rooms/ huts does your house/ homestead have?

1 room	2 rooms	3 rooms	4 room	>5 rooms

3.8 Are there other shacks within the same yard of the main house?

Yes	No

3.9 Do you have the following facilities/ services at home?

3.9.1 Water

Tap in the house	
Well outside the house (in yard)	
Borehole	
Spring / river / dam water	
Fetch water from elsewhere	

3.9.2 Toilet facilities

None	
Pit latrine	
Flush / sewage	
Bucket system	
Bush toilet	
Other, specify…….	

Waste removal	Yes	No	3.9.3
Tarred road in front of house	Yes	No	3.9.4
Gravel road in front of house	Yes	No	3.9.5
Access to electricity	Yes	No	3.9.6

3.10 To what extent do you have problems with the state of your house (e.g., size, repairs, damp, etc.)?

……
……

3.11 Do you have problems with the following?

Mice/ Rats	
Cockroaches	
Ants	
Fleas	
Mosquitoes	
Geckos	
Frogs	
Snakes	
Bed bugs	

3.12. What is the floor inside your house made of?

Cement	
Tiles	
Carpet	
Dirt	
Sand/mud	
Dung	
Other, please specify	

4. **WORK STATUS AND INCOME**

4.1. Are you currently employed?

Yes	No

If YES, go to Question 4.5.

4.2. If NO, how would you describe your current status (tick one box only)?

Unemployed	Retired	Housewife	Student	Other, specify……

4.3. Are you actively looking for paid employment at the moment?

Yes	No

4.4. How long have you been unemployed?

< 6 months	6-12 months	1-3 years	> 3 years

4.5. If YES (question 4.1) is your current job a:

Permanent position	Temporary position	Fixed term contract	Other, specify…….

4.6. Are you doing part time jobs as a second job on weekends and school vacations?

Yes	No

4.7 What is the exact title of your current job?
(Including self-employed)

4.8. What is the total income in the household per month?

$0- $100	$101-$200	$201-$300	$301-$400	$401-$500	$501-$600
$601-$700	$701-$800	$801-$900	$901-$1000	$1001-$1500	$1501- $2000
$2001- $2500	$2501- $3000	>$3 000			

4.9. Please specify the monthly income in the household (if willing). …….

4.10 Do you receive any social grants?

Old age grant	Child grant	Disability grant	Foster grant

4.11. How often does it happen that you do not have enough money to buy food for you and your family?

Always	Often	Sometimes	Seldom	Never

4.12. How many people e.g., partner, relatives & others (including yourself) have contributed to your household income from any source, (including wages/salary from paid employment, money from second or odd jobs, income from savings investments, pension, rent or property, benefits and or maintenance etc.) in the last 12 months?

People | | | | | | | | | | |

4.13. How often do you buy food?

Every day	Once a week	Once a month	Other, specify……

4.14. Where do you buy food?

Tuck shop	Street vendor	Wholesalers	Supermarket	Other, specify…… ……

4.15 What type of transport do you use to get around?

Taxi	
Bus	
Train	
Own car	
Bicycle	
Motorbike	
Cart	
Other, specify	

4.16 How much money is spent on food PER MONTH? (Tick only one box)

$ 0.00 - $ 2.00	$ 2.01 - $ 3.00	$ 3.01 - $ 4.00	$ 4.01 - $ 5.00	$ 5.01 - $ 6.00	$ 6.01 - $ 7.00	$ 7.01 - $8.00	$8.01 - $10.00
$10.01 - $12.00	$12.01 - $14.00	$14.01 - $16.00	$16.01 - $18.00	$18.01 - $20.00	>$20.01		

5 EDUCATION AND LANGUAGE

5.1. What is your highest education level?

None	Primary School	Secondary School	High School	College	Other post school

5.2 What language is spoken mostly in the house?

Shona	Ndebele	English	Other, specify……

5.3 How many children (in the household) have birth certificates?

None	1	2	3	4	5	6	7	8	All

5.4 How many children have completed their immunisation schedule?

None	1	2	3	4	5	6	7	8	All

5.5 Has any child in your household died in the past?

Yes	No

Reason: …….

5.6 Number of children attending school.

None	1	2	3	4	5	6	7	8	All

5.7 How do the children get to school?

Walk	Bus	Taxi	Parent's car	Other, specify…….

