EFFECTS OF DIFFERENT FEEDING OPTIONS ON INFANTS BORN TO HIV POSITIVE MOTHERS IN NAKURU MUNICIPALITY, KENYA

JUDITH JELAGAT SAWE
REG NO: I57/0L/1068/03

DEPARTMENT OF PUBLIC HEALTH

A research thesis submitted in partial fulfillment of the requirements for the award of the degree of Master of Public Health in the School of Health Sciences of Kenyatta University.

NOVEMBER, 2010
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature Date

__________________ ______________________
Judith Jelagat Sawe
I57/OL/1068/03

Supervisors: This thesis has been submitted for review with our approval as University Supervisors.

Signature Date

__________________ ______________________
Dr. Okello Agina
Department of Public Health/Obstetrics & Gynaecology /KU

Signature Date

__________________ ______________________
Dr. Elizabeth Kamau-Mbuthia
Department of Food, Nutrition and Dietetics / Egerton University.
DEDICATION

I wish to dedicate this work to my beloved daughter Jerioth Jebet Namwaya for the perseverance she upheld at her tender age during my studies.
ACKNOWLEDGEMENTS

I take this opportunity to thank the following for assisting me complete my studies; The School of Health Sciences and Department of Public Health for every support, care and guidance during my study in Kenyatta University. I also wish to sincerely thank my supervisors, Dr. Okello Agina and Dr Elizabeth Kamau-Mbutia; and also Dr Joseph Wamutitu (Faculty of Education- Egerton University) for their wisdom, patience, understanding, and invaluable guidance they provided throughout the period of study.

I cannot forget to thank Dr. Paul K. Mbugua (Botany Department - K.U) and his family, for their encouragement, support and prayers.

I wish to also appreciate Provincial General Hospital Medical Superintendent Dr. G.O Mugenya, Dr. B. Etemesi and the entire research committee for their support and for allowing me to collect data in their center. I wish also to thank the officers in charge of Langalanga and Kapkures Health Centers for doing the same.

Finally, I would like to thank my research assistants and the caretakers (some of whom have become my good friends) for giving consent to participate in the study. Without them I could not have done much.

God bless you all.
TABLE OF CONTENTS

DECLARATION ........................................................................................................ ii
DEDICATION ................................................................................................. iii
ACKNOWLEDGEMENTS .................................................................................. iv
TABLE OF CONTENTS .................................................................................... v
LIST OF TABLES............................................................................................... viii
LIST OF FIGURES ........................................................................................... ix
ACRONYMS AND ABBREVIATIONS ............................................................... x
ABSTRACT ........................................................................................................ xi

CHAPTER ONE: INTRODUCTION ................................................................... 1
  1.1: Background Information ....................................................................... 1
  1.2: Statement of the Problem ..................................................................... 3
  1.3: Justification of the study ..................................................................... 3
  1.4: Research Question .............................................................................. 4
  1.5: Hypothesis .......................................................................................... 5
  1.6: Broad Objectives of the study ............................................................... 5
  1.7: Specific Objectives of the study ............................................................ 5
  1.8: Assumptions of the study .................................................................. 5
  1.9: Significance of the study .................................................................... 6
  1.10: Delimitations and Limitations of the study ......................................... 6
  1.11: Operational Definitions of Terms ....................................................... 6

CHAPTER TWO: LITERATURE REVIEW ......................................................... 10
  2.1: Overview of infant feeding .................................................................. 10
  2.2: Benefits of Breastfeeding .................................................................... 10
  2.3: Role of PMTCT on choice of Infant Feeding ......................................... 12
  2.4.0: Infant Feeding options for HIV Positive mothers ............................. 12
  2.4.1: Exclusive Breast feeding ................................................................. 13
  2.4.2: Wet Nursing .................................................................................... 14
  2.4.3: Heat Treated Breast Milk ................................................................. 14
  2.5.0: Exclusive Replacement Feeding ....................................................... 15
  2.5.1: Infant Formula ............................................................................... 17
  2.5.2: Animal Milk ................................................................................... 19
  2.6.0: Infant Feeding and HIV Transmission .............................................. 20
  2.6.1: Strategies for Reducing Transmission of HIV ................................. 21

CHAPTER THREE: MATERIALS AND METHODS ......................................... 23
  3.1 Study Design ....................................................................................... 23
  3.2 Study Area .......................................................................................... 23
  3.3 Variables ............................................................................................. 23
  3.4 The Target Population ......................................................................... 23
  3.5 The Study Population .......................................................................... 24
    3.5.1 Inclusion Criteria ........................................................................... 24
3.5.2 Exclusion Criteria ................................................................. 24
3.6 Sampling Procedure .................................................................. 25
  3.6.1 Sample size determination .................................................. 25
3.7: Research Instruments ................................................................ 26
3.8: Pre-testing the Instrument ........................................................ 26
  3.8.1 Validity ............................................................................... 27
  3.8.2 Reliability ............................................................................ 27
3.9: Data Quality Control .................................................................. 27
  3.9.1: Data collection procedure .................................................. 27
  3.9.2: Data Analysis ..................................................................... 28
3.10: Ethical Consideration ............................................................. 29

CHAPTER FOUR: RESULTS AND DISCUSSION ........................................ 30
4.1: Demographic characteristics of caregivers ............................... 30
  4.1.1: Maternal education distribution ......................................... 31
  4.1.2: Income level and occupation distribution ......................... 31
  4.1.3: Maternal age and number of children .................................. 31
4.2: Caregivers’ knowledge regarding Infant feeding options ............ 32
  4.2.1: HIV Counseling and Testing ............................................... 32
  4.2.2: Caregivers knowledge on infant feeding recommendations .... 33
4.3: Infant Feeding Options ............................................................ 36
  4.3.1: Exclusive Breastfeeding .................................................... 36
  4.3.2: Mixed Feeding ................................................................. 37
  4.3.3: Infant Formula Feeding ...................................................... 40
  4.3.4: Animal milk ..................................................................... 41
  4.3.5: Wet Nursing ..................................................................... 43
  4.3.6: Heat treated breast milk .................................................... 44
4.4: Factors Influencing the Choice of Infant Feeding options by HIV Positive Mothers ........................................ 44
  4.4.1: Cost .................................................................................. 44
  4.4.2: Perception of MTCT .......................................................... 46
  4.4.3: Cultural Beliefs, Maternal Illness or Death ......................... 46
  4.4.4: Inaccessibility and Inconvenience in Preparation of Replacement Foods .................................................. 47
  4.4.5: Ignorance .......................................................................... 48
  4.4.6: Stigma and family pressure ............................................... 49
  4.4.7 Maternal age ................................................................. 49
  4.4.8: Maternal parity ............................................................... 51
4.5.0: Effects of the Chosen Feeding Options. ................................. 51
  4.5.1: Distribution of Infants by sexes ........................................... 51
  4.5.2: Mean weight of infants ...................................................... 52
  4.5.3: Association between chosen feeding options and infant nutritional status .............................................. 54
  4.5.4: Association between feeding options and infant morbidity ... 55
LIST OF TABLES

Table 4.1: Demographic characteristics of caregivers ..................................................30
Table 4.2: Relationship between Centers and Exclusive Breastfeeding .................37
Table 4.3: Other foods given with breast feeding .........................................................38
Table 4.4: Relationship between Caregivers who Preferred Mixed Feeding and
Caregivers who Practiced ..............................................................................................39
Table 4.5: Foods given to infants in addition to breast feeding ....................................39
Table 4.6: Relationship between Caregivers’ Income level and Feeding Option ....45
Table 4.7: Relationship between Educational Level and the Feeding Options ........49
Table 4.8: Relationship between Caregiver’s Age and Chosen Feeding Options ....41
Table 4.9: Relationship between Maternal Parity and Infant Feeding Options .............51
Table 4.10: Relationship between infant feeding options and nutritional status ........54
Table 4.11: Relationship between infant illnesses and chosen feeding options ....56
LIST OF FIGURES

Figure 4.1 Caregivers’ knowledge of replacement feeding..........................35
Figure 4.2 Feeding options given to babies after birth.................................36

No table of figures entries found.
CHAPTER ONE: INTRODUCTION

1.1: Background Information

HIV infection continues to be an issue of major concern globally, the worst hit part being Sub-Saharan Africa. Despite evidence that prevention programs instituted years back are beginning to have an impact in some countries, the HIV/AIDS pandemic continues to grow. By 2007, about 33.2 million people were living with HIV/AIDS globally; among these, 68% (about 22.5 million) lived in the developing world, mostly in Sub-Saharan Africa (WHO, 2007). In Kenya, statistics showed that approximately 1.4 million adults were HIV infected. In addition, more women were infected (8.7%) compared to the men who accounted for 5.6% (KAIS, 2007). This implies that children born to these women will continue to be infected by HIV/AIDS unless preventive measures are put in place. Furthermore, about 102,000 children aged less than 14 years were reported to be infected with HIV/AIDS (NACC, 2006).

Recent estimates indicate that about 10% of the reported AIDS cases in children are less than 5 years of age and that over 90% of the HIV infection in children are due to maternal to child transmission (Ministry of Health, 2005). The virus may be transmitted during pregnancy, labour, at delivery or after the child's birth through breast feeding. A pregnant mother who is HIV infected is 30-40% likely to transmit HIV to her newborn child if no intervention is put in place (MOH, 2005).

Breast feeding is a cultural norm in Sub-Saharan Africa. However, it has been observed
that about 15% of infants of HIV positive women may be infected during breast feeding (Lucas and Gilles, 2003). This has caused a dilemma as to the best mode of feeding their infants. Life saving drugs to prevent mother to child transmission of HIV have not been available to thousands of infants who have become infected at birth or through breastfeeding. A study conducted in Durban, South Africa found evidence that non-exclusive breast feeding may be an additional risk factor for infant HIV infection (Coutsoudis et al, 2001). In this study, a group of infants exclusively breastfed for at least three months had a lower transmission risk of HIV (14.6%) than did those who also received other fluids or food together with breast milk (24.1%).

Exclusive breastfeeding has been established as the best and safest way of feeding infants (Thairu et al, 2005). However, HIV has now complicated this picture due to the fact that the virus can be transmitted through breast milk. This is further compounded by the fact that a vast majority of HIV positive women in developing countries do not know their HIV status. Worse of it, many women in developing countries are faced with poverty or social pressures as well as under nutrition (Oguta, Omwega and Sehmi, 2004). An important strategy to overcome this is to provide adequate support to HIV positive mothers to enable them to select the best feeding options not only for themselves but also for their babies. The available infant feeding options for HIV positive mothers as per WHO (2005) recommendations include exclusive breastfeeding for a short duration, followed by early cessation, expressing and heat treating breast milk, commercial infant formula, animal milk (Home modified), and wet nursing.
1.2: Statement of the Problem

Breastfeeding, being the best way of feeding infants has been complicated by HIV transmission through breast milk. In order to prevent Mother to Child Transmission (MTCT) of HIV, short duration of exclusive breast feeding, followed by replacement feeding is ideal whenever it is Acceptable, Feasible, Affordable, Sustainable and Safe (AFASS). Replacement foods such as infant formula or animal milk may be used. However, due to many constraints in developing countries including AFASS stigma related to not breast feeding, and social cultural factors, most HIV positive mothers adopt mixed feeding practice which not only predispose the infant to higher rates of MTCT, but also are of questionable nutritional value. The effects of these feeding options are not well documented in developing countries, Kenya included. This study therefore aims at establishing the effects of different feeding options on infants born to HIV positive mothers in Nakuru Municipality.

1.3: Justification of the study

According to a global survey, WHO (2005b), 54% of all under five deaths in developing countries (Kenya included) were associated with malnutrition resulting from poor feeding practices, particularly in the first year of life. Poor nutrition weakens the immune system and predisposes infants to common infections such as ear infection, pneumonia, diarrhea, (WHO, 2005a) as well as low cognitive function in growing children (Vestergaad et al, 1999).
WHO as such recommends various feeding options for infants born to HIV positive mothers such as infant formula, or animal milk. These feeding options are aimed at preventing malnutrition, preventing MTCT of HIV, and improving infants’ well being. There are various factors which affect the choice of the infant food adopted by the family. Some of them include time required in infant feed preparation, commitment of caregiver to the baby, cultural background of the caregiver, stigma of exposing one's HIV status, social support available, psychological state of the mother/caregiver, peer pressure at the Maternal Child Health clinics, and socio economic status. Due to the above factors, most mothers end up with mixed feeding options putting their babies even at a higher risk of HIV infection. This implies that there is need to establish the effects of these infant feeding options to allow either further promotion or recommend change of existing infant nutrition policy.

1.4: Research Questions

The following research questions guided this study:

a. What are the feeding options used to feed infants born to HIV positive mothers?

b. What are the factors that influenced the choice of the infant feeding options by HIV positive mothers?

c. What are the effects of the chosen feeding option on the child health, growth and nutritional status?
1.5: Hypothesis

There is no significant difference in nutritional status of infants born to HIV positive mothers and fed on different feeding options.

1.6: Broad Objective of the study

To establish the nutritional and health status of infants born to HIV positive mothers and fed on different feeding options in Nakuru Municipality.

