

**EFFECTS OF STRUCTURED NUTRITION EDUCATION ON MATERNAL
BREASTFEEDING SELF-EFFICACY, PERCEPTIONS AND EXCLUSIVE
BREASTFEEDING DURATION IN KIANDUTU, THIKA-KENYA**

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**A Thesis submitted to Graduate School in Partial Fulfilment for the Doctor of
Philosophy Degree in Nutritional Sciences of Egerton University**

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DECLARATION AND RECOMMENDATION

Declaration

I declare that this thesis is my original work and has not been previously submitted or presented for the award of a degree in any other University, either in part or as a whole.

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Recommendations

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DEDICATION

Dedicated to my dear husband Martin Mungiria for support and encouragement throughout the study and our daughter Sifa- you bring so much joy in my life.

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ABSTRACT

Despite the fact that the overall benefits of exclusive breastfeeding (EBF) for the first half of infancy have well been established, especially for mother-infant pairs in low social economic status, the rates are low in Kenya. The study aimed at evaluating the effects of structured nutrition education on maternal breastfeeding self-efficacy, perceptions and EBF duration. A cluster randomized controlled intervention was carried out. The intervention included education sessions with the nutritionist at the health centre, monthly home visits by the community health workers (CHWs) plus the usual care at the Maternal Child Health (MCH) clinic. The intervention utilized the national manual on maternal infant and young child nutrition (MIYCN) and emphasized conditions infants were susceptible to with early complementary feeding, simple messages on the importance of positive attitude and making a decision to EBF, as the best choice for mothers, breastfeeding within the first hour of delivery; dietary diversity and importance of proper attachment. Monthly home visits were made by CHWs postpartum to encourage mothers to EBF and answer mothers' questions. Anthropometric and feeding data for the infants was collected at 6, 10, 14 and 24 weeks. Maternal anthropometric measurements (weight and height), and breastfeeding perceptions were collected at recruitment (28 weeks) at 38 weeks and 14 weeks postpartum while the feeding data was collected monthly. The primary outcome, duration of EBF for mothers in the intervention (n=256) compared to those in the comparison group (n=176) was examined. Secondary outcomes of the study (breastfeeding self-efficacy, and perceptions) were analysed in relation to involvement in the structured nutrition educational intervention or not. Analysis was done on intention to treat basis. A statistical significance difference was found between the two groups in regarding to EBF duration at 24 weeks log rank= 20.277, (1, n=314) $p < 0.001$. Intervention group (45.3%) compared to the comparison group (15.0%). The end line ($p=0.001$) maternal breastfeeding self-efficacy positively predicted EBF duration. Out of the four perceptions, only perceptions on barriers to EBF at end-line ($p<0.05$) positively predicted the outcome variable. Bivariate analysis yielded two socio-economic significant predictive variables of EBF duration, education level of mothers; (OR 4.75, 95% CI 1.58-14.30, $p=0.006$) and household food security (OR 0.03, 95% CI 0.01-0.09 $p=0.001$). Being in the intervention group, increased the likelihood of having higher BSE (Log odds 1.41, 95% CI 0.08-2.75) and EBF duration (Log odds 10.32, 95% CI 4.26-16.39) Structured nutrition education should be implemented to ensure mothers gain confidence and are able to deal with barriers associated with EBF for the first six months.

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ABBREVIATIONS & ACRONYMS

ANC:	Anti natal Clinic
APHIA 11:	AIDS, Population and Health Integrated Assistance Program II
BMI:	Body Mass Index
BSE:	Breastfeeding Self Efficacy
BSES:	Breastfeeding Self Efficacy Score
BSES-SF:	Breastfeeding Self Efficacy Scale-Short Form
BF:	Breastfeeding
CHWs:	Community Health Workers
EBF:	Exclusive Breast Feeding
EER:	Estimated Energy Requirements
FANTA:	Food and Nutrition Technical Assistance
FAO:	Food Agricultural Organization
GOK:	Government of Kenya
HBM:	Health Belief Model
HIV/AIDS:	Human Immuno-deficiency Virus/ Acquired Immune Deficiency Syndrome
HHFIAS:	Household food insecurity access Scale
IDDS:	Individual dietary diversity score
IFAS:	Iron Folic Acid Supplements
IOM:	United States Institute of Medicine
IUGR:	Intra Uterine Growth Retardation
IYCN:	Infant & Young Child Nutrition Project
KDHS:	Kenya Demographic Health Survey
LBW:	Low Birth Weight

LfA:	Length for Age
LMICs:	Low and Middle-Income Countries
MCH:	Maternal Child Health
MDD-W:	Minimum Dietary Diversity-Women
MIYCN:	Maternal Infant and young child Nutrition
MOH:	Ministry of Health
MOPHS:	Ministry of Public Health and Sanitation
MOMS:	Ministry of Medical Services
NACPD:	National Coordinating Agency for Population and Development
NAR:	Nutrient Adequacy Ratio
PEM:	Protein Energy Malnutrition
PCA:	Principal components extraction
PGH:	Provincial General Hospital
RDA:	Recommended Dietary Allowance
SCN:	Standing Committee on Nutrition of the United Nations
SE:	Self-Efficacy
SPSS:	Statistical Package for Social Sciences
TEE:	Total Energy Expenditure
TDHS:	Tanzania Demographic Health Survey
UDHS:	Uganda Demographic Health Survey
UN:	United Nations
UNESCO:	United Nations Education Scientific Cultural Organization
UNICEF:	United Nations Children’s Fund
UNSDG:	United Nations Sustainable Development Goals

USAID: United States Agency for International Development
WB: World Bank
WfA: Weight for Age
WfL: Weight for Length
WHO: World Health Organization

