COMPARISON OF NUTRITIONAL STATUS BETWEEN BREASTFED AND REPLACEMENT FED INFANTS BORN TO HIV INFECTED MOTHERS IN NAIROBI

BY

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A research thesis submitted in partial fulfillment for the award of the degree of Master of Science in Nursing (Paediatrics) at the University of Nairobi

October 2008

DECLARATION

I declare that this is my original work and has not been presented to any other university or training institution, for an award of degree/certificates.

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DEDICATION

I dedicate this work to my Mum Edith and Dad Anthony, for their constant encouragement and support while undertaking the study. You are a special gift in my life, God bless you.

ACKNOWLEDGEMENTS

- I wish to acknowledge my supervisors Mr. Peter M. Waithaka and Mrs. Lucy K. Bitok for their assistance and guidance through the process of research.
- I wish to thank my colleagues Rose, Mutisya and Dorcas for their constant appraisal and critique.
- I appreciate the efforts of Mr. Phillip Ayieko of Kemri-Wellcome Trust in helping me analyze the data.
- I also appreciate the help of Mr. Lambert Nyabola for his assistance in writing the thesis.
- I wish to acknowledge all the members of staff in city council clinics who patiently and tirelessly worked hard for the success of this study.
- Many thanks to the mothers and their infants for their acceptance to participate in the study and patience during data collection.
- I appreciate the efforts of Tabitha Kinyanjui my study assistant for her dedication to this study during my period of data collection.
- Lastly I acknowledge the School of Nursing Sciences of The University of Nairobi for the good learning atmosphere and Nairobi City Council for approving the study to be conducted in the City Council Clinics.

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LIST OF ABBREVIATIONS

AFASS- Acceptability Feasibility Affordability Sustainability and Safety.

AIDS- Acquired Immunodeficiency Syndrome.

AMREF- African Medical and Research Foundation.

BScN- Bachelor of Science in Nursing.

CDC – Center of Disease Control.

DMOH- District Medical Officer of Health.

EBF - Exclusive Breastfeeding.

ERF - Exclusive Replacement feeding

HC – Health Centre

HIV- Human Immunodeficiency Virus.

KDHS- Kenya Demographic and Health Survey.

Ksh- Kenyan shillings.

MOH- Medical Officer of Health.

MPH- Master of Public Health.

MSc HSM- Master of science in Health Systems Management.

MScN- Master of Science Nursing.

MTCT- Maternal To Child Transmission.

NHMB – Nairobi Health Management Board.

PCR – Polymerase Chain Reaction.

PMCT– Prevention of Mother to Child Transmission.

UNICEF- United Nations Children's Fund.

USA– United States of America.

WHO- World Health Organization.

OPERATIONAL DEFINITIONS

AFASS: It is an acronym for acceptability, feasibility, affordability, sustainability and safety. It is used by WHO to asses whether HIV infected mothers meet the criteria for giving replacement feeds to their infants.

Age: Duration of time a person has existed (in this study measured in months since child birth).

AIDS: An acquired defect of cellular immunity associated with infection by the human immunodeficiency virus, a CD4 – positive lymphocyte count under 200 cell/micro liter or less than 14% of total lymphocytes, and increased susceptibility to opportunistic infections and malignant neoplasms. Clinical manifestations also include wasting and dementia. Defination adopted from CDC, 1993.

Development: It refers to a gradual change and expansion, advancement from lower to more advanced stages of complexity, the emerging and expanding of the individual's capacities through growth, maturation and learning (Marilyn J.H, 2004).

Dyad: Refer to pair of mother (in this case HIV infected) and her baby.

Exclusive breastfeeding: An infant's consumption of human milk with no supplementation of any type (including infant formula, cow's milk, juice, sugar water, baby food and any other food, even water) except vitamins, minerals and medication. World health Organization (WHO) recommends exclusive breastfeeding from birth to six months for non infected mothers and HIV infected mothers for whom replacement feeding is not AFASS, (Kenya's National Aids Control Council, 2006). Breastfed infants who received formula or water for four consecutive days or longer or who received any solid foods were classified as having received mixed feeding.

Exclusive replacement feeding: This means breastfeeding is completely replaced with suitable breast milk substitutes that will provide the nutrients that the infant needs.

HIV: The human immunodeficiency virus that causes AIDS. It is characterized by it's cytopathic effect and affinity for the T_4 – Lymphocyte.

Infant: A child from birth to 12 months of age.

Length for age: A measurement that determines chronic deficiency conditions (Margarita. 2005). Findings below two standard deviation indicate stunting in the infant.

Mixed breast feeding: breastfed infants who received formula or water for four consecutive days or longer or who received any solid foods were classified as having received mixed breast feeding.

Mixed feeding: Giving both breast milk and other feeds, including water to an infant born to HIV infected mother.

Mother- to – child transmission: Transmission of HIV to an infant from an HIV positive woman during pregnancy, labor and delivery or breastfeeding. The term is used because the mother is the immediate source of the infant's HIV infection and implies no blame of the mother.

Normal growth: Expected increase in number and size of cells as they divided and synthesize new proteins, resulting in increased size and weight of whole or any of its parts according to age (Marilyn, 2004).

Nutrition: It refers to the study of foods, their nutrients and other chemical components, their actions and interactions in the body and their influence on health and disease. Process of food ingested, digested and absorbed to provide the body with required nutrients.

Nutrition assessment: The evaluation of the nutrition status of individuals through measurement of food and nutrient intake and evaluation of nutrition- related health indicators.

Nutritional status: A measurement of the extent in which an individual's physiological needs for nutrients are being met.

Overweight: Weight for height greater than 2 standard deviations of the WHO child growth standards median. It may indicate excess energy intake, low energy expenditure or both.

Spillover: A term used to designate the feeding behavior of new mothers who either know that they are HIV negative or are unaware of their HIV status, and who make a choice not to breastfeed, breastfeeding for a short time only, or mix-feed because of unfounded fears or misinformation about HIV, or the ready availability of breast milk substitutes.

Stunted: It is defined as height for age less than -2 standard deviation of the WHO child growth standards median.

Underweight: It is defined as weight for age less than -2 standard deviations of the WHO child growth standards median. It is used as an indicator of acute malnutrition and it reflects recent starvation, persistent diarrhea or both.

Weaning: Introduction of solid (or semi solid) foods to an infant other than breast milk.

Weight for age: It is a measure used to determine whether an infant's weight is appropriate for his/her age. Weight for age below two standard deviations the infant will be classified underweight.

Weight for length: It is a measure that determines the actual nutrition status. If it is below the mean, it is considered an indicator of wasting and is generally associated with weight loss or failure to thrive (Margarita, 2005).

ABSTRACT

Infants born to HIV infected mothers may be at a higher risk of altered nutritional status secondary to feeding practices. Exclusive replacement feeding (ERF) is costly and poor mothers in the society may not adhere to guidelines on replacement feeding for example over diluting the formula milk and inappropriate cleaning of utensils among others. The recommended exclusive breastfeeding (EBF) practice has challenges based on cultural beliefs and practices related to infant feeding in Kenya.

The overall objective of the study was to compare nutritional status of breastfed and replacement fed infants born to Human Immunodeficiency Virus (HIV) infected mothers in Nairobi.

This was a cross-sectional study conducted in Nairobi North District in four City Council health centers (Kariobangi, Baba Dogo, Mathare North and Kasarani). Study subjects were a dyad of HIV infected mother and her child selected using random sampling. A sample size of 110 was targeted distributed in the selected facilities proportionately.

The study tool was a questionnaire. A salter scale was used to weigh the children and a height board (stadiometer) was used to measure the length. Data was analyzed using statistical data analysis (stata) software and Epi info™ for anthropometric data analysis.

There was a significant difference ($p=0.02$) in mean weight for age Z scores between EBF and ERF infants.

The study findings show a positive correlation between ERF and negative growth gradients (p=0.037), wasting (p=0.019), higher family income (p=0.025). Formula milk over dilution also had a positive correlation with underweight (p=0.035). There was also a positive correlation between abnormal growth gradients and ERF (p=0.03), respiratory infections (p=0.013), past gastrointestinal problems (p=0.023) while underweight was positively correlated with respiratory infection (p=0.021) and past gastrointestinal problems (p=0.47).

A multivariate logistic regression analysis revealed an association between wasting and mode of infant feeding (p=0.014) and also with abnormal growth gradient (p=0.043). There was also significant association between stunting and mode of infant feeding (p=0.003) while abnormal growth gradients were significantly associated with the age of the infant (p=0.002) with older infants tending to have experienced abnormal growth gradients. EBF infants had better nutrition status compared to ERF infants.

HIV infected women should be counseled on exclusive breastfeeding for the first six months of life unless replacement feeding is acceptable, affordable, sustainable and safe for infants before this time.

The study duration was eight months.

CHAPTER ONE: INTRODUCTION

1.1 Background information

Human Immunodeficiency virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) has caused a tremendous impact since the first adult and child cases were reported at the Centre for Diseases Control, Antlanta, USA (Cooper et al, 1988).

The first case of AIDS in Kenya was diagnosed in 1984 (Sentinel Surveillance of HIV and STDs inside Kenya, 2005). The Kenya Demographic and Health Survey (KDHS, 2003) estimated that 1.2 to 1.5 million people in Kenya between ages of 15 to 49 years are infected with HIV. The risk of HIV transmission from an infected mother to her infant through breast milk is about 15% for infants who are breastfed up to six months and about 23% for breastfed to their second year (Kenyan National Guidelines on Nutrition and HIV/AIDS, 2007).

Breastfeeding is generally the best nutritional choice for infants, especially in areas where resources such as clean water, formula feed and provision of health care are scarce. Since the demonstration that HIV type 1 can be transmitted by breastfeeding, HIV infected mothers, their clinicians and public health practitioners in resource poor settings have struggled with the uncertainty of whether breastfeeding or replacement feeding is preferred. Although formula feeding has been shown to reduce the risk of HIV transmission from mother to child (Ngacha et al, 2000) the use of alternatives to breastfeeding in resource poor settings has been known to increase infant mortality and morbidity (WHO, 2000).

1.2 Problem statement

Infants born to HIV infected mothers may be at a higher risk of altered nutritional status secondary to feeding practices. Exclusive replacement feeding (ERF) is costly and mothers visiting city council clinics are the poor in the society who cannot afford private clinic/hospital charges. Economic constrain may result to mothers not adhering to guidelines on replacement feeding for example over diluting the formula milk and inappropriate cleaning of utensils among others. Breastfeeding carries a higher risk for HIV transmission to infant which can result to opportunistic infections and altered nutritional status.

A study done in Nairobi (Ngacha et al, 2001) on morbidity and mortality in breastfed and formula fed infants of HIV-1 infected women indicated that malnutrition occurred in 15% of formula fed and in 9% of exclusively breastfed (EBF). The high prevalence of malnutrition was associated with repeated infections and introduction of poor weaning diets.

Data from developing countries show that mortality from diarrhea, acute respiratory infections and other infectious diseases is 5-6 times higher in infants who are not breastfed than in those who are breastfed for the first two months of life, (Michael et al, 2000).

Breast milk is cheap, available, clean and warm. It is the best source of nourishment for human infants, preventing disease, promoting health and reducing health care costs (Picciano et al, 2001 and Riordan, 1997). A tin of formula milk costs Kenyan shillings (Ksh) 550. A baby will require 44 tins for the first six months of life at a cost of Ksh 24,200 (Ksh 4,034 per month). In Nairobi, 44% of the residents live below the official urban poverty line of Ksh 2,648 per month (Hugenberg et al, 2007). Hence strict adherence to ERF practices may be a challenge to many households in Nairobi's low social economic setups.

The recommended EBF practice may be a challenge to achieve because of cultural beliefs and practices related to infant feeding in Kenya.

The child at this age has no choice of the feeding approaches it may be subjected to, on the other hand the mother may be faced with hard options to chose from in ensuring the child is both safe from HIV infection and malnutrition.

1.3 Justification

Today only a limited number of studies define growth parameters and nutritional status for children of HIV infected mothers. This has been identified as an area that needs to be addressed through research according to Essential National Health Research (ENHR) priority list for Kenya (George et al, 2005).

The HIV status of the mother should not compromise the infant's nutritional status; however this may not be the case as a result of failure to adhere to recommended practices.

There is need to generate evidence based information on the practices of child feeding among HIV infected mothers and highlight the existing gaps in the practices that may hinder effective nutrition. This study was designed to generate information that will enable the mother, health care providers and the society at large to better address the issues of feeding practices for quality nutrition among children born to HIV infected mothers.

1.4 Aim

The study aim was to establish weather there is a difference in the nutritional status between the children born to HIV infected mothers based on their mode of feeding. The findings made a basis

for recommendations aimed at improving nutrition status, prevent further complications and enhance the infant's quality of life and survival.

1.5 Objective

1.5.1 Broad objective

To compare nutritional status between exclusively breastfed and exclusively replacement fed infants born to HIV infected mothers in selected Nairobi City Council clinics.

1.5.2 Specific objectives

1) To establish the household factors (social and economic) that contributes to infant nutritional status.

2) To assess the maternal factors (knowledge, attitudes and practices) that contributes to infant nutritional status.

3) To determine the infant factors that influences its nutritional status (infections such as HIV status, other infections and illnesses).

4) To determine the nutritional status of the infants.

5) To compare the nutritional status of the infants on exclusive breastfeeding and those on exclusive replacement feeding.

1.6 Hypothesis

- There is no significant difference in nutritional status among infants born to HIV infected mothers with regard to their feeding pattern either exclusive breastfeeding or exclusive replacement feeding.

1.7 Variables

1.7.1 Independent variable

- Maternal factors that contribute to infant nutritional status (knowledge, attitudes and practices).
- The household factors that contribute to infant nutritional status (demographic, social and economic).
- Infant factors that contribute to nutritional status (infection e.g. HIV status of the infant, other illnesses suffered by the child, child growth and development).

1.7.2 Dependent variable

- Nutritional status measured by:
  - Weight.
  - Length.
  - Age.
  - Sex.

1.7.3 Intervening variables

- Infant feeding practices:
  - ➢ Exclusive breastfeeding
  - ➢ Exclusive replacement feeding

1.7.4 Conceptual framework

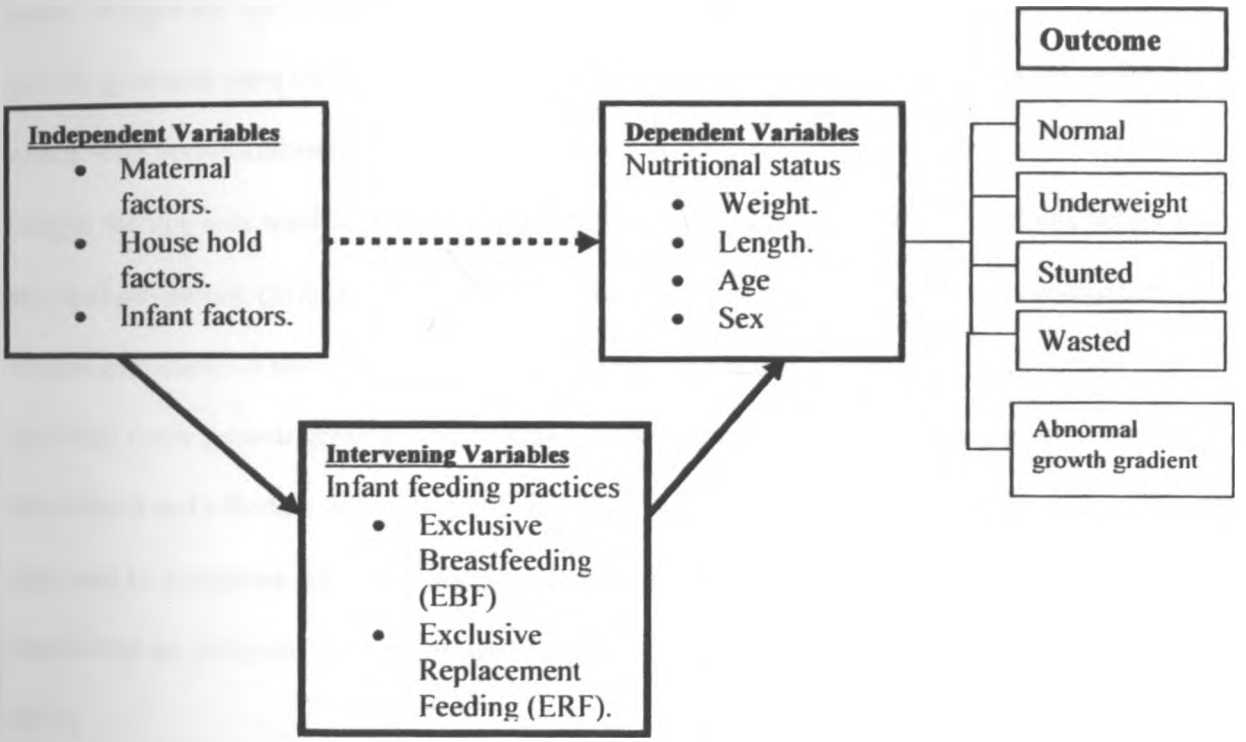


Figure 1: Conceptual framework

1.7.4.1 Operationalisation of variables

The independent variables were factors that contribute to infant nutrition status (maternal, house hold and infant factors). Maternal factors are; her level of knowledge, attitude and infant feeding practice. Maternal level of knowledge on infant feeding practices and her attitude toward infant

feeding in HIV status may influence the feeding practice she chooses for her infant and how she practices it. Household demographic, social and economic factors may influence the feeding option for the infant. Illnesses (current, past and HIV infection) in the infant may affect its nutrition outcome. Nutritional status of the infant may be influenced by infant feeding practice or directly by either of the independent variables.

The dependent variables are nutritional status measured by weight, length, age and sex of the infant. Weight for age Z score, length for age Z scores, weight for length Z scores and abnormal growth gradients were compared against National Center for Health Statistics (NCHS) references which have been recommended by WHO.

Length for age was used to determine chronic deficiency conditions where findings below two standard deviations (SD) the infant was considered stunted. Weight for age was compared with weight gain curve to differentiate acute and chronic events and also to identify abnormal growth gradients (zero growth gradient and negative growth gradient), also current weight for age was determined and a finding below two SD, the infant was classified underweight. Weight for length was used to determine the actual nutritional status of the infant and if it is below two SD it was considered an indicator of wasting and is generally associated with weight loss or failure to thrive.

