THESIS ABSTRACT

Master of Public Health

Adventist University for Africa

School of Postgraduate Studies

Title: A CASE-CONTROL STUDY OF CAREGIVER'S FEEDING KNOWLEDGE AND PRACTICES, IN RELATION TO ETIOLOGY OF DIARRHEA AMONG CHILDREN AGED 0-23 MONTHS IN GOKWE NORTH DISTRICT, ZIMBABWE

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Diarrhea prevalence among children under-five in Gokwe North district was estimated at 16.5% in 2018, surpassing the national average of 10% in the same period. The World Health Organization confirms that 54% of deaths due to diarrhea and other causes in under-fives have malnutrition as an underlying factor. The current study sought to investigate the possible relationship between the high diarrhea burden and Nutrition by examining the knowledge and practices of primary caregivers in the feeding of infants. The research followed a matched case-control study design.

A Case was defined as the mother of a child who had had one or more episodes of diarrhea two weeks before the interview date. The selection of seven clinic catchment areas, 149 cases, and 149 controls was done through multi-stage sampling. Chi-Square tests for association and a binomial logistic regression model were conducted using SPSS version 16. Controls tended to be more knowledgeable

than cases on the recommended IYCF practices. In the 0 to 5-month age group, practices that were significantly associated with diarrhea were mixed feeding (p=0.001), exclusively breastfeeding (p=0.000), and IYCF knowledge (p=0.001). For the 6 to 23 months age group significant associations were noted with the number of handwashing times (p=0.035), access to improved pit latrine (p=0.022), source of water for household use (p=0.007), type of container used (p=0.040), Mid Upper Arm Circumference (p=0.000) and IYCF Knowledge (p=0.001).

Significant predictors of diarrhea in children of 0-5 months of age were IYCF knowledge [AOR 1.15, (CI 1.06; 1.24) P = 0.001], water source [AOR 20.9, (CI 1.77; 28.4) P = 0.016]. as well as the use of a nipple bottle [AOR 0.057, (CI 0.01, 0.48) P = 0.009]. For the 6 to 23-month age group significant predictors were IYCF Knowledge [AOR 1.034, (CI 1.01; 1.06) P = 0.001] and meal frequency [AOR 0.254, (CI 0.09; 0.71) P = 0.010]. Both IYCF and WASH practices were found to be having an association with diarrhea incidence in under-five children, particularly the 0-23-month age group. IYCF practices mostly affected the 0-5 months age range whereas as the child grows further into the 6-23 months range WASH-related factors have the greater influence in determining diarrhea.

Adventist University of Africa

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A thesis

presented in partial fulfillment

for the requirements of the degree

Master of Public Health

by

Chiketa Takudzwanashe Moses

March 2023

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To God Be the Glory

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LIST OF ABBREVIATIONS

AUA	Adventist University of Africa
DMO	District Medical Officer
EBF	Exclusive Breastfeeding
FAO	Food and Agriculture Organization
GAPPD	Global Action Plan for Pneumonia and Diarrhea
GAVI	Global Alliance for Vaccines and Immunization
GIT	Gastro-Intestinal Tract
IMNCI	Integrated Management of Newborn and Childhood Illness
IYCF	Infant and Young Child Feeding
KAP	Knowledge, Attitudes, and Practices
MDG	Millennium Development Goals
MOHCC	Ministry of Health and Child Care
MUAC	Mid-Upper Arm Circumference
NNS	National Nutrition Survey
SD	Standard Deviation
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Scientists
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for international Development
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

ZDHS	Zimbabwe Demographic and Health Surveys
ZIMSTAT	Zimbabwe Statistics Agency

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CHAPTER 1

INTRODUCTION

Background to the Study

Child mortality and morbidity due to diarrhea remain high globally as noted by Carvajal-Vélez et al. (2016) and this is mostly in under developed regions such as Sub-Saharan Africa (UNICEF, 2012). Diarrhea is the number two cause of child morbidity and mortality followed by measles, malaria, and neonatal causes – Pneumonia being the leading cause. Malnutrition (mostly under-nutrition) is noted to be associated with 54% of these deaths from different causes (WHO, 2016).

The United Nations Children's Fund (UNICEF, 2019a) estimates that in 2017 alone deaths due to diarrhea in under-fives stood at 480000. It also notes that these deaths are mostly among children 2 years of age and below in South Asia and sub-Saharan Africa. The Global Plan of Action for Diarrhea and Pneumonia (GAPPD) confirms that these deaths are largely preventable (UNICEF and WHO, 2013) as the management does not require expensive technologies. It is against this background that the world countries have put ending deaths among children five years of age and below from preventable causes such as diarrhea on the agenda for Sustainable Development Goal number 3 (WHO, 2016).

As already highlighted, the burden of childhood diarrhea is high among sub-Saharan countries to which Zimbabwe also belongs. The mortality rate for under-fives in Zimbabwe stood at 86 deaths per 1000 live births (Zimbabwe National Statistics Agency & UNICEF, 2019) with over 65% of these deaths occurring before the child

reaches one year. This places Zimbabwe in the top 50 of world countries with an un-acceptably high early childhood mortality. According to the Zimbabwe Nutrition Survey of 2018, the national prevalence of diarrhea stood at 10%. There remain gaps in data on morbidity and mortality, however, since the major documents on such data are now old that is the Demographic and Health Survey, the Child Survival Strategy, and the Multiple Indicator Cluster Survey all dating to 2015. Of note is the fact that Malnutrition has been identified as an underlying influence on all the leading causes of under-five mortality including pneumonia, HIV, Diarrhea, Malaria, and Measles.

Data from the Zimbabwe National Statistics Agency (2016)- depicted in Figure 1 below shows diarrhea prevalence increased by age from 10% among children under 6 months reaching a peak at 31% among 6-11-month-olds and remaining high at 30% among 12-23 months old thereafter dropping sharply to as low as 7% among 48-59 months.

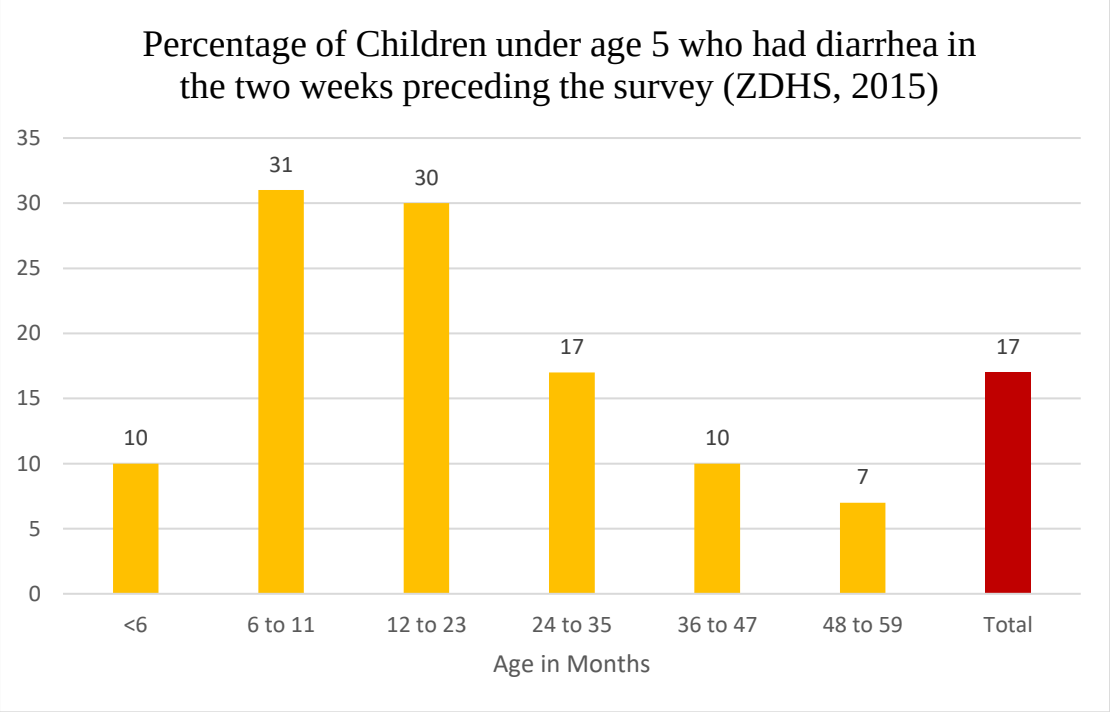

Figure 1. Prevalence of Diarrhea by Age

This poses questions on the possible reasons for a high prevalence between ages 6-23 months. The age group 0-23 months presents a special focus of nutritional assessment as it provides a window of opportunity where proper nutrition can predict better chances of development in life and the reverse is true (USAID, 2017).

It has been demonstrated previously both at global and national levels that morbidity and mortality due to diarrhea among under-fives is largely preventable using simple interventions (Ministry of Health and Child Welfare, 2010; UN, 2015; UNICEF and WHO, 2013). That diarrhea could be related to feeding practices has also been implied by findings where the prevalence of diarrhea varies with child age.

The researcher undertook to conduct a case-control study which was individually matched in Gokwe North District to investigate these child nutritional influences on diarrhea. It is hypothesized that the practices recording he feeding of children of mothers and caregivers are associated with an increase in the risk of developing diarrhea in children 0-23 months old.

Statement of the Problem

There is demonstrated global commitment towards the end of preventable child mortality and morbidity including that from diarrhea, as evidenced by the international cooperation towards SDG 3. However, mortality and morbidity from diarrhea in Zimbabwe remain high at 9% among under-fives despite local and international efforts and this is also the case in Gokwe North district where diarrhea prevalence stood at 16.5% according to UNICEF (2019b). It has been observed by the Ministry of Health and Child Welfare (2010), that 54% of the deaths from the leading causes of child mortality including diarrhea are related to malnutrition. The current study, therefore, sought to investigate these nutritional influences by examining the

practices as well as knowledge of primary caregivers in the feeding of children aged 0-23 months.

Research Questions

1. Are caregivers of children aged 0-23 months knowledgeable on the recommended child feeding practices specific to the child's age?
2. Are caregivers in the Gokwe North district implementing the recommended practices in feeding children between 0-23 months of age?
3. To what extent do child feeding practices affect diarrhea incidence in Gokwe North?
4. To what extent does caregiver access to improved WASH facilities affect Diarrhea incidence in Gokwe North?
5. Is there a relationship between diarrhea and the following demographic variables?
    a. Caregiver's age
    b. Child's age

Hypotheses

1. Child feeding practices do not affect diarrhea incidence in children aged 0-23 months living in Gokwe North
2. Caregiver access to improved WASH does not affect diarrhea incidence in children aged 0-23 months living in Gokwe North

Conceptual Framework

Caregiver knowledge was predicted to be the leading influence on nutrition-related practices in the feeding of the child. The framework predicts that the Caregiver's feeding practices determine whether or not the child experiences an episode of diarrhea. Socio-economic factors such as ownership of improved WASH infrastructure and Food security are in part influenced by the level of knowledge of the caregiver depending on their level of influence in the household. Socio-demographic factors in turn influence the nutrition practices of the caregiver according to the hypothesis. In this study, matching residence for cases and controls

would mitigate against the potential differences observed due to environmental factors such as WASH infrastructure as these are mostly communally shared, however, food security status of households remains a potential confounder.

The following schematic diagram illustrates the conceptual framework by clarifying the dependent variable and the specific independent variables under study.

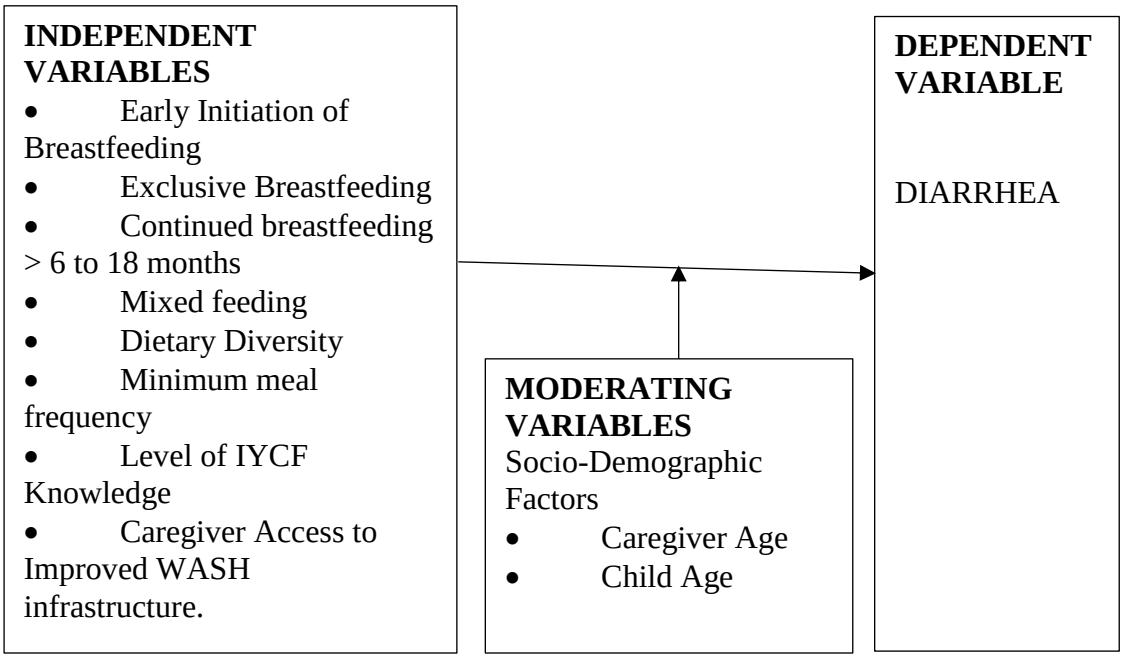

Figure 2. Conceptual Framework Showing the Variables of Interest in the Study

Significance of the Study

The study is of importance to the Ministry of Health in Gokwe North as it helps to clarify the level of adherence to recommended practices and lifesaving interventions for children. This may also be used as a starting point for the development of health promotion and nutrition education interventions for the district population. It, therefore, serves as a baseline upon which future research can be referenced after appropriate interventions are deployed.

Currently, scientific evidence is conflicting on the relationship between Nutrition and WASH due to emerging research, the current study will help add to the body of scientific knowledge on the subject and thus pave the way for improved guidance on Nutrition and WASH integrated programming in Gokwe North.

The study is situated in a time where global efforts towards ending preventable child deaths are being intensified through the SDGs, the knowledge generated is a key addition towards improving approaches aimed at reducing these deaths particularly due to diarrhea. The resource-constrained local economy requires that high-impact and targeted interventions are employed to maximize impact with limited resources. This research was thus appropriate to generate evidence for better intervention targeting optimum resource utilization.

Scope and Limitations

The study focused primarily on diarrhea in children 0-23 months of age. To examine the practices and knowledge related to child feeding by primary caregivers the study used key indicators outlined by the WHO (2008). These include Breastfeeding Initiation, Exclusive Breastfeeding (EBF), frequency of meals, Dietary diversity, and use of Complementary foods. The study population comprised all primary caregivers of children under the age of two in Gokwe North District.

According to Diouf, Tabatabai, Rudolph, and Marx (2014), diarrhea incidence varies greatly with the different seasons of the year. A limitation of the study, therefore, lies in its inability to be implemented over the space of an entire year to account for seasonal variations in incidence. The study was conducted within a four-month timeframe starting from March to June which covers the end of the rain season and the greater part of winter.

Another limitation is that the study was based on the caregiver's recall for most of the data as very few direct observations could be done. This has the potential for the introduction of recall bias. To mitigate against such bias, the recall period for dietary intake was reduced to 24 hours and diarrhea episodes focused on events having occurred within two weeks before the study date.

Operational Definitions

BOTTLE FEEDING: the practice of giving children aged 0-23 months semisolid or liquid foods using a bottle with teat or nipple, this includes expressed breastmilk.

CONTINUED BREASTFEEDING AT 18 MONTHS: Children 7- 18 months of age who were fed breastmilk on the previous day to the interview.

EPISODE OF DIARRHEA: The passage of three loose watery stools or more within 24 hours, this can include dehydration.

EXCLUSIVE BREASTFEEDING: feeding an infant using direct or expressed breast milk only for the first 6 months of age. In this study, infants below six months who are being fed on breast milk only are termed as being exclusively breastfed.

IMPROVED WASH: improved sanitation facilities are those most likely to provide private and hygienic use such as pit latrines or Blair latrines. Improved drinking water facilities are those most likely to provide safe water such as boreholes, rain harvesting, and protected wells. (WHO)

MINIMUM DIETARY DIVERSITY: is when the child aged 6-23 months ate foods and drank beverages from not less than five out of eight WHO-defined food groups within the previous 24 hours.