CHAPTER 1

1.1 Back ground information

The prevalence of child undernutrition is high in low and middle-income countries (LMICs), contributing to mortality and overall disease burden. Consequently, it is estimated that global acute malnutrition, and intrauterine growth retardation together account for two point two (2.2) million global deaths annually (Black *et al.*, 2013). Sub-optimal breastfeeding is implicated in child undernutrition. The World Health Organization (WHO) and Ministry of public health and sanitation (MOPHS) (WHO, 2002a & MOPHS, 2007) recommends exclusive breastfeeding (EBF) during the first six months of life for optimal growth, development and health. Exclusive breastfeeding has various benefits which include nutritional, developmental, immunological, economic, and emotional benefits (Kramer *et al.*, 2008). Exclusive breastfeeding for the first half year of a child's infancy is a strategy promoted to increase a child's chance of survival and of primary interest is its role in preventing gastrointestinal infections, which is important in low and middle-income countries given the high incidence of morbidity and mortality from these infections (Lamberti *et al.*, 2011).

Despite the many benefits associated with EBF its prevalence at six months in the world is low (Black *et al.*, 2013). The Southeast Asia region has the highest prevalence at 49%, followed by Eastern Mediterranean at 39%, America at 29% and with Africa having the lowest percentage of 18% (WHO, 2008). Globally 3 children in every 10 (30%) are exclusively breastfeed (Black *et al.*, 2013). Adherence to the WHO recommendation is evidently low.

In Sub-Saharan Africa, rates of partial breastfeeding in many countries are high at almost 99% among healthy mothers; however rates of exclusive breastfeeding at six months are low. In Uganda and Tanzania, partial breastfeeding rates are 98% and 97% respectively while rates of exclusive breastfeeding at 4-5 months in Uganda are 41% and 22.9% in Tanzania (UDHS 2011, TDHS 2010).

In Kenya exclusive breastfeeding rates reduce progressively from birth to 6 months. At 4-5 months rates are 42% (KNBS & ICF Macro, 2014). It is 84.1% at one month and 63 % at 2-3 months. These rates indicate early weaning with 1.9 % of infants being given

complementary foods and 6.8% water at one month (KNBS & ICF Macro, 2014). Exclusive breastfeeding rates in informal settlements have been found to be even lower with Korogocho and Viwandani in Nairobi having rates of 2% at six months (Kimani-Murage *et al.*, 2011) and Kibera also in Nairobi at 5.6% (Ochola, 2008) against the national rate of 42% (KNBS & ICF Macro, 2014).

Sub-optimal breastfeeding, especially low rates of exclusive breastfeeding in the first six months of life is implicated in child malnutrition (Grantham-McGregor *et al.*, 2007). It has also been implicated in 3.1 million child deaths globally which is equivalent to 45% of mortality in children under 5 years of age in 2011 (Black *et al.*, 2013). These deaths are preventable (Walker *et al.*, 2007) through exclusive breastfeeding for the first six months, nutrition education and counselling (Keith & Isenman, 2010).

In the Kenyan health system, nutrition education is offered during prenatal and postnatal check-ups. These nutrition education programmes have been successful in some aspects such as improving partial breastfeeding and initiation rates within the first hour after birth. In Kenya partial breastfeeding stands at 97% while 58% of children are breastfed within the first hour of birth (KNBS & ICF Macro, 2014). The figures for initiation and exclusivity to six months can however be improved through greater efforts in nutrition education that is tailored towards improving the breastfeeding self-efficacy (confidence) and perceptions about breastfeeding among mothers. Breastfeeding self efficacy has been found to predict duration and exclusivity of breastfeeding (Al-Akour *et al.*, 2010, Gross, 2008).

On the other hand, although nutrition education is offered through the antenatal clinics, many mothers deliver without ever receiving any information on breastfeeding (National Coordinating Agency for Population and Development (NACPD), 2010 & Ochola, 2008). Only 18% of women receive breastfeeding information during the eighth month of pregnancy (NACPD, 2010). There is therefore need to structure nutrition education in a way that ensures mothers seeking maternal and child health (MCH) services receive information on breastfeeding before and after delivery.

This study sought to validate and evaluate the effect of a structured nutrition education protocol which aimed at improving the perceptions and breastfeeding self-efficacy of mothers. The protocol facilitated nutrition education delivery at the health centres by nutritionists and in the homes by community health workers (CHWs). For breastfeeding mothers to be inspired to breastfeed exclusively for the first six months, their perceptions

towards breastfeeding and their breastfeeding self-efficacy must be targeted for improvement (Mutuli, Walingo & Othuon, 2012). Perceptions were assessed using Mc Carter's perceptions scales while breastfeeding self-efficacy of mothers towards breastfeeding were assessed using Dennis's breastfeeding self-efficacy scale-short form (BSES-SF). Properly developed tools with robust validity and reliability of the data in the original version when adapted and translated into local languages, allows for international comparison of results of specific constructs (Tuthill *et al.*, 2014). On the other hand CHWs have been found to be important in improving breastfeeding practices (Mannan, 2008). In the present study, they were trained in order to educate mothers in their homes using the national manual on Maternal Infant and young child Nutrition (MIYCN).

This study forms part of the efforts geared towards mitigating the effect of undernutrition on maternal-child morbidity and mortality and its irreversible effects on health, cognitive and physical development. It was hoped that the structured nutrition education would enable mothers in the intervention to have positive perceptions on EBF for the first six months and improve their breastfeeding self-efficacy and hence exclusively breastfeed for a longer duration. This is particularly important for disadvantaged groups such as those living in resource restricted settings like the study area, who stand to gain the most from breastfeeding (Denis, 2002), given their socio-economic characteristics and sanitation. According to research, mothers in these settings are less likely to practice EBF yet they are more vulnerable to infections related to early weaning such as diarrhea, (Kimani-Murage *et al.*, 2011). This study was carried out in Kiandutu informal settlement chosen as no study aimed at assessing and promoting EBF had been carried out in the area unlike other major urban informal settlements.