An infant who fits within the normal parameters for either of the categories was considered normal. Hence normal, underweight, stunting, wasting and abnormal growth gradients are the outcome of infant's nutritional status and this were compared against the practices (EBF and ERF).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

For most babies, breastfeeding is without question the best way to be fed. Breast milk provides all the nutrients needed during the first few months of life, it is usually readily available, hygienic and free.

Breast milk contains agents that help to protect against common childhood illnesses such as diarrhea and respiratory infections. Even in developed countries breastfed babies are less likely to become ill than those given replacement foods (Heinig et al, 1996).

In other parts of the world, where there is little access to clean water, sanitation and health services, failure to breastfeed can greatly increase the risks of disease and death (WHO, 2000 and Bahl, 2005).

Since 1985 when the first case of Human Immunodeficiency Virus (HIV) transmitted during breastfeeding was reported the debate has continued about whether or not HIV- positive mothers should breastfeed. Among women who are infected with HIV and receive no antiretroviral treatment or other interventions, breastfeeding for two or more years can double the rate of Maternal to Child Transmission (MTCT) to around 40% (the rest of the transmission occurs during pregnancy, labour and delivery). In Africa, between one third and one half of infant HIV infections are due to breastfeeding (De cock et al, 2000). When a mother has HIV, the dangers of not breastfeeding (respiratory infections and diarrhea) must be balanced against the threat of HIV transmission. The promotion of infant formula feeding to prevent HIV infection might increase infant morbidity, malnutrition and morbidity (WHO, 2000).

Infant feeding guidelines is considered a cornerstone in the prevention of MTCT of HIV. All HIV infected mothers should receive counseling, which includes provision of general

information about the risks and benefits of various infant feeding options, and specific guidance in selecting the option most likely to be suitable for their situation. Whatever a mother decides she should be supported in her choice (WHO, 2001).

2.2 Feeding infants (0-6 months) born to HIV-infected mothers

Women are counselled during their last trimester of pregnancy to choose a feeding option.

All women and men, irrespective of their HIV status, have the right to determine the course of their reproductive life and health, and to have access to information and services that allow them to protect their own and their family's health. Where the welfare of children is concerned, decisions should be made that are in keeping with children's best interest (UNAIDS et al, 1997).

2.2.1 Exclusive replacement feeding

Exclusive replacement feeding means breastfeeding is completely replaced with suitable breast milk substitutes that will provide the nutrients that the infant needs (Kenyan National Guidelines on Nutrition and HIV/AIDS, 2007).

It is better to feed with a cup and spoon rather than a bottle because cups are easier to clean and also cup feeding promotes greater interaction between mother and her baby (UNICEF et al, 2003).

Replacement feeding is the most highly effective way to prevent MTCT of HIV after birth. This benefit, however, must be weighed against practical difficulties and threat from other illnesses which is increased by not breastfeeding (UNICEF et al, 2003).

According to WHO, the necessary conditions for replacement feeding are Acceptability Feasibility Affordability Sustainability and Safety (AFASS) (UNICEF et al, 2003) i.e.:

1) Acceptability: breastfeeding is the norm in most cultures, and is generally encouraged by health workers. By choosing not to breastfeed, a mother risks revealing that she is HIV

positive, and becoming a target for stigma and discrimination. She must be able to cope with this problem and resist pressure from friends and relatives to breastfed.

2) Feasibility: A mother who chooses replacement feeding must have adequate time, knowledge, skills, and other resources to prepare the replacement food and feed her baby up to twelve times in 24 hours. Boiling water over a charcoal stove for instance can take up to 15 minutes per feed. Unless refrigerated, prepared formula becomes unsafe after just two hours.

3) Affordability: Someone has to pay for the ingredients, fuel, water and other equipment needed for replacement feeding. In some countries, the cost of infant formula alone is similar to the minimum urban wage and unless heavily subsidized, is well beyond the reach of most families.

4) Sustainability: Feeding an infant for the first six months of life requires around 20kg of formula and regular access of water. Even a brief disruption in supplies may have serious health implications.

5) Safety: Replacement food should be nutritionally sound and free from germs. The water it is mixed with should be boiled, and utensils should be cleaned before each use. This means the mother must have access to a reliable supply of safe water and fuel. Of the five conditions for replacement feeding, safety is often the most critical.

According to Kenyan National guidelines on nutrition and HIV/AIDS (2007), replacement feeding can use commercial baby formula or home based animal milk.

- Prepare commercial formula according to manufacturer's directions. Feed requirement for the first 6 months of life is about 20kg of formula (44 tins) each containing 450grams. This will cost an average Kenya Shillings (Ksh.) 4,034.00 per month or Ksh 24,200.00 for the 6 months period.

- Home-based formula can be made by use of milk from cow, goat, sheep or camel, whole powdered milk or unsweetened evaporated full cream milk and soya-based milk. The amount of whole fresh milk required for 6 months is about 92 liters at a cost raging 2,000-5,000 Ksh for 6 months depending on where it is purchased. To meet infant micronutrient need, a multi micronutrient formulation containing at least iron, zinc selenium, folic acid and vitamin A, C and E should be added to the animal milk at one Recommended Daily Allowance levels. This costs an additional Ksh 12,000 for 6 months.

- The family must be able to support the AFASS principles which mean having adequate resources including safe water, fuel, utensils, skills and time to prepare replacement feeding correctly and hygienically.

- Ensure that the caregivers are aware of the need for early intervention of diarrhea illnesses.

Preparation of replacement foods and feed a baby several times a day for months is challenging, even in the best of circumstances mothers who choose replacement feeding need help to succeed (UNICEF et al, 2003).

Service provider's actions to support replacement feeding for infants (0-6 months) born to HIV infected mothers according to Kenyan national guidelines on nutrition and HIV/AIDS (2007) include;

- Do careful assessment of a mother's capacity for AFASS before recommending exclusive replacement feeding.
- Demonstrate the preparation of the replacement feeding option that the mother or caretaker has chosen.
- Emphasize the need for sterile equipment and correct dilution and the dangers of keeping prepared formula for long periods at room temperature.

The United Nations Children's Fund, (UNICEF), began distributing free infant formula to governments in 1998, to be given to HIV positive mothers who wanted to avoid breastfeeding but could not afford to do so. UNICEF decided to abandon the scheme four years later after deciding it was unhelpful. The charity found that formula was often given to women who were incapable of preparing it safely, while most of those who had the resources to practice safe replacement feeding could also afford to purchase formula. Furthermore UNICEF was concerned that the provision of free formula was leading to spillover (UNICEF et al, 2003). In Nairobi city council clinics formula milk is not provided and mothers who opt for replacement feeds have to carry the burden of buying the feeds.

If a clinic does choose to provide formula then it must ensure a sustainable supply. Mothers who run out of formula may resort to over-diluting or using inadequate substitutes (UNICEF et al, 2003).

2.2.2 Exclusive breastfeeding

Exclusive breastfeeding means giving the infant breast milk only without other food or drinks apart from medications.

WHO recommends exclusive breastfeeding from birth to six months for non infected mothers and HIV infected mothers for whom replacement feeding is not AFASS (Kenya's National Aids Control Council, 2006).

Actions to support exclusive breastfeeding for infants born to HIV infected mothers according to Kenyan national guidelines on nutrition and HIV/AIDS (2007) include;

- Promote early initiation of breastfeeding (within 1 hour after delivery). This is healthy for the infant and it establishes healthy feeding patterns early on.

- Ensure the mother knows the risk of mixed feeding. Large protein molecules in the solid food may weaken the cells in the gut, or change the way cell receptors work in the gut, allowing the HIV to breach its integrity, (Hoosen et al, 2007). Early introduction of solid foods and animal milk increase HIV transmission risks compared with exclusive breastfeeding from birth (Hoosen et al, 2007).

- Make sure the mothers know good breastfeeding techniques to avoid cracked and sore nipples. Mastitis and breast abscess increase the risk of transmitting HIV through breast milk (UNICEF, 2004). Mothers should be taught by demonstration correct positioning and latch on.

- Ensure mothers who choose to express breast milk know the technique of expressing and how to store breast milk to avoid contamination. This can be done through:

  - Storing it at room temperature up to 8 hours.
  - Using a cup and spoon to avoid contamination and nipple confusion.
  - Ensure mothers know early identification of and actions to address infant feeding or breast problems including prompt seeking medical care if the baby is not feeding well or has mouth sores. or if the mother has breast problems.

2.2.2.1: Difficulties in promoting exclusive breastfeeding

Encouraging mothers to practice exclusive breastfeeding is far from easy. In many societies especially in sub-Saharan Africa, it is normal for a baby to be given water, tea, porridge or other foods as well as breast milk even during the first few weeks of life (UNICEF, 2004 and Sebalda et al, 2007).

Pressure from the society may lead to a mother practicing mixed feeding. The family will offer to buy her formula when she has chosen to breastfed, they will tell her that breast milk is not enough for the baby, she must also mix it with formula feeding, and she cannot deny that because she has not told them why she chose to exclusively breastfeed her baby so she will just mix feed (Doherty. 2006).

Based on the principle of informed choice, health workers are encouraged to give HIV infected women the best available information on the risks and benefits of each feeding method, with

specific guidance in selecting the option most likely to be suitable for their situation (WHO, 2003).

2.3 The impact of social environment on nutritional status

Socioeconomic status represents an interaction between education level of the head of household and source rather than quantity of income of the family.

Socioeconomic status informs about limitations and opportunities for nutritious food and a supportive environment with a gradient from lowest (least educated/income from day labor) to highest (best educated/income from professions or management). Moreover, levels of economic development within nations and regions of the world have a profound effect on social environments, nutritional status of the community and among individual children. Infant mortality, weight of children at birth, weight and length of small children show health and nutritional status of children (Jelliffe, 1963).

There are wide disparities in economic status and access to basic social and health amenities within Nairobi (NCSS, 2000). Two thirds of its population lives in informal settlements also referred to as slums. These urban slum dwellers have much lower social- economic and health status than the rest of the Nairobi population (unpublished material).

CHAPTER THREE: METHODOLOGY

3.1 Study design

This was a cross-sectional descriptive survey carried out over a period of eight months. Infants' nutritional status was assessed. feeding option chosen by the mother determined and also the HIV status of the infant. The difference between nutritional status among exclusively breastfed and exclusively replacement fed infants was determined.

3.2 Study area

The study was carried out in four City Council health centers in Nairobi North district. Nairobi is one of the eight provinces in Kenya and it has a population of approximately 2.1 million people (CBS, 2001). Nairobi is a cosmopolitan city. Its administrative boundary covers an area of 690 square kilometers, comprising of eight administrative divisions, namely; Central, Dagoreti, Embakasi, Kasarani, Kibera, Pumwani, Makadara and Westlands. Nairobi city is unique in that, it is a melting pot for various communities and cultures both national and international.

Nairobi Health Management Board (NHMB) was gazetted in 2002 and inaugurated in 2004. The mandate of NHMB is administration, management and development of provincial and district hospitals, public health centers and clinics in Nairobi. The board is answerable to the Minister for Local Government and its activities are overseen by a Chief executive officer. Medical Officer of Health (MOH) oversees running of Nairobi City Council health facilities.

Nairobi has three districts i.e. East, North and West each with its health facilities being headed by District medical officer of health (DMOH). Under the Ministry of Health the City Council is mandated with running of 56 clinics in Nairobi. The City Council of Nairobi has eight divisions

i.e. Kamukunji, Makadara, Kasarani, Westlands, Dagorreti, Langata, Embakasi and Starehe which also represent the constituencies in Nairobi. Nairobi North district has three divisions i.e. Kamukunji, Kasarani and Starehe. In each division there is one complete maternity unit with the main one being Pumwani maternity hospital located in Kasarani division. Mathare North Health Centre (HC), Kariobangi HC, Baba Dogo HC and Kasarani HC all from Nairobi North District were used for the study.

People visiting City Council clinics are of low social economic status since they cannot afford the cost in private clinics/hospitals. Treatment of children less than five years is free in City Council clinics while antenatal mothers pay Ksh 20.00 for every visit. This is a subsidized cost compared to a consultation charge of Ksh 500.00 to 3000.00 in private hospitals/clinics.

Human immunodeficiency virus (HIV) prevalence in Nairobi is 10.9% (Sentinel Surveillance of HIV and STDs in Kenya, 2005). HIV infected mothers are counselled on exclusive replacement feeding (ERF) or exclusive breastfeeding (EBF) if they do not meet the acceptability feasibility affordability sustainability and safety (AFASS) criteria. The mother should be allowed to make a decision on feeding pattern for her infant. Replacement feeding is costly with a tin of formula milk costing KSh.550.00. Formula milk is not provided in City Council clinics and mothers who opt for replacement feeding have to bear the cost of buying formula or other breast milk substitutes. The clinics selected for the study have a paediatric comprehensive care clinic (CCC) and do follow up for infants born to HIV infected mothers. Polymerase chain reaction (PCR) for HIV is done at six weeks and repeated one month after the mother ceases breastfeeding for infants on EBF.

3.3 Study population

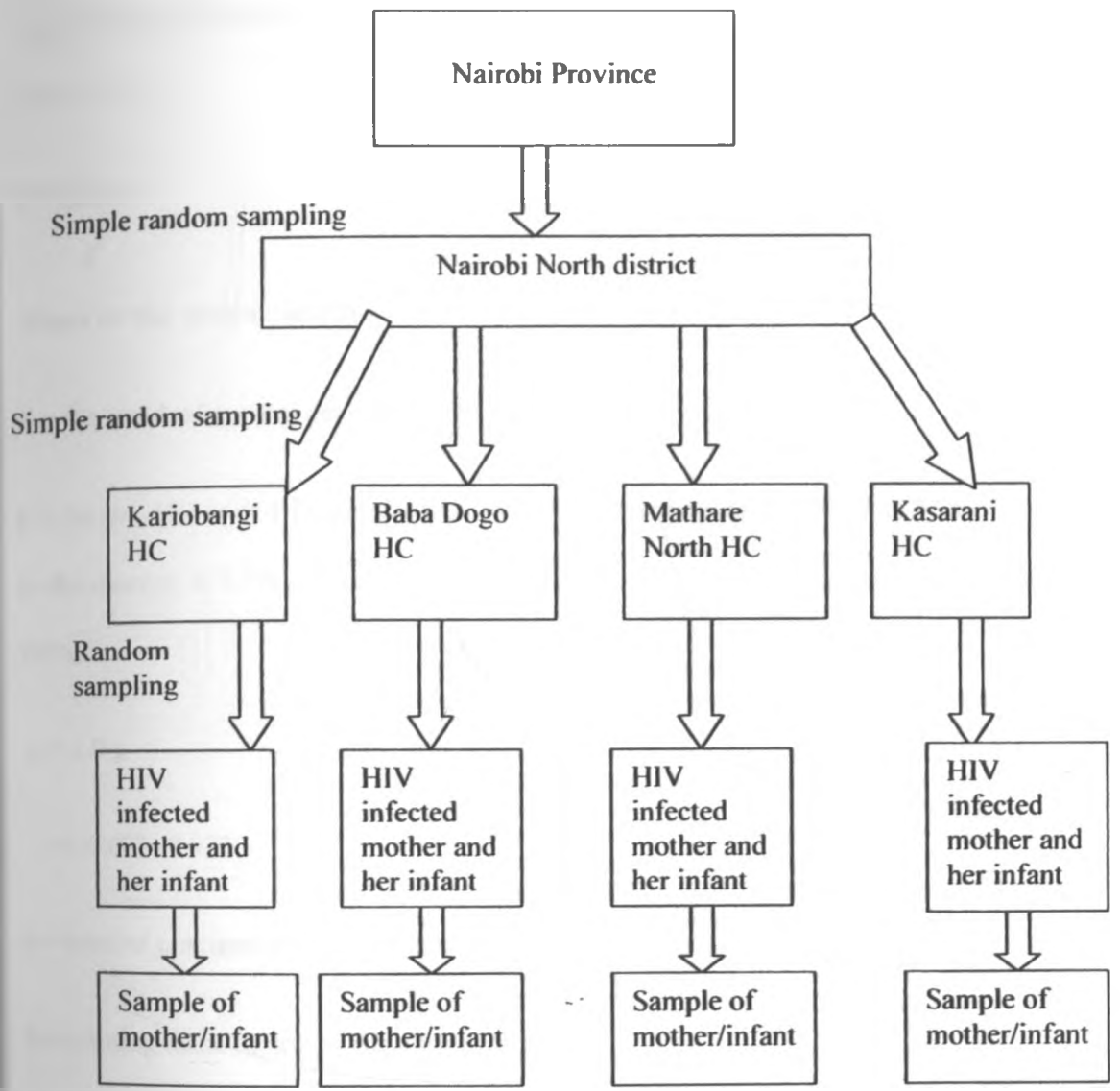
Study population was dyad of HIV infected mother and her infant below six months attending clinic in any of the four facilities chosen for the study. There were 143 dyads in total (facility records), of whom 64 were on EBF and 79 practice ERF. The facilities have infants born to HIV infected mothers on breast milk and others on replacement feeds.

3.4 Sampling

Study subjects were sampled using multistage sampling. Out of the three districts in Nairobi one was randomly selected for the study. Pieces of paper bearing the names of all the three districts were folded and one randomly picked i.e. Nairobi North district.

A similar approach was applied in selecting four out of eight Health Centers in Nairobi North District i.e. Kariobangi, Baba Dogo, Mathare North and Kasarani. The dyads were randomly selected from the four health centers proportionately.

Figure 2: Sampling model



3.4.1 Sample size determination

The following formula for prevalence study by Fisher et al, (1999) was used to determine the sample size:

$$n = \frac{Z^2 pq}{d^2}$$

Where n= the desired sample size

Z = the standard normal deviate at 95% confidence level (=1.96).

p = the prevalence of HIV among women in the target population which is 7.7%. HIV prevalence in the country is 7.7% compared with 4% among men (Kenya's National Aids Control Council, 2006).

q = 1.0-p

=1-0.077=0.923

d = level of precision (set at +/-5% or 0.05)

Substituting these figures in the above formula:

$n = [(1.96)^2 \times (7.7/100) \times 0.923] / 0.05^2$

$= 3.8416 \times 0.077 \times 0.923 / 0.0025$

$= 0.2730 / 0.0025$

$= 109.21$

The desired sample size was approximately 110 dyads (HIV infected mothers and their infant). The selected Health Centers (Kariobangi HC, Baba Dogo HC, Mathare North HC and Kasarani HC) had a total of 143 infants below six months born to HIV infected mothers of whom 64 were on exclusive breastfeeding and 79 on exclusive replacement feeding according to February 2008 City Council clinics records (unpublished data).