Food practices in the household

Tick one block for every question:	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
5.8 Who is mainly responsible for food preparation in the house?										
5.9 Who decides on what type of food is bought for the household?										
5.10 Who is mainly responsible for feeding/serving the children?										
5.11 Who is the head of this household?										
5.12 Who decides how much is spent on food?										

5.13 How many meals do you eat per day?

0	1	2	3	> 3

5.14 Where do you eat most of your meals?

Home	Friends	Work	School	Other, specify……

5.15 Where do your children eat most of their meals?

Home	Friends	School	Other, specify……

6. ASSETS

6.1 Does your home have any of the following items and how many?

	Yes
Electrical stove	
Gas stove	
Primus or paraffin stove	
Microwave	
Hot plate	
Radio	
Television	
Refrigerator	
Freezer	
Telephone/ Cell phone	
Bed with mattress	
Mattress only	
Lounge suite	
Dining room suite	
Electrical iron	
Electrical, kettle	
Car	
Bicycle	
Motorbike	

6.2 What type of fuel do you usually use for food preparation?

Wood fire	Paraffin	Electricity	Gas	Coal/Charcoal	Other, specify……

6.3 What type/s of material are your pots made off (tick all relevant options)?

Cast iron	Aluminium	Stainless steel	Clay	Other, specify……

Thank you very much for your co-operation. We appreciate the time.

Annexure K

FOOD AND NUTRITION CONSUMER SCIENCES

Anthropometric measurements
Section A:

1. Number of the participant……

2. Community……..…

3. Date of birth	Year	Month	Day

4. Gender	Male	Female

❖

❖ **Section B:**

❖ 1. Body weight (kg)	❖ 1. Body weight (kg)	❖ 2. Height/Length (cm)	❖ 2. Height/Length (cm)
kg	kg	Cm	Cm

3. Mid upper arm circumference	3. Mid upper arm circumference
cm	cm

INFANT AND YOUNG CHILD FEEDING MODULE

INFORMATION PANEL

(This information is entered after identifying eligible children from the Household Roster)

NAME OF CHILD *(FROM COLUMN 2 OF HOUSEHOLD ROSTER)*: _____

SEX OF CHILD *(FROM COLUMN 3 OF HOUSEHOLD ROSTER)* (1=Male; 2=Female): |___|

LINE NUMBER OF CHILD *(CIRCLED IN COLUMN 6 OF HOUSEHOLD ROSTER)*: |___|___|

LINE NUMBER FOR CAREGIVER OF CHILD *(FROM COLUMN 7, FAR RIGHT COLUMN OF HOUSEHOLD ROSTER)*: |___|___|

NAME OF CAREGIVER *(FROM COLUMN 2 OF HOUSEHOLD ROSTER)*: _____

THIS MODULE IS TO BE ADMINISTERED TO THE CAREGIVER (USUALLY THE MOTHER) OF CHILDREN RECORDED IN THE HOUSEHOLD ROSTER AS LESS THAN THREE YEARS OF AGE.

A SEPARATE MODULE SHOULD BE COMPLETED FOR EACH ELIGIBLE CHILD.

VERIFY THAT YOU ARE SPEAKING WITH THE CORRECT RESPONDENT BY:

1. *CHECKING THAT THE RESPONDENT'S NAME IS THE SAME AS THE NAME OF CAREGIVER LISTED IN THE INFORMATION PANEL ABOVE.*
2. *CHECKING THAT THE RESPONDENT IS THE PRIMARY CAREGIVER (WHICH IS USUALLY THE MOTHER) OF **(NAME)**.*