1.2 Statement of the problem.

Exclusive breastfeeding rates in Kenya of 61.2% (KDHS 2014) for the first six months fall far below the 80% target projected for 2017 by the Ministry of Health (MOH) in the National Maternal, Infant and Young Child Nutrition Strategy, 2011 – 2017. Therefore, the rate would need to increase by 17.8% over the present level to achieve the national goal of 80% and by 27.8% to attain the WHO recommendation of 90% EBF rate. Among challenges identified as leading to sub-optimal breastfeeding among mothers are inadequate knowledge and the widespread perception that breast milk alone is inadequate to support proper growth of infants in the first six months of life. Despite the inadequate knowledge

among mothers, coverage of nutrition education in service delivery is low with only 18% mothers receiving talks on breastfeeding at eight months gestation (NACPD, 2010). Only 53% and 43% of pregnant mothers received nutrition education during their first and follow up visits respectively. Only 32% and 18% received talks on breastfeeding in their first visit and follow-up visits respectively. At 8 months gestation only 18% received talks on breastfeeding. This is an indication of poor timing of infant feeding counselling. Furthermore education levels for mothers/caregivers in Kiandutu are low, with 10.4% having no formal education while 72.7% having primary education and below. There is need to structure simple nutrition messages that are specific to the antenatal clinic (ANC) and MCH so as to deliver to the mothers at specific visits, targeting the four recommended visits for pregnant mothers by WHO. Many interventions aimed at improving maternal breastfeeding perceptions and confidence/self-efficacy have been carried out in developed countries (Osuka *et al.*, 2014; McQueen *et al.*, 2015 and Dodt *et al.*, 2012) but none had been carried out in Kenya through the routine ANC/MCH clinic. The above factors have been found to predict breastfeeding behaviour. There was therefore need for this study.

1.3 Purpose of the study

This study sought to validate and evaluate the effect of a structured nutrition education protocol which aimed at improving the perceptions and breastfeeding self-efficacy of mothers for improved EBF duration in Kiandutu informal settlement.

1.4 Specific objectives

Specifically the study sought to;

- i. Adapt and validate the nutrition education protocol, breastfeeding perceptions and breastfeeding self-efficacy scale short form among pregnant mothers in Kiandutu informal settlement.
- ii. Assess baseline maternal breastfeeding self-efficacy and perceptions of mothers in Kiandutu informal settlement.
- iii. Assess the endline maternal breastfeeding self-efficacy and perceptions of mothers in Kiandutu informal settlement.
- iv. Determine the relationship between maternal breastfeeding self-efficacy; maternal breastfeeding perceptions and EBF duration
- v. Evaluate the effect of a structured nutrition education on maternal breastfeeding self-efficacy, breastfeeding perceptions and EBF duration

1.5 Research Question

- i. Can the structured nutrition education protocol; the breastfeeding perceptions and the breastfeeding self-efficacy short form (BSES-SF) scales be adapted and validated among pregnant mothers in Kiandutu informal settlement.

1.6 Hypotheses

The following hypothesis were tested at $\alpha= 0.05$ significance level

- i. **H₀₁**. There is no difference in BSE and breastfeeding perceptions for mothers in the intervention and comparison groups at baseline
- ii. **H₀₂** There is no difference in the rate of change in BSE and breastfeeding perceptions for mothers in the intervention and comparison groups after the intervention
- iii. **H₀₃** There is no relationship between BSE; breastfeeding perceptions and EBF duration
- iv. **H₀₄** The structured nutrition education does not have any effect on BSE; breastfeeding perceptions and EBF duration

1.7 Significance and rationale of the study

The third United Nations Sustainable Development Goal, (UN SDG) to end preventable deaths of new-borns and under-fives and reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030, is an international goal aimed at improving mother-infant health. One of the aims of Kenya's vision 2030 is to reduce infant mortality rate from 52 deaths per 1000 live births in 2008-09 to 25 deaths per 1000 live births by 2012 and reduce maternal mortality ratio from 488 deaths per 100,000 live births in 2008-09 to 147 deaths by 2012 (NACPD, 2010; KNBS & ICF Macro, 2010). This has not been achieved as the infant mortality rate stands at 39 deaths per 1000 live births and maternal mortality ratio at 362 deaths per 100 000 live births in 2014 (KNBS & ICF Macro, 2014). It is estimated that interventions aimed at promoting optimal breastfeeding have the ability to prevent 13% of child deaths (MOPHS/UNICEF 2010; Grantham *et al.*, 2007) and increase the National GDP by 3% (MOPHS/UNICEF 2010). Studies have also indicated that structured prenatal and perinatal nutrition education can increase rates of exclusive breastfeeding (Kramer *et al.*, 2008; Lin *et al.*, 2007). It was envisaged that the nutrition education intervention that utilized CHWs would lead to increased rates of EBF for the first half of infancy and hence contribute towards achieving UN SDGs three and Kenya's vision 2030 of reducing infant mortality.

The study is significant to the Ministry of Health as the nutrition education protocol can be incorporated in the MCH clinics to guide in the delivery of nutrition education, since the Ministry does not have a protocol or schedule to help in delivering nutrition education by nutritionists as yet. Currently nutrition education is offered through the Focused antenatal package; through this protocol only 18% of mothers receive information on breastfeeding at eight months of pregnancy (NACPD, 2010). The study is also significant to the Ministry of Health as it forms part of efforts geared towards achieving both the Baby friendly hospital initiative (BFHI) and Baby friendly community initiative (BFHI) in promoting breastfeeding. Publications from the study will provide researchers and scholars in the area of nutrition education and maternal-infant health with reference.