1.7: Specific Objectives of the study

This study was guided by the following specific objectives:

1. To establish the feeding options used to feed infants born to HIV positive mothers.
2. To determine the factors influencing the choice of the infant feeding options by HIV positive mothers.
3. To examine the effects of the chosen feeding options on the child health, growth and nutritional status.

1.8: Assumptions of the study

In this study, the following assumptions were made:-

a. All mothers had access to local health facilities and have been attending Antenatal Care Clinics including PMTCT clinics in Nakuru Municipality.

b. Commitment of caregivers not guaranteed
1.9: Significance of the study

Malnutrition has been ranked as one of the leading causes of death in childhood. This issue has further been worsened by the emergence of HIV / AIDS. This study therefore sought to find out what infant feeding options were used by mothers/caregivers of HIV exposed babies; and also the effects of these feeds on their health, growth and nutrition. The results obtained would bring about suggestions that might improve the existing policy on infant feeding both at health facility level and national level (that is MOH and also development partners implementing the WHO recommendations).

1.10: Limitations and Delimitations of the study

This study was limited to mothers and other caregivers of infants aged 0-10 weeks. It could not also confirm mother/caregiver commitment to childcare. Food quantities, frequency and preparation not compared.

1.11: Operational Definitions of Terms

**Exclusive Breastfeeding:** The infant is given only breast milk and prescribed medicines but no water, other liquids or food for the first six (6) months of life or until AFASS is achieved.

**Replacement feeding:** The process of feeding a child who is not receiving any breast milk with a diet that provides all the nutrients the child needs. During the first six months this should be with a suitable breast milk substitute - commercial formula, or home prepared formula with micronutrient supplements. After six months it
should preferably be with a suitable breast milk substitute, and complementary foods made from appropriately prepared and nutrient-enriched family foods.

**Complementary food:** These are foods and liquids given to infants once they reach six (6) months in addition to breast milk, formula or animal milk.

**Infant:** Is a young child from the age of four weeks till the end of the first 12 months.

**Mixed feeding:** Feeding an infant who is less than 6 months old on breast milk, water, food and other liquids.

**Breast milk banking:** Infant is given donated breast-milk, which has been Pasteurized and stored at a breast milk bank. This milk bank must screen donors, and donor milk for HIV and other possible infections.

**CD4 count:** a measure of the number of specific helper T cells which have CD4 receptors per cubic milliliter of blood. It is used to analyze the prognosis of patients infected with HIV.

**Wet Nursing:** When a woman breast feeds a baby to whom she did not give birth, it is called wet nursing.

**Definitions of the different AFASS components**

~ **Acceptable**

The mother perceives no barrier to replacement feeding. Barriers may have cultural or social reasons, or be due to fear of stigma or discrimination. Here, the mother is under no social or cultural pressure not to use replacement feeding and she is supported by the family and the community in opting for replacement feeding. Consequently, she will be
able to cope with pressure from family and friends to breastfeed. This means she can deal with possible stigma attached to being seen with replacement food.

~ Feasible

This means the mother (or family) has adequate time, knowledge, skills and other resources to prepare the replacement food and feed the infant satisfactorily. According to this concept, the mother can understand and follow the instructions for preparing infant feeds (such as infant formula); and with support from family, she can prepare enough replacement feeds correctly everyday and night, despite disruptions to the preparation of family food or other work.

~ Affordable

The mother and family (with community or health system support if necessary) can pay the cost of purchasing/producing, preparing and using replacement feeding, including all ingredients, fuel, clean water, soap and equipment, without compromising the health and nutrition of the family. This concept also includes access to medical care, if necessary, for diarrhea and the cost of such care.

~ Sustainable

This entails availability of a continuous and uninterrupted supply, and dependable system of distribution for all ingredients and products needed for safe replacement feeding, for as long as the infant needs it, up to one year of age or longer. In this concept, there is little risk that formula for instance will ever be unavailable or inaccessible. Also, another person is available to feed the child in the mothers' absence and can prepare and give replacement feeds.
Safe

Replacement foods are correctly and hygienically prepared, stored and fed in nutritionally adequate quantities with clean hands, and using clean utensils, preferably a cup.

According to this concept, the mother or caregiver:

- Has access to reliable supply of safe water (from a piped or protected well source).
- Prepares replacement feeds that are nutritionally sound and free of pathogens.
- Is able to wash hands and utensils thoroughly with soap and to regularly boil the utensils to sterilize them.
- Can boil water for preparing each of the baby's feeds.

Can store and prepare feeds in clean, covered containers and protect them from rodents, insects and other animal
CHAPTER TWO: LITERATURE REVIEW

2.1: Overview of infant feeding

It is well recognized that nutrition has a profound impact on health and development in all stages of life. However, poor feeding practices in infancy can affect health in later life. Indeed, breastfeeding remains the optimum method of feeding infants until six months of life (WHO, 2002). In resource poor settings, exclusive breastfeeding is especially important because it confers many nutritional and other health benefits. Unfortunately, breastfeeding is also a mode of peri-natal transmission of HIV. WHO recommends that breastfeeding should be avoided in HIV positive mothers when replacement feeding is Acceptable, Feasible Affordable Sustainable and Safe (Kakute et al, 2005). However, when this is not feasible, WHO further recommends exclusive breastfeeding during the first six months of life (WHO, 2005a).

2.2: Benefits of Breastfeeding

Breast-milk continues to be the main source of nutrients for several months and can provide up to one third or more of the nutrients that a child needs till the age of two years (King and Burgess, 2003). Indeed, it can be a valuable nutrient source for a longer duration in infants of sero-negative mothers. Children who are not breastfed are far more likely to suffer from malnutrition and to contract life-threatening diseases during the first year of life. Breast-milk is sufficient to provide all the necessary nutrients until about the first six months of life (WHO and UNICEF, 2006). It supplies a major part of energy, proteins and vitamin A during the first six months (Ahmed, 1996). In addition, colostrum is rich in
antibodies and is the child's first immunization.

Exclusively breastfed infants have 2.5 times fewer episodes of illness and are 25 times less likely to die of diarrhea during the first six months than those fed on breast-milk substitutes contends Ahmed. This is due to the fact that Immunoglobulins such as IgA, IgM, IgG and IgD are synthesized and stored in the breast. IgA especially coats intestinal epithelium and protect the mucosal surface against entry of pathogenic bacteria and enteroviruses (Bennett and Brown, 1999). In a multicentre cohort study done in 2004 in Ghana, India and Peru, findings showed that non-breastfed infants were at a substantially higher risk of dying compared with those who had been breastfed. This cohort study found out that the most common causes of infant death were diarrhea (42%) and acute lower respiratory tract infections (20%) of all deaths (Bahl et al, 2005).

Vestergaad et al, (1999) observed that breastfeeding has been found to be advantageous in early childhood as it enhances long-term brain development. It is also protective from sudden infant death syndrome (McVea, Turner and Peppler, 2000). In addition, breastfeeding reduces the risk of developing cancers later in life (Smulevich, Solionova, and Belyakova (1999). It protects the child by boosting their immunity (Steingraber, 2001). Breastfeeding also suppresses maternal fertility, hence assisting her to achieve a more desirable birth interval. Further, it facilitates the establishment of a strong bonding between the mother and the infant. Moreover, the cost of the extra food needed by a lactating mother is much less than the cost of artificial milk for the baby (Ahmed, 1996).
2.3: Role of PMTCT on choice of infant feeding options

Caregivers were counseled and tested for HIV in the ante-natal clinics. Those who were HIV infected were given information on feeding options regarding the choices available and their costs. They also received information and skill on how to reduce or avoid MTCT. In addition, they were provided with appropriate anti-retroviral drugs to prevent MTCT. Thereafter, the caregivers chose the feeding options based on AFASS criteria (MOH, 2006).

HIV infected caregivers who chose to breastfeed were supported on early initiation of breastfeeding and exclusive breastfeeding, prevention and management of breastfeeding problems (mastitis, Abscess, engorgement and cracked nipples). They should have been discouraged from breast feeding if they had these breast problems. Furthermore, they should have been provided with antiretroviral drugs for treatment or prophylaxis.

Those HIV-infected caregivers who chose not to breastfeed were counseled on how to care for the breast, demonstrations on safe preparation and storage of chosen milk. They also had demonstration on cup and spoon feeding. Moreover, the caregivers were put on a reliable family planning method by four weeks (MOH, 2006).

2.4.0: Infant Feeding Options for HIV Positive Mothers

WHO, (2005a) described varieties of infant feeding options which include;

Breast milk
These were:

a) Exclusive breastfeeding for one month with early cessation.

b) Heat treated breast milk - breast milk could be expressed manually with clean hands
   or with a clean pump then was heat treated to kill HIV.

c) Wet nursing and breast milk banking

2.4.1: Exclusive Breast Feeding

This means to give the infant no food or drink other than breast milk. WHO (2006) recommends exclusive breast feeding from;

(i) Non-infected mothers

(ii) Birth to six months for an HIV-infected mother, for whom replacement feeding was not AFASS.

(iii) As a continued source of nutrition, if at six months replacement feeding was not AFASS.

For caregivers who chose to breast feed, early initiation of breastfeeding (within one hour after birth) must be promoted. The PMTCT counselors must ensure that the caregivers knew the risk of mixed feeding (giving breast milk with other feeds including water). It is important to teach the caregivers by demonstration how to correctly position the baby while breastfeeding to avoid breast pathology. Caregivers who chose to express breast milk must know (by demonstration) how to express and also how to store breast milk to avoid contamination. Expressed breast milk may also be heat treated. It is important that milk should be given to infants using a spoon or cup (not a bottle with teat
or hand to avoid contamination). Care givers should also have been taught how to identify breast problems or if the baby was not feeling well or had mouth sores to ensure that prompt treatment was provided. It was also necessary to teach the caregiver also by demonstration how to heat treat breast milk. This may be useful for instance during treatment of breast infection (MOH, 2006).

2.4.2: Wet nursing

Wet-nursing in the past was culturally appropriate in many parts of Africa and indeed could still be an acceptable alternative to breastfeeding by HIV infected mothers. However, in a study done in antenatal clinics in Moshi, Tanzania, de Paoli, Manongi and Klepp, (2003) observed that wet nursing was a complex feeding option as mothers will have to disclose their HIV status to the wet nurse who also has to be tested for HIV but the mother may want her status to remain confidential. It would be necessary for the prospective wet nurse to repeat HIV tests throughout her breastfeeding period, though counseling and testing are not available in many settings, especially in rural areas. These constraints are likely to limit the attractiveness of wet nursing. Moreover, the wet nurse would be vulnerable to becoming infected considering lack of data on the risk for wet nurses (Israel and Huber, 1999).

2.4.3: Heat treated breast milk

This method is not commonly used in Kenya. (Coutsoudis, 2005) contended that although mothers participating in a focus group discussion in a rural village in South Africa (2004) had indicated that they would use heat treated expressed breast milk, the
counselors were surprised at the low uptake. Some of the reasons for their reluctance to use heat treated breast milk included lack of official endorsement in posters or media for instance, skills on how to express the milk, reduced amount of milk, hence the baby could not be satisfied, the baby still demanded the breast after a feed, there was lack of confidence in the procedure as there were no demonstrations. Oguta, Omwega, and Sehmi, (2004) on the other hand found that respondents thought that the idea of milking a human being was not normal and that breast milk could not be expressed to produce enough to satisfy the baby.

2.5.0: Exclusive Replacement Feeding

This means that breast feeding is replaced with a suitable breast milk substitute that will provide the nutrients that the infant needs. Exclusive replacement feeding can be available as commercial infant formula and home-based animal milk. Infant formula is prepared according to manufacturers’ direction. Home based formula can be made from milk obtained from cow, goat, sheep or camel. In order to meet micro-nutrient needs, a multi-micronutrient formulation containing at least iron, zinc, folic acid, selenium and vitamin A should be added to animal milk.

In addition, the family must be able to support the AFASS principle by ensuring that adequate resources are available including clean safe water, fuel, utensils, skills and time to prepare replacement feeding correctly and hygienically. Caregivers must be made aware of the need for early intervention in case of diarrhoeal illness.
The counselors in the clinic must also do a careful assessment of a mothers’ capacity for AFASS before recommending exclusive replacement feeding. The caregiver must also be provided support on the following areas;

- To provide knowledge and skills, to feed the infant with breast milk substitutes from birth to six months.
- To counsel on infant feeding options.
- Availability of multivitamins or micronutrients for children receiving modified animal milk.

The counselor should also demonstrate the preparation of replacement feeding options that the caregiver had chosen. It must be noted that to meet water requirements for infants aged 0-3 months, one part of water is added to two parts of milk should be prepared. Table sugar was also added to increase the energy content. The mixture was then boiled and cooled before feeding the infant. When replacement feeding is AFASS, avoidance of all breastfeeding is recommended. If this is not possible, exclusive breastfeeding is recommended during the first months of life and should be stopped as soon as replacement feeding is AFASS (WHO, 2005a).