The sample of 110 was derived from the study population using stratified sampling method where the strata were the feeding option (exclusive breastfeeding or exclusive replacement feeding) chosen by the mother. The sample for strata was as follows:

a) Exclusively breastfed (EBF) infants.

1) Total EBF population in the selected health facilities = 64.

2) Total number of infants below six months born to HIV infected mothers on either EBF or ERF in the selected health facilities = 143.

3) Desired sample size = 110.

4) Total number of EBF dyads that were to be sampled from the health facilities

$$= \text{Total EBF population in the selected health facilities} / \text{Total population size (EBF+ERF)} \times \text{sample size}$$

$$= {}^{64}/_{143} \times 110 = 49.$$

5) Hence 49 EBF dyads were to be sampled from the health facilities proportionately, figure 3 of sample size determination illustrates above:

b) Exclusively replacement fed (ERF) infants.

1) Total ERF population in the selected health facilities = 79.

2) Total number of infants below six months born to HIV infected mothers on either EBF or ERF in the selected health facilities = 143.

3) Desired sample size = 110.

4) Total number of ERF dyads that were to be sampled from the health facilities

$$= \text{Total ERF population in the selected health facilities} / \text{Total population size (EBF+ERF)} \times \text{sample size}$$

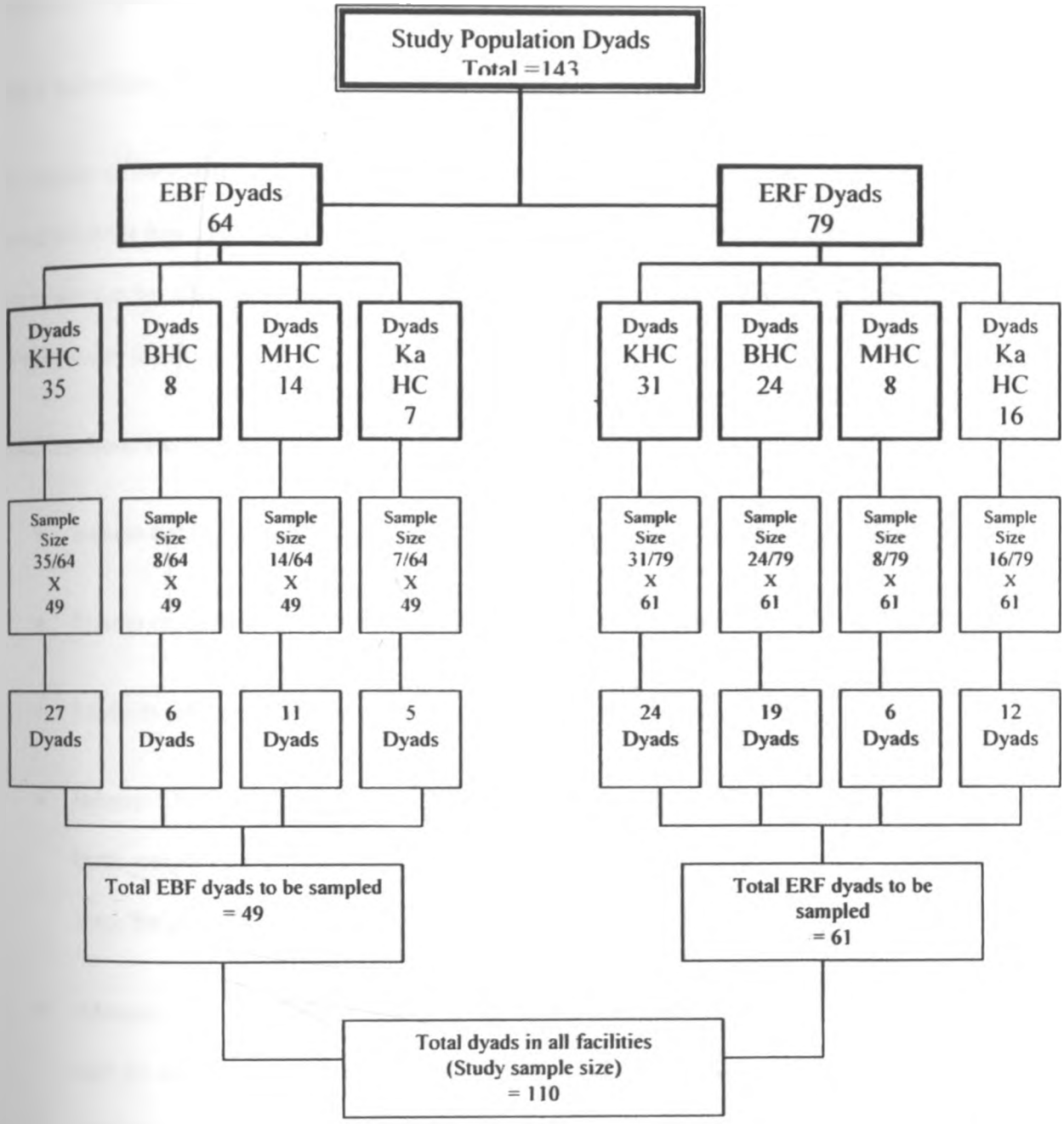
$$= {}^{79}/_{143} \times 110 = 61.$$

5) Hence 61 ERF dyads were to be sampled from the health facilities proportionately, figure 3 of sample size determination illustrates the above:

A sample of 49 exclusively breastfed infants (EBF) and 61 exclusively replacement fed (ERF) infants born to HIV infected mothers were to be drawn from the study areas to yield a sample size of 110.

The sample for each facility was drawn proportionally according to population size of infant's born to HIV infected mothers visiting the Health Centre as per February 2008 records.

Figure 3: Sample size determination



Note
KHC – Kariobangi Health Centre
BHC- Baba Dogo Health Centre
MHC- Mathare North Health Centre
KaHC- Kasarani Health Centre
EBF- Exclusive Breast feeding
ERF- Exclusive Replacement Feeding

The total number that was to be sampled from study area for both exclusive breastfed and exclusive replacement fed infants was 110.

3.4.2 Selection of study subjects

A sample of 54 exclusively breastfeeding and 66 exclusively replacement feeding infants were selected from four HCs. Mothers came to the clinic mere randomly and as they came they were recruited for the study until the desired number of subjects for each stratum was reached in each of the health facilities.

3.4.3 Inclusion criteria

- Infants below six months born to HIV infected mothers attending City Council clinics.
- Infants on exclusive breastfeeding or exclusive replacement feeding.
- Mothers (and infants) who gave consent to participate in the study.
- Infants who had a birth weight between 2500grams and 4500 grams (An infant whose birth weight is < 2500grams is underweight and one with birth weight > 4500 grams is large for gestational age, Marilyn, 2005).
- Absence of congenital malformation that could interfere in the development of the child and its nutritional state for example cleft lip and palate (Growth failure in infants with cleft lip and palate has been attributed to feeding difficulties, Marilyn, 2005).

3.4.4 Exclusion criteria

- Infants above six months who are born to HIV infected mothers.

- Breastfed infants who received formula or water for four consecutive days or longer or who received any solid foods (mixed feeding).

- Mothers and/or infants too sick to respond to the questionnaire or those who did not give consent.

- Infants who had a birth weight less than 2500grams and greater than 4500 grams.

- Infants with congenital malformation that could interfere in the development of the child and its nutritional state.

3.5 Data collection

3.5.1 Study tools

A questionnaire was used to collect data on nutritional status (age, sex, weight and length), infant feeding practices (exclusive breastfeeding or exclusive replacement feeding) and factors that contribute to child nutritional status (maternal, household and child factors). A Salter scale was used to weigh the infants and a height board (stadiometer) was used for measuring the length. Weight was recorded by placing the infant undressed and without diapers on a scale previously calibrated to the nearest 10 grams. Length was estimated using a stadiometer by placing the child on a horizontal surface on his/her back and another vertical section against the soles of their feet, accurate to 0.2cm.

The questionnaire was filled by the principal investigator and two enumerators. To avoid bias in weight and length measurements two people read the measurements and recorded findings then the average of the two readings were calculated and filled in the questionnaire.

3.5.2 Enumerators

Two research assistants among the Bachelor of Science Nursing (BScN) interns based in Nairobi were selected for the study. Their preference for selection as enumerators was based on the fact that they have been trained on research methodology, importance of accuracy in data entry and ethical legal considerations. The cadre of nurses is well grounded on nutritional assessment processes and hence they are familiar with the study's main requirements.

Selected enumerators were subjected to one day training on the research objectives, the research tool to include how to carry out anthropometric measurements (weight and height) and interview techniques before commencement of the study. They were also trained on two observers technique for taking of anthropometric measurements i.e. two observers read, each record the findings and an average of their findings is entered in the questionnaire as the anthropometric measure. The interviewee assessed palmar pallor by comparing the colour of the child's palm with his/her own palm and with the palms of other children. If the skin of the child's palm was pale, the child was considered to have some palmar pallor. If the skin of the palm was very pale or so pale that it looks white, the child was considered to have severe palmar pallor.

They were also trained on giving a health talk after collecting data and thanking the mothers.

3.5.3 Pretesting of research tool

Research tool was pre-tested for completeness and clarity at Makadara HC. It is a City Council clinic in Makadara division with similar characteristics to other City Council clinics. Infants on breastfeeding and replacement feeding together with their mothers were used as subjects for pretesting.

The information collected was checked for completeness, clarity and comprehension after which necessary amendments were made.

3.6 Data analysis and presentation

Data collected was checked for completeness. It was then entered and coded into the computer using Microsoft access. Epi info™ version 3.4.3 CDC 2007 package was used for anthropometric data analysis and statistical data analysis (stata) package used for the rest of data analysis.

Nutritional status outcome of the infant i.e. normal, underweight, stunting, wasting and abnormal growth gradients were compared against the feeding practice of the mother using multivariate logistic regression analysis.

Results were then presented in terms of tables, bar graphs, line graphs, pie charts and in percentages for qualitative data.

3.7 Ethical consideration

- Authority to carry out the research was sought from the Kenyatta National Hospital Ethics and Research Committee, City Council of Nairobi authority via MOH office in City Hall and Ministry of Higher Education Science and Technology.
- Each participant gave an informed consent based on purpose of research study, confidentiality, anonymity and benefits of the study.
- Participation to the research was voluntary and refusal to do so did not prejudice or bias participant's future care.

3.8 Results and dissemination

The results of the study are to be disseminated to City Council of Nairobi Medical Officer of Health.

Results will also be presented in scientific conferences and be submitted for publication in peer reviewed medical journals.

3.9 Study limitation

- Due to social stigma associated with HIV, some mothers did not consent to the study.
- Some dyads were not interviewed due to lack of staff co-operation.

3.10 Study benefits

- Nutritional status is a key indicator of the health status of the children and so the findings of the study gave a reflection of the health of these children.
- Guidelines for health education to HIV infected mothers in the City Council clinics may be based on the results of the study.
- Health education based on findings during data collection was provided to individual mothers after collecting the data.

CHAPTER FOUR: RESULTS

4.0 Introduction

The data was collected from Nairobi North district in four City Council Health Centers (HC) namely, Kariobangi HC, Baba Dogo HC, Kasarani HC and Mathare North HC. The total respondents were 120.

4.1 Maternal demographic data

Out of 120 respondents interviewed, 46% were from Kariobangi, 22.5% from Baba Dogo, 15.8% Mathare North and 15% from Kasarani, health centres. Table 1 illustrates these findings.

A large proportion (40.8%) of the mothers (n=120) were aged between 24 and 28 years, 29.2% were between 19 and 23 years and 20.8% were aged between 29 and 33 years. The mean age was 26 years (SD 4.6) with a median of 26 years and range of between 14 and 38 years. Table 1 illustrates these findings.

A majority of the respondents (87.5%) were married, 5.8% were single, 5% separated and a minority 1.7% widowed. Table 1 illustrates these findings.

Majority (70.8%) of the respondents had attained primary level of education, with only 26.7% having had secondary education and 0.8% tertiary education. Table 1 illustrates these findings.

The respondents who were married (n=105) were asked their spouse level of education. The spouses were more educated than the mothers with 51.4% having had secondary education, 40% primary education, 3.8% tertiary education and 4.8% in the other category i.e. spouse has not schooled or respondent did not know. Table 1 illustrates these findings.

Table 1: Maternal demographic data

Demographic data	Frequency	Percentage
Residence		
Kariobangi	56	46.7
Baba Dogo	27	22.5
Mathare North	19	15.8
Kasarani	18	15
Total	**120**	**100.0**
Maternal age (Mean 26, median 26 and SD 4.6)		
14-18	4	3.3
19-23	35	29.2
24-28	49	40.8
29-33	25	20.8
34-38	7	5.8
Total	**120**	**100.0**
Maternal marital status		
Married	105	87.5
Single	7	5.83
Separated	6	5
Widowed	2	1.67
Total	**120**	**100.0**
Maternal level of education		
Primary	85	70.8
Secondary	32	26.7
Tertiary	1	0.83
Others	2	1.7
Total	**120**	**100.0**
Spouse level of education		
Secondary	54	51.4
Primary	42	40
Tertiary	4	3.8
Others	5	4.8
Total	**105**	**100.0**

Majority (72.5%) of respondents (mothers) were housewives, 25% had informal employment and only 1.7% had formal employment. A large proportion of the respondents' spouses (86.7%)

were in the informal employment. 10.5% had formal employment and 2.9% were in the category of others i.e. beggar and no job. Table 2 illustrates these findings.

Table 2: Respondent's and spouse's occupation.

Occupation	Frequency	Percentage
Respondent's occupation		
Housewife	87	72.5
Informal employment	30	25
Formal employment	2	1.7
Others	1	0.8
Total	**120**	**100**
Spouse's occupation		
Informal employment	91	86.7
Formal employment	11	10.5
Others	3	2.9
Total	**105**	**100**

Respondents were asked the estimated family income per month (in Kenyan Shillings). Slightly less than half (45.8%) earned 3001 to 6000, 20.8% earned 6001 to 9000, 12.5% earned less than 3000. 2.5% of the respondents did not know the family's income as they were not aware of their spouses' earnings while 3.3% were dependent on relatives for financial support. Figure 4 illustrates these findings.

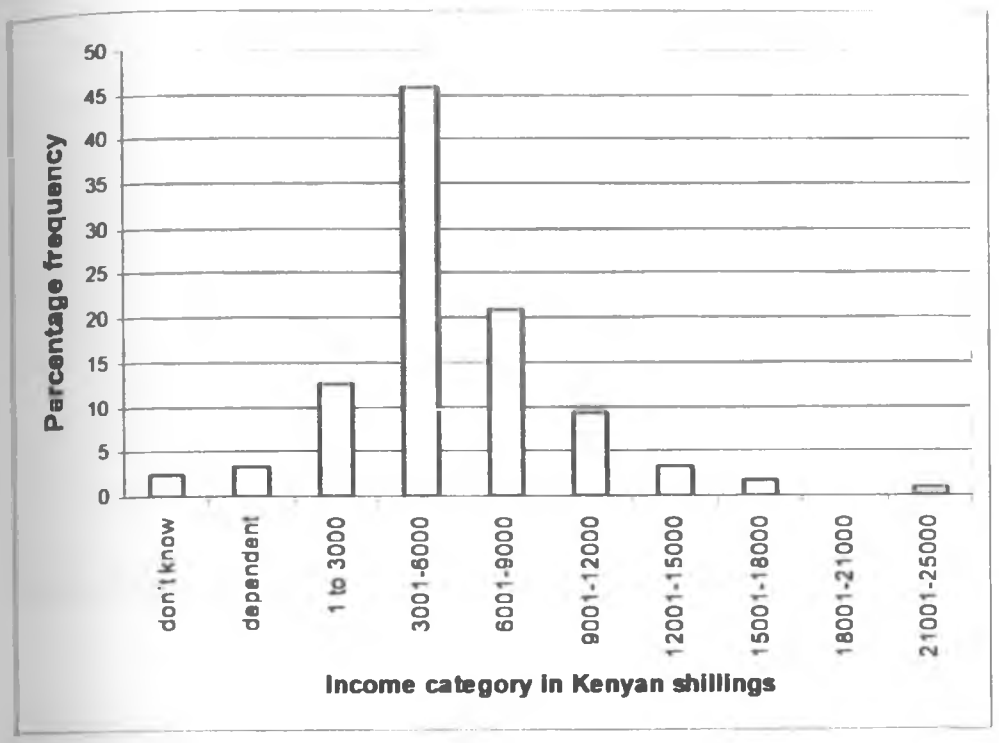


Figure 4: Family income per month in Kenyan Shillings

4.2: Infant demographic data

A total of 120 infants were included in the study. Of these, 50.8% were male and 49.2% were female.

Respondents were asked the weight of the baby at birth and this was confirmed with the clinic card for the child. Most (58.3%) of the infants, had birth weight between 2.8-3.2kg, 19.2% between 2.3-2.7kg, 13.3% between 3.3-3.7kg, 5.8% between 3.8-4.2kg and 3.3% had birth weight greater than 4.2 kg. The mean birth weight was 3.1 kg (SD 0.45). Figure 5 illustrates these findings.