1.8 Assumptions

The researcher made the assumption that information given especially on breastfeeding was correct. For breastfeeding data impromptu visits were undertaken for those mother-infant pairs in the intervention group. Probing techniques were also done in data collection for all mothers to ensure the information they gave was true. It was also assumed that the respondents identified would continue attending the selected health centres for clinics, delivery and for follow-up thereafter.

1.9 Limitations of the study

Pregnant women in developing countries start attending antenatal clinics late (many after the fifth month) and their pre-pregnancy body mass index (BMI) which is important in nutrition education and determining the amount of weight gain required per respondent was not known. More over few adults take their weight regularly. Therefore, to estimate the pre-conception weight for the women enrolled after 3months the U.S Institute of Medicine (IOM) charts were used. The pre pregnancy weight allows the determination of appropriate weight gain required throughout the pregnancy period which enables calculation of approximate calories required to enable weight gain. Further dietary diversity and having two extra meals/snacks were the key messages given in regard to nutrition modification.

1.10 Scope of the study

The study was undertaken at two health centres (Kiandurtu and Makongeni health centres) that provide Government health care for Kiandutu residents in Thika West District. Pregnant women at 30 weeks gestation or less were purposively targeted sampled and followed up to 24 weeks postpartum. A Structured Nutrition Education Intervention was

adapted among mothers attending the ANC clinic and its effect on the BSE and perceptions at mid-point and at the end of project assessed. The EBF rates were also determined.

1.11 Operational definitions of terms

The following terms are defined as used in this study:

Perceptions: Defined as the intuitive understanding and insight. It is being able to see or hear through the senses which influences on decision making on particular behaviour or choices. In this study perception in regards to EBF was measured by a perceptions scale developed by McCarter (2007).

Breastfeeding self-efficacy: Self efficacy is the confidence one has in the ability to complete a particular task (Denis & Faux 1999). For this study breastfeeding self-efficacy was defined as the confidence a woman has in her ability to breastfeed. It was measured using the Breastfeeding Self Efficacy Scale -Short Form (BSES-SF) developed by Denis (2003).

Diet quality: A general term referring to the nutritional value of an individual's food intake, It was determined by the use of the Food Agricultural organization (FAO) / Food and Nutrition Technical Assistance (FANTA), 2007) and fourteen (14) food group dietary diversity scale.

Exclusive breastfeeding: According to WHO, an infant is considered to be exclusively breastfed if he/she receives only breastmilk with no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines. Exclusivity in this study was measured at every contact postpartum until weaning or when the infant is six months, which ever came earlier.

Exclusive breastfeeding rate: This was measured as the percentage of infants aged 0 - ≤6 months (0-182 days) who were being exclusively breastfed.

Gestational weight gain: The amount of weight gained by a woman during pregnancy. In this study Gestational weight gain was measured by taking the total weight gain during the second and third trimesters of pregnancy divided by the number of weeks of gestation during this period (rate of weight gain) (Feder, 2001).

Individual dietary diversity Score: An indicator of nutrient adequacy at the individual level. In this study, the mothers' dietary diversity was determined by summing up

the number of food groups consumed by the individual respondent over the 24 hour recall period preceding the assessment. Classification based on the minimum dietary diversity – women (MDD-W) used for women of reproductive age (WRA) was used.

Infant: A baby from birth to one year. In this study an infant was defined as one from birth to six months

Nutrition education: An instructional method that promotes healthy behaviours by imparting information that individuals' can use to make informed decisions about food, dietary habits, and health. In this study nutrition education involved a one on one encounter with the nutritionist, monthly home visits by the CHWs and the usual group education sessions at the health facility.

Nutrition status: The extent to which nutritional needs are met through adequate nutrient intake as expressed by anthropometric indices (height-for-age, weight-for- height and weight-for-age) Z scores compared to WHO (2006) growth standards for infants. Nutritional status was assessed by gestational weight gain (for the mothers), and birth weight for the infants.

Optimal dietary intake: Refers to the ability to ingest a balanced diet with right amounts and quality. In this study optimal dietary intake was measured through individual dietary diversity for the mother and EBF for the infant

Partial Breastfeeding: This refers to giving a baby a mixture of some breast milk, and artificial feeds, either milk or cereal, or other food.

Post-partum factors: Occurrences immediately after birth that have an influence on breastfeeding. In this study three factors were investigated; Para (number of children) type of birth, & birth weight.

Structured nutrition education: In this study structured nutrition education was defined as the developed nutrition education protocol which was offered to women staggered into six contact sessions; four pre-natal (based on their gestation) and two post-natal at one week and four weeks

Sub-optimal Breastfeeding: Defined as the inadequate breastfeeding as determined by non-adherence to EBF in this study.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter provides the background for the study through a summary of selected literature. Studies on nutrition education are reviewed, the role of maternal formal education versus maternal knowledge in infant feeding, the importance of nutrition security in pregnancy and lactation, role of nutrients in birth outcomes and lactation. Benefits of EBF are then discussed followed by interventions the Kenyan government has institutionalized to promote infant health. The theoretical underpinning of the study is also discussed followed by the conceptual framework that will guide the study.

2.1 Nutrition education

Nutrition Education has been defined as the process that assists the public in applying nutritional knowledge and the deliberate effort to improve the nutritional wellbeing of people (Boyle, 2003). Nutritional education has been used world over to provide information aimed at improving dietary intake and breastfeeding in either group or individual and prenatal or postnatal interventions.