IF THE PERSON YOU ARE SPEAKING WITH IS NOT THAT INDIVIDUAL, ASK TO SPEAK WITH THE CORRECT RESPONDENT.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1	I would like to ask you some questions about ***(NAME)***. In what month and year was ***(NAME)*** born? What is his/her birthday? *IF THE RESPONDENT DOES NOT KNOW THE EXACT BIRTHDATE ASK:* Does ***(NAME)*** have a health/vaccination card with the birthdate recorded? *IF THE HEALTH/VACCINATION CARD IS SHOWN AND THE RESPONDENT CONFIRMS THE INFORMATION IS CORRECT, RECORD THE DATE OF BIRTH AS DOCUMENTED ON THE CARD.*	DAY ..... |___|___| *IF DAY IS NOT KNOWN, ENTER '98'* MONTH ..... |___|___| YEAR ..... |___|___||___|___|	
2	How old was (***NAME***) at his/her last birthday? *RECORD AGE IN COMPLETED YEARS.*	LESS THAN 1 YEAR ..... 0 1 YEAR ..... 1 2 OR MORE YEARS 2	
3	How many months old is (***NAME***)? *RECORD AGE IN COMPLETED MONTHS.*	Age in completed months ..... |___|___|	
4	*CHECK QUESTIONS 1, 2 AND 3 TO VERIFY CONSISTENCY* *A) IS THE YEAR RECORDED IN Q1 CONSISTENT WITH AGE IN YEARS RECORDED IN Q2?* *B) ARE YEAR AND MONTH OF BIRTH RECORDED IN Q1 CONSISTENT WITH AGE IN MONTHS RECORDED IN Q3?* *IF THE ANSWER TO 4A OR 4B IS 'NO', RESOLVE ANY INCONSISTENCIES. IF THE BIRTHDATE WAS RECORDED ON A HEALTH CARD, THIS MAY BE USED AS THE CORRECT DATA SOURCE.*	YES ..... 1 NO ..... 2 YES ..... 1 NO 2	
5	*CHECK QUESTION 3. IS THE CHILD LESS THAN 24 MONTHS?*	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → END MODULE → END MODULE

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
6	Has ***(NAME)*** ever been breastfed?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 → GO TO 7a → GO TO 7a
7	Was ***(NAME)*** breastfed yesterday during the day or at night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ GO TO 8
7a[1]	Sometimes babies are fed breast milk in different ways, for example by spoon, cup or bottle. This can happen when the mother cannot always be with her baby. Sometimes babies are breastfed by another woman, or given breast milk from another woman by spoon, cup or bottle or some other way. This can happen if a mother cannot breastfeed her own baby. Did ***(NAME)*** consume breast milk in any of these ways yesterday during the day or at night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
8	Now I would like to ask you about some medicines and vitamins that are sometimes given to infants. Was ***(NAME)*** given any vitamin drops or other medicines as drops yesterday during the day or at night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
9	Was ***(NAME)*** given [*LOCAL NAME FOR ORS*] yesterday during the day or at night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

READ THE QUESTIONS BELOW. READ THE LIST OF LIQUIDS ONE BY ONE AND MARK YES OR NO, ACCORDINGLY. AFTER YOU HAVE COMPLETED THE LIST, CONTINUE BY ASKING QUESTION 11 (SEE FAR RIGHT HAND COLUMN) FOR THOSE ITEMS (10B, 10C, AND/OR 10F) WHERE THE RESPONDENT REPLIED 'YES'.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES				QUESTIONS AND CODING CATEGORIES
10	Next I would like to ask you about some liquids that ***(NAME)*** may have had yesterday during the day or at night. Did ***(NAME)*** have any ***(ITEM FROM LIST)***?: *READ THE LIST OF LIQUIDS STARTING WITH 'PLAIN WATER'.*		YES	NO	DK	11 How many times yesterday during the day or at night did ***(NAME)*** consume any ***(ITEM FROM LIST)***?: *READ QUESTION 11 FOR ITEMS B, C, AND F IF CHILD CONSUMED THE ITEM.* *RECORD '98' FOR DON'T KNOW.*
A	Plain water?	A	1	2	8	
B	Infant formula such as [**insert local examples**]?	B	1	2	8	B. TIMES |___|___|
C	Milk such as tinned, powdered, or fresh animal milk?	C	1	2	8	C. TIMES |___|___|
D	Juice or juice drinks?	D	1	2	8	
E	Clear broth?	E	1	2	8	
F	Yogurt?	F	1	2	8	F. TIMES |___|___|
G	Thin porridge?	G	1	2	8	
H	Any other liquids such as [**list other water-based liquids available in the local setting**]?	H	1	2	8	
I	Any other liquids?	I	1	2	8	

[1] Question 7a is shaded because it is an optional question. See Section C "Suggestions for adapting the questionnaire to the survey context".