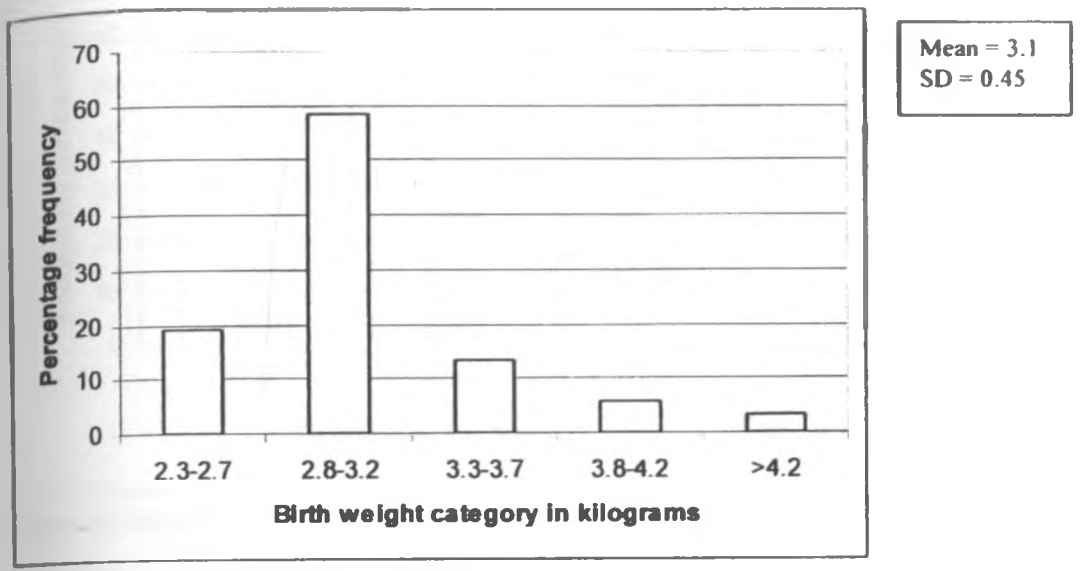


Figure 5: Birth weight of the infants

The infant's age was calculated from date of birth to date of measurement and put in weeks. The median age was 11weeks with 25th and 75th inter-quartile range of 7.9 and 16.1. respectively. The mean was 12.3 weeks (SD 5.7).

A large proportion (44.4%) of the EBF infants were aged 6 to 12 weeks, 35.2% greater than 12 weeks and 20.4% up to 6 weeks. Slightly over half (57.6%) of ERF infants were aged over 12 weeks, 34.8% were 6 to 12 weeks and 7.6% were up to 6 weeks. Figure 6 illustrates these findings.

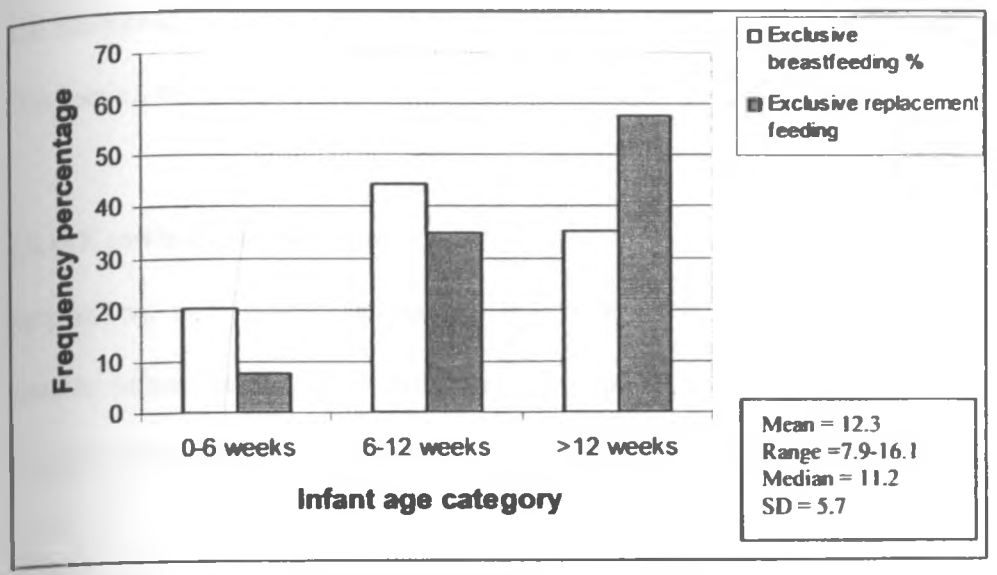


Figure 6: Infants age distribution according to feeding practice

Out of 120 dyads interviewed, 45% of the infants were exclusively breastfeeding and 55% exclusive replacement feeding. Figure 7 illustrates these findings.

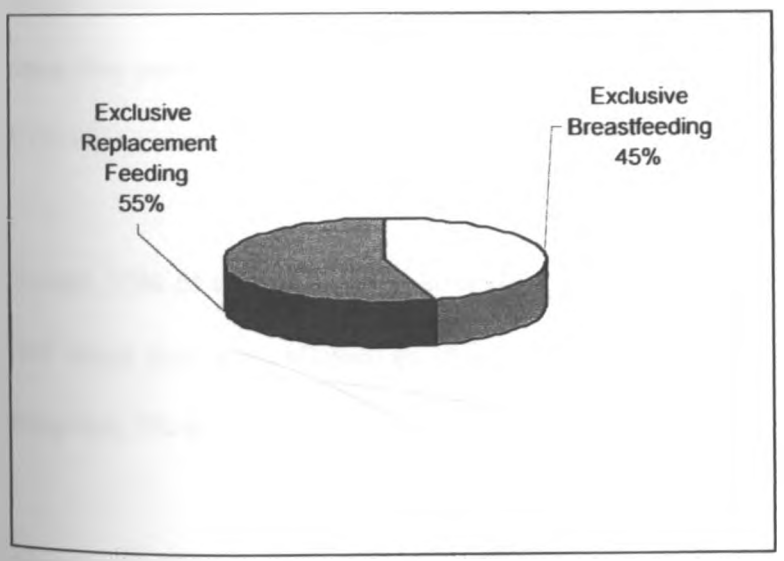


Figure 7: Mode of infant feeding (n=120).

4.3: Maternal factors that contribute to infant's nutrition status

This section describes results of maternal knowledge, attitude and practices on infant feeding.

4.3.1: Knowledge and attitude

Respondents were asked questions to reflect on their level of knowledge and their attitudes towards infant feeding. The responses were on a scale of five namely; strongly disagree, disagree, not sure, agree and strongly agree. The findings are presented in table 3.

About two-fifths (41.7%) of the respondents disagreed with the statement that normally they prefer giving alternative feeds to the baby as a mode of feeding. 32.5% strongly agreed, 13.3% strongly disagreed, 8.3% agreed and 4.2% were not sure.

About a third (32.5%) of respondents strongly disagreed with the statement that in their HIV status they prefer to breastfed the baby, 30% disagreed, 23.3% strongly agreed, 10% agreed and 4.2% were not sure.

Overall, 55% of the respondents strongly disagreed with the statement that after knowing their HIV status they were allowed to choose the feeding option for their baby, 30% agreed, 7.5% disagreed, 5% strongly agreed, and a minority 2.5% were not sure.

About a third (36.2%) of respondents who were married (n=105) disagreed with the statement that their partners were involved in decision making for baby's feeding option, 12.4% agreed,

5.7% strongly disagreed and 5.7% strongly agreed. There is none of the respondents who were not sure of their partner involvement in decision making on feeding option.

About two-fifths (38.3%) of the respondents were not sure of the statement that HIV infected mothers should take antiretroviral (ARV) to prevent mother to child transmission (PMCT), 38.3% were not sure. 37.5% strongly disagreed, 14.2% agreed, 6.7% strongly agreed and 3.3% disagreed.

About half of the respondents (48.3%) strongly agreed that there is no harm for a HIV infected mother to breastfeed and give formula fed to her infant at the same time. 29.2% disagreed, 15% strongly disagreed. 5% were not sure and 2.5% agreed.

Overall 51.9% of the respondents practicing EBF (n=54) were not sure of the statement that with a wound or infection in the breast they would continue breastfeeding, 46.3% strongly disagreed, and 1.9% disagreed. There is none of the respondents that strongly agreed or agreed to the statement.

About two-fifths (44.4%) of the respondents practicing EBF strongly agreed that they will exclusively breastfeed their baby until able to wean, 27.8% agreed, 22.2% were not sure and 5.6% disagreed. None of the respondents strongly disagreed with the statement.

More than half (59.1%) of the respondents practicing ERF (n=64) disagreed with the statement that unrefrigerated formula milk prepared four hours ago is safe for the baby, 27.3% were not

sure, 12.1% agreed while 1.5% strongly disagreed. None of the respondents strongly agreed with the statement.

About two fifths (42.4%) of the respondents practicing ERF strongly disagreed with the statement that it is better to feed the baby with a cup and spoon rather than a bottle. 25.8% agreed, 19.7% disagreed, 10.6% strongly agreed, and 1.5% were not sure.

Table 3: Maternal knowledge and attitude on infant feeding (n=120)

Maternal level of knowledge and attitude.		Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Total
Normally prefer giving alternative feeds to the baby	Frequency	16	50	5	10	39	120
	Percentage	13.3	**41.7**	4.2	8.3	32.5	100
In HIV status mother prefer breastfeeding	Frequency	39	36	5	12	28	120
	Percentage	**32.5**	30	4.2	10	23.3	100
Mother was allowed to choose the feeding option for the baby	Frequency	66	9	3	36	6	120
	Percentage	**55**	7.5	2.5	30	5	100
Partner was involved in decision making	Frequency	48	38	0	13	6	105
	Percentage	**45.7**	36.2	0	12.4	5.7	100
ARV prevent mother to child transmission of HIV	Frequency	45	4	46	17	8	120
	Percentage	37.5	3.3	**38.3**	14.2	6.7	100
No harm of mixed feeding	Frequency	18	35	6	3	58	120
	Percentage	15	29.2	5	2.5	**48.3**	100
With breast infection mother breastfeeds	Frequency	25	1	28	0	0	54
	Percentage	**46.3**	1.9	51.9	0	0	100
Exclusive breastfeeding until able to wean	Frequency	0	3	12	15	24	54
	Percentage	0	5.6	22.2	27.8	**44.4**	100
Unrefrigerated formula milk prepared four hours ago is safe	Frequency	1	39	18	8	0	66
	Percentage	1.5	**59.1**	27.3	12.1	0	100
Better to feed baby with cup and spoon rather than bottle	Frequency	28	13	1	17	7	66
	Percentage	**42.4**	19.7	1.5	25.8	10.6	100

4.3.2: Practices

When asked who takes care of the child when away, 41.5% of the respondents (n=41) said that a relative takes care, 22% sibling, 19.5% neighbour, 12.2% house help and 4.9% spouse. Table 4 illustrates these findings.

When asked who feeds the child when mother is away, 36.6% of the respondents (n=41) said that a relative does it, 19.5% sibling, 17.1% neighbour, 12.2% house help, 4.9% spouse and 9.8% others i.e. child not feed. Table 4 illustrates these findings.

Table 4: Alternative child care giver and feeder when the mother is away

	Frequency	Percentage
Alternative child care giver		
Relative	17	41.5
Sibling	9	22.0
Neighbour	8	19.5
House help	5	12.2
Spouse	2	4.9
Others	0	0.0
Total	**41**	**100**
Alternative child feeder		
Relative	15	36.6
Sibling	8	19.5
Neighbour	7	17.1
House help	5	12.2
Spouse	2	4.9
Others	4	9.8
Total	**41**	**100**

Respondents were asked if they have trained the alternative care giver on how to feed the baby when away for more than six hours, 65.8% of the respondents did not have alternative care giver. Out of the respondents who had alternative care giver, 78% responded no and 22% gave a response of yes. Figure 8 illustrates these findings.

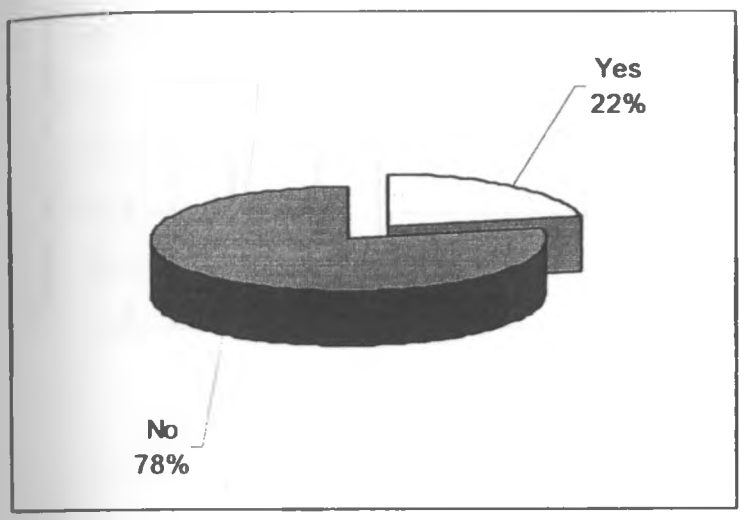


Figure 8: Training of alternative care giver on infant feeding (n=41).

Nearly all the respondents (97.5%) were cleaning the utensils of the baby, 1.7% said that relatives do clean the utensils while 0.8% said house help and 2.5% of the respondents had never used any utensils on the baby. Table 5 illustrates these findings.

Table 5: Persons who clean utensils of the baby (n=120)

	Frequency	Percentage
Mother	117	97.5
Relative	2	1.7
House help	1	0.8
Others	3	2.5

Out of 120 respondents interviewed, 95.8% use soap and water to clean utensils of the baby, 64.2% use hot water while only 0.8% use chemicals and 2.5% do not use any utensils on their babies. Figure 9 illustrates these findings.

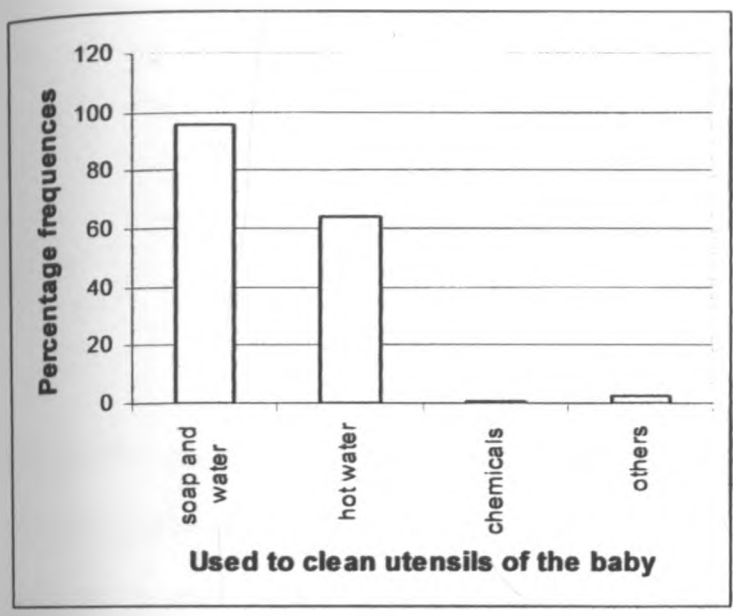


Figure 9: Cleaning utensils of the baby (n=120).

The 54 respondents practicing exclusive breastfeeding were asked when they initiated breastfeeding, 55.6% said within one hour, 18.5% between one hour to six hours, 9.3% between 13 to 24 hours, 7.4% between 25 to 48 hours and 5.5% after 48 hours and 3.7% between six to 12 hours. Table 6 illustrates the above.

Table 6: Initiation of breastfeeding by mothers (n=54)

	Frequency	Percentage
Within one hour	30	55.6
One hour to six hours	10	18.5
Six to 12 hours	2	3.7
13 to 24 hours	5	9.3
25 to 48 hours	4	7.4
After 48 hours	3	5.6
Total	**54**	**100**

Respondents practicing EBF when asked frequency of breastfeeding their children in 24 hours, about three-quarters (77.8%) of them said they breastfeed on demand, 5.6% breastfeed 6 times a day, 5.6% 8 times. 3.7% 10 times, another 3.7% often and 1.9% 7 times. Figure 10 illustrates these findings.

The 66 respondents practicing exclusive replacement feeding were asked the frequency of feeds given to the infant. 29.7% responded 7 times, 21.9% on demand, 14.1% 6 times, 12.5% 8 times, 9.9 % 6 times, 4.8% 3 times, 3.2% 2 times, 3.2% 4 times and 1.6% 3 times. Figure 10 illustrates these findings.

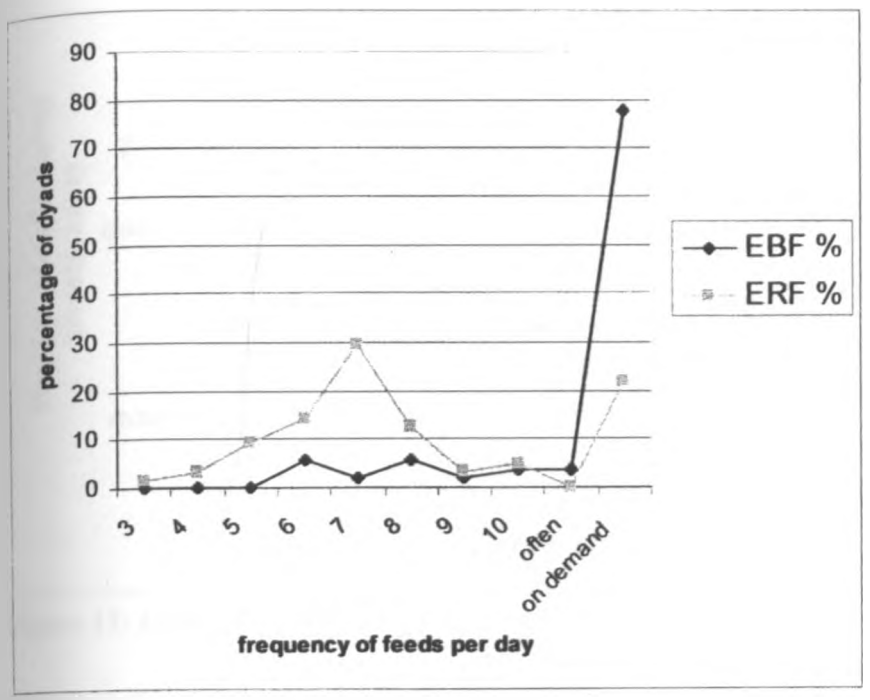


Figure 10: Frequency of feeding the infants.

Respondents practicing EBF (n=54) were asked how they position their infant on the breast. Respondents who; hold child's body close to their body, position child with his/her nose opposite their nipple, support child's whole body, position child's head and body straight and hold child facing them were considered to have correct positioning while those who did not meet the above were considered to have incorrect positioning. A majority of the respondents 83.3% had incorrect positioning and only 16.7% positioned the baby correctly on the breast.

The percentages of the specific positioning were as follows: 98.2% of the respondents said child faces the mother, 92.6% said they hold child's body close to their body, 70.4% said they position child's head and body straight, 50% said they support child's whole body and 33.3% said child is positioned with his/her nose opposite to mothers nipple. Figure 11 illustrates these findings.