The effectiveness of nutrition education interventions in breastfeeding promotion and breastfeeding self-efficacy has been studied extensively (Denis, 2003; Lin *et al.*, 2007; Schlickau, 2005; Schy, *et al.*, 1996). Studies carried out to investigate the success of these programmes, have however, been inconsistent. Positive results have been reported in some studies, (Aidan, Rafael & Lartey, 2005 & Lin *et al.*, 2007). In a study by Aidan, Rafael & Lartey (2005), the impact of lactation nutrition education on exclusive breastfeeding rates in Ghana was evaluated. In the study pregnant women were randomized into three groups. The first (n=74), received breastfeeding and exclusive breastfeeding education from the prenatal stage, the second (n=72) received breastfeeding and exclusive breastfeeding education from the peri-natal stage (within 48 hours post-partum), the third (n=85) was the control group which received general health education. At six months post-partum, the rates of exclusive breastfeeding during the previous month were highest in group one followed by those in group two, while those in group three had the lowest rates (90%, 74.4% and 47.7% respectively). In the above study, breastfeeding education was delivered both at the hospital and during home visits and the 24-hour recall was used to assess EBF. It indicates the

importance of prenatal EBF education and shows that nutrition education offered through the hospital can still be valuable and hence pertinent to the proposed study.

Lin *et al.* (2007) in a quasi-experimental design in which the experimental group (N=46 women) received a 90-minute group educational programme on breastfeeding during their 20th -36th week of pregnancy found a significant difference in the rate of exclusive breastfeeding at three days and one month post-partum as compared to the control group. The above study involved a structured nutrition education intervention. In Ansari *et al.* (2014) in a randomized controlled trial in Iran, 130 pregnant women over 36 weeks who were primiparas, were recruited and randomized into either control or intervention. Those in the intervention were exposed to nutrition education which emphasized the benefits of breastfeeding to the infant mother and community, correct attachment, methods that increase success in breastfeeding and the correct positions for lactation. Their breastfeeding efficacy was assessed before the intervention and after one month after delivery. The mean self-efficacy score of the intervention group increased after the education intervention and there was a significant difference in the mean self-efficacy score between the two groups one month after delivery ($P < 0.001$). Furthermore EBF duration rates showed a significant difference between the two groups ($P < 0.001$). At 6 months post-partum, more mothers in the intervention group was exclusively breastfeeding (73.3%) compared to those in the control (26.6%) with significant differences in the two groups ($P < 0.001$).

Schlickau (2005) used a one-on-one design to promote breastfeeding knowledge, commitment and confidence in the randomly assigned group followed up to six weeks post-partum. The study found a significant increase in mean breastfeeding confidence scores on the Breastfeeding Self-Efficacy Scale (BSES-short form), and breastfeeding rates were 67% versus 13% in the control group at 6 weeks. Mean breastfeeding duration was also significantly higher by 20 days. This study is pertinent to the proposed study since it aimed at improving maternal breastfeeding self efficacy for better EBF rates. Schy *et al.* (1996) in a quasi-experimental, randomized trial of postpartum education with low risk suburban mothers, however, showed no effect on duration six months postpartum. The authors suggested that a prenatal program would have greater effect given the short hospital stays and competing postpartum demands. A more individualized, patient-driven, interactive approach was also recommended for future study. In yet another study in Kibera-Kenya, Ochola (2008) randomized mothers who were 34-36 months pregnant into 3 arms, the Home-Based Intensive Counselling arm (HBICG) who received 7 counselling sessions; 1 prenatally and 6

postnatally. Intervention arm 2, the Facility-Based Semi-Intensive Counselling Group (FBSICG) received 1 counselling session prenatally and the control arm which received the usual care at the mother child health clinic at the health centres. Exclusive breastfeeding rate at six months, EBF rate was 23.6% in HBICG; 9.2% in FBSICG; and 5.6% in CG. Those in the intervention arm 1 had a 4.2 increased likelihood to EBF compared to those in the CG (RR=4.20; 95% CI; 1.66-10.64; p=0.002).

2.2 Maternal formal education and maternal nutrition knowledge

Different studies have reported varying associations for level of maternal education with breastfeeding duration being associated both positively (Setegn *et al.*, 2012, Vieira *et al.*, 2014 Dashti *et al.*, 2014) with a higher level of maternal education and negatively (Chudasama, Kavishwar. 2007 KNBS & ICF Macro, 2010 and KNBS & ICF Macro, 2014). For example in KNBS & ICF Macro, (2014) mothers with no education (76 percent) were more likely to initiate breastfeeding early than those with some education (65 percent or less).

Some studies have showed that higher education among women enable them to initiate breastfeeding and breastfeed for longer than those with lower education levels, (Setegn *et al.*, 2012; Vieira *et al.*, 2013; Misgan, Legesse and Liben 2015; Nyanga *et al.*, 2012; Sholeye, Abosede and Salako 2015 and Dashti *et al.*, 2014).

Dashti *et al.* (2014) investigated 373 mothers who were recruited from maternity wards in four hospitals in Kuwait and followed up to 26 weeks after delivery. The study investigated factors that were associated with the duration of breastfeeding (BF) and found maternal education to play a role in the BF duration. Mothers with 12 or more years of education were less likely to stop any (Adjusted Hazard Ratio (AdjHR) = 0.68) and full (AdjHR = 0.74) breastfeeding during the six month of the study compared with mothers with less than 12 years of education.

Sholeye, Abosede and Salako (2015) in a cross-sectional descriptive study that assessed breastfeeding practices and associated factors among 264 mothers of children less than two years of age sampled via multi-stage sampling in Sagamu, Nigeria, found the respondents' educational status (p<0.001), to be positively associated with exclusive breastfeeding. Nyanga *et al.*, (2012) in a similar cross sectional study also found maternal education to be positively associated with exclusive breastfeeding practice. The study further found that knowledge in EBF had a positive influence in practice. Similarly, knowledge of

the benefits of EBF increased with an increase of education level and were significantly positively associated ($P=0.02$). This implies that maternal education can influence knowledge leading to positive practice. A quantitative community based cross-sectional study by Liben, (2016) also found both paternal and maternal formal education to influence breastfeeding initiation.