12	Please describe everything that ***(NAME)*** ate yesterday during the day or night, whether at home or outside the home. a) Think about when ***(NAME)*** first woke up yesterday. Did ***(NAME)*** eat anything at that time? *IF YES*: Please tell me everything ***(NAME)*** ate at that time. *PROBE:* Anything else? *UNTIL RESPONDENT SAYS NOTHING ELSE. IF NO, CONTINUE TO QUESTION b).* b) What did ***(NAME)*** do after that? Did ***(NAME)*** eat anything at that time? *IF YES:* Please tell me everything ***(NAME)*** ate at that time. *PROBE:* Anything else? *UNTIL RESPONDENT SAYS NOTHING ELSE.* *REPEAT QUESTION b) ABOVE UNTIL RESPONDENT SAYS THE CHILD WENT TO SLEEP UNTIL THE NEXT DAY.* *IF RESPONDENT MENTIONS MIXED DISHES LIKE A PORRIDGE, SAUCE OR STEW, PROBE:* c) What ingredients were in that ***(MIXED DISH)***? *PROBE:* Anything else? *UNTIL RESPONDENT SAYS NOTHING ELSE.* *AS THE RESPONDENT RECALLS FOODS, UNDERLINE THE CORRESPONDING FOOD AND CIRCLE '1' IN THE COLUMN NEXT TO THE FOOD GROUP. IF THE FOOD IS NOT LISTED IN ANY OF THE FOOD GROUPS BELOW, WRITE THE FOOD IN THE BOX LABELED 'OTHER FOODS'. IF FOODS ARE USED IN SMALL AMOUNTS FOR SEASONING OR AS A CONDIMENT, INCLUDE THEM UNDER THE CONDIMENTS FOOD GROUP.* *ONCE THE RESPONDENT FINISHES RECALLING FOODS EATEN, READ EACH FOOD GROUP WHERE '1' WAS NOT CIRCLED, ASK THE FOLLOWING QUESTION AND CIRCLE '1' IF RESPONDENT SAYS YES, '2' IF NO AND '8' IF DON'T KNOW:* Yesterday during the day or night, did ***(NAME)*** drink/eat any ***(FOOD GROUP ITEMS)***?

	OTHER FOODS: *PLEASE WRITE DOWN OTHER FOODS IN THIS BOX THAT RESPONDENT MENTIONED BUT ARE NOT IN THE LIST BELOW:*

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES			
			YES	NO	DK
A	Porridge, bread, rice, noodles, or other foods made from grains	A	1	2	8
B	Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside	B	1	2	8
C	White potatoes, white yams, manioc, cassava, or any other foods made from roots	C	1	2	8
D	Any dark green leafy vegetables	D	1	2	8
E	Ripe mangoes, ripe papayas, or (**insert other local vitamin A-rich fruits**)	E	1	2	8
F	Any other fruits or vegetables	F	1	2	8
G	Liver, kidney, heart, or other organ meats	G	1	2	8
H	Any meat, such as beef, pork, lamb, goat, chicken, or duck	H	1	2	8
I	Eggs	I	1	2	8
J	Fresh or dried fish, shellfish, or seafood	J	1	2	8
K	Any foods made from beans, peas, lentils, nuts, or seeds	K	1	2	8
L	Cheese, yogurt, or other milk products	L	1	2	8
M	Any oil, fats, or butter, or foods made with any of these	M	1	2	8
N	Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits	N	1	2	8
O	Condiments for flavor, such as chilies, spices, herbs, or fish powder	O	1	2	8
P	Grubs, snails, or insects	P	1	2	8
Q	Foods made with red palm oil, red palm nut, or red palm nut pulp sauce	Q	1	2	8
Check categories A–Q		*IF ALL 'NO'*: → GO TO 13 *IF AT LEAST ONE 'YES' OR ALL 'DK'*: → GO TO 14			

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
13	Did ***(NAME)*** eat any solid, semi-solid, or soft foods yesterday during the day or at night? *IF 'YES' PROBE:* What kind of solid, semi-solid, or soft foods did ***(NAME)*** eat?	YES ..... 1 *GO BACK TO Q12 AND RECORD FOODS EATEN. THEN CONTINUE WITH Q14* NO ..... 2 DON'T KNOW 8	 → GO TO 15 → GO TO 15
14	How many times did ***(NAME)*** eat solid, semi-solid, or soft foods other than liquids yesterday during the day or at night?	NUMBER OF TIMES ..... |___|___| DON'T KNOW 98	
15	Did ***(NAME)*** drink anything from a bottle with a nipple yesterday during the day or night?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