Given the risk of HIV transmission associated with breastfeeding, the best approach to prevention would be to avoid breastfeeding when mothers are infected. However, whereas these recommendations may be easily adopted in developed countries, it may be more difficult to adopt them in Sub-Sahara Africa due to a number of reasons; Firstly, most women in Sub-Sahara Africa breastfeed their infants from birth to well over 2 years
as a result of cultural or family pressures (Kakute et al., 2005) and secondly, replacement feeding is often associated with an increased risk of morbidity and mortality, since poverty constraints the provision of appropriate and safe replacement feeds for children (Abiona, Onayade and Ijadunola, 2006). While HIV positive women commonly make a choice to exclusively replacement feed their babies during pregnancy, they often end up practicing mixed feeding. Major factors leading to this behavior include social stigma, scorn and suspicion, harsh economic circumstances, technological barriers (electricity and refrigeration requirements), and cultural issues in the community (Thairu et al., 2005, Abiona et al., 2006, and Leshabari et al., 2007).

2.5.1 Infant formula

HIV infected women who do not wish to take risks in breastfeeding their infants have the option of complete replacement with infant formula. Many HIV infected women in developed countries can quite easily provide formula as a replacement food. However, high cost, social stigma and family influences among other factors are found to be prohibiting factors to the use of Infant formula in the developing world (Omari, 2003, and Thairu et al., 2005). As such, other feeding options need to be considered for women in resource poor countries (including Kenya) with high infant mortality rate due to infectious diseases.

A recent randomized clinical trial of breastfeeding versus formula feeding conducted in Nairobi, Kenya found a lower proportion of infants becoming HIV infected in the
formula-fed group (20.5%) than in the breastfed (36.7%) group (Nduati et al., 2000). Further, they observed that there was increased maternal mortality among the breastfeeding group (30.7%) compared to 20% in the formula-fed group. The authors interpreted it as resulting from depletion of maternal stores by breastfeeding (Nduati et al., 2001). This is rather conflicting for mothers who discover they are HIV infected and cannot afford infant formula or animal milk. Moreover, early maternal death would ultimately lead to poor quality of child care with subsequent infant malnutrition.

Mbori- Ngacha et al., (2001) in their study among breast fed and formula fed infants, observed that infants in the breastfeeding arm tended to have a better nutritional status in the first six months of life. Further, they noted that among HIV-1 infected children, 29% in the formula arm and 14% in the breastfeeding arm had malnutrition at some time during follow-up. This suggests that breast feeding remains the ideal feeding option. However, with appropriate education and access to clean water, formula feeding can be a safe alternative to breastfeeding for infants of HIV -1 infected mothers in a resource poor setting. Moreover, women in the same study had access to the city council treated water supply hence they could prepare formula milk safely. Despite this, infant mortality by the age of 24 months was high (20%), and hence it is unlikely that this feeding option will be feasible for the vast majority of poverty stricken HIV infected women in Kenya who hardly have access to any water.

Since formula is found to be too expensive for most African mothers to purchase (Kshs 500 per tin), some countries such as South Africa, have in the past provided it for free in
PMTCT programs (Raisler and Cohn, 2004). The consequences of this step have widely been debated with some Pediatric HIV experts arguing that the risks of sickness and death from not breastfeeding out-weigh the increased risk of infant HIV infection assert Raisler et al, (2004). There has also been concern that the increased acceptability of formula for infants of HIV infected mothers might spill over to uninfected mothers, undermining years of public health messages about breastfeeding (Filteau, 2003).

In another randomized trial in Nairobi, Kenya, although the women who were included in the study had consented to randomization of the infant feeding option (either to breastfeeding or infant formula arm), non compliance was as high as 30% in the formula group (Nduati et al., 2000). This non-compliance probably reflects difficulties of preparing formula unlike breast-milk which is readily available. Furthermore, since breastfeeding is a norm in Kenya, not breastfeeding may be seen as admission to being HIV positive with consequent negative ramifications (Filteau, 2003).

2.6.2 Animal milk

This is a cheaper alternative to formula for young infants but require more effort to prepare. Cow's milk for instance requires dilution with boiled water and addition of sugar to be suitable for young infants (WHO, UNAIDS, UNFPA, UNICEF, 2003). Mothers living in poor socioeconomic settings who lack fuel, running water or refrigerators will often be unable to prepare this milk and preserve safely. Infants fed on animal milks may also require micronutrient supplements assert WHO, UNAIDS, UNFPA, UNICEF
This would be yet another expense for the mother.

2.6.0: Infant Feeding and HIV Transmission

It is an established fact that a fraction of infants born to HIV infected women acquires infection through breastfeeding (Dekock et al 2000). Risk factors for mother to child transmission of HIV (MTCT) through breastfeeding include maternal characteristics such as younger maternal age and high parity; low CD4 count; high peripheral blood and maternal milk viral load; mastitis, breast abscess and cracked nipple; infant characteristics such as oral sores and oral candidiasis (Ekpini et al. 1997, Semba et al. 1999; Coutsoudis and Rollins, 2003).

It has been established that there is some evidence about the risk of HIV transmission according to the pattern of breastfeeding. The possible association between the infant feeding patterns among mothers and the risk of MTCT was evaluated in a prospective study done in South Africa (Coutsoudis et al. 2001). They found that by 15 months of age, HIV infection was lower among infants who were exclusively breastfed compared to those who were mixed fed. Indeed, there is mounting evidence that the practice of mixed feeding is associated with increased risk of HIV infection in infants (Kakute et al. 2005). This is due to the fact that exposure to pathogenic bacteria and other irritants can cause inflammation of and damage to the immature intestinal mucosa. This therefore provides a direct pathway for HIV and other microbes to infect the infant. On the other hand, Preble and Piwoz (1995) contends that breast milk contains growth factors, such as epidermal
growth factor and transforming growth factor ß, which may enhance the maturation of the gut epithelial barrier and hence maintain its integrity thus hindering passage of HIV.

2.6.1: Strategies for Reducing Transmission of HIV through Breast milk

In view of the fact that HIV can be transmitted through breast milk, there is need to adopt strategies which can reduce the number of infants becoming infected such as;

a) Safer breastfeeding

The social, economic and practical constraints to the use of breast-milk substitutes in Africa have prompted research into how breastfeeding can be made safer for infants of HIV infected mothers. The best way to reduce MTCT of HIV through breast-milk is to prevent women from becoming HIV infected in the first place (MOH, 2005). Safe sex messages are also needed during postpartum (breast feeding period) for previously uninfected women since a new infection is associated with a very high risk of an infant becoming infected (Embree et al., 2000).

An HIV infected woman could make her own breast-milk safer for her infant by expressing and pasteurizing (Heat treating it). This is found to be much less convenient, time consuming, and more expensive in terms of fuel than directly suckling an infant (Israel-Ballard et al., 2006) as well as leading to social stigma as completely avoiding breastfeeding (WHO and UNICEF, 2006). Further still, immunoprotective factors in breast milk are destroyed by pasteurization.
Mastitis, an inflammatory disease known to allow in plasma-derived components and inflammatory cells such as HIV-1 infected lymphocytes, could raise HIV-1 load in breast-milk (Semba et al., 1999). This may also add the risk of transmission of HIV-1 from mother to child. Mastitis occurs due to poor lactation practices resulting in milk stasis and may be prevented by providing mothers with good lactation counseling prior to delivery (WHO, UNICEF and USAID, 2005).

It is important that health-workers are provided with additional training in order to counsel HIV infected women about their infants' feeding choices. Furthermore, it is essential that caregivers are aware that replacement feeding for instance entails cost (not only in money but also in time). That means, boiling of water, which costs both time and fuel, is essential during preparation of replacement foods. Once mothers understand, they will be able to choose feeding options that they may be able to sustain.

Improvement of maternal nutrition during lactation is important for both mother and infant (Nduati et al., 2001). Lactation is a demanding metabolic process and might be detrimental for women who are infected with HIV-1 infection. Finally, delivery interventions must also be considered for instance use of antiretroviral drugs, as they have been known to decrease maternal plasma viral load (MOH, 2005). This is necessary as it helps decrease lactation transmission of HIV during the postpartum period.
CHAPTER THREE: MATERIALS AND METHODS

3.1 Study Design

This was a descriptive cross-sectional study design. This is because the study was interviewing and examining events in the study population at one point in time.

3.2 The Study Area

The study was carried out in Provincial General Hospital-Nakuru, Langalanga and Kapkures health centers, all within Nakuru Municipality of Nakuru district in Rift Vale Province. This is because not much research has been done in this area regarding infant feeding and HIV. Nakuru district lies within the Great Rift Valley and borders other districts namely, Kericho to the west, Koibatek and Laikipia to the north, Nyandarua to the east, Narok to the south-west, and Kajiado and Kiambu to the south.

3.3 Variables

Independent Variables were the different feeding options, while the dependent variables were the nutritional and health status of infants.

3.4 The Target Population

This consisted of all relatively well infants aged 0-10 weeks born to HIV positive mothers visiting Provincial General Hospital, Langalanga and Kapkures Health centers.
3.5 The Study Population

The study population was drawn from infants aged 0-10 weeks whose mothers were HIV positive and attending Provincial General Hospital, Langalanga and Kapkures health centers in Nakuru municipality for PMTCT services. The infants were evaluated for growth, nutritional status, and morbidity at birth that is at 0 week, then at 6 weeks and 10 weeks coinciding with immunization dates.

3.5.1 Inclusion Criteria

The following criteria were used to select the respondents:

Infants aged 0-10 weeks; Mothers who attended PMTCT; Mothers who tested HIV positive and know their HIV status; Caregivers of infants whose mothers are/were HIV positive; Mother who had given consent.

3.5.2 Exclusion Criteria

The following criteria were used to exclude the respondent who did not take part in this study;

Failure of mother/caregiver to give consent; Infants with congenital malformation or those who were admitted for over one week in the newborn unit shortly after birth (because normal growth and nutritional status would have been affected); Premature babies; Very sick babies; Mothers who were HIV negative and/or refused to take HIV test; HIV positive mothers who were very sick and debilitated and therefore unable to offer appropriate basic care to the baby.
3.6 Sampling Procedure

HIV positive mothers were identified through PMTCT clinics, then later in the maternity wings after delivery using convenience sampling. Their babies were examined at birth, and then mothers’ contacts were taken and booked for their babies to be seen at the age of six weeks, then at ten weeks as they visited the clinic for immunizations.

3.6.1. Sample size determination

Determination of sample size was through the approach based on precision rate and confidence level (Kothari, 2003). According to a previous study done in Nakuru Municipality, 6.7% of Infants were malnourished at the age of 0-10 weeks (Mbuthia et al, 2008). Therefore, p=6.7%. This study took a confidence level of 95%

\[ n = \frac{z^2 \cdot p \cdot q}{e^2} \]

Where:

n = size of sample
p = malnourished infants at the age of 0-10 weeks.
q = infants who were not malnourished at the age of 0-10 weeks
z = standard variate at a given confidence level (In this case it is 1.96 for a 95% Confidence level).
e = 0.04 -since the estimate should be within 4% of the true value (Kothari, 2003). The estimate should have been within 4 % (0.04) of the true value.

\[ p = 6.7\% \ (0.067) \]
\[ q = 93.3\% \ (0.933) \]
Therefore \( n = 1.96^2 \times 0.067 \times 0.933 \times 0.04^2 \)

\[ n = 150 \]

The sample size was distributed at the ratio of 25:1:1 in Provincial General Hospital; Langalanga and Kapkures respectively. That is Provincial General Hospital (PGH) – 100, Kapkures – 25 and Langalanga – 25. This is because PGH was a larger hospital hence more patient visited the facility.

### 3.7: Research Instruments

A pre-tested questionnaire was used. It contained structured and unstructured questions, which was administered to mothers and/or caregivers. The questionnaire also contained socio demographic data, knowledge, attitude and practice questions, and child assessment questions. It was typed in English but where there were language difficulties, interpretation of words was done to either in Kiswahili or the local languages. An infantometer was used to measure the infants’ length, while a Pan Paediatric weighting scales was also used to measure the weight.

### 3.8.0 Pre-testing the Instrument

The questionnaire was pre-tested in Lanet health center. The purpose of doing so was to ensure that items in the instrument were stated clearly and had the same meaning to all caregivers.
3.8.1 Validity

An instrument was validated so that if the data is a true reflection of the variables, then inferences based on such data were considered accurate and meaningful. Also, the completeness and consistency of answers in the questionnaire ensured validity.

3.8.2 Reliability

The data collecting instruments were pre-tested in Lanet health center. They were examined to establish whether they (instruments used) yielded consistent results. Measurement (length and weight) were done three times then their average were derived to ensure accuracy.

3.9: Data Quality Control

Research assistants (nurses) were recruited and trained on interviewing the caregivers, accurately reporting the responses, and measuring the weights and lengths of the infants. The weighing scales were also calibrated using known weights prior to use. After data had been collected, each questionnaire was edited for any possible errors like wrong entries before keying into the computer.

3.9.1: Data Collection Procedures

Data was collected using questionnaires. The infants were examined to establish presence of any other illnesses. Infants' data notebooks were developed for each center and used to record the weight and length at birth, six weeks and ten weeks. Infants who had obtained
infant formula freely from NGOs without following AFASS criteria (6.6%) were excluded from the study. An Infantometer was used to measure the infant's length. In order to obtain the length, the infant was placed to lie supine on the infantometer with the head touching one end, and the legs fully extended at hips and knees, and feet at right angles to the legs, then the length was read at the distal board touching the dorsum of both feet. In addition, the infant was undressed and put to lie on the weighing scale and the weight was read. Weight and length measurements were taken to the nearest 0.1kg and 0.1cm respectively.