MINIMUM MEAL FREQUENCY: The recommended times a child 6-23 months consume solid or semisolid foods over 24 hours. These factors age and whether or not the child is still being breastfed.

MIXED FEEDING: feeding a child using formula and/or animal milk while at the same time continuing to breastfeed the infant less than six months of age. However, feeding with expressed breast milk, breastfeeding by another nursing mother, and feeding using donor human milk are not considered mixed feeding.

NUTRITIONAL STATUS: The state of the body as influenced by the intake and utilization of food nutrients.

PERSISTENT DIARRHEA: a diarrhea episode that extends up to 14 days

PRIMARY CAREGIVER: An adult who has the greatest responsibility for the daily care and rearing of a child. When dealing with children 0-23 months the primary caregiver is usually the biological mother. Other caregivers were only interviewed if the biological mother did not stay in that household or is deceased.

CHAPTER 2

LITERATURE REVIEW

A literature search was conducted to inform the study on the current scientific understanding of the relationship between IYCF practices, WASH, and Diarrhea in childhood. The review of the literature was also extended to assessing the accepted approaches to studying the subject to refine the current study's approach. Documents consulted by the researcher consisted mainly of peer-reviewed journals that are published online; policy and strategy documents of the Ministry of Health and partners as well as academic texts used in the training of nutrition and health practitioners.

A systematic approach was used to guide the search for literature where studies were retrieved based on the independent and moderating variables in the conceptual framework presented earlier. Information was collated and synthesized from various documents on how the body of scientific knowledge perceives the possible relationship of each independent and moderating variable to the dependent variable of childhood diarrhea.

Theoretical Approaches to the Study

As highlighted in the conceptual framework above, the current study was constructed around the constructs of the social cognitive/learning theory. This is because of the theory's strengths which, according to Sharma (2016) include its comprehensiveness in assessing the role of knowledge and environmental factors in the prediction of behavior. While several constructs exist in the social cognitive

theory, this study was built mainly on three. As articulated by Sharma (2016) the first construct of the theoretical approach is Knowledge, which entails having information and facts regarding a topic. It recognizes that knowledge is a necessary, though not sufficient, determinant of practice and predictor of change. The knowledge levels in both case and control caregivers were assessed and compared in the study.

To assess the effectiveness of SCT in guiding research and behavior change, a Cluster randomized controlled trial was implemented in Iran by Shamizadeh, Jahangiry, Sarbakhsh, and Ponnet (2019). The trial focused more on the knowledge construct and assessed fasting blood glucose levels in treatment and non-treatment groups of prediabetes, where the treatment group had been exposed to 16 weeks of 90-minute weekly health education sessions on lifestyle and diet management. The results of the trial indicated that an SCT-based physical exercise intervention was effective in reducing the risk of diabetes among rural prediabetes (Shamizadeh et al., 2019). thus cementing the importance of knowledge as an important cause for behavior change.

Another important construct of the approach is outcome expectations. Fasbender (2020) defines outcome expectancies as the anticipated consequences of the behavior that a person intends to undertake. In his perspective, it is therefore believed that practices are shaped by an individual's perception of the potential positive results to be accrued from engaging in the practice. This construct tends to measure individual motivation for specific practices. The current study sought to ascertain such motivation concerning important child-feeding practices notably exclusive breastfeeding and the use of recommended complementary feeding.

Carillo (2010) further stresses the unique advantage of the Social Cognitive Theory over other theoretical approaches by positing that, the SCT emphasizes the

bidirectional nature of causation where behavior, cognitive and emotional factors, and the environment constantly and mutually influence each other. An individual's self-efficacy towards practicing a certain behavior is influenced by prior successful experiences and performance, self-efficacy is therefore seen as an effect while behavior acts as a cause. In this regard, behavior plays the role of a predictor exerting an influence or motivation on either cognitive or emotional factors and even the environment.

The third important construct is the environment. According to Sharma (2016), in this construct the theory recognizes, in agreement with most socio-ecological models that behavior or practice does not occur in a vacuum but there is a physical and social context that shapes it. This was the focus of assessments on WASH-related practices to ascertain how the environmental context shapes WASH practices and determine if they have a bearing on the etiology of diarrhea.

Early Breastfeeding Initiation

Early breastfeeding initiation refers to the practice of introducing the new born to breast milk within one hour after birth (WHO, 2008). This practice is recommended whether or not the mother has started producing milk, the infant has to be introduced to the breast and begin sucking.

Gizaw, Woldu, and Bitew (2017) after conducting a study on IYCF practices in Ethiopia came up with a recommendation that if diarrhea is to be prevented in children under two years of age mothers should be encouraged to initiate early breastfeeding and go on to practice exclusive breastfeeding. This stems from their finding that diarrhea had an association with late initiation of breastfeeding for children under 6 months of age (AOR = 9.13). Though the risk was lesser in the 6-24months age group still the delay to initiate breastfeeding remained a significant

predictor of diarrhea [AOR 2.87, 95% CI, 1.49, 5.51]. In this cross-sectional study, 60.6% of the infants had been initiated early.

Similar sentiments are echoed by Ogbo et al. (2017) who in a multicounty study involving 9 sub-Saharan African countries found early initiation to be associated with lowered risk of developing diarrhea [OR = 0.81, CI; 0.77–0.85, P<0.001]. Both studies defined early initiation as being started on breastmilk within the first hour of being born as guided by UNICEF and WHO (2013). This same definition is also used in the current study in Gokwe North.

The current definition of early initiation of breastmilk being an introduction to breastmilk within the first hour of life is also utilized by Ahmed, Page, Arora, and Ogbo (2020). In their analysis which made use of data from the Ethiopian demographic and health surveys over several years, Ahmed et al. (2020) found that Infants and young children aged 0–23 months who had been introduced to breast milk within the first hour after birth had significantly fewer chances of experiencing diarrhea compared to those who were not breastfed within the first hour of birth (OR: 0.88; 95% CI: 0.79, 0.94).

Possible explanations for the protective effects of early initiation are also suggested in that study. The mechanism of protection was premised on the infant having accessed colostrum which has been demonstrated to have high immune boosting functions and is present in breast milk over the first three days of life.

Exclusive Breastfeeding

Conclusive research on the relationship between diarrhea and child feeding has revolved mostly around breastfeeding. The practice of exclusive breastfeeding refers to feeding a child who is below the age of six months solely on the mother's milk (WHO and UNICEF, 2021). As observed by Mulatu, Yimer, Alemnew, Linger,

and Liben (2021), it is the World Health Organization (WHO) recommendation that at least 95% of children aged 1 month and below and 90% of those below the age of 6 months should be exclusively breastfed, for continued breastfeeding at least 90% of those aged 6–23 months should be partly breastfed. The continued emphasis on near-universal coverage of exclusive breastfeeding by the WHO is guided by several studies which have established a solid case for its effectiveness in averting child illnesses.

Victora et al. (2016) have concluded based on several models that the scaling up of breastfeeding including exclusive breastfeeding in the first six months of life to a near universal level could prevent an estimated 823 000 deaths annually in children younger than 5 years from the different infectious causes. This was concluded to be the case regardless of the income setting of the household. In addition, about half of all episodes of diarrhea and at least a third of respiratory infections would be avoided by practicing breastfeeding. Breastfeeding could also prevent 72% of hospitalizations from diarrhea (Victora et al., 2016). What this means in essence is that the diarrhea episodes experienced by infants who are breastfed would not be as severe enough or of long duration enough to warrant hospitalization.

Unfortunately, these gains are still far from being realized due to the very low uptake of exclusive breastfeeding, as Victora et al. (2016) further observed, the rate of exclusive breastfeeding among nursing mothers in low to middle-income settings was at 37% against the 90% target. UNICEF (2019b) estimated the prevalence of exclusive breastfeeding for infants less than 6 months to be at 57.1% in Gokwe North district which is the focus of the current study. This modest performance though is still below the WHO target of 90%.

F. A. Ogbo, Nguyen, Naz, Agho, and Page (2018) based on the Demographic Survey from Tanzania, found that diarrhea prevalence was lower among breastfed infants 0-5 months and among those who continued with exclusive breastfeeding at 8 months when compared to those on complementary feeding [AOR 0.31, CI: 0.16–0.59, $P < 0.001$]. This could stem from the fact that breast milk not only provides protective factors to the infant but also promotes the development of the child's immune system and confers appropriate inflammatory responses (Robinson and Fall, 2012). In West Bengal diarrhea prevalence was noted to be at 20.33% among children exclusively breastfed and rose to 31.57% where exclusive breastfeeding was practiced for less than 6 months (Gupta, Sarker, Rout, Mondal, and Pal, 2015). In the same study, the highest prevalence of diarrhea was in the ages of 6-11 months which the researchers attributed to the introduction of contaminated weaning foods.

The critical role that exclusive breastfeeding plays in determining diarrhea outcomes when compared to all the other feeding practices is attested to by Shati et al. (2020). In a study where they assessed several IYCF practices, only exclusive breastfeeding emerged as a factor associated with diarrhea (OR=0.447).

A strong protective effect of exclusive breastfeeding was demonstrated by Victora et al. (2016) where after pooling the results of three studies in low-income settings they observed that exclusively breastfed children had only a 12% risk of death when compared with children who were not breastfed. Whereas these findings had been demonstrated for low to middle-income contexts, the researchers went a step further and pooled the results of 4 randomized controlled trials from high-income settings. The results indicated that breastfeeding was still effective at reducing child mortality as there was a 58% reduction in the chances of developing necrotizing

enterocolitis in infants which is a disorder characterized by inflammation of the bowels and usually has very high case fatality (Victora et al., 2016).

The discussion on the efficacy of exclusive breastfeeding would not be complete without alluding to the finding that exclusive breastfeeding within the first six months of life confers protective effects which go beyond the first year of life. In the Gizaw et al. (2017) study, for instance, it was observed that the odds of developing diarrhea were high in children 6–24 months of age who had not been exclusively breastfed in their first six months (AOR 19.24, 95% CI, 8.26, 44.82).

The WHO (2012), Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition, sets six strategic action areas for lowering mortality and morbidity associated with nutrition. One of these six objectives is to work towards increasing the rates of exclusive breastfeeding during the first 6 months of life to at least 50% by the year 2025 (Zong, Wu, Zhao, Magnussen, and Xi, 2021, as cited by Hossain and Mihrshahi, 2022). This signifies the urgent need that needs to be placed on addressing this issue.

Mixed Feeding

While the World Health Organization's guidance on infant and young child feeding champions the need for exclusive breastfeeding as discussed above, it discourages the practice of mixed feeding as it has the potential for reducing the child’s access to breastmilk. UNICEF (2018) defines mixed feeding as including both breast milk and any other solid or semi-solid food or liquid including water, animal milk, and formula foods before the child reaches 6 months of age. This practice of mixed feeding is contradictory to exclusive breastfeeding and can be understood as being the opposite of exclusive breastfeeding in the current study. That means by

definition and in practice an infant who is below the age of six months who is not being exclusively breastfed is essentially mixed-fed.

The practice of mixed feeding increases the infant's risk of infections through one of several mechanisms. To begin with, feeding the child other foods in addition to breast milk reduces the child's capacity to consume breastmilk which is the recommended complete food for infants under 6 months. With reduced access to breastmilk, the child fails to take advantage of the protective factors in breast milk as discussed above. These include the fact that breast milk provides all the nutrients including micronutrients needed to support immune responses (Tam, Keats, Rind, Das, and Bhutta, 2020) and that breast milk provides immunological factors that aid the child's natural defenses in fighting off infections including diarrhea (F. A. Ogbo et al., 2017; Robinson and Fall, 2012).

Secondly, mixed feeding increases the infant's risk of infections since it entails the introduction of other foods which are liable to contamination in their preparation. As noted by Islam et al. (2013), the risk of contamination of food was high at the time the child transitioned from breastmilk to other foods. This exposes the infant to infections including diarrhea.

Continued Breastfeeding

The current guidance on breastfeeding for infants as outlined by WHO and UNICEF (2021) is that nursing mothers should exclusively breastfeed an infant for the first six months of life. That means the child will be surviving solely on the mother's milk without the addition of any other foods including water. However, once the child reaches 6 months of age they are then introduced to other solid as well as semi-solid foods that the rest of the family members in the household in which they are living is eating. This introduction of other solid and semi-solid foods does not

mean that the child is weaned from breast milk. The breastfeeding guidelines indicate that the child is to continue on the mother's milk despite them now taking other foods.

The continuation of breastfeeding for infants who have grown beyond six months of age is a critical recommended infant and young child feeding practice for which mothers are encouraged to continue until the child reaches twenty-four months of age or even beyond (UNICEF, 2018; WHO and UNICEF, 2021). To assess the adherence of mothers to this recommended practice, the World Health Organization uses two indicators. The first one measures the proportion of children who are aged 12 -15 months who receive breastmilk as part of their diet while the second one measures the proportion of children 20-23 months of age who are still being given breast milk as part of their diet. The latter is the preferred one as it measures children who are approximating the recommended 2-year age mark. The current study also assessed the practice among caregivers in Gokwe North district using the latter variant of the indicator which measures adherence at 20-23 months of child's age.

Researchers such as Doma et al. (2021) have studied the determinants of continued breastfeeding at 24 months in low-income contexts and found that among other causes of non-adherence to the practice, the sex of the child was a significant contributor. They observed that women who were nursing baby girls were less likely to breastfeed for up to 24 months compared to those breastfeeding a male infant (AOR 0.44). their findings however do not attempt to explain the reasons for such differences in practice based on the sex of the child. The current research also did not investigate further the possibility of such a practice being prevalent in the study population of Gokwe North, the focus being rather to assess the potential protective effect of continued breastfeeding on infants where the practice was conducted.

While several studies concur that breastfeeding has a protective effect against morbidity and mortality due to any cause in infants (Gizaw et al., 2017; F. A. Ogbo et al., 2018; Shati et al., 2020). Lamberti, Walker, Noiman, Victora, and Black (2011) go a step further and zero in their attention on diarrhea mobility and mortality being averted by breastfeeding in its variations including breastfeeding at 2 years. In their submission, Lamberti et al. (2011) observed that infants who had not been breastfed had an excess risk of diarrhea mortality when they were compared to their counterparts who had been fed breastmilk among children aged 6-23 months (RR: 2.18). Thus, providing further evidence of the protective effect of any exposure to breastmilk. These conclusions were drawn after a meta-analysis of eighteen studies on infant and young child feeding practices.

When comparisons are drawn between exclusive breastfeeding and continued breastfeeding in addition to complementary feeds the mechanisms through which these interventions protect the infant are observed to be different though complementary. Robinson and Fall (2012) posit that breast milk is protective for infants exclusively breastfed because among other reasons it eliminates the chances of the child consuming contaminated food since they are getting their feeding direct from the mother without any handling. This would not be applicable in the case of continued breastfeeding since the child will have been already introduced to complementary feeds. The efficacy of breastfeeding in protecting the infant would therefore stem from the observation that according to Lamberti et al. (2011), breast milk contains important natural immunity mechanisms that are passed to the infant thus aiding the child's immune defenses in fighting off infection.

It is also important to highlight in the discussion of evidence on the importance of continued breastfeeding that it is not all the studies that concur on

continued breastfeeding as a protective factor. One such study that seems to contradict conventional evidence is by Ahmed et al. (2020) where according to their submission children 20–23 months of age whose mothers had continued breastfeeding at two years had higher odds of experiencing diarrhea compared to those whose mothers had weaned them off breastmilk before the age of 20 months (OR: 1.57; 95% CI: 1.12, 2.21). The authors did not think of this observation as an anomaly as they went on to highlight several studies where such similar findings had been done.

They however attempted to explain such a finding by suggesting that the increase in diarrhea among infants at 2 years could be due to the concurrent feeding of potentially contaminated complementary foods with breastmilk to children the infants might be a possible reason for the observed association between diarrhea and continued breastfeeding at two years of age (Ahmed et al., 2020). In such instances, it would therefore be ideal to ensure access to improved water sanitation and hygiene facilities by communities to reduce the potential for contamination of complementary foods.

A study whose findings concur with those of Ahmed et al. (2020) is the one conducted by F. A. Ogbo et al. (2017) where the analysis showed that children who continued breastfeeding for one year whilst living in households with unimproved sanitation were more likely to experience diarrhea compared to their counterparts. This analysis demonstrates the modifying effect of sanitation (type of toilet) on the association between infant feeding practices and diarrhea concluding that the impact - in terms of effect sizes - of early initiation of breastfeeding and exclusive breastfeeding on diarrhea prevention were stronger in infants whose households had improved sanitation.