There is considerable evidence that breastfeeding initiation and duration are influenced by maternal education although studies have produced mixed results. Low maternal education and lack of information or advice from health care providers or other sources has been associated with early weaning (Wijndaele *et al.*, 2009 and Das *et al.*, 2013).

Formal education may influence care practices in three main pathways; first directly transfer health knowledge to the mother, which may influence her practice as seen in Nyanga *et al.* (2012). In her study Nyanga found maternal education level to be positively associated with knowledge ($P=0.02$) and duration of exclusive breastfeeding. Secondly maternal formal education may impact additional skills and expertise to her, enabling her to obtain formal /informal employment which translates to a better income for her household. In her conclusion Nyanga recommended that further studies are required to assess the impact of a strong focused educational program. This study may fill this gap identified. Some studies have associated socio-economic status with breastfeeding duration (Kimani *et al.*, 2011; Ochola 2008 & Mc Carter, 2007). Lastly, formal education also makes women more receptive to modern medicine hence her health seeking behaviours are improved compared to the less educated woman (Christiaensen & Alderman, 2004) which may include Maternal Child Health (MCH) service seeking behaviour.

Numerous studies have also linked nutrition knowledge with higher rates of EBF (Maonga *et al.*, 2015, Susiloretni 2015, Setegn *et al.*, 2011 Tsai, Huang and Lee, 2015). For example Susiloretni (2015), in a study that sought to identify determinants of exclusive breastfeeding (EBF) at the individual, family, community, and organizational level in rural Indonesia found out that mothers with a high level of breastfeeding knowledge had the greatest EBF duration. In this study 599 participants were enrolled, consisting of 163 mother infant pairs, 163 fathers, 163 grandmothers, 82 community leaders, and 28 midwives. Similar findings were reported by Vieira *et al.* (2013) who found guidance on breastfeeding received at the hospital to be a determinant of EBF duration, Setegn *et al.* (2011) found that post natal counselling which influences a mothers knowledge also to be a determinant of EBF duration

while Tsai, Huang and Lee (2015) found health literacy, and knowledge being determinants. Maonga *et al.* (2015) in a study that sought factors affecting exclusive breastfeeding among women in Muheza District Tanga Northeastern Tanzania, found those with good knowledge of EBF had higher odds of exclusive breastfeeding their infants compared to those who had low knowledge. Similarly low knowledge has been found to be a determinant of early cessation of EBF (Kimani *et al.*, 2015). Yegammai *et al.*, 2002 also found out that improving the mother's knowledge during pregnancy through nutrition education created great advantages for infants zero (0) to six (6) months.

Maternal education may improve the caregiver's socio-economic status hence indirectly influence nutritional status which is positive but the poor can also benefit through nutritional education interventions meant to enlighten them on good feeding practices (Keith & Isenman 2010). Todd & Shekar, (2006) underscore the fact that higher incomes and better food security improve nutrition over a longer term but child malnutrition is a result of factors such as poor feeding practices. Furthermore, studies show that many women fail to breastfeed their infants optimally due to perceived milk insufficiency (Kimani *et al.*, 2011; Lakati *et al.*, 2011; Bunik *et al* 2010; Agunbiade, and Ogunleye, 2012; Goosen, Mclachln and Schbl , 2014). This perception may be eliminated through nutrition education

In Kenya only 9% of women have secondary education (KNBS & ICF Macro, 2010). Improving advice given by health care providers appears the most tractable area for intervention in the promotion of exclusive breastfeeding.

2.3 Exclusive breastfeeding

The health benefits of breastfeeding are widely acknowledged for both the infants and mothers. Breast milk is considered to be the best source of nutrition for infants (Piccianno & Mc Donald 2006; WHO, 2002). Due to its many benefits exclusive breastfeeding (EBF) for the first six (6) months is recommended by WHO (2002), and the Ministry of Health in Kenya (as a member country). The WHO recommendation largely relied on a systematic review by Kramer and Kakuma (WHO, 2002) of infant and maternal health benefits of EBF for six months versus three to four months. Studies have demonstrated significant advantages of breastfeeding for infants, mothers, families and the society at large.

Nutritional benefits of breast milk for the infant have been extensively documented in literature. Human milk provides both nutrition and bioactive components that confer benefits

for the growth, development and health of infants, (WHO, 2002; Piccianno & Mc Donald 2006). Mean intakes of breast milk provide energy and proteins to meet required amounts during the 1st six months of infancy (WHO, 2002). Breast milk is however dependent on both endogenous stores and exogenous dietary sources to meet requirements (Turner, 2006) and therefore the adequacy of the exogenous sources depend mainly on the mother's diet. These include vitamin A, E, D, K, B₁ B₂ B₃ B₁₂ and iodine and selenium. Apart from the above nutrients the nutritive value of breast milk remains constant and is nature's best way of feeding an infant \leq 6months which supports adequate growth and is a good measure of an infant's nutritional status (Butte, Lopez-Alarcon and Garza 2002). Exclusive Breastfeeding is effective in ensuring child health and survival especially in the early months of life as it contains many immune-protective factors that augment the infant's immature immune system.

It is strongly correlated with increased child survival and reduced risk of morbidity, particularly from pneumonia and diarrhoeal diseases. Other health benefits include; a reduced risk of Sudden Infant Death Syndrome (SIDS) (McVea, Turner and peppler 2000), asthma, childhood cancers, insulin dependent diabetes mellitus, reduced morbidity from gastrointestinal and respiratory infections, and is linked to motor skill development (Kramer & Kakuma 2002; Kramer *et al.*, 2008; Mortensen *et al.*, 2002 & Fewtrell, 2004). Significantly reduced risk of gastroenteritis (adjusted odds ratio 0.61; 95% confidence interval 0.41 to 0.93) was observed in a PROBIT cohort (Kramer, *et al.*, 2003), Quigley, Kelly and Sacker (2007) are in agreement with this. Quigley *et al.* (2007), in a study found out that risk of hospital admission with a diagnosis of gastroenteritis decreased from 1.1% to 0.5% with EBF.