3.9.2: Data Analysis

The collected data was entered into a computer and cleaned ready for analysis. The Statistical Package for Social Sciences (SPSS) version 13 was used to process the data. Data was summarized using descriptive and inferential statistics. ANOVA was used to test whether there were significant differences between means of weight and length among the three different health facilities. Chi-square was used to test whether there was any significant difference between two variables which are categorical in nature. For example, the relationship between caregivers’ age, income level, or educational level and infant feeding options. In addition, the length for age, weight for age, and weight for length z-scores were computed using WHO Anthro 2005 (WHO, 2005). However, length for age (stunting) was not appropriate for this age. Significance was set at 95% significance level. P-values were also set at 0.05. That meant any value less than 0.05 was significant and vice versa.
3.10: Ethical Consideration

Permission to carry out research was sought from the ethics committee at Kenyatta University, the Ministry of Education, Science and Technology, MOH Municipality, MOH Nakuru District, and Heads of respective health facilities. Participation was voluntary after informed consent. All the information obtained was kept confidential. The subjects were free to withdrawal at any time without penalty or loss of benefits/privileges; for instance referral of infants found with growth faltering for further counseling by nutritionists on feeding options or referred for specialist's care.
CHAPTER FOUR: RESULTS

4.1: Demographic and Socio-economic characteristics of caregivers

The study consisted of 140 primary caregivers, out of whom 98.6% were biological mothers. Table 4.1 below shows the distribution of the caregivers’ characteristics in terms of age, occupation, education level, income level, number of children, and housing.

Table 4.1: Demographic and socioeconomic characteristics of caregivers in percentage

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>N</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20 yrs</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>20-29 yrs</td>
<td>58</td>
<td>41.4</td>
</tr>
<tr>
<td>30-39 yrs</td>
<td>68</td>
<td>48.6</td>
</tr>
<tr>
<td>40-49 yrs</td>
<td>7</td>
<td>5.0</td>
</tr>
<tr>
<td>50-59 yrs</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>96</td>
<td>68.6</td>
</tr>
<tr>
<td>Informal employment</td>
<td>26</td>
<td>18.6</td>
</tr>
<tr>
<td>Formal employment</td>
<td>16</td>
<td>11.4</td>
</tr>
<tr>
<td>Business persons</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>73</td>
<td>52.1</td>
</tr>
<tr>
<td>Secondary</td>
<td>49</td>
<td>35</td>
</tr>
<tr>
<td>College</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>None</td>
<td>7</td>
<td>5.0</td>
</tr>
<tr>
<td>Number of Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>20.0</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>19.3</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>23.6</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>21.4</td>
</tr>
<tr>
<td>≥ 5</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>Type of housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi permanent</td>
<td>58</td>
<td>41.4</td>
</tr>
<tr>
<td>Temporary</td>
<td>43</td>
<td>30.7</td>
</tr>
<tr>
<td>Permanent</td>
<td>39</td>
<td>27.9</td>
</tr>
<tr>
<td>Income level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500</td>
<td>57</td>
<td>40.7</td>
</tr>
<tr>
<td>500-1000</td>
<td>18</td>
<td>12.9</td>
</tr>
<tr>
<td>1001-1500</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>1501-2000</td>
<td>18</td>
<td>12.9</td>
</tr>
<tr>
<td>&gt;2000</td>
<td>42</td>
<td>30.0</td>
</tr>
</tbody>
</table>
4.1.1: Maternal education distribution

Table 4.1 shows distribution of caregivers’ education level. Results indicate that a large proportion of caregivers (52.1%) had only minimal education of up to primary school level, while 5.0% had no formal education. However, a small fraction (7.9%) had tertiary education and 35.0% had secondary education. The fact that majority of the caregivers had a low level of education might have influenced the wrong choices of infant feeding options that they made.

4.1.2: Income level and occupation distribution

Table 4.1 shows the summaries of caregivers’ occupation and income level. Majority of the caregivers (40.7%) were poor, earning less than Ksh. 500 per month with only 30.0% of them earning over Ksh 2,000 per month. Further, 29.4% earned between Kshs.500 and Ksh 2000 a month. With regard to occupation, 68.6% of the caregivers were unemployed, while a small proportion (1.4%) depended on small scale businesses. About Twenty percent and 11.4% of the caregivers were engaged in informal and formal employments respectively. This indicated that majority of the caregivers might not afford to buy replacement foods for their infants due to cost implications. Consequently, majority of the caregivers would be left with the option of breast feeding.

4.1.3: Maternal age and number of children

Table 4.1 presents the distribution of caregivers’ age and parity. Majority of the caregivers (48.6%) were aged 30-39 years, while those aged 50 and above were 0.7%.
Further, 5.0% were aged 40-49 years while those aged less than 30 years were 45.7%. Regarding maternal parity, 39.3% of the caregivers had 1-2 children while 45% had 3-4 children. Only 15.7% of them had more than 4 children. Relationship between income level and maternal parity was insignificant at 5% significance level (Chi-square test, P=0.281). Further, it was found that the relationship between caregiver’s occupation and income level was significant at 5% significance level (Chi-square test, P=0.000); while that of caregivers’ income level and type of housing was significant at 5% significance level (Chi-square test, P=0.000). In addition, the relationship between maternal parity and maternal age was found significant at 5% significance level (Chi-square test, P=0.000).

4.2.0: Caregiver’s knowledge on Infant feeding options

The researcher examined the caregivers’ level of knowledge concerning infant feeding using a set of questions. This is important to establish whether caregivers could clearly recall the information that they received from PMTCT counselors regarding Infant feeding options.

4.2.1: HIV Counseling and Testing

The caregivers who participated in this study had to have visited antenatal clinics where they were tested, provided with appropriate information, and knew their HIV status. HIV positive mothers were counseled on available feeding options in the antenatal clinic (This information was volunteered by caregivers). In these clinics, each individual mother was counseled and tested. In addition, confidentiality was ensured. If the test was positive, the
caregiver was advised on how to care for herself so as not to be re-infected with HIV or with new strains and thus increase the viral load in her blood. A high viral load is usually associated with increased MTCT if she chooses to breast feed her infant. She was also counseled on available infant feeding options. Based on the knowledge given, the mothers were supposed to choose an infant feeding option appropriate for them after birth. These sessions took about half an hour or less and may inevitably have led to inappropriate feeding practices due to the fact that counseling took a short time. Those who were HIV negative were asked to return for counseling and re-testing (this is because the mother could have been in the ‘window period’). Caregivers who were HIV positive were followed till after delivery when they were counseled again on chosen feeding options according to AFASS in the maternity. This session also took half an hour or less depending on issues that may arise. This short duration of PMTCT counseling may have indeed been an indicator of incorrect feeding choices.

4.2.2: Caregivers knowledge on infant feeding recommendations

Results showed that majority of the caregivers (97.9%) attended antenatal clinic during pregnancy. This is representative of all mothers who deliver in Kenya. The remaining 2.1% were recruited because they were counseled by the PMTCT staff in maternity after birth. Results further revealed that majority of the caregivers (87.9%) had received advice from the health workers on appropriate infant feeding options to be given to infants after birth. On the other hand, 7.9% were not advised, while 4.3% could not remember. This
may suggest that caregivers’ knowledge on infant feeding was satisfactory considering the fact that most of them attended clinics and were counseled on infant feeding.

The study also investigated caregivers’ level of knowledge on the feeding recommendations for infants of HIV positive mothers. Results showed that while 14.7% were well informed, 36.7% were partially informed, 35.3% were poorly informed, and another small proportion (13.3%) had no information at all. Given that only a small fraction (14.7%) was well informed, then it follows that the caregivers’ level of knowledge was poor. This contradicts an earlier assumption that since most caregivers attended clinics and were advised on infant feeding, then they were knowledgeable on recommended infant feeding. This scenario may probably be due to lack of adequate formal education as majority of the caregivers (57.1%) had a low level of education with only 7.9% of them having tertiary education. Little or no formal education may be a hindrance to acquiring knowledge even when they had been taught in antenatal clinics. In addition, the short duration of time spent counseling the caregivers on infant feeding options in the PMTCT clinics (as noted earlier), could also have resulted in poor knowledge of the feeding options.

Results further showed that majority (93.6%) of caregivers knew that breast feeding was the ideal way of feeding infants if the mother was HIV negative. However, there was a small proportion (6%) that either chose glucose solution, which is of low nutritional value, or did not know at all. From the latter responses, this study seeks to raise questions
concerning the quality of counseling caregivers receive in antenatal clinics, and hence indicate the need for more public health education.

The study also investigated caregivers’ level of knowledge regarding replacement feeding for infants of HIV positive mothers as advised in the clinic based on WHO (2005). Results revealed that while 32.7% of the caregivers did not know which food is recommended, 34% of them chose infant formula and animal milk, 18.7% chose animal milk, 9.3% selected formula, while a small proportion (5.3%) chose heat treated breast milk, formula and animal milk (figure 4.1). This seems to suggest that knowledge was a major hindrance to selecting replacement feeding considering the fact that over 40% of the caregivers had poor information. This means there is a possibility that the quality of counseling on infant feeding in the clinic was wanting.

![Figure 4.1 Caregiver’s knowledge on replacement feeding](image-url)
4.3: Infant Feeding Options

Results showed that among all the caregivers studied, 71.4% of them fed their infants with breast milk after birth; out of which, 70.7% were exclusively breast fed at birth. Results further indicated that 14.3% gave cows milk, while 9.3% fed their infants with formula. The rest fed their infants either with a combination of breast milk and cows’ milk (4.3%), and 0.7% gave their infants fruit juice (figure 4.2).

![Figure 4.2 Feeding options given to babies after birth.](image)

4.3.1: Exclusive Breast Feeding

Results showed that 71.4% of caregivers’ breast fed the infants after birth out of which 70.7% of the caregivers exclusively breast fed the infants at birth. It was also observed
that at the time of the interview (at the age of ten weeks), only 24.3% of the caregivers were still exclusively breast feeding the infants.

This study also compared the association between the three data collection centers and exclusive breast feeding at birth. The findings were shown in table 4.2.

**Table 4.2: Relationship between Centers and Exclusive Breastfeeding**

<table>
<thead>
<tr>
<th>Data collection centers</th>
<th>Other foods given besides breast milk at birth</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes(%) response</td>
<td>No (%) response</td>
</tr>
<tr>
<td>PGH</td>
<td>20.0</td>
<td>46.4</td>
</tr>
<tr>
<td>Langalanga</td>
<td>3.6</td>
<td>14.3</td>
</tr>
<tr>
<td>Kapkures</td>
<td>5.7</td>
<td>10.0</td>
</tr>
<tr>
<td>Total</td>
<td>29.3</td>
<td>70.7</td>
</tr>
</tbody>
</table>

Results showed (table 4.2) that most of the caregivers from PGH (46.4%) practiced exclusive breast feeding followed by Langalanga (14.3%), and the least proportion of the caregivers were from Kapkures (10.0%) all at birth. From these findings, it seemed to suggest that the quality of PMTCT counseling may have been poor among caregivers mainly from Kapkures. The differences between exclusive breast feeding and the data collection centers was not statistically significant at 5% significance level (chi-square test, p=0.449).

**4.3.2: Mixed Feeding**

Although the caregivers had been counseled on appropriate feeding options, it was noted that caregivers still gave their infants other foods in addition to breast feeding. Results showed that majority of the caregivers (50%) gave their babies water (predominantly breastfeeding) in addition to breast milk. Possible reasons why caregivers gave water
may be that water quenches thirst and relieves infants’ abdominal discomforts. Moreover, 15% of the infants were fed on cow’s milk and breast milk (mixed feeding). Results further indicated that while 10% were given infant formula, fruit juice and breast milk (mixed feeding), 0.7%, were given a combination of cow’s milk, infant formula and breast milk (mixed feeding) as shown in table 4.3.

**Table 4.3: Other foods given with breast feeding at Ten Weeks**

<table>
<thead>
<tr>
<th>Types of foods given</th>
<th>Gave (%)</th>
<th>Did not give (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Cow’s Milk</td>
<td>15.0</td>
<td>85.0</td>
</tr>
<tr>
<td>Formula and fruit juice</td>
<td>10.0</td>
<td>90.0</td>
</tr>
<tr>
<td>Infant formula and cow’s milk</td>
<td>0.7</td>
<td>99.3</td>
</tr>
</tbody>
</table>

Regarding the source of water for preparing infant food, majority of the caregivers (58.6%) received piped water, 18% bought it from a water point, and 7.9% also bought it from hawkers whose source was unknown. Another group (17%), fetched water from the river while 4.3% obtained it from an unprotected well as 4.3% obtained it from other sources.

Mixed feeding increases Mother to Child Transmission of HIV. Therefore, HIV positive mothers who choose to breastfeed should do so exclusively and the more strictly they are able to comply, the lower the risk of HIV transmission will be for their infants.
Results also revealed that those caregivers who preferred mixed feeding and practiced it were 5.7%, while those preferred but did not practice it were 15.7%. Further, those who would not prefer and practiced mixed feeding were 23.6%, while those who never preferred mixed feeding and never practiced were 55.0% (Table 4.4).