Dietary Diversity

WHO and UNICEF (2021) recommend a seven-food-group dietary diversity score where children in the 6-23 months age group are expected to have eaten no less than 4 of the 7 food groups within the previous day before assessment. Each food group is given a score of one (1) and depending on the reported amount of food groups eaten the child gets a score of from 0 to 7. The importance of dietary diversity has largely been studied concerning its impact on nutrition outcomes and not necessarily on diarrhea and other infections. However, suggestions are posited on its potential for mitigating infections through ensuring optimal nutrition and a healthy immune function.

For instance, Khamis, Mwanri, Ntwenya, and Kreppel (2019) highlighted that there was a significant reduction in stunting, wasting, and underweight in infants who consumed a diverse diet. The proportionate reduction was noticed with every unit increase in the number of food groups that the child had eaten. Higher dietary diversity scores (four to seven) were found to be associated with higher Height for Age z scores (Sié et al., 2018) which means higher dietary diversity was effective in reducing chronic malnutrition. If these measures of nutrition status are in any way associated with diarrhea incidence, then it follows that a relationship would exist between diarrhea incidence and dietary diversity.

Low dietary diversity scores were in a study by Kamenju and Fawzi (2017) found to have an association with a higher risk of developing diarrhea with blood (Dysentery) among HIV-exposed infants. The researcher could not access other studies that made this express analysis for further comparisons. It is therefore assumed that the existence of a relationship between dietary diversity and diarrhea

incidence that is asserted by Kamenju et al. (2017) is a result of the observation that dietary diversity is a notable determinant of nutrition status as discussed earlier.

Nutritional Status: Micronutrients

Brown (2003) summarises the three leading schools of thought on the possible pathways by which nutrition is related to the incidence of diarrhea in under-fives. According to his submission, micronutrient status, child feeding practices, and anthropometric factors pose an increased risk of diarrhea.

Two key micronutrients stand out in studies of childhood infections particularly diarrhea, these are Zinc and Vitamin A. Tam et al. (2020) after systematically reviewing studies in low to Middle-income settings found that Vitamin A supplements were an effective strategy for reducing mortality of all causes in children whereas Zinc supplementation specifically decreased the incidence of diarrhea. The difference views seen converge on the notion that micronutrients play an important role in determining both the severity and occurrence of diarrhea in children below the age of two years

Nutritional Status: Anthropometric Factors

Research on anthropometric factors however remains inconclusive as available evidence is mostly from descriptive cross-sectional studies which cannot ascertain causality between for example low height for age and diarrhea episodes as these two are already present at the time of analysis.

Associations between anthropometric measures and diarrhea have been demonstrated in some research. For example, according to a study by Netsereab (2017), severely underweight children had 1.59 times more chances to have diarrhea than their counterparts with normal weight for height.

A vicious cycle of under nutrition is in some cases perpetuated because according to the conceptual framework for malnutrition by UNICEF disease affects dietary intake and absorption of nutrients thus perpetuating malnutrition. As a general rule, the impact of diarrhea on a child's nutrition status is directly proportional to the number of days in a year that a child spends experiencing episodes of diarrhea (WHO, 2020). In undernourished children, acute and persistent diarrhea episodes tend to be more severe; they last longer and are more frequent. In addition, the risk of fatality from diarrhea including dysentery is increased significantly in undernourished children with the severity of effects being proportional to the severity of under nutrition (WHO, 2020).

Demographic Characteristics of Children and Caregivers

In some studies, the propensity to breastfeed was also observed to be higher among mothers with higher levels of education. For example, in Robinson and Fall's 2012 study; 91% of mothers who had completed secondary education tended to initiate breastfeeding compared to 63% among those who had left school at age 16 years and younger. While evidence points to the fact that diarrheal disease incidence varies with a child's age (Diouf et al., 2014), there have been no statistically significant differences in incidence between male and female under-fives according to Mwambete and Joseph (2010). Other characteristics which have shown significant association with under-five diarrheal incidence in the work of Diouf et al. (2014) are low birth weight, father's education, parents being married, low household income, and increased household size.

Related findings were also presented by Escobar et al. (2015) Some of the risk factors for diarrhea they noted indicate the multi-causal nature of diarrhea, these were

low maternal educational attainment; under-nutrition; lower socio-economic status of the household; presence of another child with diarrhea and existence of an upper respiratory tract infection. A position that Randremanana et al. (2016) also espouse when they posit that possession of cattle and living in electrified houses – which are measures of better socioeconomic status – were protective factors in diarrhea etiology.

Mother and Infant Age

The question of whether caregiver and child age influences the practice of recommended infant and young child feeding behaviors and the etiology of diarrhea has been evaluated in prior studies. Infants aged 6–11 months were 6.28 times more likely to be affected by diarrheal disease compared with children aged less than six months (AOR 6.28, 95% CI, 3.00, 13.12) (Gizaw et al., 2017). The likelihood of diarrheal disease was also 6.21 times more likely to be higher among children aged between 12–24 months (AOR 6.21, 95% CI, 3.13, 12.30) (Gizaw et al., 2017). This is also consistent with the results of the Zimbabwe National Statistics Agency (2016) findings of the cross-sectional study.

Concerning the mother's age and its association with diarrhea in the infant, Sadiq et al. (2022) observed a correlation between maternal age and childhood diarrhea. In their multivariate analysis, children of mothers >30 y of age had lower diarrhea odds when compared to children of mothers <25 y of age (OR 0.73 [95% CI 0.63 to 0.86]). Part of the reasons they posit for such results include that children of younger mothers may be experiencing poor health outcomes due to the social disadvantages that more youthful mothers face where women who have children at an early age are likely to remain uneducated, unemployed, and poor. Finlay, Özaltin, and Canning (2011) further concur that women who delay having their first child are more likely to be educated, more likely to have a partner, are richer, more likely to live in

an urban area, and more likely to live in better sanitary conditions whereas young mothers tend to have lower educational and socioeconomic characteristics. They conclude that Increasing the age at first birth in in low income countries may have large beneficial ripple effects in terms of child health outcomes.

Similar findings are posited by Edwin and Azage (2019) where an inversely proportional relationship was observed been the mother's age and the odds of diarrhea in a Tanzanian study.

Diarrhea

Reviewing the different studies on diarrhea morbidity in under-fives is fraught with challenges mainly emanating from the fact that several inconsistencies exist in the definition of a diarrhea episode used. The World Health Organization's international standard definition of a diarrhea episode was used in the current study standard and valid results. The Integrated Disease Surveillance Technical Guidelines for Zimbabwe (Ministry of Health and Child Welfare, 2010) state this definition as the passage of three or more loose or watery stools within 24 hours, this can be with or without dehydration. In some instances, the loose stools may be stained with blood a condition known as Dysentery.

Etiology of Diarrhea

The common causes of diarrhea in under-fives are infections of the gastro-intestinal tract due to viruses (rotavirus); Bacteria (*E. coli, salmonellae, Shigella, campylobacter,* and *Yersinia*), or Parasites (giardia, cryptosporidium, cyclosporine, and entamoeba). These infections are spread mostly through the ingestion of food or water contaminated by the agents highlighted above or through fecal-oral spread (Ministry of Health and Child Welfare, 2010). In Gokwe North district no laboratory results have been processed to ascertain the agent responsible for the diarrhea cases.

This means without a specific target, the research will have to assess a wider range of possible agents. The Global Enteric Multi-centre Study (Kotloff et al., 2013) however, identified that most of the cases of moderate and severe diarrhea in third-world African countries were caused by one of four main pathogens that are Rotavirus, *Cryptosporidium spp*, Enterotoxigenic *Escherichia Coli* and *Shigella*.

Caregiver Knowledge

Islam et al. (2013) assessed how weaning food was contaminated with Faecal Coliforms (FC) and Streptococci (FS) before and after a four-week training of mothers on critical control points in the food preparation chain. The results revealed a statistically significant drop in FC and FS from 1.84 log (10) and 1.92 log (10) cfu/g before training to 0.86 log (10) and 1.33 log (10) cfu/g after the training ($p<0.001$). This showed that hygiene interventions can reduce food contamination. Therefore, the authors conclude that food hygiene awareness among mothers could be an important intervention for preventing food-related diarrhea.

Following an impact assessment of a 2-year agriculture, nutrition, and behavior change project targeting women in Burkina Faso it was concluded that these interventions had a statistically significant impact in improving child diarrhea outcomes among children under one year of age (Olney, Pedehombga, Ruel, & Dillon, 2015). For instance, underweight prevalence was reduced by 8.7 percentage points ($P < 0.01$) among infants whose mothers received the intervention. Thus highlighting the importance of maternal knowledge in determining childhood health outcomes.

The psychosocial condition of mothers also plays a role in child health outcomes as attested to by Ullah et al. (2019) who concluded that maternal depression

appeared to be one of the most important risk factors for diarrhea among children 0-23 months of age [AOR, 1.58 CI: 1.31, 1.90)].

Water, Sanitation, and Hygiene (WASH)

Among other simple interventions Water and Sanitation Hygiene (WASH) improvements by caregivers present a huge potential for the reduction of diarrheal disease rates in children. An estimated 30-48% reduction as observed by Baker et al. (2014) can be accrued by promoting hand washing with soap or ash as contaminated hands play a key role in the transmission of diarrhea-related pathogens. It is common practice in the conduct of health surveys and demographic studies to use spot checks of hand washing stations with water and soap as a credible proxy measure for hand washing practices (Baker et al., 2014).

Escobar et al. (2015) noted that among the key interventions that reduced the prevalence of diarrhea among native Brazilian children were, strengthening the primary health care network; oral rehydration solution usage; reducing child under-nutrition and improving access to potable drinking water. The role of sanitation is further expounded by Randremanana et al. (2016)where the presence of garbage dumping sites around the house presented a risk factor for developing severe diarrhea.

However new evidence is emerging which on the contrary suggests that there is no association between WASH and nutrition interventions on diarrhea. Such evidence is propagated by the findings of two WASH benefits cluster randomized control trials conducted in Kenya and Bangladesh. According to Null et al. (2018) in the Kenya trial, simple primary health care interventions such as household-level water treatment, upgrading from unimproved to improved latrines, and use of hand washing stations did not reduce childhood diarrhea or improve growth. According to the authors, the interventions might have been more effective on condition of higher

adherence or if the environment had lower baseline sanitation coverage. The contribution of these latest researches has further confounded the evidence base on WASH, Nutrition, and Diarrhea interactions thus making it especially key for this current research to also assess issues of level of adherence to the particular practices to ascertain the true extent of the association.

Other Considerations

In analyzing factors that may have contributed to the decline in under-five diarrhea mortality in Tanzania between the years 1980 and 2015, Masanja et al. (2019) pointed to ORS use, changing in stunting prevalence, vitamin A supplementation, changes in wasting prevalence, and change in age-appropriate breastfeeding practices as the main contributing factors. Most of these are direct indicators of nutrition status which demonstrate the role of nutrition in determining diarrhea outcomes. A study which ran by the same title and protocol in India by Choudhary et al. (2019) echoes the same sentiments and goes to further highlight that the use of ORS and interventions for reducing stunting were the two key strategies, each accounting for 32% of deaths averted. Stunting reduction simply entails a reduction in chronic undernutrition.

CHAPTER 3

METHODOLOGY

This chapter focuses on the steps the researcher took in assessing the relationship between caregiver infant and young child feeding practices and the occurrence of diarrhea among infants 0-23 months of age in the Gokwe North district.

Study Design

The study protocol involved a matched Case-Control study design. Where a Case was the mother or caregiver of a child who had experienced an episode of diarrhea within the previous two weeks from the day of the interview. The control group consisted of mothers or caregivers of children 23 months and below whose children had not experienced an episode of diarrhea over two weeks or more before the date of the interview.

The study was particularly set out to assess whether child feeding practice was associated with the diarrhea outcome, the case-control study was therefore ideal as it provided data that could be analyzed for association with some degree of confidence in the strength of the association. Considering that child feeding practice is a compound variable consisting of several specific practices, the case-control's ability to assess multiple exposures was thus deemed appropriate to study this compound predictor variable. A case-control design was also chosen in the study of diarrhea and its association with nutrition since diarrhea is a condition of short duration and would not be possible to follow up for long periods. The design also meant that results could be available quicker to inform the response to the several outbreaks of diarrhea that

were being experienced at the time in Gokwe North. Another consideration for the design choice was the low cost and time requirements of case-control studies were convenient to the student researcher who had limited time and funding in which to conduct the study.

To improve statistical precision, controls were matched to the cases by age and residence to minimize the influence of potential confounders that were likely to be introduced by these variables. During conceptualization, the research initially intended to match by child sex, however during data collection this proved challenging as it would tend to compromise matching by the residence which the research intended to rely on. This coupled with the fact that there hasn't been evidence in the literature to show the existence of significant differences in the etiology of diarrhea between the two sexes resulted in matching by sex being dropped from the data collection protocol.

Age was not stated as an absolute figure but as a range and two age ranges were employed in this study which include 0-5 months and 6-23 months according to the observation of diarrhea prevalence in the two strata. As such a 10-month child could be matched with a 15-month child since both of them existed in the same 6-23-month range.

A residence was matched in terms of the village from which the case and the control permanently reside. Matching for residence was aimed at controlling the effect of environmental factors such as access to water and sanitation, food security status as well as climate. Based on the principle of geographic spatial autocorrelation, study elements that exist in the same locality tend to have similar characteristics, therefore matching residence was predicted to help identify controls that were as closely related

to the cases as possible except for IYCF and WASH practices. With the foregoing considerations in place, matching was done at the individual level.

The two-week interval was borrowed from the methodology that is used in conducting Demographic and Health Surveys in Zimbabwe (Zimbabwe National Statistics Agency, 2016) as well as nutrition surveys such as the 2018 national nutrition survey. Ascertaining whether or not a child had experienced an episode of diarrhea was done through a review of the health facility Integrated Management of Childhood Illness (IMNCI) register.

Study Population and Sampling Procedure

The population of interest to the study was comprised of primary care givers of children aged 0-23 months in Gokwe North District. To determine the size of this population, the population of children 0-23 months was used since they exist in a 1:1 ratio of primary caregiver to child or infant in the population. The total population of children 0-23 months is estimated at 19,020 according to Gokwe North District Health Information statistics which are derived from the 2012 National Census and a national year-on-year population growth projection of 1.1%. This population is distributed under the catchment areas of 21 Clinics across the district and 1 district hospital. These health facilities and their outreach points were the entry points through which the study population was accessed.

A multi-stage sampling approach was used in the current study. The first sampling stage consisted of selecting Seven (7) clinic catchment areas out of the 21 clinics in the district. These were purposively sampled based on the high burden of diarrhea in under-fives. The seven clinics namely Simchembu, Zhomba, Bururе, Chireya, Zumba, Kuwirirana, and Mtora Mission are among the high-burden facilities for under-five diarrhea (Gokwe North Health Information Office, 2019). An equal

number of study participants was then randomly selected from each of the seven study catchment areas.

The map in Appendix E indicates the distribution of health facility catchment areas that were sampled for the study in the district.

Inclusion and Exclusion Criteria

Cases

Primary caregivers were included in the Case group if their child was aged 0-23 months and had experienced an episode of diarrhea over the past two weeks from the date of the interview. In addition, the caregiver had to consent to participate in the study before they could be interviewed.

For the exclusion criteria, caregivers were excluded from the Case group if the child was above 23 months of age.

Controls

Primary caregivers were included in the Control group if their child was aged 0-23 months and had not experienced an episode of diarrhea over the past two weeks from the date of the interview. In addition, the caregiver had to consent to participate in the study before they could be interviewed.

For the exclusion criteria, caregivers were excluded from the case group if the child was above 23 months of age or if the child had had an episode of diarrhea within the past two weeks.

Sample Size Determination

A representative sample size was calculated using the formula below which is advanced by Kim, Williamson, and Lin (2016) in their work.

$$n = (\frac{r+1}{r}) \frac{(\boldsymbol{P})(1-\boldsymbol{P})(Z_\beta + Z_{\frac{\alpha}{2}})^2}{(P_1 - P_2)^2}$$

Where:

n: Sample Size in the Case group

r: is the ratio of controls to cases, in this case, it is 1

P: is the variability or standard deviation

Z_β: is the desired power, in this case set to 80% which is 0.84

$Z_{\alpha/2}$: is the desired level of significance, in this case set to 0.05 which is 1.96

$(p_1-p_2)^2$: is the effect size ie difference in proportions

Since the proportion of exposed in the control group is not known p_2 was set at 0.50 in conformity with literature. The sample size was calculated based on the assumption that the study intended to detect an odds ratio of 2.0 or greater.