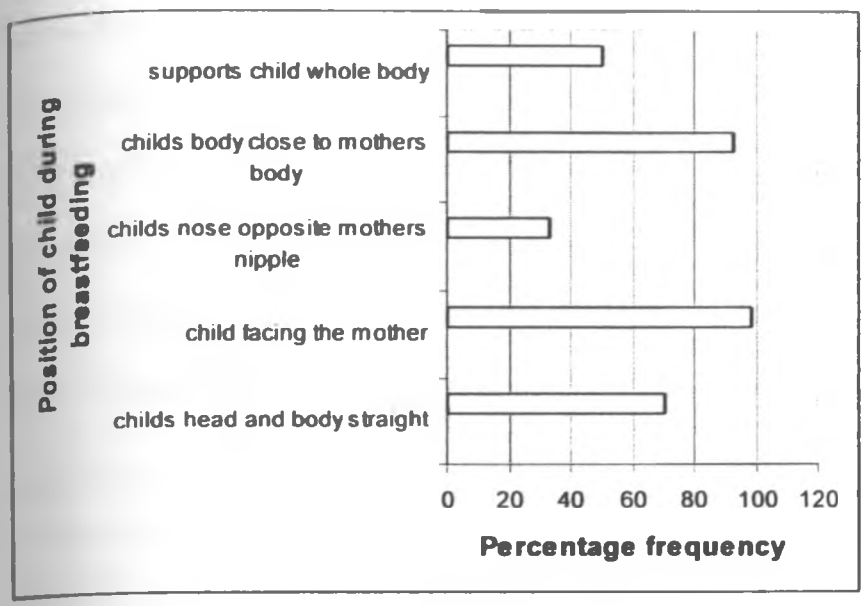


Figure 11: Child positioning on the breast (n=54)

The 54 respondents practicing exclusive breastfeeding were asked how long the child suckles on average 48% said the child suckles until full, 33% said the child suckles for less than 30 minutes and 19% said child suckles for between half an hour to one hour. Figure 12 illustrates these findings.

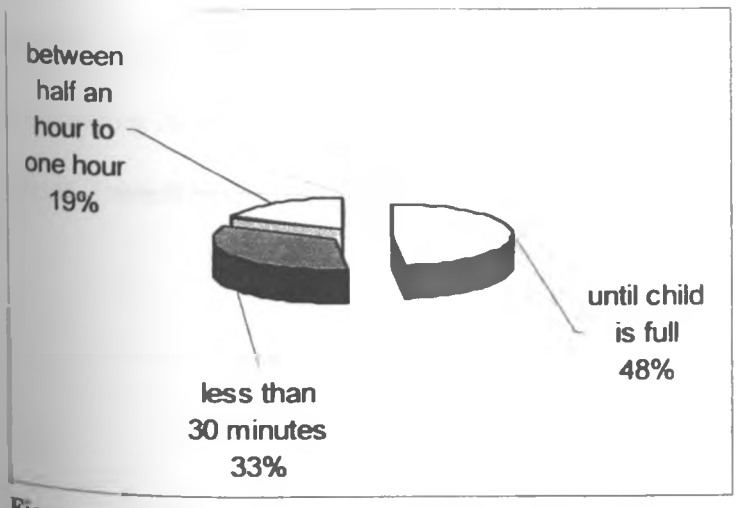


Figure 12: Average duration of child suckling (n=54).

Respondents practicing ERF (n=66) were asked what feeds they give their babies, 80.3% of the respondents gave formula milk, 74.2% cow's milk, 25.8% porridge, 9.1% mashed foods and 4.5% responded other feeds i.e. ugali, fruits and juice. Respondents who had initially started with formula milk indicated that they could not afford hence opted for cow's milk which is also relatively expensive. Table 7 illustrates these findings.

Table 7: Feeds given to ERF infants (n=66, Multiple response question)

Type of feed	Frequency	Percentage
formula milk	53	80.3
cows milk	49	74.2
porridge	17	25.8
mashed foods	6	9.1
others	3	4.5

Respondents practicing ERF and were using formula milk (n=53), were asked the amount of water they add to one scoop of formula milk. 84.9% added ≤ 30mls of water to one scoop of formula milk (correct dilution) while 15.1% added more than 30mls (over dilution). The specific responses were as follows: 58.5% gave a response of 25mls, 24.5% 30mls, 7.5% 40mls while those adding 20mls, 130mls, and 140mls of water or not sure were 1.9 % of the total number of infants. Table 8 below illustrates these.

Table 8: Amount of water added to one scoop of formula milk (n=53)

Amount of water in added to one scoop of formula milk	Frequency	Percentage
20mls	1	1.9
25 mls	31	58.5
30 mls	13	24.5
40 mls	4	7.5
130 mls	1	1.9
140 mls	1	1.9
Half baby bottle	1	1.9
Not sure	1	1.9
Total	**53**	**100**

Respondents practicing ERF (55%) were asked if there are social cultural factors that make it difficult for them to use this method; 61% answered in the negative and 39% gave affirmative response. Figure 13 illustrates these findings.

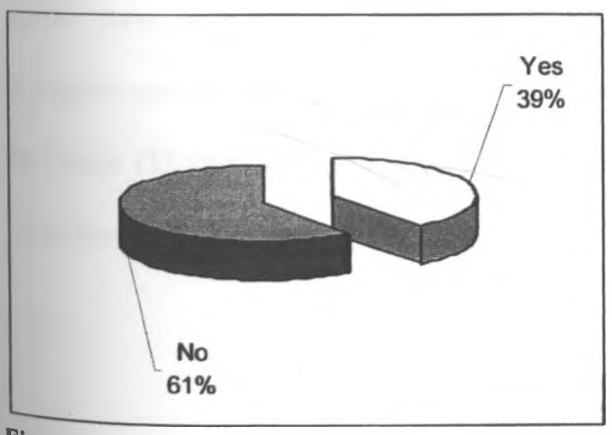


Figure 13: Social cultural practices make it difficult to practice ERF

Out of the respondents whom social cultural practices affect their feeding practice 92.3% mentioned pressure from neighbours/relatives/friends to breastfeed was the contributing factor, 3.9% said they were embarrassed for not breastfeeding and 3.9% said they were not able to buy food for the baby. See table 9.

Table 9: Social cultural factors that make it difficult for mothers to practice ERF (n=26).

Social cultural factors	Frequency	Percentage
Pressure from neighbours/relatives/friends to breastfeed	24	92.3
Embarrassed for not breastfeeding	1	3.9
Mother not able to buy food for the baby	1	3.9
Total	**26**	**100**

4.4: Infants nutrition outcome

A total of 120 infants were assessed on nutrition status outcome i.e. normal, underweight, stunted, wasted and abnormal growth gradients.

Infants' clinic cards were checked for weight for age chart, those who had zero growth gradients or negative growth gradient were considered to have abnormal growth gradients. About a third of the infants (32.5%) had experienced abnormal growth gradient while 67.5% had not. Table 10 illustrates these findings.

Table 10: Growth gradient status

Abnormal growth gradient	Frequency	Percentage
Abnormal	39	32.5
Normal	81	67.5
Total	**120**	**100**

Of the infants who had experienced abnormal growth gradients; 69.2% were in the exclusive replacement feeding arm while 30.8% were in the breastfeeding arm. Figure 14 illustrates these findings.

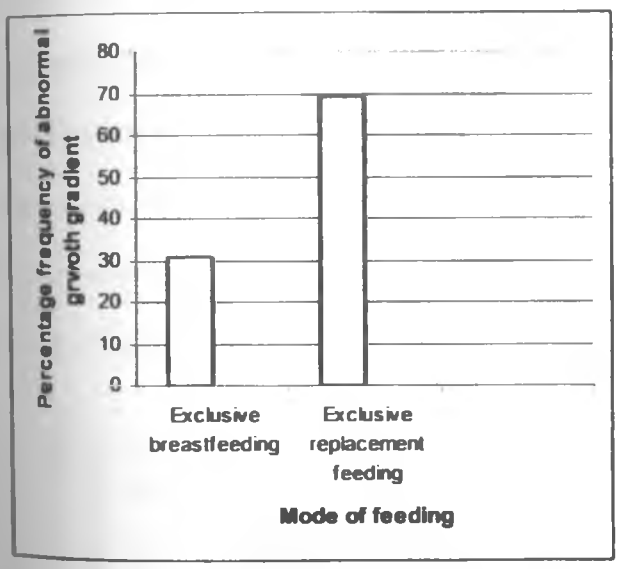


Figure 14: Abnormal growth gradients of the infants.

Of the infants who had experienced abnormal growth gradients; 15% had experienced zero growth gradients. Majority (83.3%) of who were on ERF and a minority (16.7%) were on EBF. Figure 15 illustrates these findings.

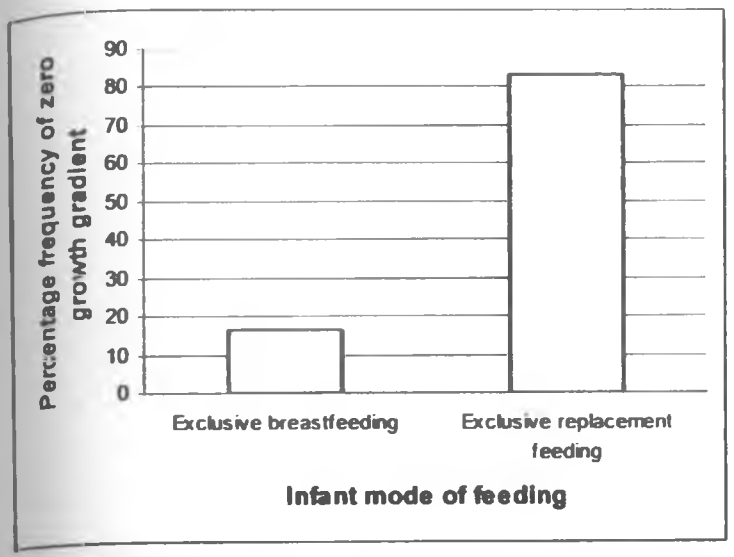


Figure 15: Zero growth gradient for weight gain curve

Out of the infants with abnormal growth gradients, 20% had experienced negative growth gradients. Overall, 58.3% of infants with negative growth gradient had one frequency of negative growth gradients. 37.5% two and 4.2% three.

The infants with one frequency of negative growth gradient were 10 ERF and 4 EBF, those with two negative growth gradient were 5 ERF and 4 EBF while those with a frequency of three was 1 EBF. Figure 16 illustrates these findings.

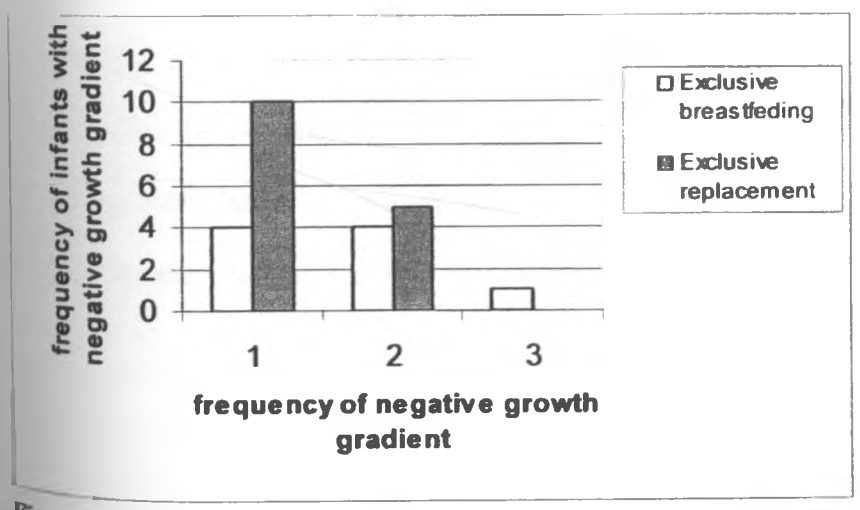


Figure 16: Infants with negative growth gradient for weight gain curve

The infants' cards were checked for the illness the child suffered at the time of abnormal growth gradient (n=39). More than half (56.4%) of children with abnormal growth gradient had respiratory infections. 41% had gastrointestinal problems. 2.6% had dermatological conditions and 15.4 % were in the others category i.e. fever, refusal to feed or no illness. Table 11 illustrates these findings.

Table 11: Illness child suffered at the time of abnormal growth (multiple responses)

Cause	Frequency (n=39)	Percentage
Respiratory infections	22	56.4
Gastrointestinal problems	16	41.0
Dermatological conditions	1	2.6
Others	6	15.4

Out of the infants, 1.7% of were observed to have moderate wasting; none had pitting oedema of both feet and palmar pallor.

A majority (83.3%) of the EBF infants did not have current illness and 16.7% had while 84.8% of ERF infants did not have current illness and 15.2% had. About two thirds of EBF infants had not suffered past illness and a third had while ERF infants, almost three quarters had suffered and only a quarter had not. Table 12 below illustrates these findings

Table 12: Infant illnesses

	Exclusive breastfeeding		Exclusive replacement feeding	
	Frequency	Percentage	Frequency	Percentage
Current illness				
Yes	9	16.7	10	15.2
No	45	83.3	56	84.8
Total	54	100	66	100
Past illness				
Yes	17	31.4	48	72.7
No	37	68.5	18	27.3
Total	54	100	66	100

Respondents when asked on the current illness the child is being treated for; 75% responded respiratory infections, 10% said gastrointestinal problems and 15% were in the others category i.e. cardiovascular problems and dermatological problems. Table 13 illustrates these findings.

The infants cards were checked for cause of past illness and the following were the findings; 61.5% infants had respiratory infections, 30.8% gastrointestinal problems, while 7.7% were in the others category i.e. dermatological problem, fever and malaria. Table 13 illustrates these findings.

Out of 120 infants, 87.5% had been tested for HIV while 12.5% had not been tested. The infants tested for HIV 1.7% were positive, 60% were negative and 38.3% had their HIV status undetermined i.e. infants awaiting PCR results or those who had not been done PCR test. Table 13 illustrates these findings.

Table 13: Current and past illness of the infants

Illness	Frequency	Percentage
Current Illness (n=20)		
Respiratory infections	15	75
Gastrointestinal problems	2	10
Others	3	15
Total	**20**	**100**
Past Illness (n=65)		
Respiratory infections	40	61.5
Gastrointestinal problems	20	30.8
Others	5	7.7
Total	**65**	**100**
HIV status		
Negative	72	60
Positive	2	1.7
Undetermined	46	38.3
Total	**120**	**100**

Out of 65 infants who had suffered past illness, mothers were asked when the illness occurred, 43.1% said April, 21.5% said May, 20% March and 7.7% June. Figure 17 illustrates these findings.

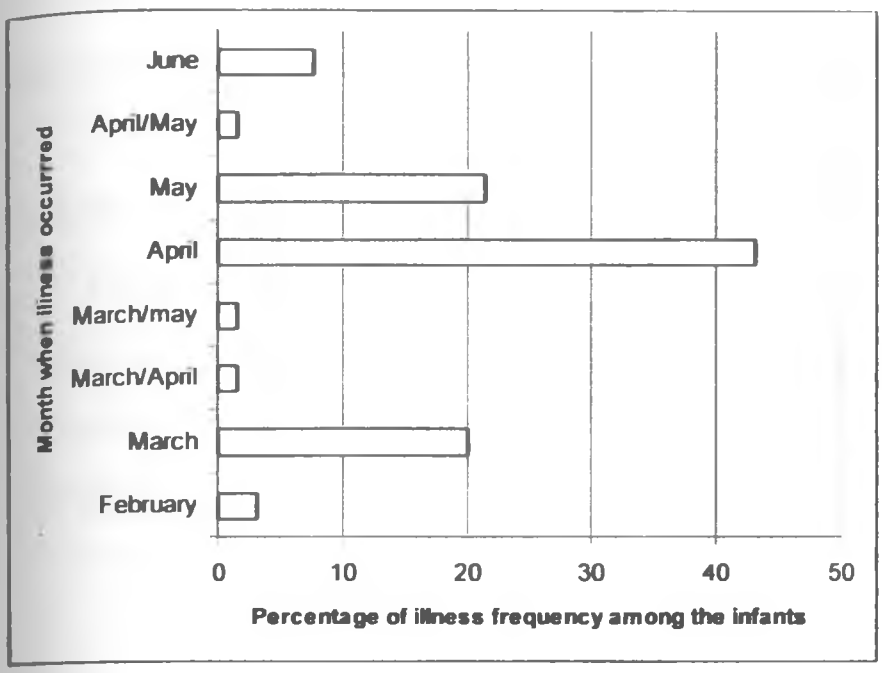


Figure 17: Months when illness occurred and number of children affected.

4.5: Assessment of nutritional status using different indicators

4.5.1: Infant's nutrition status

Table 14a presents the nutritional status of the infants using different assessment indicators, namely, weight for length Z scores, length for age Z scores and weight for age Z scores.

The median weight for length Z scores for the infants was 0.19 with the 25th and 75th interquartile range of -0.82 and 1.06 respectively and a mean of 0.06.

The median length for age Z scores for the infants was -0.3 with the 25th and 75th interquartile range of -1.34 and 0.6 respectively and a mean of -0.37.

The median weight for age Z scores for the infants was -0.09 with the 25th and 75th interquartile range of -0.74 and 0.67 respectively and a mean of -0.04.

Table 14a: Infant's nutrition status

Characteristic of infants	Number (n)	Median (interquartile range)	Mean
Weight for length Z scores	120	0.19 (-0.82 - 1.06)	0.06
Length for age Z scores	120	-0.3 (-1.34 - 0 .6)	-0.37
Weight for age Z scores	120	-0.09 (-0.74 - 0.67)	-0.04

Table 14b illustrates the infants' nutrition status outcome calculated using weight for length, length for age and weight for age Z scores.

Out of the infants, 11.7% were wasted while 88.3% had normal weight for length Z scores, 12.5% were stunted while 87.5% had normal length for age Z scores and 3.3% were underweight while 96.7% had normal weight for age Z scores.

Table 14b: Infant's nutrition status outcome

Nutrition outcome	Frequency	Percentage
Weight for length		
Below -2SD(wasted)	14	11.7
Above -2SD	106	88.33
Total	**120**	**100**
Length for age		
Below -2SD(stunting)	15	12.5
Above -2SD	105	87.5
Total	**120**	**100**
Weight for age		
Below -2SD(underweight)	4	3.3
Above -2SD	116	96.7
Total	**120**	**100**

4.5.2: Bivariate analysis of variables

Relationship between independent variables and nutrition status outcome was determined results are as presented.