**Table 4.4: Relationship between Caregivers who Preferred Mixed Feeding and Those who Practiced**

<table>
<thead>
<tr>
<th>Those who Preferred Mixed Feeding</th>
<th>Those who Practiced Mixed Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (%)</td>
<td>Yes (%)</td>
</tr>
<tr>
<td>No (%)</td>
<td>No (%)</td>
</tr>
</tbody>
</table>

The relationship between those caregivers who preferred mixed feeding and those who practiced it (mixed feeding) were not statistically significant at 5% significance level (Chi Square test, p=0.722). This means that those who did not prefer mixed feeding were not likely to practice it (mixed feeding).

Results also showed that majority of caregivers in PGH practiced mixed feeding compared to the rest of the centers. That means in addition to breast feeding, in PGH centre majority (31.4%) gave water (predominantly breastfeeding), in Langalanga centre majority (8.6%) gave water, and in Kapkures centre majority (10.0%) also gave water (predominantly breastfeeding). Moreover, 10.7% of the caregivers fed their infants on breast milk and cow’s milk as shown in table 4.5.
Table 4.5: Foods given to infants in addition to breast feeding

<table>
<thead>
<tr>
<th>Data collection centers</th>
<th>Other foods given to the infant with breast milk at the age of ten weeks (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water</td>
</tr>
<tr>
<td>PGH</td>
<td>31.4</td>
</tr>
<tr>
<td>Langalanga</td>
<td>8.6</td>
</tr>
<tr>
<td>Kapkures</td>
<td>10.0</td>
</tr>
<tr>
<td>Total</td>
<td>50.0</td>
</tr>
</tbody>
</table>

This difference may be due to poor quality in antenatal nutritional counseling mainly in PGH caregivers. This feeding practice might depress infant growth resulting in growth faltering with recurrent infections. The relationship between the data collection centers and mixed feeding was not statistically significant at 5% significance level (chi-square test, \( p=0.558 \)).

4.3.3: Infant Formula Feeding

This is one of the feeding options that could have been chosen by HIV infected women who do not wish to take risks in breastfeeding their infants. However, its use is inhibited by cost. Results showed that out of all the caregivers interviewed, only 9.3% fed their babies with infant formula as a feeding option after birth. This is indeed a low percentage compared to breast milk or animal milk. Some of the reasons cited by caregivers for not choosing Infant Formula included high cost, lack of knowledge on availability or preparation of this food.
Regarding utensils that were used for feeding infants, (7.1%) of the caregivers feeding their infants on infant formula used bottles and teats, 1.4% used a cup and spoon, while 1.4% of them used a cup. The choice of a bottle and teat is indeed an indicator of poor maternal counseling in the PMTCT clinics. These feeding utensils are however not recommended given the fact that it is difficult to clean bottles and teats and hence associated with infant infections such as gastroenteritis. Results also indicated that other foods that were given to infants in addition to infant formula included Porridge-2.9%, water- 2.1%, and cow’s milk- 4.3%. This indeed suggested that without support, it is difficult to practice exclusive formula feeding.

Results revealed that 10.0% of the caregivers had access to boiled water when needed as 0.7% could not access it. Concerning preparation of food, results indicated that 9.3% of the caregivers used boiling water, while 1.4% did so with difficulty. Results further showed that while 5.7% of the caregivers could afford infant formula, 3.6% could not. However, the latter group still bought it with difficulty. There is a likelihood that such a group could have easily diluted the milk so as to use for long before buying another tin.

4.3.4: Animal milk

This feeding option is cheaper compared to infant formula. It was observed that 14.3% of the caregivers interviewed fed their infants on animal milk after birth. At the age of ten weeks, 15% of the infants were fed on cow’s milk in combination with breast milk. Results also showed that majority of the caregivers (12.1%) had adequate time to prepare
the milk as 1.4% did not have, while 0.7% sometimes had time for milk preparation. Moreover, it was noted that whereas 7.9% of the caregivers had the money to buy the milk, 4.3% sometimes had money to buy it, while 2.9% of them had no money. Such a financial condition, coupled with stigma may discourage the caregivers from continued use of replacement feeding thus causing some of them to breast feed their infants. Among those caregivers who bought the milk, a small fraction bought it daily while the majority paid for it at the end of the month.

Regarding the quality of cow’s milk, results showed that majority of the caregivers (12.9%) diluted the milk with boiled water while 1.4% did not. The former group (12.9%) diluted the milk as long as they were feeding their infants with cow’s milk. Indeed, in ideal situations, cow’s milk should be diluted for the infant from birth till at the age of three (3) months. However, using unboiled water during preparation of infants’ milk might transmit infection such as recurrent diarrhoeal diseases. It is noteworthy that a fraction of caregivers either obtain water from a common water point, from hawkers, river or unprotected wells. That means the safety of this water may be questionable. Results further revealed that 3.6% of the caregivers correctly diluted the infants’ milk (1 part of water to 2 parts of milk or ratio of 1:2) while 3.6% incorrectly diluted the cow’s milk (ratio of 1:1) hence reducing its nutritional value. Another group, (5.7%) of them used a measuring cup and so did not know the amount of water used. This practice however might affect the growth of the infants due to either under diluting or over diluting the milk. Although sugar is usually added to cow’s milk to increase its energy
content, results showed that 6.4% of the caregivers added sugar, while 7.9% of them did not. These modes of preparation may affect the quality of the milk as well as infants’ growth. It was also established that 2.9% of the caregivers who fed their infants with cow’s milk after birth also fed them with porridge, while 5.0% gave water, and a smaller proportion (1.4%) gave mashed fruits. However, 5.0% of the infants were fed with only cow’s milk.

4.3.5: Wet Nursing

Wet nursing was culturally acceptable in many parts of Africa and it may still be an ideal alternative to breast feeding by HIV infected mothers today. However, UNICEF, UNAIDS, UNFPA, WHO (2003) recommends that wet nursing be considered only when a potential nurse is informed that she needs to take a voluntary test and found to be HIV negative. Consequently, elderly postmenopausal women are preferred as wet nurses in the belief that they are more likely to abstain from sex. Results found that 57.1% of the caregivers had heard about wet nursing while 42.9% had not heard of it. This means that nearly half of the caregivers did not know about wet nursing and therefore indicating that the caregivers were not adequately counseled in clinics. Further, it was observed that a significant proportion (21.4%) of caregivers could comfortably practice wet nursing, while the rest (78.6%) would not. This seemed to suggest that wet nursing was unacceptable as a feeding option among caregivers in this study.
4.3.6: Heat treated breast milk

This method of feeding is not commonly used in Kenya. Although it is a promising approach for making breast feeding safe, it involves two new practices that have to be introduced and sustained on a daily basis. This includes expressing and then heat treating the breast milk. Since breastfeeding is a norm in Kenya, this feeding method may arouse suspicion among neighbors and family that the caregiver could be HIV positive. Results revealed that majority of the caregivers (63.6%) had not heard of heat treated breast milk while only 36.4% had heard about it. In addition, most of the caregivers (54.3%) would not consider heat treating of breast milk as a feeding choice for their babies, citing the fact that its preparation was time consuming. However, only 45.7% would consider heat treated breast milk as a feeding choice for their infants. The fact that majority of the caregivers had not heard of heat treated breast milk raises questions on the quality of PMTCT counseling.

4.4: Factors Influencing the Choice of Infant Feeding options by HIV Positive Mothers

The study sought to find out factors that influenced choice of infant feeding options. This section therefore presents factors that influenced caregivers’ choice of feeding options as discussed below:

4.4.1: Cost

Majority of the caregivers (34%) could not choose infant formula due to high cost of this specific food. In addition, results revealed that 13% of the caregivers could not afford
cow’s milk as it was also expensive. As had been noted earlier, majority of the caregivers in this study were poor and what was left for most of them was to feed their infants with breast milk which was the best option in this study. This means that replacement feeding was not affordable. Therefore, the best feeding option in this situation was breast feeding (figure 4.2). Table 4.6 presents the relationship between income level of caregivers and their choice of infant feeding options.

### Table 4.6: Relationship between Caregivers’ Income level and Feeding Options

<table>
<thead>
<tr>
<th>Monthly income levels (Ksh)</th>
<th>Feeding options chosen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBF</td>
</tr>
<tr>
<td>&lt;500</td>
<td>32.9</td>
</tr>
<tr>
<td>500-1000</td>
<td>8.6</td>
</tr>
<tr>
<td>1001-1500</td>
<td>1.4</td>
</tr>
<tr>
<td>1501-2000</td>
<td>8.6</td>
</tr>
<tr>
<td>&gt;2000</td>
<td>19.3</td>
</tr>
<tr>
<td>Total (%)</td>
<td>70.7</td>
</tr>
</tbody>
</table>

From the above table, results showed that among those caregivers who breast fed the infants, majority of them (32.9%) earned less than Ksh. 500 per month while 5.0% of those caregivers who began feeding their infants on cow’s milk also earned less than Ksh. 500 per month. Further, 1.4% of those who earned less than Ksh 500 per month fed their babies on infant formula. This indicates that caregivers earning less than Ksh. 500 could only choose to breast feed their infants rather than opt for replacement foods that were costly. Furthermore, even those caregivers earning over Ksh. 2000 still chose to breast feed (19.3%) their infants. However, results showed that there was a slight increase in the
proportion of those who fed the babies with infant formula (4.3%) among caregivers earning more than Ksh. 2000 as opposed to those being paid between Ksh 500-2000. This was possibly because caregivers in this category earned over Ksh. 2,000 per month and a small proportion of caregivers could afford infant formula. The relationship between the income level and the feeding option was not statistically significant at 5% significance level (chi-square test, p=0.339).

4.4.2: Perception of MTCT

Results indicated that majority of the caregivers (71.4%) knew that there was a problem if an HIV positive mother breast fed her baby while 27.1% knew there was no problem. These latter responses may have been as a result of poor counseling in the antenatal clinics. The remaining 1.4% of them did not know. However, most of the caregivers (67%) feared that their babies may be HIV infected if they breast fed them. Interestingly, although a large percentage of caregivers (71.4%) feared that they may infect their babies with HIV, they went ahead and breast fed. However, due to the caregivers’ low income, (Table 1) it was unlikely that a significant percentage of caregivers would consider opting for replacement feeding despite being aware that breast feeding could result in MTCT of HIV.

4.4.3: Cultural Beliefs, Maternal Illness or Death

Results showed that 29.5% of caregivers were influenced by certain cultural factors in their choice of feeding options. Major cultural factors included;
a) Bewitched so that caregivers could not secrete breast milk (10.7%). Such caregivers would not opt for replacement feeding even if indeed the latter was AFASS.

b) Failure to breast feed which was thought of as upsetting the family ancestors (7.1%) hence causing death of the baby.

c) Any caregiver who did not breast feed the infants would be suspected by the public as being involved in extramarital sex (6.4%) which would lead to the death of the baby if breast fed again.

d) Any caregiver not seen to be breast feeding would be considered irresponsible or careless (5.0%).

Therefore, in view of these cultural beliefs, most caregivers were found to prefer breast feeding their infants rather than ignoring their cultural issues hence exposing their infants to the risk of MTCT. In addition, the study respondents also comprised of non biological mothers of whom 0.7% were due to maternal death, while 0.7% of the mothers were ill. These infants were fed on either cow’s milk or infant formula since they could not be breastfed.

**4.4.4: Inaccessibility and Inconvenience in Preparation of Replacement Foods**

Results found out that while 2.9% of the caregivers could not access cow’s milk, 5.7% could not also access infant formula, and 2% of them could not find infant formula in local shops. This therefore suggests that the caregivers had no other choice but to breast feed the infants. Results also showed that caregivers could not opt for heat treated breast
milk (54.3%), cow’s milk (1.4%), and Infant formula (1.4%) as preparation of these foods was time consuming. This also indicated that the quality of PMTCT counseling was poor. This was probably the reason why a large proportion of caregivers in this study chose breast milk (71.4%).

4.4.5: Ignorance

Results showed that 1.4% of the caregivers did not know how to correctly dilute the milk while 9.3% did not know the amount of water that they added to the milk. However, 7.9% of the caregivers did not add sugar to the milk. This was probably due to the fact that the quality of counseling of caregivers in the antenatal clinic may also have been poor. This study sought to find out if education level would influence the choice of infant feeding options by caregivers. Table 4.7 showed the relationship between the caregiver’s education level and the choice of infant feeding options.

Table 4.7: Relationship between Educational Level and the Feeding Options

<table>
<thead>
<tr>
<th>Education level</th>
<th>Feeding options chosen (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBF</td>
<td>Cow’s Milk</td>
</tr>
<tr>
<td>Primary</td>
<td>36.4</td>
<td>7.9</td>
</tr>
<tr>
<td>Secondary</td>
<td>23.6</td>
<td>5.0</td>
</tr>
<tr>
<td>College</td>
<td>5.7</td>
<td>1.4</td>
</tr>
<tr>
<td>None</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>70.7</td>
<td>14.3</td>
</tr>
</tbody>
</table>
Table 4.7 showed that majority of the caregivers of primary level (36.4%) and consequently secondary level caregivers (26.3%) opted to breastfeed their infants. This was probably because their income level was low and therefore the caregivers preferred to breastfeed their infants rather than choose replacement foods which were costly. Moreover, the caregivers who had low education level only breastfed their infants possibly because they could not recall available replacement food. The relationship between the education level and the feeding options were not statistically significant at 5% significance level (chi-square test, p=0.680).