$p_1 = (ORp_2)/ p_2(OR-1) +1$

$p_1 = 2.0(0.5)/ [(0,5) (2.0-1) + 1]$

$p_1 = 0.66$

P = $(p_1 + p_2) /2$

= (0.66+0.50)/ 2

= 0.5833

$$n = (\frac{2}{1}) \frac{(0.583)(1-0.583)(0.84+1.96)^2}{(0.66-0.50)^2}$$

Sample size in the control group = 149

Therefore, the total sample size is = <u>298</u>

Since the study used a 1:1 ratio matched approach the expected number of controls was set at an equal to the number of cases. Two strata are inherent in the study due to key differences in recommended feeding patterns in the age ranges of the children which the researcher intended to study - that is the 0-5 months and the 6-23

months. A 1:3 ratio was used to allocate the number of cases for the two strata as shown in the table. This ratio was decided upon based on the observation that children 0-5 months of age constitute a quarter of the 0-23 months age spectrum.

Table 1. Number of Cases versus Controls Interviewed

Age Range	Number of Cases	Number of Controls	Total
0-5 months	37	37	74
6-23 months	112	112	224
Total	149	149	298

Instruments for Data Collection

A structured interviewer-administered questionnaire was used for the collection of knowledge and practice data from interviewees. Key variables that were measured included household demographics, socio-economic indicators; water and sanitation; knowledge of child feeding as well as practices.

A standard IYCF questionnaire featuring a 24-hour Dietary Recall was used to assess feeding practices, this was adapted to also capture data on caregiver's knowledge, diarrhea, and WASH by synchronizing it with the Food and Agriculture Organization (Macías and Glasauer, 2014) KAP survey generic questionnaires. Comparing and modifying these standard tools was done to come up with a questionnaire that would best answer the objectives of the current research. The resultant data collection instrument adapted to the current research is presented in Appendix B. Since the questionnaire would be interviewer-administered there wasn't much necessity to translate it into local languages. However, a process of questioning technique standardization was engaged for all the data collection assistants.

Validity and Reliability

The researcher had intended on conducting a pre-test to assess the validity of the data collection instrument, however, due to the time and movement constraints resulting from the Covid-19 pandemic the process could not be initiated. However, since the questionnaire used for this study was used in several studies prior including national surveys in the country and its validity and reliability have been tested in several other similar settings it was adopted for the current study. For instance, the study by Zakria, Ismail, Mansor, and Sulaiman (2019) assessed the reliability of the questionnaire among caregivers of under 2-year children in Malaysia and found marginal reliability scores of 0.91 and 0.74 for the knowledge section with regards to breastfeeding and complementary feeding they concluded that the questionnaire had good reliability.

Data Collection Procedure

Given the sample size to be covered, the primary researcher engaged and trained five data collection assistants to expedite the data collection process and ensure that the research is conducted within the stipulated time limitations. The data collection assistants recruited were already working in the Ministry of Health as Ward Nutrition coordinators in the respective clinic catchment areas. Using seasoned nutrition coordinators in the study helped reduce the amount of training needed as these had experience in data collection for nutrition assessments.

Recruitment of actual participants (cases) was done using simple random sampling where all the cases found in the local clinic or outreach point IMNCI register over the two weeks were assigned numbers and the required number for that locality was picked from a hat until the required sample is achieved. The research would have wanted to randomly pick participants from the whole clinic catchment

area but due to limited travel logistics, only villages within a five-kilometer radius of the health facility were eventually selected. In cases where the number of eligible children was low, all the children who had been treated for diarrhea in that clinic were purposively sampled in the study. Consent was then sought from the identified caregivers for them to participate in the study.

To select the controls caregivers from the same area of residence as the case whose children had not experienced an episode of diarrhea were selected through snowballing in that village and matched. In the snowballing, the Case caregiver would give information on potential caregivers from their peer circle who could be eligible to participate in the study. These were then interviewed to ascertain if their child was an appropriate control.

After consent was granted the data collection assistant would read out each of the questions from the questionnaire and explain it to the respondent. The data collector would then complete the appropriate fields of the questionnaire mostly by ticking the check boxes based on the participant's response. After completion of the interview questions, the data collection assistant would request to take MUAC measurements on the child's left arm using a standard pediatric MUAC tape. Measurements were entered in the appropriate field of the questionnaire.

Method of Data Analysis

Data from the study were analyzed using the statistical package SPSS version 16. The data was taken through univariate, bivariate as well as multivariate analysis as is presented in the results section. Key statistical tests done include cross-tabulation of Contingency tables and testing for association using Chi-Square tests, a forward stepwise binomial Logistic Regression was also done, including analysis of crude as well as adjusted odds ratios.

Since the nature of the variables yielded mostly categorical data the first step in the analysis included cross-tabulation of the independent variables against the dependent variable. Once all variables are presented in contingency tables, the Chi-Square tests for association were then done. Descriptive data on demographic information and knowledge was analyzed and presented in the form of tables, comparisons were made between the cases and the controls for example mean age of caregiver and average level of educational attainment to determine if any differences exist between the cases and the controls. To assist in the data analysis, the primary researcher consulted with a Biostatistician, especially in conducting an interpretation of the logistic regression model.

Data that were collected for the research were matched for age and residence. The matching by age was controlled in the analysis by maintaining two broad strata for all the responses. The two strata were 0-5 months and the 6-23 months age groups. This ensured that a standard analysis could still be done without the need for a pair-matched analysis. As explained by Pearce (2016) for simple matching factors such as age, it is not pertinent that one conducts a pair-matched analysis. This is because both the standard adjusted analysis will produce the same odds ratio as the matched pairs analysis, the only difference being that the matched pairs will yield a slightly wider confidence interval.

Ethical Considerations

The study's focus was on adults from whom verbal informed consent was sought for them to participate in the study. Appendix B shows the informed consent form which was used in the current study. In addition, confidentiality was assured to the participants by conducting interviews at the household level without the

interference of the other community members. No incentives were offered to lure participants into the study, participation was entirely voluntary.

Permission to access data from the Ministry of health was sought from the District Medical Officer for Gokwe North District which information was used solely for academic purposes. The official letter of approval from the District Medical officer is filed in Appendix A. The research proposal was also presented before the AUA faculty for guidance before the researcher could interact with study participants.

CHAPTER 4

FINDINGS AND DISCUSSION

The chapter presents the findings of the Case-control study which was conducted in Gokwe North District to examine the null hypotheses that child feeding practices of caregivers and caregiver access to improved WASH were not associated with the incidence of diarrhea among children aged 0-23 months. The results are presented below in the form of tables, graphs, and narratives according to each research question. To guide the investigation, the following research questions were employed:

1. Are caregivers of children aged 0-23 months knowledgeable on the recommended child feeding practices specific to the child's age?
2. Are caregivers in the Gokwe North district implementing the recommended practices in the feeding of children between 0-23 months of age?
3. To what extent do child feeding practices affect diarrhea incidence in Gokwe North?
4. To what extent does caregiver access to improved WASH facilities affect Diarrhea incidence in Gokwe North?
5. Is there a relationship between diarrhea and the following demographic variables?
    a. Caregiver's age
    b. Child's age

Study Setting

The study was conducted in Gokwe North District which is a district to the further north of the Midlands province in Zimbabwe. The district is largely rural comprising 36 administrative wards which are managed by the Rural District council

based at the rural service center in Ward 13. Twenty-two (22) health facilities service the district population of 260000. Of these 22 health facilities in the district, 20 are primary health care clinics, one is a mission hospital and 1 is a district hospital that works as the referral center for the rest of the health facilities. It is at the district hospital that the district health executive which is responsible for the management of all the health facilities in the district is domiciled. The study was conducted within the catchment areas of 7 of the 20 clinics. That are Mutora Mission, Simchembu, Zhomba, Chireya, Burure, Zumba, and Kuwirirana.

Response Rate

The study managed to achieve the targeted sample size of 298 participants which translates to a 100% response rate. Since the selection of controls was through snowballing the process had to be repeated several times until suitable controls who were willing to participate in the study were identified. This iterative process resulted in the study meeting its target sample size.

Demographic Characteristics of Respondents

The following frequency table presents key findings on selected demographic characteristics of respondents which were of interest to the study. For this analysis, ownership of improved WASH facilities is also treated as a demographic characteristic as it is a proxy for the socio-economic status of the household.

Table 2. Demographic Characteristics of Caregivers of 0-23 Months Infants

Variable	Category	0-5 Months		6-23 Months	
		Cases n (%)	Controls n (%)	Cases n (%)	Controls n (%)
Education	No Schooling	01 (2.7)	00 (0)	04 (3.6)	02 (1.8)
	Primary	15 (40.5)	08 (21.6)	43 (38.4)	46 (41.1)
	Secondary	19 (51.4)	28 (75.7)	62 (55.4)	59 (52.7)
	Tertiary	02 (5.4)	01 (2.7)	03 (2.7)	05 (4.5)
Age	< 20	09 (24.3)	01 (2.7)	18 (16.1)	22 (19.6)
	21-30	18 (48.6)	19 (51.4)	57 (50.9)	49 (43.8)
	31-40	09 (24.3)	15 (40.5)	30 (26.8)	35 (31.2)
	41-50	00 (0)	02 (5.4)	07 (6.2)	06 (5.4)
	> 50	01 (2.7)	00 (0)	00 (0)	00 (0)
	Median Age	25 (Q1 = 20.5; Q3 = 32.5)	30 (Q1 = 22.5; Q3 = 34.5)	27 (Q1 = 22; Q3 = 33)	28 (Q1 = 22; Q3 = 35)
Occupation	Farmer	22 (59.5)	25 (67.6)	77 (69.4)	73 (65.2)
	School Teacher	01 (2.7)	01 (2.7)	03 (2.7)	04 (3.6)
	Not employed	12 (32.4)	09 (24.3)	26 (23.4)	25 (22.3)
	Self-employed	02 (5.4)	02 (5.4)	05 (4.5)	10 (8.9)
Latrine Ownership	Yes	22 (59.5)	25 (67.6)	55 (49.1)	72 (64.3)
	No	15 (40.5)	12 (32.4)	57 (50.9)	40 (35.7)
Water Source	Borehole	11 (29.7)	13 (35.1)	21 (18.8)	40 (35.7)
	Shallow Well	08 (21.6)	08 (21.6)	52 (46.4)	36 (32.1)
	Deep Well	05 (13.5)	10 (27.0)	17 (15.2)	23 (20.5)
	Sand Abstraction	13 (35.1)	06 (16.2)	22 (19.6)	13 (11.6)

The respondents classified as farmers under occupation are individuals who are contracted by cotton companies through the provision of inputs to produce cotton on their small-scale pieces of land, in turn after the harvest they sale the produce to the companies after deducting the cost of inputs. This category of respondents has reliable access to markets for their products which in turn guarantees access to better financing for the household for at least three months in the year when the cotton is being harvested and sold with the possibility of extension up to 6 months if the income is properly managed. The self-employed category includes all other individual-run income-generating activities including sewing, vegetable vending,

carpentry, etc which in the rural settings in which they are operated do not necessarily guarantee stable income flows for the household.

In the 0–5-month age group, the median age for the Cases was 25 years with an interquartile range (IQR) of 20.5 – 30.2 whereas that of the Control was 30 years with an IQR of 22.5 – 32.5. Of the women in the control group, 40.5 % (n=15) were above the age of 30 compared to only 24.3% (n=9) of the cases in that age range.

Concerning the highest level of education attained caregivers in the case group were divided almost equally between primary and secondary levels with 40.5 % having reached primary school level and 51.4% having reached secondary school level. For the control group, the majority 75.7% had attained up to Secondary level, and 21.6% of them had Primary schooling only.

In some studies, reviewed, the influence of the mother's educational level has been measured against their inclination towards practicing certain recommended behaviors that are deemed to be protective against diarrhea and not necessarily against the incidence of diarrhea itself. For instance, in Robinson and Fall's (2012) study; 91% of mothers who had completed secondary education tended to initiate breastfeeding compared to 63% among those who had left school at age 16 years and younger. Therefore, the mechanism by which maternal education becomes a protective factor would be through its deterministic effect on breastfeeding.

As observed in the current study, the proportion of women attaining secondary women was higher among control mothers 75.75 when compared to 51.4% among case mothers. This access to more years of education by mothers whose children did not develop diarrhea could mean they have better access to information including on infant and young child feeding since they are more literate.

The protective effect of higher levels of maternal education as a determinant of breastfeeding has also been reiterated by Duan et al. (2022). In a large sample size study in China, they observed that individual caregiver attributes associated with breastfeeding included maternal education, breastfeeding knowledge and attitude, employment as well as psychosocial factors, such as breastfeeding intention and self-efficacy (Duan et al., 2022). It is key to note that all these factors except employment are related to the cognitive domain and are modifiable through maternal education.

In both the case and control groups the mean household size was almost the same, 6.08 for the cases and 5.84 for the controls. The modal number of children per caregiver in Cases was 1 child whereas in the control group, the modal number was 3.

The fewer the number of children the caregiver had given birth to the more the chances of the child experiencing diarrhea and the reverse is true. This coupled with the fact that caregivers in the case group tended to be younger (median age 25 years) than those in the control group (median age 30 years) could suggest that younger mothers who have given birth to fewer children could be less experienced in the proper care of the child thus resulting in exposures to factors that increased their risk of diarrhea.

The Blair toilet in its two forms the standard and the upgradable form are the recommended type of latrine for use in rural Zimbabwe. In terms of absolute figures, there were no large differences observed between the case and the control groups regarding their access to improved sanitation facilities at the household level in the form of the Blair toilet. 59.5% (n=22) of the cases had Blair toilets compared to 67.6% (n=25) for the Controls.

Concerning access to WASH facilities the notable differences between the two groups were observed in their sources of water for household use. The different types

of water sources are further classified into safe versus unsafe categories where borehole and deep wells are classified as safe while shallow well and sand abstraction are classified as unsafe sources. This classification reveals that 43.2% (n=16) of Cases had access to safe water sources against 62.2% (n=22) safe water access by the controls.

Table 3. Demographic Characteristics of 0-23 Months Infants

Attribute	Category	0-5 Months		6-23 Months	
		Cases n (%)	Controls n (%)	Cases n (%)	Controls n (%)
Sex of Child	Male	17 (45.9)	15 (40.5)	64 (57.1)	2 (46.4)
	Female	20 (54.1)	22 (59.5)	48 (42.9)	59 (52.7)
Vaccination Status up to date for Age	Yes	35 (94.6)	33 (89.2)	96 (85.7)	107 (95.5)
	No	02 (5.4)	04 (10.8)	14 (12.5)	05 (4.5)

It was observed that the modal age at the time of data collection for infants who developed diarrhea (cases group) was 5 months whereas that of infants in the control group was 2 months. Infants who experienced episodes of diarrhea in the current survey tended to be on the older end of the 0-5 months spectrum and the reverse is true for those who did not develop diarrhea.

Relationship between Diarrhea and Children's Demographic Characteristics

To assess the relationship between the demographic variables which were assumed to have the potential for moderating the relationship between the independent and the dependent variables, a logistic regression model was fitted.

Table 4. Logistic Regression for Demographic Variables against Dependent Variable

Variable	AOR	95% CI		p-value
		Lower	Upper	
0-5 Months age group				
Caregiver Age	0.910	0.594	1.394	0.663
Child Age	0.986	0.369	2.634	0.978
6-23 Months age group				
Caregiver Age	0.964	0.906	1.026	0.248
Child Age	1.011	0.968	1.056	0.617

In both the 0-5 months and the 6-23 months age groups, no significant relationships were noted between the dependent variable and the caregiver's age as well as the child's age. In both cases, p values were greater than 0,05. This was despite the trends that had been observed in the descriptive analysis as presented above. The findings are also contrary to the Zimbabwe National Statistics Agency (2016) data where variations in diarrhea incidence were observed by child age from 10% among children under 6 months reaching a peak at 31% among 6-11-month-olds and remaining high at 30% among 12-23 months old thereafter dropping sharply to as low as 7% among 48-59 months. This could stem from the fact that the ZDHS results were also purely descriptive and could have yielded a different observation had they done some hypothesis tests.