Determining association between various independent variables and stunting status of the infants

Among the independent variables only mode of infant feeding was found to have significant findings. Table 15a illustrates these findings.

Two (3.7%) of the exclusively breastfed infants were stunted and 52 (96.3%) had a normal length for age Z scores while 13 (19.7%) of exclusively replacement fed infants were stunted and 53 (80.3%) had a normal length for age Z scores. There was a statistically significant difference

in length for age Z scores between exclusively breastfed and exclusively replacement fed infants born to HIV infected mothers (p=0.02). Stunted infants were 6.34 times as likely as normal length for age Z scores to be on exclusive replacement feeding (odds ratio 6.34). Table 15a illustrates these findings.

Table 15a: Association between independent variables and stunting

Variable	Normal	Stunted	Total	Chi square	Odds ratio (95% confidence interval)	p value
Spouse level of education						
primary	36	6	42			
secondary	49	5	54			
tertiary	3	1	4	0.07	1.08 (0.63-1.83)	0.79
others	2	3	19			
Total	90	15	105			
Spouse occupation						
informal employment	80	11	91			
formal employment	9	2	11	0.00	1.02(0.49-2.12)	0.96
others	1	2	18			
Total	90	15	105			
Prefer alternative feeds to breastfeeding						
agree	69	2	71			
disagree	47	2	49	0.24	1.31 (0.44-3.91)	0.62
Total	116	4	120			
Prefer breastfeeding in HIV status						
agree	77	3	80			
disagree	39	1	40	0.34	0.70 (0.21-2.36)	0.56
Total	116	4	120			
Mother choose mode of infant feeding						
agree	76	2	78			
disagree	40	2	42	0.19	1.28 (0.42-3.89)	0.67
Total	116	4	120			
ARV prevent MTC transmission						
agree	93	2	95			
disagree	23	2	25	0.35	1.45 (0.42-5.06)	0.55
Total	116	4	120			
No harm of mixed feeding						
agree	57	2	59			
disagree	59	2	61	0.12	0.83 (0.28-2.46)	0.73
Total	116	4	120			

Infants age category						
less than 16 weeks	15	1	16			
6-12 weeks	41	6	47	0.54	1.05 (0.92-1.19)	0.46
greater than 12 weeks	49	8	57			
Total	105	15	120			
Mode of infant feeding						
EBF	**52**	**2**	**54**			
ERF	**53**	**13**	**66**	**5.56***	**6.34 (1.3-31.28)**	**0.02***
Total	**105**	**15**	**120**			
Prefer to feed baby with a cup and spoon rather than bottle						
agree	22	2	24	0.00*	3.70 (0.99-13.80)	0.96*
disagree	40	2	42			
Total	62	4	66			
Feeds given to ERF infants						
milk	45	3	48			
other feeds	17	1	18	0.1	1.24 (0.32-4.72)	0.75
Total	62	4	66			
Frequency of feeds for ERF infants						
Less than 8 times	29	8	37			
Greater than 8 times	11	2	13	2.83	0.13 (0.01-1.39)	0.09
On demand	11	3	14			
Total	51	13	64			
Social cultural practices make it difficult for mother to practice ERF						
agree	25	1	26	0.5	1.60 (0.43-5.94)	0.48
disagree	37	3	40			
Total	62	4	66			
Current illness						
yes	14	5	19			
no	91	10	101	3.91	0.31 (0.09-1.06)	0.05
Total	105	15	120			
Past illness						
yes	58	7	65			
no	45	8	53	0.49	1.47 (0.49-4.40)	0.48
Total	105	15	167			
Abnormal growth gradient						
yes	34	5	39			
no	71	10	81	0.01	1.04 (0.33-3.31)	0.94
Total	105	15				

* Yates correction was employed for the cells with frequency less than 5 in more than 20% of the cells to determine yates' chi-square and yates' p-value.

Determining association between various independent variables and abnormal growth gradient

Among 16 infants aged less than 16 weeks none had experienced abnormal growth gradient, 11 (23.4%) out of the infants aged 6-12 weeks had experienced abnormal growth gradient while 36 (76.6) had not and the infants greater than 12 weeks 28 (49.1%) had experienced abnormal growth gradient while 29 (50.9%) had not. There was a statistically significant difference in growth gradients between infants of different ages in weeks (p=0.0). The infants who were less than 16 weeks had reduced odds of abnormal growth gradients (odds ratio=1.21). Table 15b illustrates these findings.

Table 15b: Association between independent variables and abnormal growth gradients

Variable	Normal growth gradients	Abnormal growth gradients	Total	Chi square	Odds ratio (95% confidence interval)	p value
Spouse level of education						
primary	36	6	42			
secondary	49	5	54	0.33	0.9 (0.61-1.30)	0.56
tertiary	3	1	4			
others	2	3	5			
Total	90	15	105			
Spouse occupation						
informal employment	56	35	91			
formal employment	9	2	11	0.01	0.91 (0.18-4.53)	0.91
others	16	2	18			
Total	81	39	120			
Income						
below Ksh 9,000	64	31	95	0.58	0.00 (.-.)	0.45
above Ksh 9,000	12	6	18			
Total	76	37	113			
Child carer						
mother	31	16	47			
others	50	23	73	0.35	1.97 (0.20-19.8)	0.56
Total	81	39	120			
Prefer alternative feeds to breastfeeding						
agree	47	24	71	0.14	1.5 90.2-10.89)	0.71
disagree	34	15	49			
Total	81	39	120			

Prefer breastfeeding in HIV status						
agree	52	28	80	0.13	0.66 (0.07-6.61	0.72
disagree	29	11	40			
Total	81	39	120			
Mother choose mode of infant feeding						
agree	52	26	78	0.41	1.90 (0.3-14.16)	0.52
disagree	29	13	42			
Total	81	39	120			
Partner was involved in decision making for infant mode of feeding						
agree	70	31	101	0.77	0.00 (.-.)	0.38
disagree	11	8	19			
Total	81	39	120			
ARV prevent MTC transmission						
agree	62	33	95	2.72	4.0 (0.53-31.07)	0.15
disagree	19	6	25			
Total	81	39	120			
No harm of mixed feeding						
agree	41	18	59	0	0.97 (0.13-7.15)	0.97
disagree	40	21	61			
Total	81	39	120			
Infants age category						
less than 16 weeks	**16**	**0**	**16**	**16.5**	**1.21(1.10-1.32)**	**0.0**
6 to 12 weeks	**36**	**11**	**47**			
greater than 12 weeks	**29**	**28**	**57**			
Total	**81**	**39**	**120**			
Mode of infant feeding						
EBF	42	12	54	0.21	1.20 (0.55-2.58)	0.65
ERF	39	27	66			
Total	81	39	120			
Positioning of the baby on the breast						
correct positioning	35	10	45	0	0.00 (.-.)	0
incorrect positioning	7	2	9			
Total	42	12	54			
Duration of suckling						
until full	21	5	26	0.51	2.78 (0.15-52.57)	0.48
less than 30 minutes	14	4	18			
between 30 to 60 minutes	7	3	10			
Total	42	12	54			

Unfrigerated formula milk is safe after 4 hours of preparation						
agree	34	24	58	0.58	0.00 (.-.)	0.45
disagree	5	3	8			
Total	39	27	66			
Prefer to feed baby with a cup and spoon rather than bottle						
agree	19	23	42	0.34	1.82 (0.23-14.10)	0.52
disagree	8	16	24			
Total	27	39	66			
Feeds given to ERF infants						
milk	18	30	48	0.01	0.88 (0.08-9.24)	0.92
other feeds	9	9	18			
Total	27	39	66			
Dilution of formula milk (one scoop)						
below 30mls	3	5	8	0.02*	0.07 (0.00-1.07)	0.89*
above 30mls	18	37	55			
Total	21	42	63			
Frequency of feeds for ERF infants						
Less than 8 times	17	20	37	6.22	0.46 (0.25-0.85)	0.01
Greater than 8 times	11	2	13			
On demand	11	3	14			
Total	39	25	64			
Social cultural practices make it difficult for mother to practice ERF						
agree	16	10	26	0.36	2.0 (0.19-21.12)	0.55
disagree	23	17	40			
Total	39	27	66			
Sex						
male	40	21	61	3.97	0.00 (.-.)	0.05
female	41	18	59			
Total	81	39	120			
Current illness						
yes	15	4	19	3.59	0.17 (0.02-1.36)	0.06
no	66	35	101			
Total	81	39	120			
Past illness						
yes	29	36	65	0.66	0.40 (0.04-4.00)	0.42
no	52	3	55			
Total	81	39	120			

- Yates correction was employed for the cells with frequency less than 5 in more than 20% of the cells to determine yates' chi-square and yates' p-value.

Determining association of various independent variables and underweight among the infants

There were no significant association between weight for age Z scores and each of the considered independent variables. Table 15c illustrates these findings.

Table 15c: Association between independent variables and underweight

Variable	Normal	Underweight	Total	Chi square	Odds ratio (95% confidence interval)	p value
Child carer						
mother	46	1	47	0.35	1.97 (0.20-19.79)	0.56
others	70	3	73			
Total	116	4	120			
Prefer breastfeeding in HIV status						
agree	35	5	40	0.13	0.66 (0.07-6.61)	0.72
disagree	69	9	78			
Total	104	14	118			
Mother choose mode of infant feeding						
agree	69	9	78	0.41	1.90 (0.25-14.16)	0.52
disagree	37	5	42			
Total	106	14	120			
Partner was involved in decision making for infant mode of feeding						
agree	89	12	101	0.77	0.00 (.-.)	0.38
disagree	17	2	19			
Total	106	14	120			
ARV prevent MTC transmission						
agree	83	12	95	2.12	4.0 (0.53-31.07)	0.15
disagree	23	2	25			
Total	106	14	120			
No harm of mixed feeding						
agree	54	5	59	0	0.97 (0.13-7.15)	0.97
disagree	52	9	61			
Total	106	14	120			
Prefer to feed baby with a cup and spoon rather than bottle						
agree	40	2	42	0.34	1.82 (0.23-14.10)	0.52
disagree	22	2	24			
Total	62	4	66			

Feeds given to ERF infants						
milk	45	3	48	0.01	0.88 (0.08-9.24)	0.92
other feeds	17	1	18			
Total	62	4	66			
Dilution of formula milk (one scoop)						
below 30mls	6	2	8	3.02*	0.07 (0.00-1.07)	0.08*
above 30mls	44	1	45			
Total	50	3	53			
Social cultural practices that make it difficult to practice ERF						
agree	25	1	26	0.36	2.0 (0.19-21.12)	0.55
disagree	37	3	40			
Total	62	4	66			
Current illness						
yes	17	2	19	3.59	0.17 (0.02-1.36)	0.06
no	99	2	101			
Total	116	4	120			
Past illness						
yes	62	3	65	0.66	0.40 (0.04-4.00)	0.42
no	54	1	55			
Total	116	4	120			
Abnormal growth gradient						
yes	36	1	37	3.38	6.67 (0.64-69.22)	0.07
no	80	1	81			
Total	116	2	118			

* Yates correction was employed for the cells with frequency less than 5 in more than 20% of the cells to determine yates' chi-square and yates' p-value.

Determining association of various independent variables and wasting among the infants

There were no significant association of weight for length Z scores and each of the considered independent variables. Table 15d illustrates these findings.

Table 15d: Association between independent variables and wasting

Variable	Normal	Wasted	Total	Chi square	Odds ratio (95% confidence interval)	p value
Income						
below Ksh. 9,000	85	10	95	0.58	0.00 (.-.)	0.45
above Ksh. 9,000	16	2	18			
Total	101	12	113			

Child carer						
mother	40	7	47	0.35	1.97 (0.20-19.79)	0.56
others	66	7	73			
Total	106	14	120			
Prefer alternative feeds to breastfeeding						
agree	64	7	71	0.14	1.47 (0.20-10.89)	0.71
disagree	42	7	49			
Total	106	14	120			
Prefer breastfeeding in HIV status						
agree	71	9	80	0.13	0.66 (0.07-6.61)	0.72
disagree	35	5	40			
Total	106	14	120			
Mother choose mode of infant feeding						
agree	69	9	78	0.41	1.90 (0.25-14.16)	0.52
disagree	37	5	42			
Total	106	14	120			
Partner was involved in decision making for infant mode of feeding						
agree	89	12	101	0.77	0.00 (.-.)	0.38
disagree	17	2	19			
Total	106	14	120			
ARV prevent MTC transmission						
agree	83	12	95	2.12	4.0 (0.53-31.07)	0.15
disagree	23	2	25			
Total	106	14	120			
No harm of mixed feeding						
agree	54	5	59	0	0.97 (0.13-7.15)	0.97
disagree	52	9	61			
Total	106	14	120			
Infants age category						
less than 16 weeks	12	4	16	2.33	0.9 (0.79-1.03)	0.13
6-12 weeks	42	5	47			
greater than 12 weeks	52	5	57			
Total	106	14	120			
Mode of infant feeding						
EBF	50	4	54	1.71	2.23 (0.65-7.67)	0.19
ERF	56	10	66			
Total	106	14	120			

Initiation of breastfeeding						
within 1 hour after delivery	29	1	30			
after one hour of delivery	5	1	6	1.14	3.6 (0.29-45.68)	0.29
others	16	2	18			
Total	50	4	54			
Positioning of the baby on the breast						
correct positioning	42	3	45			
incorrect positioning	8	1	9	0	0.00 (.-.)	0
Total	50	4	54			
Unfrigerated formula milk is safe after 4 hours of preparation						
agree	49	9	58	0.58	0.00 (.-.)	0.45
disagree	7	1	8			
Total	56	10	66			
Prefer to feed baby with a cup and spoon rather than bottle						
agree	37	5	42	0.34	1.82 (0.23-14.10)	0.56
disagree	19	5	24			
Total	56	10	66			
Feeds given to ERF infants						
milk	40	8	48	0.01	0.88 (0.08-9.24)	0.92
other feeds	16	2	18			
Total	56	10	66			
Frequency of feeds for ERF infants						
Less than 8 times	30	7	37			
Greater than 8 times	12	1	13	1.46	0.59 (0.25-1.39)	0.23
On demand	13	1	14			
Total	55	9	64			
Social cultural practices make it difficult for mother to practice ERF						
agree	20	6	26	0.36	2.03 (0.19-21.12)	0.55
disagree	36	4	40			
Total	56	20	66			
Sex						
male	51	10	61			
female	55	4	59	3.97	0.00 (.-.)	0.05
Total	106	14	120			
Current illness						
yes	18	1	19			
no	88	13	101	3.59	0.17 (0.02-1.36)	0.06
Total	106	14	120			

Past illness						
yes	57	8	65			
no	49	6	55	0.66	0.40 (0.04-4.00)	0.42
Total	106	14	120			
HIV infected						
yes	1	1	2			
no	64	8	72	0.06	0.00 (.-.)	0.81
Total	65	9	74			
Abnormal growth gradient						
yes	32	7	39			
no	74	7	81	2.19	2.31 (0.74-7.25)	0.14
Total	106	14	120			

• Yates correction was employed for the cells with frequency less than 5 in more than 20% of the cells to determine yates' chi-square and yates' p-value.

4.5.3: Bivariate correlation of independent variables against the nutrition status outcome

Independent variables were correlated and p value determined for significant dependent variable. Table 16 illustrates these findings.

4.5.3.1: Maternal demographic data

Maternal demographic data was correlated against all the variables.

Respondents who were older tended to be more educated (p=0.025), they also preferred giving alternative feeds to the baby as a mode of feeding (p=0.039) and they also thought that it is better to fed the baby with a cup and spoon rather than a bottle (p=0.013).

Respondents who were more educated tended to have employment (p= 0.027), they also had infants with a high birth weight (p=0.045) and had alternative care giver for the baby when mother is away (p = 0.018).

Respondents who were employed tended to disagree that cultural differences make it difficult for them to practice ERF (p = 0.031).

Spouses who had employment tended to have infants who had higher birth weight (p= 0.048).

Families that had a higher income per month tended to have mothers with a higher level of education (p = 0.045) and also spouses who were employed (p = 0.048).

4.5.3.2: Infant demographic data

Infants' demographic data was correlated against all the variables.

The infants with a higher birth weight tended to be female (p = 0.039).

Infants on exclusive replacement feeding tended to have negative growth gradient (p=0.037), also tended to be wasted (p=0.019) and their families tended to have a higher income per month (p = 0.025).

4.5.3.3: Maternal factors contributing to infant's nutrition status

Respondent's whose partners were involved in decision making for infant's feeding option tended to agree that HIV infected mothers should take ARV to prevent mother to child transmission (p = 0.011).

Respondents who agreed to the statement that HIV infected mothers should take ARV to prevent mother to child transmission tended to have infants who were not treated for respiratory infections (p = 0.015) and who had not suffered past illness (p = 0.047).

Respondents who agreed to the statement that there is no harm for HIV infected mother to mix feed tended to be from the breastfeeding arm ($p = 0.033$).

Respondents who agreed to the statement that it is better to feed the baby with a cup and spoon rather than a bottle tended to have a higher family income per month ($p = 0.035$).

Respondents who over diluted formula milk tended to have infants who were underweight ($p=0.028$) and with history of past illness ($p=0.048$).

Respondent's using soap and water to clean utensils tended to have infants who had not experienced past illness ($p = 0.024$).

Infants' nutrition outcome

Infants who were underweight tended to be male ($p = 0.046$), had respiratory infection ($p = 0.021$) and past gastrointestinal problems ($p = 0.047$).

Infants who had experienced abnormal growth gradient tended to be on exclusive replacement feeding ($p = 0.030$), had past respiratory infections ($p = 0.013$) and past gastrointestinal problems ($p = 0.023$).