### 4.4.6: Stigma and family pressure

Historically, health workers have told mothers and community that breast feeding was the best choice for babies and is still so. Many people are now aware that breast feeding is recommended for HIV positive mothers if she is fit. Results however showed that about 21% of the caregivers could not choose replacement feeding for fear that relatives and neighbors would suspect that the reason for them not breastfeeding was HIV related. Results also observed that a small fraction of the caregivers (2%) were coerced by family members to breast feed their infants thus leaving no choices for them.

### 4.4.7 Maternal age

This study also compared the relationship between Caregivers’ age and the feeding options that they chose (Table 4.8).
Table 4.8: Relationship between Caregivers’ Age and Chosen Feeding Options

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Feeding options chosen (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBF</td>
</tr>
<tr>
<td>&lt; 20</td>
<td>2.1</td>
</tr>
<tr>
<td>20-29</td>
<td>29.3</td>
</tr>
<tr>
<td>30-39</td>
<td>35.7</td>
</tr>
<tr>
<td>40-49</td>
<td>3.6</td>
</tr>
<tr>
<td>50-59</td>
<td>0</td>
</tr>
<tr>
<td>Total (%)</td>
<td>70.7</td>
</tr>
</tbody>
</table>

Results indicated that among those caregivers who chose to breast feed, majority (35.7%) of them were aged 30-39 years followed by those who were aged 20-29 years (29.3%). Reasons could include first, caregivers aged 20-39 years were the majority (Table 4.1) and secondly, this was probably because the older mothers often influenced their feeding choices. Findings also revealed that caregivers aged less than 20 years either breastfed (2.1%) their infants or fed them on cow’s milk (2.1%). Most of these caregivers were school dropouts and therefore, they had no source of income. As a result, they either breast fed or fed the infants with cow’s milk and no formula. On the other hand, caregivers who were over 50 years chose infant formula (0.7%). This may be due to the fact that the infants they cared for belonged to their daughters who succumbed to HIV and also, they may be relatively stable financially. The relationship between the caregiver’s age and the feeding option chosen were not statistically significant at 5% significance level (chi-square test, p=0.083). This indicates that caregivers aged 20-39 years were likely to breast feed their infants.
4.4.8: Maternal parity

This study sought to establish if maternal parity would influence the choice of infant feeding options (Table 4.9)

Table 4.9: Relationship between Maternal Parity and Infant Feeding Options

<table>
<thead>
<tr>
<th>Maternal parity</th>
<th>Chosen feeding options (%)</th>
<th>EBF</th>
<th>Cows milk</th>
<th>Infant formula</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>14.3</td>
<td>2.1</td>
<td>2.1</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>15.0</td>
<td>2.9</td>
<td>0.0</td>
<td>1.4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>16.4</td>
<td>2.9</td>
<td>2.9</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>15.0</td>
<td>2.9</td>
<td>2.9</td>
<td>0.7</td>
</tr>
<tr>
<td>≥5</td>
<td></td>
<td>10.0</td>
<td>3.6</td>
<td>2.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>70.7</td>
<td>16.0</td>
<td>10.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Results showed that majority of the caregivers with different number of children mainly chose breast milk. Further, the findings showed that the largest proportion among those who breast fed the infants (16.4%) were those caregivers having three children. The least proportions in the same category (10.0%) were those caregivers having five or more children. As had been noted earlier, a low proportion of caregivers fed the infants with replacement food. The relationship between maternal parity and the choice of feeding options were not statistically significant at 5% significance level (chi-square test, p=0.819).

4.5.0: Effects of the Chosen Feeding on Infant growth, Morbidity and Nutritional Status

Anthropometry is the measurement of an individual’s weight and height in relation to infant’s age and sex. It one of the methods used to assess nutritional status.
Anthropometric measurements are compared with the WHO Anthro 2005, version 2.02 reference standards and presented as indices. Three (3) indices commonly used to describe malnutrition are: - weight for age (underweight) - reflects acute and chronic malnutrition; Height/length for age (stunting) – reflects chronic malnutrition; and weight for height/length (wasting) - reflects acute malnutrition.

Cut-off for Z-scores is as follows;

<-1 to >-2 z- scores represents mild malnutrition.

<-2 to >-3 z-scores represents moderate malnutrition.

<-3 z- scores represents severe malnutrition.

4.5.1: Distribution of Infants by Sexes

Results showed that 47.9% of the infants were females while 52.1% were males. This means that there was a good representation of both sexes in the study.

4.5.2: Mean Weights of Infants from Birth to Ten weeks

The study compared the mean weights of infants at birth, six weeks, and ten weeks among infants fed on different feeding options as shown in Figure 4.3.
Figure 4.3 Infant Growth from Birth to Ten Weeks

The graph above showed the mean weights of infants who were fed on different feeding options. The mean weights of exclusively breast fed infants were higher than those of predominantly and mixed fed infants whose mean weights were nearly similar. That means at birth, the mean weight among exclusively breast infants was 3.3 kg, at six weeks, mean weight was 4.6 kg and at the age of ten weeks, mean weight was 5.5 kg. Results also revealed that among those who were predominantly and mixed fed, the mean birth weights were 3.0kg and 2.9kg respectively. At the age of six weeks, mean weights were 4.2kg and 4.0kg respectively, and at ten weeks, mean weights were 5.1kg and 4.8kg respectively. Results further indicated that exclusively breast fed infants were associated with better growth as opposed to other feeding modes. However, the mean weights among those infants who were mixed fed were the least suggesting that mixed feeding was associated with poor growth.
4.5.3: Association between Chosen Feeding Options and Infant Nutritional Status

This study also examined the relationship between chosen feeding options and the infants’ nutritional status. The findings are shown in table 4.10.

Table 4.10: Relationship between Infant Feeding Options and Nutrition Status

<table>
<thead>
<tr>
<th>Infant feeding options</th>
<th>EBF</th>
<th>Breast milk and water</th>
<th>Breast milk and formula</th>
<th>Breast milk and cow milk</th>
<th>Others</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional Status (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whz birth</td>
<td>0.0</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.000</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.8</td>
<td>2.3</td>
<td>0.8</td>
<td>0.0</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waz birth</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.000</td>
</tr>
<tr>
<td>moderate</td>
<td>0.0</td>
<td>2.8</td>
<td>1.4</td>
<td>0.7</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whz 6 wks</td>
<td>2.1</td>
<td>5.6</td>
<td>1.4</td>
<td>0.7</td>
<td>0.0</td>
<td>0.995</td>
</tr>
<tr>
<td>moderate</td>
<td>2.8</td>
<td>4.9</td>
<td>1.4</td>
<td>0.7</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waz 6 wks</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
<td>0.673</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.7</td>
<td>8.4</td>
<td>1.4</td>
<td>0.7</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whz 10 wks</td>
<td>5.7</td>
<td>5.6</td>
<td>0.0</td>
<td>3.5</td>
<td>0.0</td>
<td>0.000</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.1</td>
<td>2.8</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waz 10 wks</td>
<td>1.4</td>
<td>4.2</td>
<td>0.7</td>
<td>3.5</td>
<td>0.0</td>
<td>0.000</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.0</td>
<td>3.5</td>
<td>0.0</td>
<td>1.4</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results showed that majority of the infants who were malnourished were those who were fed on breast milk and water (predominantly breast fed). This was probably because the caregivers might have fed infants with untreated water. Results revealed that at the age
of six weeks, while 5.6% of the infants were moderately wasted, 4.9% were severely wasted. At the same age, results also showed that 8.4% of the infants were severely underweight. At the age of ten weeks, results showed that while 5.6% of the infants were wasted, 4.2% were moderately underweight as 3.5% were severely underweight. Results also indicated that infants fed on cow’s milk and breast milk were moderately wasted at the age of ten weeks (3.5%) and also moderately underweight (3.5%) at the age of ten weeks. This was probably because mixed feeding (breast milk and cow’s milk) is usually associated with illnesses which further compromise infants’ nutritional status. Regarding exclusive breast feeding, majority of infants were well nourished. However, 2.8% of the infants were severely wasted at the age of six weeks, while at the age of ten weeks, 5.7% of the infants were moderately wasted. This may have been due to an illness such as diarrhea or HIV infection considering the fact that this study did not determining the infants’ HIV status.

4.5.4: Association between feeding options and infant morbidity

Results indicated that 47.1% of the infants had suffered from an illness lasting for more than a week while 52.9% had none. The study examined the relationship between chosen feeding options and different illnesses (Table 4.11).
Table 4.1: Relationship between infant illnesses and chosen feeding options

<table>
<thead>
<tr>
<th>Illnesses</th>
<th>Chosen Feeding Options (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBF</td>
</tr>
<tr>
<td>Diarrhea/vomiting</td>
<td>0.7</td>
</tr>
<tr>
<td>Cold/cough</td>
<td>0.0</td>
</tr>
<tr>
<td>Cold/cough/skin rashes/ fever</td>
<td>0.0</td>
</tr>
<tr>
<td>Cold/cough, oral sores, skin rashes</td>
<td>0.0</td>
</tr>
<tr>
<td>Fever</td>
<td>0.0</td>
</tr>
<tr>
<td>Others</td>
<td>0.0</td>
</tr>
<tr>
<td>None</td>
<td>23.6</td>
</tr>
<tr>
<td>Total</td>
<td>24.3</td>
</tr>
</tbody>
</table>

Table 4.11 showed that majority of the infants who presented with the various illnesses were mainly those who were fed on (BM) breast milk and water. This may have been due to the fact that the quality of water that the caregivers used was questionable thus affecting its safety. For instance, (as had been noted earlier) 12.9% of the caregivers bought water from a water point, another 12.1% fetched from the river, while 7.9% bought from hawkers, and 4.3% obtained it from unprotected wells. Majority of the infants in this group (16.4%) suffered from diarrhea and vomiting probably due to exposure to untreated water. This was followed by those who suffered from cold/cough, skin rashes and oral sores (5.0%). In addition, respiratory conditions like cold and cough accounted for 4.3% while 2.9% suffered from fever. Furthermore, infants who were fed on breast milk and cows’ milk (CM) – mixed feeding were (5.0%). Generally, infant illnesses were seen to be associated with mixed feeding. It was noted that exclusive
breast feeding (EBF) was associated with the least proportion of illnesses (only 0.7% suffered from diarrhea and vomiting). This indicated that exclusive breast feeding was indeed an ideal feeding option among infants born to HIV positive women. Null hypothesis: Association between infant morbidity and chosen feeding options was significant at 5% significance level (chi square test, p=0.000).
CHAPTER V: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1: Introduction

This study was designed to evaluate the effect of different feeding options on infants born to HIV positive mothers. The discussions and conclusions arrived at are stated and recommendations made with an overall goal of enabling the caregivers to understand the effects of infant feeding options. This results in prevention of malnutrition, a reduction in MTCT, with subsequent improved infant wellbeing.

5.2: Discussion

5.2.1: Caregivers’ Knowledge Regarding Infant Feeding

Although 96% of the caregivers attended antenatal clinics, the study showed that majority of them had poor knowledge regarding available infant feeding options. However, only a small proportion was well informed which seemed to correlate with the number of respondents who had tertiary education. Majority of the caregivers had only primary education while another small fraction had none. Lack of education is indeed a major draw back to understanding the principles of infant feeding. This finding agreed with a study done among HIV positive women in Zimbabwe which showed that level of education among caregivers influenced their choice of infant feeding options (Gara et al., 2005). In addition, this may have been due to the problem of recall and lack of repeated counseling sessions on infant feeding (Chopra and Rollins, 2007). This meant that the quality of PMTCT counseling was poor.
5.2.2: Infant Feeding Options

The study revealed that while 70.7% of the infants were exclusively breastfed after birth, only 24.3% were still exclusively breast feeding at the time of this interview (at the age of ten weeks). This finding disagreed with that of a similar study done in Abidjan, Cote d’Ivoire (Becquet et al., 2005) who observed that exclusive breastfeeding was low. It indicated that 47% of the caregivers initiated breast feeding after birth. Among these women, only 10% were still exclusively breast feeding at the age of three months. Indeed, it is an established fact that exclusive breast feeding promotes growth, provides adequate nutrients to build the body, and protects the baby against illnesses (MOH, UNICEF, WHO and USAID, 2007). Studies have also revealed that exclusive breast feeding carries a lower risk than mixed feeding. A lower risk of about 4% was reported in South Africa (Coovadia et al., 2007) and 1.3% (HIV transmission between six weeks and six months) in Zimbabwe (Iliff et al., 2005).

Moreover, although the caregivers had been counseled to exclusively breast feed their infants in antenatal clinics, about 76% of them were still practicing mixed feeding at the time of interview. Some of the foods that were given to the infants in addition to breast feeding included water, cow’s milk, infant formula or fruit juice. The study also revealed that majority of the caregivers fed the infants with water in addition to breast feeding. This finding agreed with those of a focus group discussion in Nigeria which argued that breast milk was ‘food’ and that after eating, a baby required water (Abiona et al., 2006). Furthermore, it has been observed that mixed feeding increases MTCT of HIV
(Coutsoudis et al, 2001). Indeed, mixed feeding in HIV positive mothers is not the right practice. Studies have shown that mixed feeding increases MTCT fourfold while predominantly breast feeding is associated with a 2.6 fold increase in MTCT as compared to exclusive breast feeding (Iliff et al., 2005).