While the current study has failed to demonstrate a relationship between the mother's age and the odds of diarrhea in infants, several studies reviewed including Sadiq et al. (2022), Finlay et al. (2011), as well as Edwin and Azage (2019) tend to concur that a significant relationship does exist between these variables. For instance, Sadiq et al. (2022) observed that children of mothers >30 y of age had lower diarrhea odds when compared to children of mothers <25 y of age (OR 0.73). Whereas similar findings are posited by Edwin and Azage (2019) where in a Tanzanian study they

observed that an increase in the mother's age at the time of giving birth was significantly correlated with a decrease in the odds of diarrhea.

Part of the reasons the scientific community attributes to these findings are posited by Finlay et al. (2011) that women who delay having their first child are more likely to be educated, more likely to have a partner, are richer, more likely to live in an urban area, and more likely to live in better sanitary conditions whereas young mothers tend to have lower educational and socioeconomic characteristics. They conclude that Increasing the age at first birth in low-income countries may have large beneficial ripple effects in terms of child health outcomes.

The failure of the current study to demonstrate these relationships may be related to the sample size used in the study. Whereas the studies referenced above were mostly nationally representative surveys with large sample sizes the current study was limited to a few wards within one district.

Knowledge of Mothers and Caregivers on Recommended Infant and Young Child Feeding Practices

Since the focus of the study was caregiver practices, knowledge of recommended practices was assumed to be a determinant of whether or not they would execute certain practices. Knowledge was assessed using a set of IYCF and WASH-related questions and the caregiver's score was presented as a percentage.

Table 5. Mean Knowledge Scores of Respondents

	0-5 Months		6-23 Months	
	Mean	SD	Mean	SD
Cases	36.11	13.87	40.80	16.4
Controls	54.70	15.6	51.87	17.2

Table 6. Knowledge Scores Frequencies

Knowledge scores	0-5 Months		6-23 Months	
	Cases n (%)	Controls n (%)	Cases n (%)	Controls n (%)
Above 50%	05 (13.5)	22 (59.5)	45 (40.1)	70 (62.5)
Less than 50%	32 (86.5)	15 (40.5)	67 (60)	42 (32.5)

For both age groups controls had mean knowledge scores above 50 while cases had mean knowledge scores below 50. More than half (59.5%) of Controls in the 0-5 month age group managed to score above 50 while only 13.5% of Cases managed scores of 50 and above. In the 6-23 months age groups, 62.5% of Control caregivers managed to score above 50 whereas 40% of the Cases scored above 50%.

Knowledge levels of 50 and above were classified as Good Knowledge while scores below 50 were classified as Poor Knowledge in the current study. Controls therefore tended to have good knowledge of IYCF and cases tended to have poor knowledge. This rating scale was adopted from Assefa, Woldesenbet, Molla, Zeleke, and Simie (2021).

However, according to Macías and Glasauer (2014), knowledge scores of less than 70 indicate that there is a need for a Nutrition Education intervention for the target audience. For both cases and Controls, therefore, IYCF knowledge levels among caregivers in Gokwe North are below optimum and require intervention. The critical role that nutrition education interventions for caregivers play in improving knowledge levels is demonstrated by Islam et al. (2013). After observing that complementary foods for infants who had recently been weaned in Bangladesh were contaminated with Faecal Coliforms (FC) and Streptococci (FS) they developed and implemented a randomized controlled trial where the treatment group was exposed to a four-week training on critical control points in the food preparation chain. The

results revealed a statistically significant drop in FC and FS in the food being given to weaned children (Islam et al., 2013).

Therefore, the authors came to similar conclusions as did Macías and Glasauer (2014) that food hygiene awareness among mothers could be an important intervention for preventing food-related diarrhea. It is therefore critical that health promotion programmers in the Ministry of Health and Child care in Gokwe North district take deliberate actions to develop interventions that address the dearth of knowledge among caregivers that had been demonstrated in the current research.

Table 7. Knowledge of Recommended Hand Washing Times

Handwashing times identified	0-5 Months		6-23 Months	
	Cases n (%)	Controls n (%)	Cases n (%)	Controls n (%)
One	00 (0)	00 (0)	09 (8.0)	04 (3.6)
Two	06 (16.2)	05 (13.5)	30 (26.8)	15 (13.4)
Three	12 (32.4)	13 (35.1)	23 (20.5)	29 (25.9)
Four	12 (32.4)	09 (24.3)	29 (25.9)	43 (38.4)
Five	07 (18.9)	10 (27.0)	21 (18.8)	21 (18.8)

Only 18.9% of caregivers in the case group for 0-5 month infants managed to recall the five recommended critical times for hand washing against 27% among control caregivers in the same age group. For the 6-23-month group, both case and control groups had an 18.8% recall of the five critical hand washing times.

Prior studies such as Olney et al. (2015) concluded that interventions that were targeted at improving maternal knowledge on nutrition and WASH had reduced the chances of infants developing diarrhea in different settings. Thus emphasizing the importance of caregiver knowledge. The findings of the current study suggest a similar viewpoint as there are observable differences in knowledge levels of cases and those of controls.

Implementation of Recommended Feeding Practices by Mothers and Caregivers of Children Aged 0-23 Months

Since this was a quantitative study, assessment of IYCF practices looked at the already known feeding practices including those recommended by WHO, and data was collected to ascertain the extent to which those behaviors were being practiced.

Table 8. IYCF Practices of Caregivers for 0-5 Months Infants

Practice	Category	Cases n (%)	Controls n (%)
Exclusive Breastfeeding	Yes	12 (32.4)	31 (83.8)
	No	25 (67.6)	06 (16.2)
Early Initiation of Breastfeeding	Yes (within one hour of birth)	31 (83.8)	34 (91.9)
	No (more than one hour)	06 (16.2)	03 (8.1)
Feeding using a bottle with a nipple	Yes	19 (51.4)	05 (13.5)
	No	18 (48.6)	32 (86.5)

The recommended child feeding practices are being implemented in varying degrees between case and control caregivers in Gokwe North. Controls performed better on all three IYCF indicators for the 0-5 months age group that is EBF, early breastfeeding initiation, and bottle feeding as shown in the table above. The high prevalence of exclusive breastfeeding 83.8% among control caregivers is especially remarkable compared to the 32.4% among cases. The analysis also showed that the propensity to exclusively breastfeed among caregivers reduced as the child grew older as shown in Figure 3.

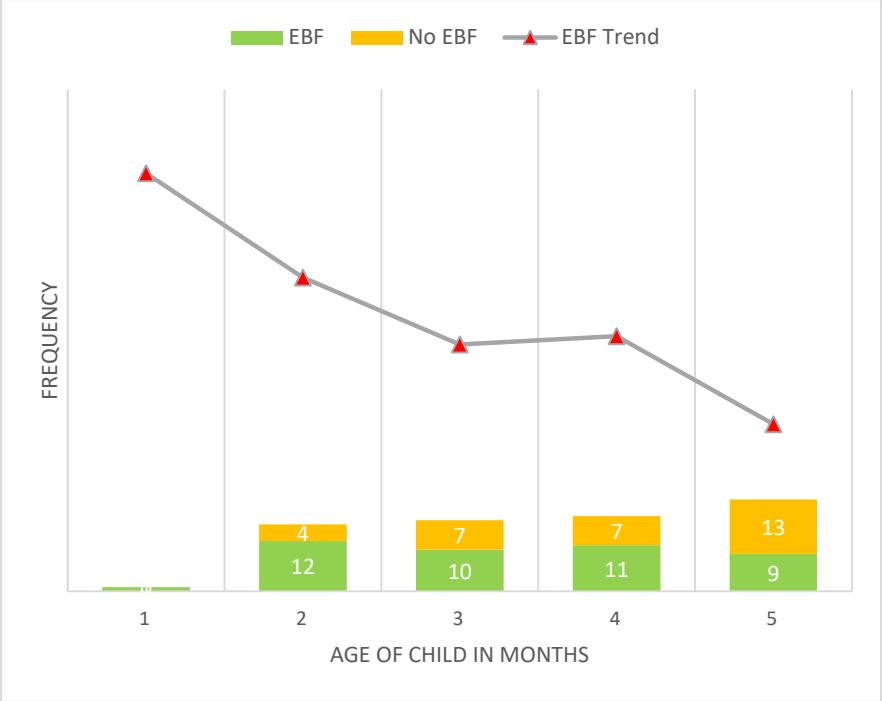

Figure 3. Exclusive Breastfeeding Trends against Child Age

It was noted that overall exclusive breastfeeding stood at 40% just before the child reached six months of age. This finding highlights that the practice of exclusive breastfeeding is still low in Gokwe North considering that the WHO Global Nutrition targets are aiming for an exclusive breastfeeding rate of 90% among infants below the first six months of life (Mulatu et al., 2021).

Another practice that was seen to be prevalent among the study population was the use of bottles with nipples when feeding fluids to the child. A 32% overall prevalence of the practice in the 0-5 months caregivers is quite high considering that the WHO guiding principles on infant feeding recommend the total avoidance of nipple bottles preferring cup feeding instead (WHO and UNICEF, 2021). Nipple bottles have been observed to be difficult to keep clean and present a potential route for the transmission of pathogens that exposes the child to diarrheal diseases. It is, however, refreshing to note that the practice was quite low (13.5%) among controls as compared to the cases (51.4%).

A significant proportion of the caregivers indicated having practiced early initiation of breastfeeding. 83.8% among the cases and 91.9% among the controls. Early initiation of breastfeeding is a provider-initiated process at the health facility just after birth hence its high uptake in both the Case and Control groups. The high uptake of this recommended practice during the early stages of the life of the infant could be responsible for the low diarrhea prevalence observed in this study in children at the lower end of the 0-5 month age spectrum. Apart from increasing the chances of the child receiving colostrum which helps fight infections, early initiation has also been shown to stimulate milk production thus increasing the chances of the child getting adequate amounts of breastmilk.

Abie and Goshu (2019) detected that children who had not been initiated on breastmilk within the first hour were three times more likely to experience neonatal morbidity and mortality than those who were initiated within the first hour of life. Delayed breastfeeding according to Mugadza, Zvinavashe, Gumbo, and Pedersen (2018) increases the risk of developing neonatal sepsis within the first week of life.

Table 9. IYCF Practices of Caregivers for 0-23 Months Infants

	Practice	Cases n (%)	Controls n (%)
Continued Breastfeeding	Yes	84 (75.0)	93 (83.0)
	No	28 (25.0)	19 (17.0)
Minimum Meal Frequency	Minimum Recommended	46 (41.1)	63 (56.3)
	Less than Recommended	57 (50.9)	24 (21.4)
	More than recommended	09 (8.0)	25 (22.3)
Dietary Diversity	Less than 50%	62 (55.4)	42 (37.5)
	Above 50%	50 (44.6)	70 (62.5)

For the 6-23-month age group, the results table above indicates that levels of Continued Breastfeeding after 6 months of age were quite high in both the Case and the Control group which is 75% and 83% respectively. The continued provision of

breastmilk to a child in addition to complementary foods is a recommended practice that ensures the child's immune defenses continue receiving additional antibodies thus strengthening the ability to fight infection.

With regards to meal frequency, more of the cases received less than the recommended umber of meals for a child's age compared to the controls (50,9% versus 21.4% respectively). On the other end of the meal frequency spectrum, there were more controls (22.3%) who received the above-recommended number of meals than in the case group (8%). A great majority of controls (62.5%) had dietary diversity scores above 50 when compared to 44.6% of the cases managing dietary diversity scores above 50. In this research, a cut of 50 was used to distinguish between good scores and poor scores.

Effect of Caregiver Access to Improved WASH Facilities on the Incidence of Diarrhea in Gokwe North

A bivariate analysis was done to determine if an association existed between caregiver socio-demographic characteristics and diarrhea as presented in Table 10.

Table 10. Bivariate Analysis on WASH Access using Chi-Square Tests

Variable	0-5 Months		6-23 Months	
	Chi-square value	P-value	Chi-square value	P-value
Access to Improved Pit Latrine	0.525	0.469	5.255	0.022
Source of water for household use	4.412	0.220	12.041	0.007
Type of Water Container in Household	1.057	0.304	4.220	0.040

Table 11. Cell Counts for the Bivariate Analysis on Access to Improved WASH Facilities

			Did the child have Diarrhea (Case) or Not (Control)			
			0-5 months		6-23 Months	
			Case	Control	Case	Control
Household access to an improved latrine	Yes	Count	22	25	55	72
		Expected Count	23.5	23.5	63.5	63.5
	No	Count	15	12	57	40
		Expected Count	13.5	13.5	48.5	48.5
Source of Water for Household Use	Borehole	Count	11	13	21	40
		Expected Count	12.0	12.0	30.5	30.5
	Shallow Well	Count	8	8	52	36
		Expected Count	8.0	8.0	44.0	44.0
	Deep Well	Count	5	10	17	23
		Expected Count	7.5	7.5	20.0	20.0
	Sand Abstraction	Count	13	6	22	13
		Expected Count	9.5	9.5	17.5	17.5
Type of container used for fetching water	Bucket with lid	Count	34	36	85	97
		Expected Count	35.0	35.0	91.0	91.0
	Bucket without lid	Count	3	1	27	15
		Expected Count	2.0	2.0	21.0	21.0

In the 0-5 months age group, 2 cells (50.0%) have an expected count of less than 5 for the type of Container used for household water fetching. The Fisher's exact test was therefore used and there was no significant association between the type of container used for fetching water and the occurrence of diarrhea ($p = 0.615$). For the rest of the variables, Pearson's Chi-square test was used since the expected cell counts were greater than 5.

There were no significant associations observed between access to improved WASH and diarrhea incidence in the 0-5 month age group. In the 6-23-month age group, significant associations were observed and these include access to an improved pit latrine (0.022), source of water for household use (0.007), and type of container used (0.040) as shown in the table above. This highlights the importance of access to

proper WASH facilities as the child transitions from the exclusive breastfeeding phase to the Complementary feeding stage. The older the child grows the more they are less dependent on the mother as the primary source of food (breast milk) and the more they rely on complementary foods. Therefore, environmental factors begin to be significant in determining diarrhea outcomes.

Assessment of the household's source of water for household use and its subsequent classification as a safe or unsafe source, the types of containers used for storage were intended to highlight the household water safety levels. As identified in the global enteric multicenter study (Kotloff et al., 2013), most diarrhea episodes are a result of infection of the gastrointestinal tract by bacteria such as Shigella, and *E. coli* which are introduced through contaminated water and food. Concerning that etiology the current study found that children from households that used sand abstraction on dry riverbeds as the main source of water were 21 times more likely to experience a diarrhea episode when compared to children from households that used borehole water which is deemed to be the safest water sources in rural Zimbabwe. Water safety, therefore, plays a critical role in shaping diarrhea outcomes for infants.

Significant relationships between the water source that a household uses and the risk of diarrhea in infants that the current study has highlighted as presented above are also echoed by several studies in the Zimbabwean context. While several studies present the findings from the whole population perspective, the current study focusses more on the infants and how they are impacted by household access to safe water. One such study that amplifies the role of safe water access was by Moyo et al. (2022). In a case-control study in Bulawayo Zimbabwe, the key risk factors for developing diarrhea were drinking water from boreholes (aOR)=2.66; 95%CI=(1.41-5.00)] and the risk was magnified by being under-five years of age [aOR=5.73; 95%CI=(2.06-

15.89)] (Moyo et al., 2022). They, however, make it categorically clear that the type of boreholes that the participants in their study were using had already been decommissioned because they were contaminated with coliforms. However, due to severe water rationing by the council, people used the water anyhow. Thus highlighting the extent of the risk associated with making use of contaminated or unsafe water for drinking in the household.

Point of use water storage practices are also assessed by Moyo et al. (2022) and in their study they observed that storing water in an open container in the household was a risk factor for diarrhea [AOR=2.76; 95%CI=(1.38-5.53)]. The risk also emanates from the risk of contamination that water stored in an open container was exposed to.

Coupled with the issue of water safety in the sanitation continuum is the assessment of household access to an improved pit latrine. The results demonstrated a significant association between access to a Blair latrine and diarrhea in infants. Part of the reason is that the use of proper sanitation facilities reduces the chances of flies interacting with human excrement and bringing pathogenic microbes to food. Also, the use of proper sanitation ensures that water sources are not contaminated with human excreta thus ensuring water safety and its resultant effects explained above. Finally, the use of proper sanitation will ensure that general environmental contamination is reduced. In the albescence of sanitation facilities children can encounter excreta as they play and interact with their environment thus exposing them to diarrhea-causing microbes.