Table 16: Pearson correlation for independent variables against significant nutrition status outcome

Variable	Pearson correlation	p value
Maternal demographic data		
Older respondents		
Respondents tended to be more educated	0.284	**0.025**
preferred giving alternative feeds to the baby as a mode of feeding	0.287	**0.039**
agreed to the statement that it is better to the baby with a cup and a spoon rather than a bottle	0.219	**0.013**
More educated respondents		
tended to have employment	0.202	**0.027**
infants had a high birth weight	0.183	**0.045**
had alternative care giver	-0.215	**0.018**
Employed respondents		
disagreed with the statement that cultural differences make it difficult for them to practice ERF	0.266	**0.031**
Employed spouses		
infants had a higher birth weight	0.181	**0.048**
Families with a higher income per month		
respondents had higher level of education	0.190	**0.045**
spouses were employed	0.201	**0.048**
Infant demographic data		
Infants with high birth weight		
tended to be female	0.219	**0.039**
ERF infants		
had negative growth gradient	0.232	**0.037**
tended to be wasted	0.211	**0.019**
families had a higher income	0.179	**0.025**
Maternal factors contributing to infant's nutrition status		
Respondent's using soap and water to clean cup		
had infants who had not experienced past illness	0.232	**0.024**
Respondent's whom partners were involved in decision making for infant's feeding option		
agreed to the statement that HIV infected mothers should take ARV to prevent mother to child transmission	0.207	**0.011**
Respondents who agreed to the statement that HIV infected mothers should take ARV to prevent mother to child transmission		
Infants were not treated for respiratory infections	0.189	**0.015**
infants had not suffered past illness	0.177	**0.047**
Respondents who agreed to the statement that there is no harm for HIV infected mother to mix feed		
tended to be from breastfeeding arm	0.189	**0.033**

Respondents who agreed that it is better to feed the baby with a cup and spoon rather than a bottle		
had a higher family income per month	0.219	**0.035**
Respondents who over diluted formula milk		
had infants who were underweight	0.184	**0.028**
had infants who had experienced past illness	0.273	**0.048**
Infants nutrition outcome		
Infants who were underweight		
tended to be male	0.234	**0.046**
had respiratory infection	0.211	**0.021**
had past gastrointestinal problems	0.182	**0.047**
Infants who had experienced abnormal growth gradients		
tended to be on ERF arm	0.198	**0.03**
had respiratory infections	0.226	**0.013**
had past gastrointestinal problems	0.203	**0.023**

4.5.4: Comparison of nutrition status outcome using different variables

4.5.4.1: Weight for length Z scores

The mean weight for length Z score for exclusively breastfed infants was 0.13 (SD 0.22) while for exclusively replacement fed infants was -0.009 (SD 0.24). However, the difference between the two was not statistically significant (p =0.67).

The mean weight for length Z scores for infants without abnormal growth gradient was 0.23 (SD 1.94) while for infants with abnormal growth gradient was -0.30 (SD 1.42). The difference between the two was found to be not statistically significant (p=0.13).

4.5.4.2: Length for age Z scores

The mean length for age Z scores for infants without abnormal growth gradient was -0.31 (SD 1.50) while for infants with abnormal growth gradient was -0.51 (SD 1.45). However, the difference was not statistically significant (p=0.49).

The mean length for age Z scores for exclusively breastfed infants was -0.08 (SD 1.09) while for exclusively replacement fed infants was -0.61 (SD 1.71). The difference was statistically significant (p=0.05).

4.5.4.3: Weight for age Z scores

The mean weight for age Z scores for infants without abnormal growth gradient was 0.271 (SD 0.15) while for infants with abnormal growth gradient was -0.43 (SD 1.22). The difference was found to be statistically significant (p= 0.02).

The mean weight for age Z scores for exclusively breastfed infants was -0.27 (SD 1.25) while for exclusively replacement fed infants was -0.29 (SD 1.27). The difference was found to be statistically significant (p = 0.02).

4.5.5: Multivariate logistic regression analysis

A multivariate logistic regression was done for independent variables against the dependent variables. Table 17 illustrates these findings.

A significant association was found between wasting and the following independent variables; mode of infant feeding (p=0.014), abnormal growth gradient (p=0.043) and sex which was found to be boarder line (p = 0.055).

Stunting had a significant association with mode of infant feeding (p=0.003) while sex was found to be boarder line (p=0.05).

There were no significant findings in logistic regression of underweight against the independent variables.

Abnormal growth gradients were found to have a significant association with age of infant (p = 0.002).

Table 17: Multivariate logistic regression analysis

Wasting					
Mode of feeding	8.848	7.891	2.44	**0.014**	1.54 - 50.81
Abnormal growth gradient	5.464	4.595	2.02	**0.043**	1.05 - 28.40
Sex	4.016	2.913	1.92	**0.055**	0.97 - 16.64
Age of the infant	0.916	0.0657	-1.22	0.223	0.80 - 1.05
Current illness	0.275	0.379	-0.94	0.349	0.02 - 4.10
Past illness	2.627	4.072	0.62	0.533	0.13 - 54.82
Stunting					
mode of feed	16.978	16.22	2.96	**0.003**	2.61 - 110.43
Abnormal growth gradient	2.066	1.66	0.9	0.37	0.42 - 10.12
sex	3.79	2.61	1.94	**0.053**	0.98 - 14.59
Age of the infant	1.058	0.66	0.91	0.36	0.94 - 1.19
Current illness	4.337	7.38	0.86	0.39	0.15 - 121.6
Past illness	0.354	0.51	-0.72	0.48	0.02 - 6.01
Underweight					
Abnormal growth gradient	12.29	22.62	1.36	0.17	0.33 - 452.69
Age of the infant	0.93	0.12	-0.52	0.6	0.72 - 1.21
Past illness	0.62	1.26	-0.24	0.81	0.011 - 33.59
Abnormal growth gradient					
mode of feed	2	0.87	1.6	0.109	0.86 - 4.71
sex	1.37	0.57	0.75	0.456	0.60 - 3.12
Age of the infant	1.13	0.04	3.07	**0.002**	1.04 - 1.22

From the study findings there was a significant difference in nutrition status between exclusively breastfed and exclusively replacement fed infants born to HIV infected mothers hence null hypothesis is rejected.

CHAPTER FIVE: DISCUSSION

This study has shown that the mode of infant feeding practiced by the mother influences the nutrition outcome of the infant. Infants who were on exclusive breast feeding had better nutritional status compared to those who were on exclusive replacement feeding. Exclusive breast feeding infants were also less likely to experience abnormal growth gradients or suffer illnesses.

Majority of the mothers had a lower level of education compared to their spouses. Similar trends were established by the KDHS (2003) where the level of education for females in Nairobi who were educated up to secondary school was 30.9 % compared that of males (38.3%). In relation to the level of education most of the house holds depended on father as source of income.

The fathers' income in many households was irregular and inadequate. Some mothers (15.1%) over diluted the formula milk for children who were on exclusive replacement feeding. One of the reasons they gave for the over dilution was lack of money. Andresen. (2007), in his studies observed that 14% of mothers who prepared formula milk under observation over diluted it. The practice of over diluting formula milk was found to be significantly associated with underweight and past illness in the infant. A study by Ngacha, (2001), documented contrasting findings where mothers were able to administer formula feeds without seriously compromising the nutritional status of their infant. It is very important for health care providers to asses the mother's capacity for AFASS before recommending for exclusive replacement feeding. The WHO (2001) recommends the same to avoid a possibility of compromising the nutrition status of the infant as was the case in this study.

More infants were on exclusive replacement feeding according to records in the health facilities; this is supported by the findings of Mridula, (2003), where a majority of the infants were on exclusive replacement feeding and Bii, (2008), where 35% of babies were EBF, 50% not breastfed at all and 14% received mixed feeding. However the findings are in contrast to Coovadia, (2007), where 82% of HIV positive mothers started exclusive breastfeeding, 7.9% replacement feeding and 2.5% started feeding with a mixture of breastfeeding and others fluids. From the study findings infants' feeds were mainly formula milk and cow's milk which were offered seven times a day to majority of the infants. Exclusive replacement feeding was significantly associated with negative growth gradients, stunting, underweight and wasting.

ERF was significantly associated with a high family income ($p=0.025$) in this study and this is comparable to Bii, (2008), where choice of infant feeding method was influenced by social economic status of the mother. However the study findings are in contrast to Bland, (2003), where clean water supply and regular maternal income were independently associated with intention to replacement feed.

All HIV infected mothers should receive counseling on infant feeding options and specific guidance in selecting the option most likely to be suitable for their situation. Whatever a mother decides she should be supported in her choice, WHO, (2001). Interestingly, this study found that, majority of respondents were not allowed to choose the feeding option for their baby rather they were told to breastfed or give replacement feeds by the health workers. This is in contrast to Bland, (2007) findings where feeding intentions for antenatal mothers were EBF (73%), ERF (9%) and 18% were undecided.

Though WHO, (2001), recommends all HIV infected mothers to be counseled on risks and benefits of various infant feeding options, the study findings were that about half of the respondents lacked knowledge on the dangers of mixed feeding. This indicates low level of knowledge on infant feeding practices in HIV status. These findings are comparable to Omwega, (2006). where maternal knowledge on mother to child transmission of HIV was as low as 8.9%.

HIV infected mothers practicing EBF should know good breastfeeding techniques to avoid cracked and sore nipples. Mastitis and breast abscess increase the risk of transmitting HIV through breast milk (UNICEF. 2004). A majority of the respondents practicing EBF had incorrect positioning of the baby on the breast and half were not sure whether they would continue breastfeeding with wound or infection in the breast. The correct practice of baby positioning during breast feeding was associated with mothers who had high level of education. Incorrect positioning of the baby on the breast was however not associated with infant's nutrition status.

Majority of the respondents disagreed with the statement that it is better to feed the baby with cup and spoon rather than bottle though cups are easier to clean and also cup feeding promotes greater interaction between mother and her baby. This finding is supported by the findings of Ogumba, (2006) where majority of the respondents disagreed with the statement cup and spoon should be used in feeding babies complimentary food. However there was no association between mother's opinion on feeding the baby with cup and spoon rather than a bottle and the infant's nutrition status.

About two fifths of ERF respondents gave affirmative response when asked if there are social cultural factors that make it difficult for them to use this method. Pressure from neighbours/relatives/friends to breastfeed was the main contributing factor. This finding is supported by the findings of Doherty. 2006. where pressure from the society lead to difficulties in the practice of ERF. This shows that the pressure from the society may hinder adherence to ERF practice.

Almost three quarters of the infants who suffered past illness were on exclusive replacement feeding. Data appear to be consistent with other studies by WHO (2000) and Heinig (1996), demonstrating an increased risk of infant morbidity and mortality associated with replacement feeding. Data from developing countries also show that mortality from diarrhea, acute respiratory infections and other infectious diseases is 5-6 times higher in infants who are not breastfed than in those who are breastfed for the first two months of life, (Michael, 2000). Also a study by Mridula, (2003), demonstrated an increased risk of hospitalization resulting from increased risk of morbidity for replacement fed Indian infants who are born to HIV infected mothers compared with breastfed infants. The study findings show that illnesses occur more in ERF infants compared to EBF infants. However these findings are in contrast to Ngacha, (2001) where there was equal morbidity in breastfed and formula fed infants in Kenya.

Majority of the infants who suffered past illness mainly had respiratory infections and gastrointestinal problems both of which were associated with abnormal growth gradients. These infections are more likely to be as a result of bacteria infection in the infants. According to a study by Noorani, (2007), nearly a third (28.9%) of the children admitted with severe

malnutrition at Kenyatta national Hospital had concomitant severe bacterial infections, primarily manifesting as bacteremia. Babirekere-iriso, (2006), found the prevalence of bacteremia to be 22% among malnourished children at Mulago Hospital, Kampala. HIV status was not associated with nutrition status outcome of the infants.

From the study findings underweight was significantly associated with male infant ($p=0.046$), respiratory infection ($p=0.021$) and past gastrointestinal problem ($p=0.047$). More studies are needed to identify underweight causative factors among infants.

About a third of the infants had experienced abnormal growth gradients which were significantly associated with; exclusive replacement feeding, underweight, past respiratory infections, past gastrointestinal problems and age (older infants tended to have experienced abnormal growth gradients).

Infants on exclusive breastfeeding had better nutritional status compared to exclusively replacement fed infants and this findings are supported by the findings of Ngacha, (2001) where infants in the breastfeeding arm tended to have better nutritional status, significantly so during the first six months of life and WHO, (2000) promotion of infant formula feeding might increase infant morbidity, malnutrition and mortality.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

- Most of the house holds were of low social economic status with husband engaging in casual irregular employment, their income could not adequately support exclusive formula feeds supply.

- Majority of the respondents were not allowed to choose the feeding option for their infants and lacked knowledge on infant feeding in HIV status. They also had wrong practice of the mode of feeding they were using. Over dilution of formula milk was associated with underweight and past illnesses in the infants.

- More infants had in the past suffered illness, mainly respiratory infections and gastrointestinal problems which were associated with abnormal growth gradients. Majority of the infants were HIV negative and their HIV status was not associated with nutrition status outcome.

- Majority of the infants had normal nutrition status outcome (weight for length, length for age, weight for age and normal growth gradients).

- Abnormal growth gradient were associated with exclusive replacement feeding, underweight, past respiratory infections, past gastrointestinal problems and age.

- EBF infants tended to have better nutritional status outcome (weight for length, length for age, weight for age and normal growth gradients) compared to ERF infants.

6.2 Recommendations

1. Due to poor economic status of exclusive replacement feeding mothers, there is need for health care workers to do detailed assessment of social economic status so as to advice the mothers on the most appropriate feeding method during counseling on infant feeding.
2. The health care workers should counsel all HIV infected women on risks and benefits of various infant feeding options and specific guidance and education in selected option. This should include:
   - Exclusive breastfeeding with demonstration on good breastfeeding technique to ensure correct positioning and latch on.
   - Dangers of breastfeeding with breast wound or infection.
   - Cup and spoon feeding.
   - Correct dilution of formula milk. The message to be displayed in charts and photos in the health facilities with emphasis on benefits and dangers of not adhering to the guidelines.
3. The City Council of Nairobi through Ministry of Health to come up with new guidelines for counseling HIV infected women on exclusive breastfeeding for the first six months of life unless replacement feeding is acceptable, affordable, sustainable and safe for infants before this time.
4. A study to be done comparing the nutrition status of infants born to HIV infected mothers from different socioeconomic status.

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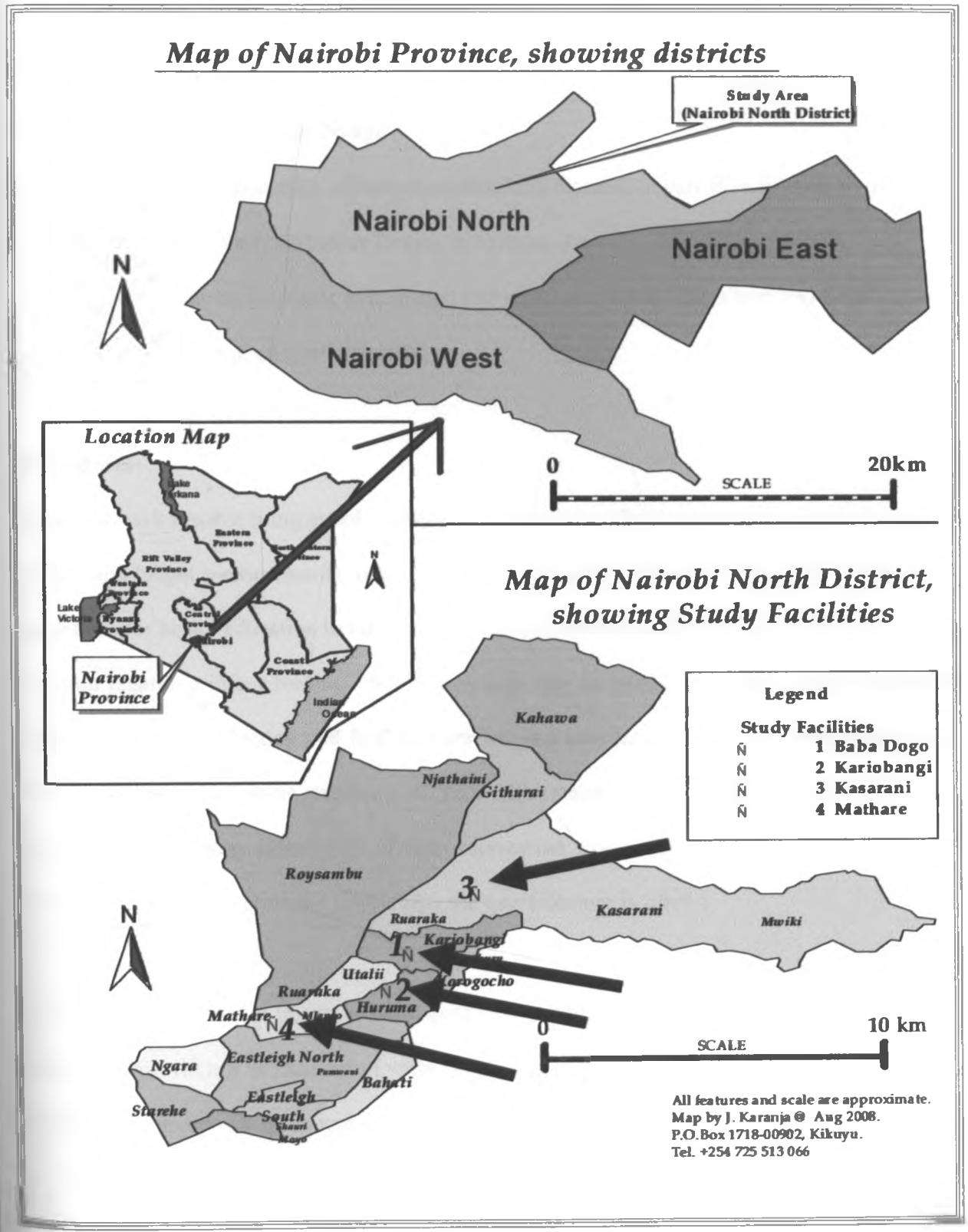
Map showing the study facilities in Nairobi North District



APPENDICES

Appendix 1: Consent form

School of Nursing Sciences - University of Nairobi

Principal investigator: Emily Nyaga

I am a student in the University of Nairobi undertaking research in partial fulfillment of the requirement of the award of Masters Degree in Nursing. I am carrying out research on 'Comparison of nutritional status of breastfed and replacement fed infants born to HIV infected mothers in City Council clinics in Nairobi.

Procedures:

This study will involve being asked questions which will be filled by interviewee and also taking weight and height measurements of your infant. The results of this study may aid in review of guidelines for health education to HIV infected antenatal mothers helping them to make the right decision regarding infant feeding. Some questions may be personal in nature and due to time taken during data collection and health education you may take longer time than usual in the clinic. You may feel some exposure of your HIV status by participating in the study but remember there is confidentiality of the information given. You will benefit from health education that shall be provided to you after the questionnaire is filled.