In a large cohort of 4,164 infants' information on duration, exclusivity and infections was sought at varying times. Compared to children who were never breastfed, in the first six months of life those who were breastfed exclusively until the age of 4 months and partially thereafter had a 35% lower risk of Upper respiratory throat infections (URTI), 50% had a lower risk of Lower respiratory throat infections (LRTI), while 59% had a lower risk of gastrointestinal tract infection (GI) (having all differences statistically significant). These children also had a 54% lower risk of LRTI between ages 7 and 12 months. Infants who were breastfed exclusively for six months also had significantly lower rates of URTI compared to those who were never breastfed. In this prospective cohort study, the length of exclusive

breastfeeding was significantly associated with fewer URTI, LRTI, and GI in the first year of life. Of interest is the fact that partial breastfeeding, even for six months, did not significantly lower infection rates. Further, four months of exclusive breastfeeding without any later breastfeeding did not reduce rates of these infections (Duijts, Jaddoe, Hofman, *et al.*, 2010).

There is however an emerging body of evidence that expresses the need to start complementary feeding at four (4) months of age. For instance, Fewtrell *et al.* (2011), in their review concluded that there is a higher risk of iron deficiency anaemia associated with a 6 months EBF which is a risk factor to irreversible adverse mental, motor, and psychosocial outcomes. This is supported by Chantry, Howard and Auinger (2006). Of concern also is a higher incidence of food allergies, and a higher risk of coeliac disease, associated with long term complications with longer exclusivity (Fewtrell *et al.*, 2011). Research findings in developed countries suggests decreased rates of peanut and egg allergy as a consequence of introducing these allergens in a critical early window likely to be the first 4–6 months of life (Du Toit, Katz, Sasieni, *et al.*, 2008 and Prescott, Smith, Tang, *et al.*, 2008). Further Fewtrell *et al.* (2011) argue that the sample that was included in the WHO 2005 study which gave rise to the new WHO standards now in use, was too small to allow generalization and may not represent those perceived by their parents as signaling hunger much earlier and so requiring weaning foods earlier. Demand weaning has been advocated for with the argument that infant's growth differs from one infant to another and hence breast milk adequacy will differ according to an infant's size, activity, growth rate, and sex, and the quality and volume of the breast milk supply (Reilly, Ashworth and Wells 2005, and Ward 2009). Norris *et al.* 2005 & Poole *et al.* 2006 further lament the lack of specific recommendations for the introduction of solid foods in special groups such as preterm infants, who may have specific nutrient needs that are unlikely to be met by a recommendation designed for healthy full-term infants. Furthermore the data suggest that both early (<3 months) and late (>6 months) introduction of gluten containing foods may increase the risk of celiac disease or wheat related allergy in at-risk infants.

In a Cochrane review of 2012 the authors insinuate that individual infants should be managed individually, so that insufficient growth or other adverse outcomes are not ignored and appropriate interventions are provided. They however conclude that there were no risks posed if EBF was recommended, in both developing and developed-country settings as a general policy, for the first six months of life given the body of evidence gathered in the

review (Kramer and Kakuma 2012). Furthermore milk and energy sufficiency during EBF period of six months has been documented. In a longitudinal, observational field study that measured milk intake, energy intake and took anthropometric measurements at 25 weeks post-partum, Nelsen *et al.* (2011) found out that well supported mothers were well able to adhere to the World Health Organization recommendations. There was evidence of high infant milk intake and that milk increased significantly over time, fulfilling infant energy requirements for the first half of infancy. In this study there was no evidence of insufficient milk supply during 6 months of EBF. The fifty healthy exclusively breastfeeding mother-infant pairs were included from breastfeeding support groups in Glasgow- Scotland.

The discourse to give complementary feeds at either 4-6 months or 6 months is only for the developed countries and is generally based on micronutrient adequacy. There is a general agreement that given the high rates of morbidity and mortality in developing countries exclusive breastfeeding for the first six months of life should be practiced, (Fewtrell *et al.*, 2011). This is despite the fact that in these settings new-born iron stores may be suboptimal, with evidence suggesting that EBF without iron supplementation for six months may compromise hematologic status (Kramer & Kakuma, 2012). The benefit of infection prevention of breast milk overruns other benefits given sanitation aspects in many developing countries especially those that are resource constrained as is the case of the study area. The evidence in this discourse is therefore pertinent to this study. Furthermore in the above systematic review, there were no benefits that were found for early supplementation for infants in both developing countries and developed countries.

2.4 Breastfeeding self-efficacy

Many known predictors of EBF duration have been identified through many studies and they include demographic attributes such as maternal age, marital status, education level, and socioeconomic status however all these factors are non-modifiable (Mutuli, & Walingo, 2014; Ibanez *et al.*, 2012 and Mutuli, Walingo & Othuo, 2012). Similarly some modifiable variables have been identified through research and they include attitude, social expectations and self-efficacy (Katherine 2015; Al-Akour *et al.*, 2010; Gross, 2008 and Gijsbers *et al.*, 2007).

There is need to place greater attention on the modifiable factors since other strategies may not produce intended results. For example, many strategies have been put in place by many governments including Kenya in the promotion of EBF. Strategies employed by the

Kenyan Government currently include, the Baby Friendly Hospital Initiative, Comprehensive Policy guidelines on Infant Young Child Feeding are among ongoing policy efforts being utilized to promote optimal breastfeeding in Kenya (MoH, 2007 & MoH, 2008) and training health care workers on strategies of improving breastfeeding behavior, but evidence shows that they have unsuccessfully promoted EBF (Mutuli, & Walingo, 2014) since rates are still low at 42% in the 4-5 months age blanket (KNBS & ICF Macro, 2014).