This factor is well demonstrated in the SHINE Study (Zvitambo Institute for Maternal and Child Health Research, 2018) where one of the study arms of the randomized controlled trial involved children in the WASH arm being isolated for

several months and encouraged to play in a sanitized and secured environment. However, after the period of assessment, the children were still found to have in their GIT presence of enter toxigenic e coli despite them being limited in their interaction with their immediate environment. This proved that the chances of environmental contamination are quite high since children can easily ingest dirt. If in the presence of heightened levels of sanitation contamination could still occur the implications for households with no sanitation infrastructure at all would mean that there is a high level of risk for the children from diarrhea.

The current study was able to highlight the critical relationship between access to proper sanitation and child health outcomes such as diarrhea in keeping with established scientific knowledge. This critical relationship is also posited by Baker et al. (2014) who demonstrated that an estimated 30-48% reduction in diarrhea incidence can be accrued by promoting hand washing with soap or ash as contaminated hands play a key role in the transmission of diarrhea-related pathogens

Effect of Child Feeding Practices on the Incidence of Diarrhea in Gokwe North

This analysis sought to establish all study variables that are associated with the dependent variable. The analysis does not explain confounding and any relationships between the independent variables themselves. Chi-square tests for association were conducted for each of the independent variables, the results of the analysis are presented in Table 12.

Table 12. Bivariate Analysis on IYCF Practices using Chi-Square Tests

Variable	0-5 Months		6-23 Months	
	Chi-square value	P-value	Chi-square value	P-value
Child being breast fed in addition to other foods	1.014	0.314	2.181	0.140
Dietary diversity	-	-	16.697	0.161
Child fed other foods	10.118	0.001	-	-
Exclusive Breastfeeding	20.041	0.000	-	-
Early breastfeed Initiation	1.138	0.286	-	-
IYCF knowledge	23.378	0.001	37.376	0.001
Nipple Bottle Feeding	12.087	0.001		
Minimum Meal Frequency	-	-	23.625	0.000
Child Vaccination	0.725	0.394	5.855	0.054

For the Early Initiation of Breastfeeding variable, 2 cells (50.0%) had an expected count of less than 5 to assess association between this variable and diarrhea occurrence the Fisher's exact test was used. No significant association was found between early breast-feeding initiation and the occurrence of diarrhea using Fisher's exact test ($p = 0.479$). the rest of the variables were assessed using Pearson's Chi-square test since the cell counts were greater than five.

Several significant associations were noticed between diarrhea incidence and child-feeding practices as illustrated in the bivariate analysis. In the 0 to 5 months age group, variables that were significantly associated with diarrhea were mixed feeding ($p=0.001$), exclusively breastfeeding (0.000), and IYCF knowledge ($p=0.001$). For the 6 to 23 months age group, significant associations were noted with the number of hand washing times ($p=0.035$).

Table 13. Cell Counts for the Bivariate Analysis of IYCF Practices

			Did the child have diarrhea (Case) or Not (Control)			
			0-5 months		6-23 Months	
			Case	Control	Case	Control
Child being breastfed	Yes	Count	-	-	84	93
		Expected Count	-	-	88.5	88.5
	No	Count	-	-	28	19
		Expected Count	-	-	23.5	23.5
Child fed other foods besides breast milk	Yes	Count	13	2	-	-
		Expected Count	7.5	7.5	-	-
	No	Count	24	35	-	-
		Expected Count	29.5	29.5	-	-
Exclusive Breastfeeding	Yes	Count	12	31	-	-
		Expected Count	21.5	21.5	-	-
	No	Count	25	6	-	-
		Expected Count	15.5	15.5	-	--
Early Breastfeeding Initiation	Yes	Count	31	34	-	-
		Expected Count	32.5	32.5	-	--
	No	Count	6	3	-	-
		Expected Count	4.5	4.5	-	--
Nipple Bottle feeding	Yes	Count	19	5	-	-
		Expected Count	12.0	12.0	-	-
	No	Count	18	32	-	-
		Expected Count	25.0	25.0	-	-
Minimum meal frequency	Minimum Recommended	Count	-	-	46	63
		Expected Count	-	-	54.5	54.5
	Less than Recommended	Count	-	-	57	24
		Expected Count	-	-	40.5	40.5
	More than recommended	Count	-	-	9	25
		Expected Count	-	-	17.0	17.0

The current study concurs with several studies which demonstrated a strong association between exclusive breastfeeding and diarrhea incidence. For instance, as discussed earlier 53% of hospital admissions due to diarrhea could be averted if children were exclusively breastfed (Quigley, Kelly, and Sacker, 2007). Also, Gupta et al. (2015) found a diarrhea prevalence of 20.33% in exclusively breastfed infants against an increased 31.57% prevalence in non-exclusively breastfed infants. Whereas

the current study observed a 27.9% prevalence in exclusively breastfed against a high 80.6% prevalence in non-exclusively breastfed children. On the flipside mixed feeding which entails introducing other foods in addition to breast milk to infants under the age of 6 months was also shown to be associated with diarrhea howbeit with a contributory effect.

Part of the reasons why exclusively breastfeeding infants has a protective effect on diarrhea outcomes include the fact that breast milk not only provides protective factors to the infant but also promotes the development of the child's immune system and confers appropriate inflammatory responses (Robinson and Fall, 2012). Islam et al. (2013) also highlighted that the presence of fecal coliforms (bacteria) in weaning food corresponded to the rate of diarrhea occurrence in children. For children who are not exclusively breastfed therefore there is the potential of contamination of the other foods they are being fed with pathogenic microbes which increases their chances of diarrhea. In addition, the other foods being fed can cause inflammation of the intestinal tract in the child thus causing diarrhea. IYCF guidelines have also shown that feeding children other foods reduces their capacity to breastfeed (WHO and UNICEF, 2021) thus reducing their access to critical antibodies, and anti-inflammatory responses present in breast milk. Overall, it contributes to retarded development of the immune system and exposes the infant to the ripple effects of a weakened immune system against diarrhea.

A strong protective effect of exclusive breastfeeding was also demonstrated by Victora et al. (2016) where after pooling the results of three studies in low-income settings they observed that exclusively breastfed children had only a 12% risk of death when compared with children who were not breastfed. It is therefore important

to ensure high levels of exclusive breastfeeding among nursing mothers within the population to reduce the risk of childhood diarrhea.

As the bivariate analysis transitioned from the 0-5 month age group to the 6-23 month children a notable shift was observed in the variables that had significant associations with diarrhea incidence. That is whereas variables with significant association in the former category were to do with infant and young child feeding practices, in the latter category variables that had significant association and to do with water and sanitation hygiene. The only direct IYCF-related practice that had a significant association in the 6-23-month group was minimum meal frequency ($p=0.000$).

There was however no significant association between diarrhea occurrence and vaccination status for both the 0-5 month and the 6-23-month age groups $p = 0.394$ and $p = 0.054$ respectively. According to the Global Alliance for Vaccines and Immunization (GAVI, 2011), more than 40 percent of diarrhea hospitalizations in Africa are due to Rotavirus which is vaccine-preventable. The lack of a significant association in the current study is not to discredit the evidence that the global vaccine experts have brought forward. Rather it may stem from the fact that vaccination coverage was quite high in both the case (85.7%) and the control (95.5%) groups therefore observable differences could be insignificant.

The vaccination coverage observed in both case and control groups in Gokwe North is significantly higher than the impact level PENTA 3 immunization coverage of 80% as set by GAVI (2016). It is this high coverage that is proposed to be masking the effect of vaccination on diarrhea outcomes. The influence of vaccination status maybe easily detectable in settings where there are very low (below 80%) baseline vaccination coverages.

After having identified the independent variables that are significantly associated with the etiology of diarrhea the final analysis was to identify significant predictors of diarrhea in Gokwe North among children 0-23 months. These are factors that could independently be responsible for the occurrence of the dependent variable.

Multivariate Analysis 0-5 Months Age Group

Multivariate analysis was conducted to determine the significant predictors of diarrhea in children of 0-5 months of age. The first step was to include all variables in the model and the results are shown in Table 14 below.

Table 14. All Variables Included in the Regression Model 0-5 Months Group

Variable	COR	95% CI		P-Value
		Lower	Upper	
Caregiver Age	0.910	0.594	1.394	0.663
Parity	3.838	0.264	55.870	0.325
Education				
No schooling	1.00			0.973
Primary	1	0.000	.	0.999
Secondary	49145868.446	0.000	.	1.000
Tertiary	99423639.617	0.000	.	1.000
Occupation				
Farmer	1.00			0.564
Teacher	0.892	0.003	278.937	0.969
Housewife	28083807.840	0.000	.	1.000
Other	0.122	0.000	50.075	0.493
Size Household	0.734	0.386	1.397	0.346
Hand Washing Times	0.831	0.252	2.743	0.762
Blair toilet				
Yes	1.00			
No	11.497	0.383	344.879	0.159
Water Source				
Borehole	1.00			
Shallow well	24.214	0.789	742.682	0.068
Deep well	24.069	0.507	1141.743	0.106
Sand abstraction	78.175	1.422	4298.279	0.033
Water containers				
Bucket with Lid	1.00			

Variable	COR	95% CI		P-Value
		Lower	Upper	
Bucket without Lid	1.577	0.000	7037.712	0.973
Child sex				
Male	1.00			
Female	2.323	0.163	33.146	0.534
Child Age	0.986	0.369	2.634	0.978
Vaccination status				
Yes	1.00			
No	0.041	0.000	7.502	0.230
Breastfeeding				
Yes	1.00			
No	6604.065	0.000	.	1.000
Mixed feeding				
Yes	1.00			
No	5.936	0.116	304.589	0.375
EBF				
Yes	1.00			
No	23.524	0.373	1484.273	0.135
Early Initiation				
Yes	1.00			
No	36.723	0.151	8928.665	0.199
Nipple Bottle				
Yes	1.00			
No	0.024	0.001	.901	0.044
IYCF Knowledge	1.212	1.047	1.403	0.010

In the next step, covariates, which were statistically significant at the first step of the model, and those which had p values less than 0.2 were included in the final multivariate analysis model. The variables which were not statistically significant at alpha 0.05 included access to Blair toilet, water source, vaccination status, exclusive breastfeeding status, and initiation of breastfeeding. The variables were added into the next stage of the regression analysis to improve biological plausibility since some of the prior studies assessed had identified some of these variables as statistically significant predictors of diarrhea incidence.

Table 15. Multivariate Analysis Results for Diarrhea Incidence and Predictor Variables for the 0-5 Month Age Group

Variable	AOR	95% CI Lower	Upper	P-value
Blair Toilet				
Yes	1.00			
No	5.555	0.827	37.303	0.078
Water source				
Borehole	1.00			0.102
Shallow well	8.506	0.809	89.393	0.074
Deep well	10.179	0.762	135.897	0.079
Sand abstraction	20.962	1.769	248.402	0.016
Vaccination				
Yes	1.00			
No	0.359	0.016	8.083	0.519
EBF				
Yes	1.00			
No	6.224	0.821	47.181	0.077
Early initiation				
Yes	1.00			
No	10.380	0.329	327.298	0.184
Nipple Bottle				
Yes	1.00			
No	0.057	0.007	0.483	0.009
IYCF Knowledge	1.148	1.061	1.242	0.001

Significant predictors of diarrhea in children of 0-5 months of age were IYCF knowledge (0.001), water source (0.016), and use of a nipple bottle (0.009). The rest of the variables were not significant predictors of diarrhea incidence in this age group at a 5% level of significance. The results indicate that children from households that had sand abstraction as their source of water were 21 times more likely to suffer from diarrhea when compared to those who used boreholes as their source of water. Children who were fed using nipple bottles were 18 times more likely to experience an episode of diarrhea as compared to those whose caregivers reported not to be using the bottle for feeding.

Multivariate Analysis 6-23 Months Age Group

The first step was to include all variables in the model. The results of the multivariate analysis are shown in Table 16.

Table 16. First Step Involving all Variables in the Regression Model 6-23 Month Group

Variable	COR	95% CI		P-Value
		Lower	Upper	
Caregiver Age	1.054	0.966	1.149	0.235
Parity	0.773	0.511	1.168	0.221
Education				
No schooling	1.00			
Primary	0.00	0.000	0.00	0.999
Secondary	0.00	0.000	0.00	0.999
Tertiary	0.00	0.000	0.00	0.999
Occupation				
Farmer	1.00			0.564
Teacher	0.785	0.167	3.690	0.760
Housewife	0.000	0.000	0.000	0.999
Self-employed	0.638	0.123	3.314	0.593
Other	0.231	0.012	4.279	0.325
Size Household	1.053	0.926	1.198	0.430
Hand Washing Times	1.211	0.866	1.694	0.264
Blair toilet				
Yes	1.000			
No	1.503	0.734	3.077	0.265
Water Source				
Borehole	1.00			
Shallow well	1.313	0.417	4.132	0.642
Deep well	0.479	0.156	1.472	0.199
Sand abstraction	1.638	0.503	5.330	0.413
Water containers				
Bucket with Lid	1.000			
Bucket without Lid	1.444	0.589	3.538	0.422
Child sex				
Male	1.00			
Female	0.000	0.000	0.000	1.000
Child Age	0.927	0.858	1.001	0.053
Vaccination status				
Yes	1.00			

Variable	COR	95% CI		P-Value
		Lower	Upper	
No	0.000	0.000	0.000	1.000
Breastfeeding				
Yes	1.000			
No	0.665	0.254	1.743	0.407
MUAC				
Green	1.000			
At-risk of malnutrition	4375056594	0.000	0.000	0.999
MAM	1741522329	0.000	0.000	0.999
SAM	3499541551	0.000	0.000	0.999
Dietary diversity	1.003	0.985	1.020	0.755
Meal Frequency				
Minimum recommended attained	1.000			
Less than recommended	0.939	0.312	2.821	0.910
More than recommended	0.281	0.082	0.960	0.043
IYCF Knowledge	1.026	1.003	1.050	0.025

Statistically significant variables ($p<0.05$) are IYCF Knowledge, meal frequency, child age, and water source. The variables care giver age, occupation, and hand washing times were added to the second equation for biological plausibility reasons despite them not being statistically significant at alpha 0.05. Below are the results of the final step of multivariate analysis for the age group, 6 to 23 months.

Table 17. Last Step of the Multivariate Analysis for the 6 to 23 Months Group

Variable	AOR	95% CI Lower	Upper	P-value
Meal frequency				
Minimum recommended attained	1.000			
Less than recommended	0.694	0.258	1.868	0.470
More than recommended	0.254	0.090	0.718	0.010
Water source				0.052
Borehole	1.00			
Shallow well	2.516	0.926	6.837	0.070
Deep well	1.027	0.404	2.611	0.955
Sand abstraction	2.453	0.852	0.063	0.096
Occupation				0.406
Farmer	1.00			
Teacher	0.598	0.149	2.395	0.467
housewife	0.155	0.016	1.526	0.110
Self-employed	0.393	0.090	1.724	0.216
Other	0.249	0.016	3.792	0.317
Handwashing times				0.086
No knowledge	1.000			0.086
One critical time identified	0.891	0.180	4.417	0.888
Two critical times identified	0.613	0.218	1.723	0.353
Three critical times identified	1.600	0.611	4.188	0.339
Four critical times identified	2.075	0.838	5.142	0.115
Child age	0.964	0.906	1.026	0.248
Caregiver age	1.011	0.968	1.056	0.617
IYCF Knowledge	1.034	1.014	1.055	0.001

The results indicate that the variables that significantly influence diarrhea incidence for the 6 to 23 months age group are IYCF Knowledge (0.001) and meal frequency (0.004). All the other variables did not have a significant influence on the incidence of diarrhea as shown in the table above. Those with a meal frequency of minimum recommended attained were 4 times more likely to have diarrhea as compared to those who had a meal frequency of more than recommended (p=0.010). IYCF knowledge increase did not have a protective effect on the incidence of

diarrhea. A unit increase in IYCF Knowledge increased the risk of diarrhea slightly by 3.4% (p=0.001).

In the final analysis, the study ascertained that while several nutrition and WASH practices had significant associations with diarrhea outcomes, only four of these variables could be categorically identified as predictors of diarrhea. These are IYCF Knowledge, Water source, meal frequency, and feeding using a bottle with a nipple.

As indicated before children in households that used sand abstraction in rivers as the primary water source (considered to be the most unsafe of the available options) were 21 times more likely to experience an episode of diarrhea (p=0.016) when compared to those that used boreholes. The significance of this finding after adjusting for potential confounders in the logistic regression attests to the critical role that water safety plays in the etiology of diarrhea. Typically, the sand abstraction practiced in most rural communities in Gokwe North involves digging a shallow hole in the dry riverbed from which water is extracted and used for domestic purposes without further processing. This water has gone through an extensive filtration system in the sand however this treatment does not remove contamination with pathogenic microbes.