In addition, it was found that despite of having been counseled on all feeding options, a fraction of caregivers still had difficulties in preparing cow’s milk. Thus, while a section of caregivers incorrectly diluted it, others did not measure the amount of water to add to milk, and another group did not add any sugar. This study noted that the Kenya National Guidelines advocates that the PMTCT counselors should provide information on feeding options, demonstrate safe preparation and storage of infant food, and demonstration of cup and spoon feeding (MOH, UNICEF, USAID, and FANTA, 2007). Therefore, this was an indication that the quality of PMTCT counseling was poor. These findings agreed with those of (Oguta et al, 2004) who found out that caregivers’ knowledge regarding dilution of cow’s milk was poor, and that while some caregivers over-diluted the milk, others over-concentrated it rendering the practice inappropriate. This further agreed with Muko et al, (2004) who noted that incorrect dilution of milk affected its quality which may subsequently cause infant under nutrition. However, in a study done in antenatal clinics in Moshi, Tanzania, the authors suggested that in resource poor settings, the avoidance of breast feeding was unlikely to be acceptable, feasible, affordable, sustainable or safe, and that breast feeding would remain the most appropriate choice for most women (de Paoli et al, 2003). In addition, it was found that majority of the
caregivers did not consider heat treated breast milk as a feeding option of choice. This also agreed with de Paoli et al, (2003) contention that while expressing and heat treating breast milk is a promising approach of ensuring that breast milk is safe, it may not be sustainable as it required skill and proper facilities. More-over, in a study done at Homa Bay, respondents felt that the idea of milking a human being was culturally not normal and that breast milk could not be expressed to produce enough to satisfy the baby contended Oguta et al, (2004).

5.2.3: Factors influencing choice of infant feeding options

a) Cost

The study showed that while majority of the caregivers found infant formula expensive, another fraction could not also afford cow’s milk. This may have resulted in majority of caregivers choosing to breastfeed the infants. This was further compounded by the fact that majority of the caregivers (Table 4.1) earned less that Kshs.500 per month. It also emerged from this study that on average, the cost of a tin of infant formula on the local market was Ksh. 700, while a baby required approximately 30 tins within the first ten weeks (Ksh.15, 000). This finding agreed with Muko, et al (2004) who asserted that the most common factor affecting caregivers’ choice of replacement feeding was cost, as they found that 69% of the women could not afford replacement food. Thairu, (2007), in a similar study in Rwanda, agreed with these findings by asserting that while 81% of HIV positive mothers chose to breast feed their infants, 53% of these mothers justified their choice that they lacked financial means to make other choices.
b) Perception of MTCT

The study revealed that out of all the caregivers who chose to breast feed, majority of them knew that there was a problem with breast feeding. Among these, a large proportion (67%) feared that their babies may be infected with HIV. The rest either knew there was no problem (27.3%) or did not know (1.3%). In a similar study done in Zimbabwe, 49% of the women were afraid to breast feed after being aware of the link between HIV transmission and breast milk (Downs and Cooper, 2007).

c) Inconvenience in replacement food preparation

Furthermore, the inconvenience of preparing replacement foods was mostly associated with lack of time and inadequate skill rather than stigma. In a study done in antenatal clinics in Moshi, Tanzania, it emerged that while expressing and heat treating breast milk is a promising approach of ensuring that breast milk is safe, it may not be sustainable as it involves two new practices that must be sustained (de Paoli et al., 2003). In another study done in Kilimanjaro Tanzania, caregivers who chose replacement food after counseling expressed uncertainty about preparing the formula or cow’s milk (Leshabari et al., 2006). This may be the reason why majority of the caregivers chose to breast feed their infants.

d) Cultural beliefs, Maternal Illness or death

The study also showed that the clinical state of the caregivers was another factor. In fact very sick mothers would not be able to breast feed their infants. In a study done in Cameroon, more mothers (19.5%) were too sick to be able to breast feed their babies
(Muko et al, 2004). Furthermore, in a randomized clinical trial done in Nairobi Kenya, the most common reasons for early introduction of weaning foods were maternal illnesses, and insufficient milk production often due to maternal illnesses (Nduati et al, 2000). This ultimately leaves the infants with the option of replacement feeding. In addition, maternal death soon after birth poses a major challenge for orphaned infants in communities with limited resources. The study found that 2% of the mothers had died leaving infant orphans. Although breast milk banks were nearly completely phased out two decades ago, Brazil and South Africa have revisited it (Downs and Cooper, 2007). This provides orphaned infants with safe breast milk. This is also a useful option for mothers with mastitis. Results further revealed that about 30% of the caregivers had certain cultural issues affecting their choice of breast feeding. In a study done in Kilimanjaro Tanzania, focus group participants did observe that community commitment to breast feeding is so culturally embedded that refusal to breast feed without a strong reason could result in loss of respect, rejection, and withdrawal of assets granted to a woman during her postnatal confinement (Leshabari et al, 2006). This suggests that women have a notion that breast milk is superior to replacement food. No consideration seemed to be given to the fact that HIV can be transmitted through breast milk.

e) Stigma and family pressure

In communities where breast feeding was the norm, choosing replacement feeding would have seemed abnormal prior to the advent of HIV. Now that there has been public awareness about transmission of the virus through breast milk, mothers are reluctant not
to breast feed their infants even if free formula was provided (Omari et al, 2003). In a randomized clinical trial done in Nairobi, Kenya, women assigned to formula often experienced community, family or spousal pressure to breast feed. Despite the knowledge about breast milk HIV transmission risk, 30% of women randomized to use formula admitted to non compliance (Nduati et al, 2000). The primary reason for this appeared to have been the stigma of HIV infection, which had become associated with replacement feeding. Furthermore, exclusive breast feeding given beyond 2-3 months without adding supplements could also be interpreted as an indication that the mother might be HIV positive (Leshabari et al, 2006). The study also revealed that a few mothers accessed formula freely (though they were later excluded). Certainly, those caregivers who might obtain free milk are not likely to breast feed. In addition, issues surrounding availability of free formula could eventually discourage breast feeding among sero-negative mothers (Filteau, 2003) undermining many years of public health messages.

5.2.4: Effects of Feeding Options on Infant Growth, Nutrition Status and Morbidity.

The study showed that majority of the infants who were malnourished were those fed on breast milk and water. This agreed with a study done in Nairobi which showed that exclusively breast fed infants had better nutritional status compared to other foods (Mbori-Ngacha et al., 2001). However, those infants who were exclusively breast fed were well nourished (MOH, UNICEF, WHO, and USAID, 2007).
The study also revealed that majority of the infants who suffered from various illnesses were those who were fed on breast milk and water (predominantly breast feeding). Moreover, majority of those infant who were ill suffered from diarrhea and vomiting then closely followed respiratory tract infections. These findings were similar to those of a prospective observational study in Lusaka, Zambia which showed that exclusive breast feeding was associated lower risks of diarrhea and pneumonia (Kuhn et al., 2007). However, those that were well nourished were mainly among exclusively breastfed infants. This finding agreed with an article (MOH, UNICEF, WHO, and USAID, 2007) which revealed that breast milk contains anti-infective properties which protect the infant from getting sick. These findings however disagreed with an earlier study (Kagaayi et al, 2008) conducted in Rakai, Uganda. The authors observed that although exclusive breast feeding was associated with high rates of morbidity, formula feeding was more deleterious. These findings also disagreed with those of a randomized clinical trial of breast fed and formula fed infants of sero-positive women in Nairobi, Kenya (Mbori-Ngacha et al, 2001) which found out that there was no difference in incidences of illnesses in breastfed and non-breast fed infants.

Moreover, the study showed that exclusively breastfed infants were associated with better growth compared to other foods. This was consistent with another report which showed that growth of formula-fed infants in the first three (3) months of life was slower than that of exclusively breast fed infants (Kiarie et al., 2004)
5.3: Conclusion

This study came up with the following conclusions:

Exclusive breastfeeding is the cornerstone of public health. Infants who are exclusively breastfed have a much better chance of survival as opposed to those infants who are mixed fed. The latter group suffers from recurrent childhood illnesses leading to poor growth. It was also noted that infant feeding decisions were influenced by several factors such as financial considerations. In view of the complexity of the infant feeding decisions, it is important to support women who opt not to breast feed on safe use of replacement foods which may be readily available. Indeed, exclusive breast feeding is a safe and effective practice that substantially protects infants of HIV positive women against major childhood illnesses and consequently, support infant growth. Furthermore, the findings in this study showed that HIV-exposed infants whose mothers practiced exclusive breast feeding associated with better health.
5.4: Recommendations

1) The most significant factor in adherence to choice of infant feeding is the number of antenatal visits. Respective health authorities should ensure that the first visit should be used for testing and introduction of infant feeding options. Thereafter, the caregivers probably require three (3) more sessions to be supported on their appropriate choices. This subsequently ensures that caregivers avoid wrong feeding practices such as mixed feeding which affects infant growth.

2) The Ministry of Health should also ensure that available information centers in each hospital for HIV positive mothers should be strengthened. For instance, permanent staff/counselors could be posted there. This enables the clients to receive support on their choice of infant feeding options. In addition, they make enquiries, clarify feeding options, and receive new updates as the PMTCT clinics often get overwhelmed by a large number of clients.

3) Each individual hospital should also establish centers where counselors demonstrate safe replacement feeding preparations. (Some caregivers in this study did not know infant formula, cow’s milk was over diluted, and sugar was not added).

4) Health workers need to also ensure that Infant feeding messages should be repeatedly emphasized during Immunizations, mothers’ visit to family planning
clinic at six weeks, and every other hospital visit. This is important since their counseling time on infant feeding in PMTCT is short and caregivers may adopt other foods talked about in the community.

5) It is important that the Ministry of Health develop and sustain availability of educational materials to be used during infant feeding counseling. Although they were initially available in PGH, they have since been worn out without any replacement. The two health centers (Langalanga and Kapkures) had not received any. Caregivers were then verbally counseled on infant feeding. Ultimately, this may affect the quality of PMTCT care. Information should also be provided in a language that the clients can understand.

5.5: Suggestions for further research

The infants’ HIV status should be established and a repeat study done to compare the findings with those of this study.

In addition, a similar study should also be done and a comparison group included. That is, Infants of sero negative mothers should also be included then results are compared.
REFERENCES


Israel-Ballard, K.A., Maternowska, M.C., Abrams, B.F., Morrison, P.,


of Prevention and Control of Communicable Diseases. WHO Regional Office for Africa, 3(1).


APPENDICES

APPENDIX I: QUESTIONNAIRE

IMPACT OF DIFFERENT FEEDING OPTIONS ON INFANTS BORN TO HIV POSITIVE MOTHERS IN NAUKURU MUNICIPALITY, KENYA

The purpose of this interview is to assess the nutritional status of infants born to HIV positive mothers on different feeding options. I am going to ask you a number of questions about yourself, your family and your child. The information obtained will be kept confidential and no names will be recorded. Your participation or non participation will not affect your attendance or care at local health facilities.

Respondent Number

Consent Given (signature)

INSTRUCTIONS
1. Mark with a tick on the box with the appropriate answer.
11. Where there is no box, please put the answer on the space provided.

PART A: SOCIAL DEMOGRAPHIC DATA

1. Who is the principal caregiver of the infant?
   Biological mother □
   House girl □
   Aunt □
   Grandmother □
   Others .................................................................

2. What is the age of the caregiver (in years)?
   Less than 20 □
   20-29 □
   30-39 □
   40-49 □
   50-60 □
   Over 60 □

3. If not the mother, what happened to the mother (Tick the appropriate option).
   Mother deceased □
   Mother is working away from home □
   Mother traveled □
   Mother is ill □
   Others specify .........................................................
4. For surrogate mothers, how did the child come to your care?
   - Maternal death
   - Abandonment
   - Adoption
   - Others specify

5. Occupation of respondent
   - Housewife
   - Formal employment
   - Informal employment
   - Unemployed
   - Business person
   - Others

6. Education level of respondent
   - Primary
   - Secondary
   - University / College
   - None
   - Others

7. How many children do you have in your household?
   - 1
   - 2
   - 3
   - 4
   - 5 and above

8. What type of housing do you live in?
   - Permanent
   - Semi permanent
   - Shanty/temporary

9. What is your income level per month in Kenya shillings?
   - < 500
   - 500 – 1000
   - 1001 – 1500
   - 1501 – 2000
   - > 2000

10. Does your baby take alternative feeds other than breast milk?
    - Yes
    - No
11. If your answer in to Q10 is yes what is the source of the breast milk substitute?
Bought from the shop  
From local dairy  
I own a cow  
From hawkers  
Others .................................................................

12. What is the source of water for domestic use?
Piped  
Bought from water point  
Bought from hawkers  
Others specify .............................................................

13. Where do you dispose human waste?
Pit latrine  
Flush toilet  
Others specify .............................................................

PART B: FOR BIOLOGICAL AND SURROGATE MOTHERS

14. Was antenatal clinic attended by the child's mother during pregnancy?
Yes  
No  

15. Where was the child born?
Home assisted by TBA  
Health facility  
Others specify .............................................................