You and your child are at liberty to participate or to withdrawal at any time without prejudice or coercion. You will not be required to write your name or that of your infant in the questionnaire. Results of the study will be treated with confidentiality and used only for the intended purposes.

Do you wish to participate in this study?

(Tick as appropriate)

Yes ☐

No ☐

For any clarification contact the undersigned,

Kenyatta National Hospital Ethics and Research Committee

Professor Bhatt – the chairman Kenyatta Ethics and Research Board,

P.O Box 20723,

Nairobi.

Or

The investigator – Emily Nyaga at 0720917977.

Appendix 2: Questionnaire

Questionnaire for the research on comparison of nutritional status of breastfed and replacement fed infants born to HIV infected mothers in City Council clinics in Nairobi.

Code for the questionnaire.....

Date.....

Venue.....

Initial of the interviewer.....

Instructions to research assistants:

1. Give the mother the consent form, let her read it, explain and interpret where necessary let her give a verbal consent to participate in the study and tick as appropriate
2. Two observers will take weight and length measurements for the infants to increase accuracy.
3. Indicate the appropriate response in the box provided by making a tick (√) sign.

1.0: Assessment of household factors that contributes to nutritional status of infant born.

1.1. How old are you..... (Age in completed years).

1.2. What is your marital status?

1. □ Married
2. □ Single
3. □ Divorced
4. □ Widowed
5. □ Separated
6. □Others specify .....

1.3. What is your level of education?

1. □ Primary

2. □ Secondary

3. □ Tertiary

4.□ Others specify .....

1.4. What is your spouse level of education?

1. □ Primary

2. □ Secondary

3. □ Tertiary

4. □ Others specify .....

1.5. What is your occupation?

1. □ Housewife

2. □ Informal employment

3. □ Formal employment

4.□Others specify .....

1.6. What is your spouse occupation?

1. □ Informal employment

2. □ Formal employment

3. □ Others specify .....

1.7. How much is the estimated family income per month.....Kenyan Shillings.

1.8. When you are away, who takes care of the child?

1. □ House help

2. □ Sibling

3. □ Relative

5.☐Others specify.....

1.9. When away who feeds the child?

1. ☐ House help

2. ☐ Sibling

3. ☐ Relative

5.☐ Others specify.....

1.10. Have you trained the alternative care giver on how to feed the baby when you are away from the baby for more than six hours?

1. ☐ Yes

2. ☐ No

3.☐ Others specify .....

1.11. Who takes care of the utensils for the baby? **(Tick all that applies).**

1. ☐ Mother

2. ☐ House help

3. ☐ Sibling

4. ☐ Relative

5.☐Others specify.....

1.12. When cleaning baby's utensils do you use **(Tick all that applies).**

1. ☐ Soap and water

2. ☐ Hot water

3. ☐ Chemicals

4.☐ Others specify.....

2.0: Maternal maternal factors (knowledge, attitudes and practices) that contribute to child nutritional status. (For questions 2.1 to 2.6, 2.14, 2.15, 2.21 and 2.22 in this section, please circle the option that best describes the response the mother has given you. Numbers in the brackets indicate the scores).

2.1. Normally I prefer giving alternative feeds to the baby as a mode of feeding

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.2. In my HIV status I prefer to breastfeed my baby

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.3. After knowing my HIV status I was allowed to choose the feeding option for my baby

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.4. My partner was involved in decision making for our baby's feeding option

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.5. HIV infected mothers should take antiretroviral (ARV) to prevent mother to child transmission

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.6. There is no harm for a HIV infected mother to breastfeed and give formula fed to her infant at the same time.

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.7. What is the mode of feeding for your infant?

1. □ Exclusive breastfeeding (**If exclusively breastfeeding ask question 2.8 to 2.15).**

2. □ Exclusive replacement feeding (**If exclusively replacement feeding go to question 2.16 to 2.22).**

3. □ Others specify .....

2.8. When did you initiate breastfeeding?

1. ☐ Within one hour after delivery

2. ☐ After one hour of delivery

3. ☐ Others specify.....

2.9. How often do you breastfeed your baby in a day.....

2.10. When away from the child for more than six hours what is he/she fed on mainly?

1. ☐ Expressed breast milk

2. ☐ Formula milk

3. ☐ Cow's milk

4. ☐ Porridge

5. ☐ Mashed foods

6.☐ Others specify .....

2.11. How do you position your child on the breast? **(Tick all that applies).**

1. ☐ Child's head and body straight

2. ☐ Child facing you

3. ☐ Child's nose opposite your nipple

4. ☐ Child's body close to your body

5. ☐ Supports child's whole body

6.☐ Others specify .....

2.12. How long does the child suckle on average?

1. ☐ Until it is full

2. ☐ Less than 30 minutes

3. ☐ Between half an hour to one hour

4.☐ Others specify .....

2.13. What other feeds do you give child apart from breast milk? (Tick all that applies).

1. □ None

2. □ Formula milk

3. □ Cow's milk

4. □ Porridge.

5. □ Mashed foods.

6. □ Others specify .....

2.14. If I have a wound or infection in the breast I should continue breastfeeding

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.15. I will exclusively breastfeed my baby until am able to wean

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

(For exclusively breastfed go to questions in section 3.0)

2.16. What do you feed your baby?

1. □ Formula milk

2. □ Cow's milk

3. □ Porridge

4. □ Mashed foods

5.□ Others specify .....

2.17. **(If formula feeding)** How much water do you add to one scoop of formula milk?.....

2.18. How often do you feed your baby? .....

2.19. Are there social cultural factors that make it difficult for you to use this method?

1. □ Yes

2. □ No

3.□ Others specify .....

2.20. If yes in above, specify the social cultural practices

1. □ .....

2. □.....

3. □.....

2.21. Unrefrigerated formula milk. prepared 4 hours ago is safe for the baby

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

2.22. It is better to feed the baby with a cup and spoon rather than a bottle

1. Strongly disagree (0) 2. Disagree (1) 3. Not sure (2) 4. Agree (3) 5. Strongly agree (4)

(Adopted from Kenyan National Guidelines on Nutrition and HIV/AIDS, 2007).

3.0. Nutrition assessment

3.1. When was your baby born? (Specify date/month/year).....

3.2. Identify the sex of the baby.

1. □ Male

2. □ Female

3.3. What was the weight of your baby at birth? .....Kilograms.

(Prepare to take length and weight measurements for the baby)

3.4. Length of the infant .....centimeters.

3.5. Weight of the infant .....kilograms.

(Observe the growth monitoring chart)

3.6. Has the child experienced abnormal growth gradients?

1. □ Yes

2. □ No

3.□ Others specify .....

If yes in above,

3.7. How often has the child's growth gradient been zero (flat) _____?

3.8. How often has the child's growth gradients been negative (sloping down) _____?

3.9. What were the probable causes? (Check in the card for anything that could have caused abnormal growth gradient)

1. □.....

2. □.....

(If there is nothing indicative of the cause in the above, ask the mother) What would have been a probable cause?

1. □.....

2. □.....

3.10. Does the child have visible severe wasting? (Indicated by folds of skin on the buttocks and thigh).

1. □ Absent
2. □ Moderate
3. □ Severe
4. □ Others specify----------

3.11. Look and feel for pitting oedema of both the feet

1. □Absent
2. □ Moderate
3. □ Severe
4. □ Others specify----------

3.12. Assess the infant's palm for palmar pallor

1. □ No pallor

2. □ Some pallor

3. □ Severe pallor

4. □ Others specify----------

3.13. Is your child ailing?

1. □ Yes

2. □ No

3.□ Others specify .....

3.14. If yes for the above, what illness is he/she being treated for **(check in the card and tick all that applies).**

1. □ Respiratory infections

2. □ Gastrointestinal problems

3. □ Musculoskeletal

4. □ Cardiovascular

5. □ Others specify .....

3.15. Has the child suffered from any illness in the past?

1. □ Yes

2. □ No

3.□ others specify .....

(If yes in question 3.15 ask question 3.16)

3.16. What illness was your child treated for **(check in the card and tick all that applies).**

1. □ Respiratory infections

2. □ Gastrointestinal problems

3. □ Musculoskeletal

4. ☐ Cardiovascular

5. ☐ Others specify .....

3.17. When did the illness occur? (Specify month and year).....

4.0: HIV status of the infant (Check in the records)

4.1. Has the baby been tested for the HIV virus?

☐ Yes

☐ No

☐ Other Specify.....

4.2. If yes in question 4.1. does the baby have the virus?

☐ Yes

☐ No

☐ Other Specify.....

Appendix 3: Letter to Kenyatta National Hospital Research and Ethics Committee

Emily Muthoni Nyaga,

School of Nursing Sciences,

University of Nairobi,

P.O Box 30197,

Nairobi.

The chairman,

Kenyatta Ethics and Research Board,

P.O Box 20723,

Nairobi.

Dear Sir/ madam,

RE: APPROVAL TO CARRY OUT RESEARCH IN NAIROBI NORTH DISTRICT CITY COUNCIL CLINICS.

I am a second year student at the University of Nairobi taking Masters of Science in Nursing Pediatric option. I am interested in carrying out research in city council clinics in Nairobi to assess relationship between nutritional status in exclusively breastfed and exclusively replacement fed infants born to HIV infected mothers.

The results of the study will form basis for health education to HIV infected antenatal mothers in city council clinics

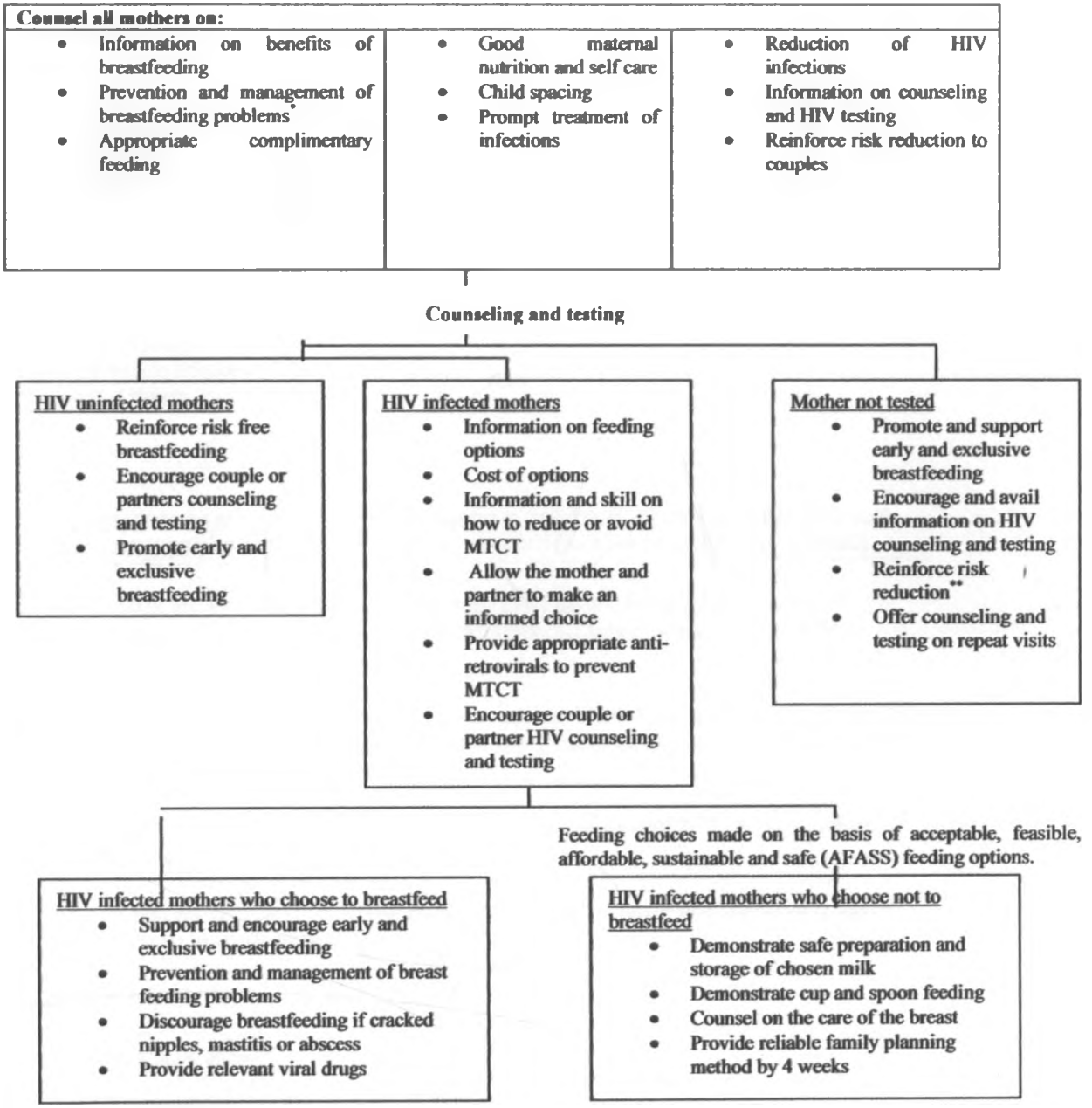
I am hence seeking your approval to carry out the research.

Yours faithfully,

Emily Muthoni Nyaga

Appendix 4: Kenyan National Guidelines on Nutrition and HIV/AIDS

Guidelines for counseling on HIV and infant feeding



* Breastfeeding problems: Abscess, mastitis, breast and nipple disease

** For women who have features of clinical AIDS, manage as positive and encourage counseling and testing

Figure 18: Guidelines for counseling on HIV and infant feeding

Adopted from Kenyan national guidelines on nutrition and HIV/AIDS, (2007)

Appendix 5: Approval letter from Kenyatta National Hospital Ethics and Research Committee

KENYATTA NATIONAL HOSPITAL
Hospital Rd. along, Ngong Rd.
P.O. Box 20723, Nairobi.
Tel: 2726300-9
Fax: 725272
Telegrams: MEDSUP", Nairobi
Email: knhadmin@knh.or.ke

Ref: KNH-ERC/ 01/ 378

6th May, 2008

Emily Muthoni Nyaga
School of Nursing Sciences
University of Nairobi

Dear Emily

RESEARCH PROPOSAL: "RELATIONSHIP BETWEEN NUTRITIONAL STATUS IN BREASTFED AND REPLACEMENT FED INFANTS BORN TO HIV INFECTED MOTHERS IN NAIROBI" (P33/2/2008)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** your above revised research proposal for the period 6th May, 2008 – 5th May, 2009.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimen must also be obtained from KNH-ERC for each batch.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M. Bhatt, Chairperson, KNH-ERC
The Deputy Director CS, KNH
The Chairman, Dept. of Nursing Sciences, UoN
Supervisors: Mr. Peter M. Waithaka, School of Nursing, UoN
Mrs. Lucy K. Bitok, School of Nursing, UoN

Appendix 6: Letter of approval from the Permanent Secretary Ministry of Science and Technology

REPUBLIC OF KENYA

MINISTRY OF HIGHER EDUCATION SCIENCE & TECHNOLOGY

Telegrams: "SCIENCE TEC", Nairobi
Telephone: 02-318581
E-Mail:ps@scienceandtechnology.go.ke

JOGOO HOUSE "B"
HARAMBEE AVENUE.
P.O. Box 9583-00200
NAIROBI

When Replying please quote

Ref. MOHEST 13/ 435 /2 **24th July 2008**

Nyaga Emily Muthoni
University of Nairobi
P.O. Box 1175
EMBU

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on, ***'Relationship between Nutritional Status in Breast Fed and Replacement fed Infants Born to HIV Infected Mothers in Nairobi,***

I am pleased to inform you that you have been authorized to carry out research in Nairobi North District for a period ending 30th December, 2008.

You are advised to report to the Provincial Director of Education Nairobi and the District Commissioner Nairobi before embarking on your research.

On completion of your research, you are expected to submit two copies of your research report to this office.

M. O. ONDIEKI
FOR: PERMANENT SECRETARY

Copy to:

The Provincial Director of Education
NAIROBI

The District Commissioner
Nairobi North District
NAIROBI

Appendix 7: Research permit letter from Ministry of Science and Technology

PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss NYAGA EMILY MUTHONI

of (Address) UNIVERSITY OF NAIROBI P.O.BOX 30197 NAIROBI

has been permitted to conduct research in ..... Location,

NAIROBI NORTH District,

NAIROBI Province,

on the topic RELATIONSHIP BETWEEN NUTRITIONAL STATUS IN BREAST FED AND REPLACEMENT FED INFANTS BORN TO HIV INFECTED MOTHERS IN NAIROBI

for a period ending 30TH DECEMBER 2008

PAGE 3

Research Permit No. MOHEST 13/001/38C 435

Date of issue 24.7.2008

Fee received SHS.500

For PERMANENT SECRETARY, MINISTRY OF SCIENCE AND TECHNOLOGY

PERMANENT SEC
MINISTRY OF ED

Applicant's Signature

M.O.ONDIEKI

FOR Permanent Secretary
Ministry of
Science and Technology

Appendix 8 Permit letter from City Council of Nairobi to carry out the study

CITY COUNCIL OF NAIROBI

MEDICAL OFFICER OF HEALTH
Tel: 224281 Ext. 2040
248316

P.O BOX 30108
NAIROBI.

PUBLIC HEALTH DEPARTMENT

Our ref. PHD/MOH/R.1 VOL. 1 (74) 08
Your ref.:

Date: 3rd April 2008

EMILY MUTHONI NYAGA ✓
P O BOX 19676 00202
NAIROBI

Dear Sir

RE: RESEARCH

We acknowledge receipt of your letter dated 13th February 2008 regarding the above subject matter.

Permission has been granted to your request for attachment on "relationship of nutrition status in breastfed and formula fed infants born to HIV infected mothers" in our health facility as part fulfillment of the course. This is subject to the payment of Kshs.1,200.00 as research fee. You will be attached at the following facilities for one month from the date of your reporting.

- Baba Dago H/C
- Mathare North H/C
- Kasarani H/C
- Kariobangi H/C

By a copy of this letter the In-charges of the named facilities are requested to accord you the necessary assistance.

JOHN NTOITI
CHIEF ADMINISTRATIVE OFFICER

cc. In-charge - Baba Dago, Mathare North, Kasarani and Kariobangi H/Cs.