More than 25% of respondents in the study confirmed using sand abstraction as the primary water source which translates to a very significant proportion of the population. The 2019 Multiple Indicator cluster survey estimated that in the Midlands province where Gokwe North is situated, 26.8% of the population was at high risk of having fecal contamination in their water source of more than 100 E.Coli per 100ml of water. The proportion of the population at risk rose to 37.9% after factoring in water transportation and storage at the household level. Based on the same source,

95.2% of households in the Midlands reported not having any household water treatment method that they were practicing. This was the highest proportion recorded amongst the 10 provinces in the country. Water quality as a predictor for childhood diarrhea, therefore, remains a critical issue among the study population.

Whether or not a child receives the recommended minimum meal frequency for their age is a key indicator in assessing infant and young child feeding practices. The variable is classified into three responses according to WHO (2008) that is minimum recommended attained, below the minimum as well as above minimum. An adjusted Odds ratio of 0.254 (p=0.010) for the above recommended with recommended attained as the reference category indicates that with regards to meal frequency going above the recommended levels was beneficial and protective against diarrhea. Instead of being toxic or having negative effects such as obesity on the child exceeding the recommended meal frequency in this study context is improving the child's nutritional outcomes and reducing their risk of diarrhea.

This could be related to the observation made by Wagris, Seid, Kahssay, and Ahmed (2019) that less than a quarter of children are receiving nutritionally sufficient and diversified foods in the first instance. The more the number of meals the child would take therefore, the more their chances of eating a diverse diet and achieving optimum nutrition status. Reducing both chronic and acute under nutrition has been shown to reduce the prevalence of diarrhea by as much as 32% (Choudhary et al., 2019; Masanja et al., 2019). One key strategy for reducing both chronic and acute malnutrition is by ensuring adequate nutrition through meal frequency. Together with dietary diversity, minimum meal frequency is used to calculate the compound indicator on the minimum acceptable diet.

Children to whom caregivers had practiced feeding fluids using a bottle with a nipple were 18 times more likely to develop diarrhea (p=0.009) than those who had not used such a bottle. Bottle feeding remains a key indicator that WHO monitors as this has often been associated with various illnesses in children. Contamination of the bottles often occurs because it is often difficult to sterilize the nipple properly. The feeding bottle, they further add, is an important factor in the malnutrition- infection cycle, often reported to be a major cause of infant and child mortality. WHO and UNICEF (2021) guidelines for IYCF assessment recommend that a feeding bottle with a nipple should not be used in the feeding of infants at any age. The current research rightfully observed the negative effects of this practice as it emerged as a key risk factor in the etiology of diarrhea.

An observation highlighted in an earlier segment whose analysis will not answer to easy solutions in the current research pertains to the finding that contrary to what was expected, IYCF knowledge did not have a protective effect on the etiology of diarrhea. This finding is very inconsistent with the hypothesized relationship where improving IYCF knowledge was expected to determine the practice of behaviors that are protective against diarrhea. One way to make sense of this anomalous outcome would be to interpret it as implying that IYCF knowledge has no deterministic effect on IYCF practices. The current study did not however attempt to study this relationship partly due to the complexity of combining key IYCF practices into a weighted score that could then be compared with the knowledge score using a correlation analysis for example.

The lack of a significant relationship between these two could stem from the fact discussed earlier that environmental factors do play a critical role in shaping diarrhea outcomes especially as the child transitions at 6 months of age and is

introduced to complementary foods. This position assumes the limits of knowledge that no matter how knowledgeable a caregiver is, if they do not have the necessary environmental support they are not likely to execute the recommended behaviors. Such environmental supports would include a food-secure household, water, and sanitation infrastructure, and access to child vaccination services.

On the other hand, F. A. Ogbo et al. (2018) found that infants aged 6–8 months who had been introduced to complementary foods were more likely to experience an episode of diarrhea when compared to those who had not received any complementary foods. Caregivers who were knowledgeable that at 6 months a child had to be introduced to complementary and did as recommended would most certainly have encountered diarrhea according to F. A. Ogbo et al. (2018) viewpoint. Their knowledge could have placed the children at risk of diarrhea in the absence of proper procedures on how the recommended behavior is to be executed in a manner that is safe for the child. Therefore, in addition to environmental supports the teaching of caregivers on recommended IYCF practices would not be adequate if it does not ensure practical skills transfer to the caregiver.

Based on lessons from Asia, Paintal, and Aguayo (2016) acknowledge that a wide range of factors determines the IYCF knowledge levels of the caregiver and the extent of their ability to practice the recommended behavior. In their recommendation, they suggest the need to build the knowledge, skills, and capacity of community health workers so that they can provide mothers/caregivers with accurate and timely information, counseling, and support on IYCF during and after common childhood illnesses. This is to be combined with large-scale communication strategies that address traditional beliefs and norms that may be harmful. This is a critical

confirmation of the need for knowledge to be accompanied by clear skills and creating a supportive social environment.

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

The research set out to investigate two null hypotheses, the first hypothesis being that there was no significant association between child feeding practices of caregivers and the etiology of diarrhea among children aged 0-23 months in the Gokwe North District of Zimbabwe. The second hypothesis examined by this research was that there is no association between access to improved WASH by households and diarrhea incidence in children aged 0-23 months living in Gokwe North.

The analysis was inspired by the observation that morbidity from diarrhea in Gokwe North District remains high at 16% against a national diarrhea prevalence of 9% among children aged 0 to 59 months. The most affected age group was 0-23 months of age as observed in the Zimbabwe Demographic and Health surveys of 2015. This is despite the demonstrated global commitment toward the end of preventable child morbidity and mortality.

It has been previously demonstrated by the World Health Organization that 54% of the deaths from the leading causes of child mortality including diarrhea are related to malnutrition, mostly in its poverty-mediated form of undernutrition. The current study, therefore, sought to investigate the role that nutrition plays in determining child health outcomes in the Gokwe North district by examining the knowledge and practices of primary caregivers in the feeding of children under the age of two years.

A matched case-control study methodology was used in the assessment to compare differences between the child-feeding practices of those who developed diarrhea against those who did not. Matching was done in the assessment to control for confounding. However, a matched pairs analysis was not done in the current study as the researcher lack the necessary logistical capacity to handle the collection and processing of data in its matched pairs form.

The conditions for inclusion into the study included being the caregiver of a child who was aged 0-23 months at the time of the interview; the child would have experienced an episode of diarrhea in the two weeks before the interview; both the mother or caregiver and the child had to be usual residents of Gokwe North District and the caregiver had to give verbal consent to participate in the interview after the protocol had been explained to them. If the diarrhea had a known medical cause or was a known side-effect of treatment that the child was taking the caregiver was excluded from the study as diarrhea episodes of such origin would confound the situation.

Since the recommended feeding practices differ between the 0-5 months and the 6-23 months age groups, the two strata were analyzed separately in the study in Gokwe North District. Data was collected separately and processed separately for each stratum. No comparison was made about the etiology of diarrhea in children under 6 months versus those age 6-23 months. The way the findings are presented for the two strata is simply to indicate what the key risk factors and protective factors were for each stratum and the trends in IYCF practices and not necessarily to compare the two strata.

In the bivariate analysis, it was found that variables that were significantly associated with diarrhea among infants in the 0-5 months age group were mixed

feeding, exclusively breastfeeding, number of hand washing times, IYCF Knowledge of the mother, and bottle feeding. For the 6-23 months age group, variables that were significantly associated with diarrhea included meal frequency; access to improved pit latrine, source of water for household use, type of container used, Mid Upper Arm Circumference, and IYCF Knowledge of the mother.

Both Infant and Young Child Feeding practices, as well as Water, Sanitation, and Hygiene related factors, have a bearing in determining diarrhea outcomes in Gokwe North and these also interact with each other to maximize or minimize the effect (confounding). After adjusting for confounding in the multivariate analysis the key variables which remained significantly associated with diarrhea outcomes were bottle feeding, water sources, and IYCF knowledge scores of mothers in the 0-5 months age group. Meal frequency and IYCF knowledge scores remained significantly associated with diarrhea in the 6-23 months age group after adjusting for confounding.

Giving a child more meals than the recommended age was found to be protective against diarrhea. A protective effect was also noted from using boreholes as the main source of water for household use as compared to sand abstraction. Children from households that used sand abstraction were 21 times at greater risk of diarrhea than those that used boreholes. Feeding a child using a bottle with a nipple increased the child's risk of diarrhea 18 times more than those who did not use bottle feeding.

It remained however unclear why IYCF knowledge could not provide the expected protection against diarrhea. Increasing the mother's IYCF knowledge score did not provide a corresponding increase in protection against diarrhea for the child. The failure to demonstrate the protective effect of IYCF knowledge of the caregiver may emanate from the fact that for both the case and control groups the knowledge

level though different was still lower than the Food and Agricultural Organization recommendation of at least 70% for there to be impact in improving child health outcomes.

Conclusion

Based on the findings presented above the researcher rejects the null hypotheses that infant and young child feeding practices of caregivers as well as access to improved Water, Sanitation, and Hygiene had no significant relationship with the etiology of diarrhea among children 0-23 months of age in Gokwe North district of Zimbabwe.

It is concluded that significant associations exist between some infant and young child feeding practices and the etiology of diarrhea and the key variables with such associations have been summarized as above. The research also highlighted the critical role that access to proper water, sanitation, and hygiene, particularly household water safety played in predicting the odds of diarrhea.

In conclusion, it is key to note that both IYCF and WASH Practices are associated with the occurrence of diarrhea in under-five children, particularly the 0-23 month age group. IYCF practices mostly affected the 0-5 age range whereas as the child grows further into the 6-23 months range WASH-related factors have a greater influence in determining diarrhea outcomes.

Recommendations

Given the above findings, the foregoing discussions, and how some of these findings resonate with scientific evidence as put forward by studies in other related contexts, the researcher presents some recommendations to health promotion, nutrition, and WASH programmers in the Gokwe North district that may be critical in reducing the risk of diarrhea among 0-23 months infants.

To begin with, the researcher recommends that the departments of health strengthen the promotion of affordable IYCF practices chiefly exclusive breastfeeding. The research has highlighted the important role that exclusive breastfeeding plays in ensuring the protection of infants against diarrhea episodes. Since breast milk is often the most readily available food communities and caregivers will need to appreciate the importance of this readily available source of infant feeding and make the best use of it. The proportion of mothers practicing exclusive breastfeeding remains low both in the study and the general population yet this is a cost-effective and proven means of improving child diarrhea outcomes. Exclusive breastfeeding presents a high-impact low-cost intervention whose promotion can go a very long way in reducing diarrhea risk even beyond the first six months of life.

Given the high efficacy that exclusive breastfeeding has in priming the infant against diarrhea, the researcher recommends that more evidence be gathered as to why this life-saving intervention is being practiced by only 40% of mothers in the current study and 51% of mothers in Gokwe North district (Food and Nutrition Council, 2018). Such evidence will be key in the formulation of specific interventions for breastfeeding promotion. Another area that may need dedicated attention in such efforts is the improvement of knowledge on infant and young child feeding knowledge. The low mean knowledge scores among both control and case groups in the current study may mean that mothers are not aware of the critical role exclusive breastfeeding and breastfeeding in general plays in strengthening their children's defenses against infection resulting in them not prioritizing it.

Since the study has revealed that the distribution of IYCF knowledge is such that within the same community there are mothers who have very good knowledge levels and those with poor knowledge levels, the IYCF education sessions could

follow the positive deviance strategy. The positive deviance strategy is an approach to adult learning that provides a platform for knowledge transfer where those members of the group who are performing poorly on a given subject area in this case breastfeeding knowledge and practice, can learn from their counterparts who have similar backgrounds but are performing well with regards to the recommended breastfeeding behaviors. This makes the knowledge applicable and raises the learner's self-efficacy which as outlined in the conceptual framework of this study is a critical part of social learning theory. As highlighted in the discussion above, the promotion of breastfeeding must not focus only on exclusive breastfeeding but must also emphasize the importance of continued breastfeeding for up to two years.

Another recommendation that is derived from the study findings is that for communities with low dietary diversity such as those in this study, the promotion of meal frequency should go beyond the recommended levels. The study revealed that those infants who were fed several meals which is more than the recommended for their age had a protective advantage against diarrhea. Increasing the number of meals, a child takes will most likely improve their chances of them accessing a diversified diet thus improving their nutrition status.

In the promotion of appropriate IYCF practices, I recommend that programmers go beyond the mere delivery of health education as the study has shown that knowledge alone will not provide the desired practice. This could be achieved through participatory methodologies that demonstrate the actual processes of executing the behavior. In addition, strategies for follow-up should be incorporated into the delivery of IYCF education until the caregivers have acquired and maintained the behaviors. The promotion of appropriate IYCF practices should also address

community-wide factors in the social environment that will pave the way for caregivers to execute the recommended practices.

Another area that will demand critical attention pertains to the promotion of point-of-use water safety practices. Since a significant proportion of the participants were using unimproved water sources such as sand abstraction there is a need for the population to use strategies to improve water safety once it's at the point of use. Strategies such as chlorination using water treatment chemicals, filtration and boiling as well as solar disinfection can be promoted. It would be necessary to set up community health clubs specifically for caregivers of children 0-23 months where they can be engaged in the participatory health and hygiene education curriculum.

The overall observation is that there is a need for the design and implementation of targeted high-impact interventions if caregivers are to adopt the recommended practices that improve child diarrhea outcomes. In some of the areas studied here, the WASH situation is so dire that the communities there would need external support in the setting up of safe water sources such as boreholes. In the long term, such areas would need prioritization when donor and humanitarian agencies working in the area of water and sanitation are secured to work in the district by the local authorities. In the short term, such communities would need to be assisted with safe water storage containers which can be issued to every woman who delivers at a health facility to reduce the chances of contamination of the water used in the care of the infant.

Suggestions for Future Research

The researcher recommends that as a follow-up to the current research, there is a need to conduct a qualitative study that would inform the reasons behind the actual practices that were reported in the current study. For example, the study showed that

EBF rates in Gokwe North were at 40% against a target of at least 50% by 2025. Unearthing reasons for the current performance could give program developers a more comprehensive appreciation of the behavioral determinants. These determinants of behavior can then be targeted to ensure they develop relevant interventions to improve the uptake of recommended IYCF practices and help reduce the risk of diarrhea among infants 0-23 months of age.

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APPENDICES

APPENDIX A

LETTER OF AUTHORIZATION

AUA
Adventist University of Africa

Private Bag Mbagathi
00503 Nairobi, Kenya
Tel (254) 254 733-
333-451/452
Fax: (254) 20 660 3150
Email: info@aua.ac.ke
WEB: www.aua.ac.ke

Location:
Advent Hill, Magadi Road, Ongata Rongai

January 23, 2020

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

INTRODUCTION OF CHIKETA TAKUDZWANASHE MOSES

Greetings from the Adventist University of Africa (AUA), Kenya. This letter is to introduce to you **Chiketa Takudzwanashe Moses** who is a student at the Adventist University of Africa, School of Postgraduate Studies located in Ongata Rongai, Kenya with student identification number **S2018091** offering Master of Public Health degree at AUA.

Moses is currently undertaking a research leading to the production of a thesis on the subject: "***Caregiver's feeding knowledge and practices, in relation to etiology of diarrhea among children aged 0-23 months in Gokwe North District***". As part of the research process, he needs to conduct a survey by distributing questionnaire. His proposal has been approved by the research panel and he is ready to gather data for his study.

May I request your kind assistance in granting Moses whatever help he may need to enable him gather data for his research work. Be assured that any information that Moses will gather for his research will be treated in the strictest confidence and none of his participation.

Thanking you in advance for your assistance and support in furthering this research endeavor.