16. What type of birth did you have for this baby?
Normal vaginal  
Assisted vaginal  
Caesarean section  

17. What is the birth order of this child in the family?
First born  
Second born  
Third born  
Fourth born  
Other (write birth order of child) ...........................................
18. For biological mothers, have you lost any other of your children in the last 12 months?

Yes [ ] No [ ]

If your answer to Q18 is Yes, what was the cause of the death(s)

……………………………………………………………………………………………………

19. Did the health workers advice you on what food to give the baby after birth?

Yes [ ] No [ ] I can't remember [ ]

If yes what where you advised? …………………………………………………………………………………

……………………………………………………………………………………………………

PART B: KNOWLEDGE QUESTIONS

I am going to ask you the following questions:

20. Do you know feeding recommendations for infants of HIV positive mothers?

Well informed [ ] Not informed [ ]

Poorly informed [ ] Partially informed [ ]

21. WHO advices replacement feeding for infants of HIV positive mothers. What are some of the replacement feeds recommended?

Formula [ ] Heat treated breast milk [ ]

Animal milks [ ] I do not know [ ]

22. Is there any problem if an HIV positive mother breastfeeds her baby?

Yes [ ] No [ ]

23. If your answer to Q22 is yes what is the problem with breastfeeding if a mother is HIV positive?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

24. What factors may increase HIV transmission to your child if you opt to breast feed?

Breastfeeding and giving the child other food and fluids [ ]

Cracked nipples [ ]
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged breastfeeding</td>
<td>☐</td>
</tr>
<tr>
<td>Breast engorgement</td>
<td>☐</td>
</tr>
<tr>
<td>Mouth sores in the baby</td>
<td>☐</td>
</tr>
<tr>
<td>All of the above</td>
<td>☐</td>
</tr>
<tr>
<td>I do not know</td>
<td>☐</td>
</tr>
</tbody>
</table>

25. If one is HIV negative what is the ideal way of feeding her child?
   - Breast milk ☐
   - Cow's milk ☐
   - Formula ☐
   - Others, list …………………………………………………………………………………

26. Have you heard of wet nursing?
   - Yes ☐
   - No ☐

27. Have you heard of heat treating of breast milk?
   - Yes ☐
   - No ☐

28. What was the source of information you know regarding infant feeding?
   - Health worker ☐
   - A support group ☐
   - Mass media (radio, TV or Newspaper) ☐
   - Others specify …………………………………………………………………………………

PART C: ATTITUDE QUESTIONS

I will ask you the following questions:

29. Do you have any cultural barriers to not breast feeding?
   - Yes ☐
   - No ☐

   If your answer is Yes, list some of them
   ………………………………………………………………………………………………………

30. Would lack of breast feeding affect your baby? Explain briefly
    ………………………………………………………………………………………………………
    ………………………………………………………………………………………………………
    ………………………………………………………………………………………………………

31. Do you think you can comfortably practice wet nursing?
    - Yes ☐
    - No ☐

    If your answer is No, explain why?
    ………………………………………………………………………………………………………
    ………………………………………………………………………………………………………

32. Would you consider heat treating of breast milk as a feeding choice for your baby?
    - Yes ☐
    - No ☐
If No, explain why……………………………………………………………………

33. What do you consider as best feeding option for infants of HIV positive mothers?
   Breast milk
   Infant formula
   Cow's milk
   Others, list ………………………………………………………………………

34. Briefly explain why you think the feed you chose above (Q33) is good for small infants?
   ……………………………………………………………………………………………
   ……………………………………………………………………………………………

35. Is it possible not to breastfeed completely?
   Yes ☐ No ☐

36. Would you formula feed exclusively if possible?
   Yes ☐ No ☐

37. Would you prefer mixed feeding?
   Yes ☐ No ☐

38. Is animal milk a good feed for the baby?
   Yes ☐ No ☐
   If the answer is yes, explain why
   ……………………………………………………………………………………………
   ……………………………………………………………………………………………

PART D: PRACTICE QUESTIONS

I will ask you the following questions on what you practice

39. What feeding option did you give the baby after birth?
   Breast Milk ☐ Pumpkin ☐
   Cow's milk ☐ porridge ☐
   Infant formula ☐ Fruit juice ☐
   Others specify ………………………………………………………………………

With reference to question 39 briefly explain why you did not choose to use the following feeding options:
   Breast milk………………………………………………………………………………
   Infant formula…………………………………………………………………………
   Cow’s milk………………………………………………………………………………

If not breastfeeding go to Q.47

40. Did you experience any problems with breastfeeding?
   Yes ☐ No ☐
41. If your answer to the above (Q40) is yes, what kind of problem was that?
   - Cracked nipples ☐
   - Breast engorgement ☐
   - Breast abscess ☐
   - Others specify ............................................................

42. How often did/do you breast feed each day?
   - Three times ☐
   - Four times ☐
   - Twice ☐
   - On demand ☐

43. Do you give the baby any other feeds other than breastfeeding?
   - Yes ☐
   - No ☐

44. If your answer to Q43 is yes, what feeds are they?
   - Water ☐
   - Formula ☐
   - Pumpkin ☐
   - Fruit juice ☐
   - Cow’s milk ☐
   - Others, List……………………………………………………………

45. For how long did you breastfeed the baby?
   - One week ☐
   - One Month ☐
   - Till now ☐
   - Other, specify .................................................................

46. For those who have stopped breastfeeding, what feeds do you give the baby now?
   - Cow's milk ☐
   - Infant formula ☐
   - Mashed fruits ☐
   - Porridge ☐
   - Others, list .................................................................

   For those who use infant formula answer the following questions:
   If not using formula, go to Q56.

47. Have you had problems affording to buy formula each month? .........................
   - Yes ☐
   - No ☐

48. Do you have access to sites where formula is available?
   - Yes ☐
   - No ☐

49. Do you feed the baby at night?
   - Yes ☐
   - No ☐

50. If your answer to Q49 is no, explain why?
    ..............................................................................................

51. Do you have access to boiled water whenever you need it?
   - Yes ☐
   - No ☐
52. Do you prepare each feed with boiled water?

Yes ☐ No ☐ Yes with difficulty ☐

53. Do you clean the baby's utensils after each feed?

Yes ☐ No ☐ Yes, but with difficulty ☐

54. What utensil do you use to feed the baby?

Cup ☐ Cup & spoon ☐ Bottle with teat ☐
Others, specify …………………………………………………………………

55. What other feed do you give the infant other than formula milk?

Porridge ☐ Water ☐ Tea ☐
Mashed fruits ☐
Others, list……………………………………………………………………………………………………………………………………………………

For those who use cow's milk, answer the following questions:

56. Do you dilute cow's milk with boiled water before giving the baby?

Yes ☐ No ☐

If your answer is No, go to Q58.

57. If your answer to Q56 is yes, how much water do you add to the milk?

Ratio of 1:1 ☐
Ration of 1:2 ☐
Unknown ☐
I use a measuring cup but do not know amount ☐

58. Do you add sugar to baby's milk?

Yes ☐ No ☐

59. How often do you feed the baby with cow’s milk in a day?

Thrice ☐ More than four ☐
Four times ☐ On demand ☐

60. Do you always have the money to buy cow's milk?

Yes ☐ No ☐ Sometimes ☐

61. What other feed do you give the infant other than cow's milk?

Porridge ☐ Water ☐ Tea ☐ Mashed fruits ☐
Others, list……………………………………………………………………………………………………………………………………………………
62. Do you have adequate time to prepare the milk?
   Yes ☐  No ☐  Sometimes ☐
63. Do you boil the water before preparing the infant's feeds?
   Yes ☐  No ☐

**PART E: MATERNAL SOCIAL STATUS QUESTIONS**
64. When was the diagnosis of HIV done?
   Before pregnancy ☐
   During pregnancy ☐
   After pregnancy ☐
   I do not remember ☐
65. Are you on ARVs?
   Yes ☐  No ☐
66. Does your family know that you are HIV positive?
   Yes ☐  No ☐
67. If the answer to Q66 is yes, who is aware of your diagnosis?
   My husband ☐
   My mother ☐
   My parents ☐
   Others specify …………………………………………………………………………………
68. Have you had any support on your choice of feed from your family, friends or health workers?
   Yes ☐  No ☐
   If your answer to Q68 is no, explain why they are not willing to help?
   …………………………………………………………………………………
   …………………………………………………………………………………
69. Have you experienced any opposition regarding your choice of feed?
   Yes ☐  No ☐

**PART F: CHILD ASSESSMENT**
70. What is the age of the infant (in days)? ……………………………………………………..
71. What is the sex of the infant ………………………………………
72. List what the following measurement were at birth: (check in child's record card)
   Weight ………………………………………
   Length ………………………………………
73. Medical history: Has the child suffered any serious illness lasting longer than one week since birth?
   Yes ☐  No ☐
74. If your answer to Q73 is Yes, what was the nature of illness(es)?

- Diarrhea and vomiting
- Fever
- Oral sores
- Others

- Cold/cough
- Refusal to feed
- Skin rashes

75. Infant’s immunization status (Check card)

- BCG
- OPV birth

- None
- Up to date

76. Physical examination checklist

Date of birth

Weight at zero (0) week

Length at zero (0) week

Date at six (6) week when weight and length were done

Weight at six (6) weeks

Length at six (6) weeks

Date at ten (10) week when weight and length were done

Weight at ten (10) weeks

Length at ten (10) weeks

Maternal weight (when infant is 10 weeks)

Maternal height (when infant is 10 weeks)

---

End of Interview.

Thank you for sharing your experiences of raising a young child. Your answers will help us to develop better programs for mothers and their infants. I appreciate the time that you have given.
APPENDIX II: MAP OF STUDY AREA

Source: MOH – Nakuru Municipality
Appendix III: Work plan for the research

<table>
<thead>
<tr>
<th>Activities</th>
<th>Jun. 07-08</th>
<th>June 07-08</th>
<th>June-Oct. 07-08</th>
<th>Nov 08-09</th>
<th>Feb-Aug. 09-10</th>
<th>Jun-Sep. 09-10</th>
<th>Sept 09-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal Defense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write the draft thesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defending draft thesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thesis defense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX IV: RESEARCH BUDGET

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>COST</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Stationary and materials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocopy papers</td>
<td>4 reams</td>
<td>500</td>
<td>2000</td>
</tr>
<tr>
<td>Spring files</td>
<td>5</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>Staplers and staples</td>
<td>2</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Ball pens</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Pencil sharpeners</td>
<td>2</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Rubbers</td>
<td>3</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>HB pencils</td>
<td>10</td>
<td>25</td>
<td>250</td>
</tr>
<tr>
<td>Notebook</td>
<td>1</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Felt pens</td>
<td>4</td>
<td>60</td>
<td>240</td>
</tr>
<tr>
<td>Calculator (Casio 82MS)</td>
<td>1</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Flash Disk</td>
<td>1</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td><strong>2. Secretarial services</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typesetting of Research</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal @ 30/= per page for 25 pages</td>
<td>25 pages</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Proposal photocopying @ 3/= per page</td>
<td>125 pages</td>
<td>375</td>
<td>375</td>
</tr>
<tr>
<td>Proposal binding each @ 60/=</td>
<td>5 booklets</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Photocopying the questionnaires each with 3 pages</td>
<td>400</td>
<td>9</td>
<td>3600</td>
</tr>
<tr>
<td>Internet access and downloading @ 2/= per minute</td>
<td></td>
<td></td>
<td>5000</td>
</tr>
<tr>
<td><strong>3. Transport</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport cost from Nakuru- Nairobi</td>
<td>6 trips</td>
<td>1000</td>
<td>6000</td>
</tr>
<tr>
<td>Transport cost to study area for 60 days</td>
<td>5 people</td>
<td>50</td>
<td>15000</td>
</tr>
<tr>
<td><strong>4. Miscellaneous</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical package and data analysis</td>
<td></td>
<td></td>
<td>20000</td>
</tr>
<tr>
<td><strong>5. Training and allowances</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training 3 assistants for 3 days</td>
<td>3</td>
<td>500</td>
<td>4500</td>
</tr>
<tr>
<td>Allowances and lunch for 3 assistants for 60 days</td>
<td>3</td>
<td>500</td>
<td>90,000</td>
</tr>
<tr>
<td><strong>6. Thesis typing and photocopying</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typing 100 pages @ 30/= per copy</td>
<td>100</td>
<td>30</td>
<td>3000</td>
</tr>
<tr>
<td>Thesis photocopying of 100 pages @ 3/= for 10</td>
<td>100</td>
<td>300</td>
<td>3000</td>
</tr>
<tr>
<td>Thesis binding 10 copies @ 1/3</td>
<td>10</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td><strong>7. Purchase of Research tools</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighing scales</td>
<td>1</td>
<td>10000</td>
<td>10000</td>
</tr>
<tr>
<td>Length board (Infantometer)</td>
<td>1</td>
<td>6000</td>
<td>6000</td>
</tr>
<tr>
<td>Tape measures</td>
<td>4</td>
<td>250</td>
<td>1000</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>180,065</td>
</tr>
<tr>
<td><strong>8. Contingency Provision @ 10% of the total</strong></td>
<td></td>
<td></td>
<td>18,000</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>198,065</strong></td>
</tr>
</tbody>
</table>