KENYATTA UNIVERSITY
SCHOOL OF APPLIED HUMAN SCIENCES
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Date: 31st August, 2017

For attention: Professor C Napier

Durban University of Technology

Dear Sir/Madam,

REF: REFERENCE FOR CONSOLATA NOLEGA MUSITA

I am hereby granting Lynn Pfumvuti Permission to use the Nutrition Knowledge Questionnaire as a pre-requisite for her Master's degree in Food and Nutrition: Consumer Sciences.

Thank you

Yours faithfully

Dr. Peter M. Chege
Lecturer - Department of Food, Nutrition and Dietetics - Kenyatta University
P.O Box 43844-00100 - Nairobi, Kenya
Tel: +254 722 642 356
Email:chegepeterm@gmail.com

Nutrition knowledge of the caregiver with an infant

1. Have you received any training on nutrition? _____ 1. Yes 2. No

2. If yes, where did you receive the training, which lessons/topics where you trained on and what was the duration of training?

Place of training	Lessons/topics	Duration of training

3. Do you know the duration of exclusive breastfeeding? _____ 1. Yes 2. No.
4. If yes, what is it?_____
5. Do you know the duration of continued breast feeding? _____ 1. Yes 2. No.
6. If yes, what is it? _____
7. Why is exclusive breast feeding recommended for infants? _____?
8. Why is exclusive breast feeding not recommended past 6 months? _____?
9. What are the advantages of breast milk? _____?
10. What are the disadvantages of early complementary feeding? _____

DUT DURBAN UNIVERSITY OF TECHNOLOGY

FOOD AND NUTRITION CONSUMER SCIENCES

COPING STRATEGIES FOR WARD 14 COMMUNITY

Subject number: _____ Date: _____

Interviewer: _____

In the past 30 days, if there have been times when you did not have enough food or money to buy food, how often has your household had to:	All the time? Every day	Pretty often? 3-6 */week	Once in a while? 1-2 */week	Hardly at all? <1* /Week	Never	Raw score	Severity weight	Score = Relative Frequency x weight
Relative frequency score	**7**	**4.5**	**1.5**	**0.5**	**0**			
a. Ask for food from neighbours?								
b. Rely on less expensive and preferred food?								
c. Gather wild food?								
e. Send household members to beg?								
f. Limit portion sizes?								
g. Reduce the number of meals eaten in a day?								
h. Skip entire days without eating?								
i. Restrict consumption by adults in order for small children to eat?								
j. Sell some belongings in order to get money to buy food?								
k. Steal vegetables from other peoples' vegetable gardens to eat?								
l. Go to the local soup kitchen for a meal?								
m. Ask for food from welfare or church organisations?								
n. Do small pieces of work for food/money?								
o. Contribute to food stokvel in order to ensure food over a scarce period?								
p. Eat food that you did not prefer because of lack of money.								
q. Relied on seed stock								
r. Reduced your own consumption for the sake of the children.								
TOTAL HOUSEHOLD SCORE								

Severity weight: 1=least severe; 4=most severe

To Whom It May Concern

Re: Editing of Master's Dissertation entitled:

Relationship between Infant Feeding Practices and Caregivers' Nutrition Knowledge on the Nutritional Status of Infants Aged between 6 to 12 Months in a Rural Community in Zimbabwe

By: Ms Lynn Pfumvuti

Submitted in fulfilment of the requirements of the Master of Applied Science in Food and Nutrition in the Department of Food and Nutrition: Consumer Sciences, Faculty of Applied Sciences at the Durban University of Technology

I have recently edited this document in terms of language usage and grammatical correctness. I also queried several issues to do with the content of the work and they were corrected and/or resolved by the author.

For the record I am an experienced editor and proofreader and have edited several dissertations.

My academic qualifications are as follows:

Bachelor of Arts (English and Afrikaans) (UN Durban)

University Education Diploma (UED) (UN Durban)

Diploma in Translation (Afrikaans/English) (Unisa)

Michael Vermeer
Editor Proofreader Translator

30 August 2021