Yours faithfully,

Dr. Daniel Ganu
Dean, School of Postgraduate Studies

DISTRICT MEDICAL OFFICER
GOKWE NORTH DISTRICT HOSPITAL
2020 -02- 1
P.O. BOX 162, NEMBUDZIYA
ZIMBABWE

APPENDIX B

INFORMED CONSENT

Student researcher: CHIKETA TAKUDZWANASHE M
Title of project: Caregiver's feeding knowledge and practices, about etiology of diarrhea among children aged 0-23 months in Gokwe North district
I am taking this study as a requirement of the Master in Public Health degree program that I am undertaking at the Adventist University of Africa. I am asking for your voluntary participation in my research work. Please read the following information about the research and if you would like to participate, please sign in the appropriate box below.
Purpose of the research project: To examine the nutrition-related factors responsible for the prevalence of diarrhea in under-fives
Time required for participation: You will need roughly thirty minutes to answer the questionnaire
Risks: This research has no conspicuous risks, yet you may encounter some discomfort from the personal questions being asked.
Benefits: Contribution to the body of knowledge on Nutrition and Hygiene interactions.
How confidentiality will be maintained: Any information that is given by you will be viewed as private, and it will be accessible just to the researcher. Information you give won't be discharged without your consent. After the study, it will be destroyed. If you have any questions about this study, feel free to contact me at (Phone +263777733378). Email: takudzwanashem@aua.ac.ke
Voluntary participation: Your participation in this study is entirely voluntary. If you decide not to participate no negative consequences will occur to you. Please be aware that if you decide to participate, you are free to stop participating at any time and you may decide not to answer any particular question.
By signing this form I am attesting that I have read and understand the information above and I freely give my consent to participate or permission for my child to participate.
Adult informed consent: Date reviewed: _____. Signed: _____
Printed Name (Optional): _____

APPENDIX C

QUESTIONNAIRE

Socio-demographic, Knowledge, and Practices questionnaire for caregivers

SECTION 1: DETAILS OF CAREGIVER		
1. Name and code	What is your name?	*Respondent code*
	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _
2. Sex	*Insert the sex of the caregiver*	Male □ Female □
3. Relationship	What is your relationship with the child you take care of?	Mother □ Father □ Grandparent □ Other □ Specify: ……
4. Caregiver's age	When is your birthday? *Probe if necessary*: On what day and in which month and year were you born?	_ _ / _ _ /_ _ _ _ day month year
	How old are you?	Age in years ____
5. Parity (only for women)	How many children do you have? *For pregnant women: ask if this is her first pregnancy*	Number of children _ _ First pregnancy □
6. Geographical characteristics	Where do you live?	□Ward _____ □Village _____
7. Educational level	Have you ever attended school? *If yes, continue asking*: What is the highest level of school you attended?	None □ Primary school □ Secondary school □ Higher □
	What is the highest grade/form/year you completed at that level?	Grade _ _
8. Caregivers' Occupation	What is your Occupation?	.....
9. Family Size	How many people stay in this household?	……..…..
10. Hand washing	At what times do you usually wash your hands? (caregiver should identify the five critical times)	After Using the toilet □ After removing diaper □ Before handling food □ Before eating □ Before breastfeeding □

10. WASH Infrastructure	Which type of toilet do you use as a household?	Blair Toilet ☐ None ☐
11. Water Source	Where do you fetch water for household consumption?	Borehole ☐ Shallow well ☐ Deep well ☐ Sand abstraction ☐ Other _____
12. Water Safety	What type of containers do you use for fetching water?	Bucket with lid ☐ Bucket without lid ☐ Other: _____
SECTION 2: DETAILS OF THE CHILD		
1. Child's sex	Is **the** child male or female?	Male □ Female □
2. Child's age	When is your child's birthday? Does he/she have a health/vaccination card with the birth date recorded? *If yes, record the date of birth as documented in the card*	_ _ _ _ / _ _ / _ _ year month day
3. Diarrhea	*Did the child ever experience an episode of diarrhea over the past two weeks?*	Yes ☐ No ☐
4. Vaccination Status	*Is the child up to date with their age-specific vaccination status. (ask to see immunization card)*	Yes ☐ No ☐ Primary Course Complete ☐

NOTE: IN ADDITION TO THE DEMOGRAPHIC DATA, FOR INFANTS 0 – 5 MONTHS CAREGIVER IS TO RESPOND TO QUESTIONS IN MODULE ONE AND FOR CHILDREN 6-23 MONTHS CAREGIVER IS TO RESPOND TO QUESTIONS IN MODULE TWO.

MODULE 1: FEEDING INFANTS (0–6 MONTHS)

Practices

Question P.1: Breastfeeding

Was the baby breastfed yesterday during the day or at night?

Yes

No

Don't know/no answer

P.2: Feeding breast milk

Did your baby consume Breast milk by spoon, cup, or bottle yesterday during the day or night?

Yes

No

Don't know/no answer

Question P.3: Feeding breast milk when the mother is absent

i) When you are not home or cannot feed the baby yourself, who does it?

Father

Grandmother

Other children
Other_____
Don’t know/no answer
ii) If you are not there to feed the baby, what type of food is the baby fed?
Breast milk by spoon, cup, or bottle
Infant formula by spoon, cup, or bottle
Other liquids

Question P.4: Introducing liquids

Next, I would like to ask you about some liquids that the baby may have had yesterday during the day or at night.
Did your baby have any of the following liquids?
A. Plain water
Yes□
No□
Don’t know
C. Milk, such as tinned, powdered, or fresh animal milk
Yes
No
Don’t know
D. Juice or juice drinks
Yes
No
Don’t know
E. Clear broth
Yes
No
Don’t know
Don’t know
G. Thin porridge
Yes
No
Don’t know
H. Any other liquids such as (*list other water-based liquids available in the local setting*)
Yes
No
Don’t know
I. Any other liquids
Yes
No
Don’t know

Question P.5: Initiation of breastfeeding

How long after birth did you first put the child to the breast?
Immediately after birth.
If less than 1 hour, write ‘00’ for hours.
If 1-24 hours, record the number of completed hours from 1 to 23.
Otherwise, record the number of completed days.
Don’t know.

Question P.6:

In the first 3 days after delivery, was the child given anything to drink other than or in addition to breast milk?
Plain water
Sugar water or glucose water
Powdered or fresh animal milk
Infant formula (add locally available brand names)
Other (specify): _____

Question P.7:

Did the child drink anything from a bottle with a nipple yesterday or last night?
Yes
No
Don't know

Knowledge

Question K.1: Breast milk at birth
What is the first food a newborn baby should receive?
Only breast milk
Other: _____
Don't know
Question K.2: Recommended length of exclusive breastfeeding
Until what age is it recommended that a mother feeds nothing more than breast milk?
From birth to six months
Other: _____
Don't know
Question K.3: Breast milk is sufficient for babies from birth to six months old
Why do you think breast milk is the only food recommended for infants up to six months old?
Because breastmilk provides all the nutrients and liquids a baby needs in its first six months
Because babies cannot digest other foods before they are six months old
Other: _____
Don't Know
Question K.4: Frequency of feeding
How often should a baby younger than six months be breastfed or fed with breast milk?
On-demand, whenever the baby wants
Other: _____
Don't know
Question K.5: Benefits of exclusive breastfeeding for babies
What are the benefits for a baby if he or she receives only breast milk during the first six months of life?
He/she grows healthily
Protection from diarrhea and other infections
Protection against obesity and chronic diseases in adulthood
Protection against other diseases. Specify _____
Other: _____
Don't know
Question K.6: Benefits of exclusive breastfeeding for mothers
What are the physical or health benefits for a mother if she exclusively breastfeeds her baby?
Delays fertility

Helps her lose the weight she gained during pregnancy
Lowers risk of cancer (breast and ovarian)
Lowers risk of losing blood after giving birth (less risk of post-partum hemorrhage)
Improves the relationship between the mother and baby
Other: _____
Don't know
Question K.7: Maintaining breast milk supply
Many times, mothers complain about not having enough breast milk to feed their babies.
Please tell me different ways a mother can keep up her milk supply.
Breastfeeding exclusively on demand
Manually expressing breast milk
Having good nutrition/eating well/having a healthy or diversified diet
Drink enough liquids during the day
Other: _____
Don't know
Question K.8: Overcoming barriers to breastfeeding
Many mothers need to work and are separated from their babies. In this situation, how could a mother continue feeding her baby exclusively with breast milk?
By Expressing breast milk by hand, storing it, and asking someone to give breast milk to the baby
Other: _____
Don't know
Question K.9: Seeking health care if breastfeeding difficulties arise
If a mother has difficulties feeding breast milk what should she do to overcome them?
Seek professional help from healthcare services: doctors, nurses, midwives, or other health professionals
Other: _____
Don't know

Module 2: Feeding young children (6–23 months)

MUAC Measurement: _____
Practices
Question P.1: Continued breastfeeding
Was your baby breastfed or did he or she consume breast milk yesterday during the day or at night?
Yes
No
Don't know/no answer
Question P.2: Dietary diversity
Yesterday during the day or at night, did the child eat any of the following foods?

Group	Food lists	No	Yes
Group 1: Grains, roots, and tubers	Porridge, bread, rice, noodles, or other foods made from grains		
	White potatoes, white yams, manioc, cassava, or any other foods made from roots		
Group 2: Legumes and nuts	Any foods made from beans, peas, lentils, nuts, or seeds		

Group 3: Dairy products			
	Milk, such as tinned, powdered, or fresh animal milk		How many times? |___||___|
	Yogurt or drinking yogurt		How many times? |___||___|
	Cheese or other dairy products		
Group 4: Flesh foods	Liver, kidney, heart, or other organ meats		
	Any meat, such as beef, pork, lamb, goat, chicken, or duck		
	Fresh or dried fish, shellfish, or seafood		
	Grubs, snails, or insects		
Group 5: Eggs	Eggs		
Group 6: Vitamin A fruits and vegetables	Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside		
	Any dark green vegetables		
	Ripe mangoes (fresh or dried [not green]), ripe papayas (fresh or dried), musk melon **[**		
	Foods made with red palm oil, red palm nut, or red palm nut pulp sauce		
Group 7: Other fruits and vegetables	Any other fruits or vegetables		
Others (not counted in the dietary diversity score)	Any oil, fats, butter, or foods made with any of these		
	Any sugary foods, such as chocolates, sweets, candies, pastries, cakes, or biscuits		
	Condiments for flavor, such as chilies, spices, herbs, or fish powder		

The baby does not consume any food other than breast milk

Question P.3: Minimum meal frequency

How many times did the child eat foods that is meals and snacks other than liquids yesterday during the day or at night?

Number of times: _____

Don't know/no answer

Minimum meal frequency attained?

Less than recommended

The minimum number of times each day

More than recommended

KEY: Recommended for minimum meal frequency:

For breastfed children:

2–3 times for breastfed infants 6–8 months

3–4 times for breastfed infants 9–23 months
For non-breastfed children:
4 times for non-breast-fed children 6–24 months (including milk feeds, identified in question P2, Group 3)

Knowledge

Question K.1: Continued breastfeeding
Until what age is it recommended that a mother continues breastfeeding?
Six months or less
6–11 months
12–23 months
24 months and more (correct response)
Other: _____
Don't know

Question K.2: Age of start of complementary foods
At what age should babies/children start eating foods in addition to breast milk?
At six months
Other
Don't know

Question K.3: Reason for giving complementary foods at six months
Why is it important to give foods in addition to breast milk to babies from the age of six months?
Breast milk alone is not sufficient (enough)/cannot supply all the nutrients needed for growth/from six months, baby needs more food in addition to breast milk
Other: _____
Don't know

Question K.5: Dietary diversity and ways of enriching porridge
To feed their children, many mothers give them porridge. Please tell me some ways to make porridge more nutritious or better for your baby's health.
Which foods or types of food can be added to porridge to make it more nutritious?
Animal-source foods (meat, poultry, fish, liver/organ meat, eggs, etc.)
Pulses and nuts: flours of groundnut and other legumes (peas, beans, lentils, etc.), sunflower seed, peanuts, soybeans
Vitamin-A-rich fruits and vegetables (carrot, orange-fleshed sweet potato, yellow pumpkin, mango, papaya, etc.)
Green leafy vegetables (e.g. spinach)
Energy-rich foods (e.g. oil, butter/ghee)
Other: _____
Don't know

Question K.6: Responsive feeding
Do you know any ways to encourage young children to eat?
Giving them attention during meals, talking to them, making meal times happy times clap hands
make funny faces/play/laugh
demonstrate opening your mouth very wide/modeling how to eat
say encouraging words
draw the child's attention
Other: _____
END OF QUESTIONNAIRE

APPENDIX D

CURRICULUM VITAE

CHIKETA TAKUDZWANASHE MOSES (Mr)
Health Education & Promotion Practitioner
CAREER OBJECTIVE: To empower Individuals, Families, and Communities with health knowledge and facilitate sustainable behavior change through participatory community-led innovations. In the process developing and implementing high-impact interventions for the emancipation of marginalized rural women and children.
SKILLS
Community mobilization
Program planning
Stakeholder analysis
Project Monitoring
Community Capacity Development
Proficiency in Computer packages: SPSS, DHIS2, Microsoft Office Suite, Adobe Photoshop, and Corel Draw
Clean Class four Driver's license
EXPERIENCE
Acting Provincial Health Promotion Officer April 2020 – November 2020
Ministry of Health and Child Care **– Midlands**
Supported Health Promotion Personnel in 8 districts in the design and implementation of district-specific Risk communication strategies for the COVID-19 response.
Technical lead in the development and implementation of Capacity development training for health workers in risk communication.
Collected daily input from 8 districts on Covid19 risk communication and drafted provincial situation reports daily.
Developed and disseminated program monitoring tools for risk communication teams in the 8 districts including cloud-based activity trackers.
Represented the Ministry of Health at various provincial and national review and planning meetings across different program areas.
Successfully implemented the National Knowledge Attitudes and Practices Survey on COVID-19 in the province. Learning is subsequently used to inform risk communication strategies.
District Health Promotion Officer, Gokwe North DistrictOctober 2016 – To date
Ministry of Health and Child Care
Responsible for overall support to all 22 health facilities and health teams in the development and delivery of health education at the health facility and community level.
Led in drawing Monthly and Quarterly demand creation and community mobilization plans for different health programs.

Coordinated with the Community Nursing and Health Information departments in the planning and conducting annual Data Quality Audits for the EPI program which generated a lot of learning for program strengthening.
Conducted Data collection and analysis for monitoring priority indicators under the Results Based Financing model at Primary Health Care Level. Subsequent use of such data for improvement of health care delivery system.
Conducted on-site data verifications for clinics. Helped identify bottlenecks in data flow and worked with health staff and district health information officer to address challenges
Conducted supportive supervision and job mentorship for health facility staff in Nutrition, Maternal and Child Health, TB as well as HIV programming.
Did Data Collection and Collation for various national-level surveys in the district including Lot Quality Assessment (2017), National Nutrition Survey (2018), Covid19 Rapid Assessment (2020), VMMC Demand Creation Randomized Controlled Trial (2017), and Life-course Immunization Project End line survey (2019)
Was a Provincial trainer for the Integrated Disease Surveillance and Response and have facilitated various such pieces of training at provincial and district levels.
Conducted Capacity building of Community-Based Organizations (CBOs) in HIV and Child Protection through training and knowledge transfer strategies in partnership with National AIDS Council.
Drew up weekly, monthly, and quarterly health promotion reports on various agreed performance indicators that were instrumental in guiding decision-making and program implementation in the district.
Successfully engaged in proposal writing and preparation of funding requests for health campaigns and emergency response, e.g. EPI Catch-up campaigns 2018-19 and VMMC Push plans.
Participated in District Health Executive planning and management meetings for program coordination and integration on a routine basis.
EMPLOYER: CARE International Zimbabwe
TITLE: WASH Graduate Intern
DUTY STATION: CHIVI District
DURATION: August-September 2016
RESPONSIBILITIES
Collecting input to feed into the revision, updating, and consolidation of the project work plans in preparation for sharing with project partners.
Raising procurement requests in line with the procurement and work plans and following up for timely delivery.
The support project team in conducting PHHE training and Demand Led Sanitation programming.
Preparing liquidations for project/travel advances and updating the internal project expense tracking system.
Participating in the development and application of monitoring and evaluation tools and reporting systems.
CAPACITY DEVELOPMENT CONSULTANCY
Was the Assistant Provincial Trainer in the Community Working Group on Health consultancy for the training of Health Centre Committees in Results Based financing.
Scope of consultancy: Focused on five districts of Masvingo Province namely Gutu, Bikita, Zaka, Masvingo, and Chivi.
Duration: (January-April 2015)
Achievement:

Successfully coordinated with Provincial and District level stakeholders in the planning and implementation of capacity development training in all five districts completing the task on time and having trained committees from all health facilities.

EDUCATION

Bachelor of Social Sciences Special Honors In Monitoring and Evaluation
September 2020
Lupane State University (ZWE)

BSc Health Education and Health Promotion July 2014
University of Zimbabwe (ZWE)

Master of Public Health Due for completion in 2023
Adventist University of Africa (KE)

Languages
Shona: Native Speaker, Reader, Writer
English: Fluent Speaker, Reader, and Writer

REFEREES

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APPENDIX E

MAP OF GOKWE NORTH DISTRICT

The red points indicate health facilities where data collection was conducted.