Key of the modifiable factors is the Breastfeeding self-efficacy, which is the mother's perceived ability to breastfeed her infant and is a salient variable in breastfeeding duration (Mutuli, & Walingo, 2014), as it predicts whether a mother will choose to breastfeed, how much effort she will expend, whether she will have self-encouraging or self-defeating thoughts, and how she will emotionally respond to breastfeeding difficulties. In particular, efficacious mothers are more likely to choose breastfeeding, persist through the breastfeeding difficulties, employ self-enhancing thoughts, and react positively to perceived difficulties (Denis, 1999). A mother's breastfeeding confidence is positively correlated with the length of breast feeding (Denis 2003). This variable is modifiable (Blyth *et al.*, 2004). Modifiable factors can be manipulated by healthcare providers and therefore provide an opportunity for them to effect significant change in behaviour.

Several studies (Blyth *et al.*, 2002; Dennis, 1999; de Jager *et al.*, 2013; Meedya, Fahy, & Kable, 2010 and Tsai, Huang & Lee, 2015) have revealed an association between Breastfeeding self-efficacy and breastfeeding outcomes. No study to the best of the researcher's knowledge has been published in this area in any African country. Henshaw *et al.* (2015) in a prospective study that investigated breastfeeding self-efficacy, mood, and breastfeeding outcomes among primiparous women found that those who had a high BSE at 2 days postpartum had a higher rate of exclusive breastfeeding at 6 months postpartum. On the other hand Keemer (2013), using Kruskal-wallis analysis identified a significant lower median self-efficacy score 43.43 (SD=12.19) for those who used alternative techniques of infant feeding compared to a median self-efficacy score of 53.32 (SD=7.40) for those who EBF in a retrospective descriptive study. Similarly, Tsai, Huang and Lee (2015) in a study that investigated the maternal and hospital factors associated with first-time mothers' breastfeeding practice in a prospective study found out that Breast feeding self-efficacy was significantly related to exclusive breastfeeding during the hospital stay and was positively and significantly associated with breastfeeding exclusivity after discharge. On the other hand de Jager *et al.* (2014) investigated the psychosocial variables associated with the ability to

exclusively breastfed to six months postpartum in a retrospective study. Results showed that women who exclusively breast fed to six months postpartum exhibited higher, breastfeeding self-efficacy, and path analyses indicated that breastfeeding self-efficacy was a strong significant predictor of both exclusive breastfeeding intention and duration.

Other studies have demonstrated a significant relationship between breastfeeding self-efficacy in the neonatal period and breastfeeding duration at 6 months (Bosnjak, *et al.*, 2012; McCarter-Spaulding & Gore; 2009, Wilhelm *et al.*, 2008) while a new mother's level of breastfeeding self-efficacy in the neonatal period has also been seen to predict duration and exclusivity of breastfeeding at 4, 6, 8, and 16 weeks after delivery (Blyth *et al.*, 2002; Dennis, 2003; McCarter-Spaulding & Gore, 2009).

This study utilized a structured nutrition education in the MCH clinic using the Health Belief Model with an aim of influencing maternal breastfeeding self-efficacy positively and evaluating its effect on EBF rates. Structured education in the prenatal and perinatal period has been found to be more influential in the promotion of breastfeeding confidence and EBF than the provision of written materials and/or peer support alone (Fairbank *et al.*, 2000; Susin *et al.*, 1999). Structured prenatal nutrition education has also helped mothers gain confidence and has led to increased rates of breastfeeding (Kramer *et al.*, 2008; Schlickau, 2005; Lin *et al.*, 2007). It is important to test the effect of maternal breastfeeding self-efficacy in the African setting given varying socio-economic circumstances and cultural infant feeding norms. No such study has been carried out in Africa.

2.5 Perceptions and EBF

Many psychological factors influence the duration, and exclusivity of breastfeeding, and trends and patterns are different from one population and from one nursing mother to another (Vieira *et al.*, 2014). Psychological factors that have been associated with breastfeeding outcomes include a mothers attitude towards breastfeeding, social expectations, self-efficacy, social networks attitude, subjective norm and perceived behavioural control, (Mutuli, Walingo & Othuon, 2012, Al-Akour *et al.*, 2010; Gross, 2008 and Gijbers *et al.*, 2007).

According to Callen & Pinelli, (2004), the pathways by which, psychosocial factors affects optimal breastfeeding is difficult to disentangle. This is because the determinants are multivariate ranging from societal values and norms, environmental to personal factors

(Watson 2013). These factors operate in various pathways to influence Breastfeeding outcomes, trends can however be identified in a population. According to Mutuli, Walingo & Othuon, (2012), breastfeeding for a mother is a choice, not a behaviour that is randomly assigned and as Ross (2013) notes, every mother is unique in relation to her local reality and context which may inevitably influence her breastfeeding practices.

On the other hand the psychological factors such as perceptions of mothers towards breastfeeding are modifiable. It has been suggested that a focus on factors such as maternal infant feeding attitude may help to increase breastfeeding duration (Dungy *et al.*, 2008, Sittlington *et al.*, 2007) and many studies have elucidated the influence of a mother's attitude towards breastfeeding as a choice of infant feeding method on breastfeeding outcomes. For example in a cohort study of 427 mother infant pairs that assessed the influence of infant feeding attitudes on breastfeeding in rural Western Australia, using the Iowa Infant Feeding Attitude Scale (IIFAS), reported a significant difference in exclusive breastfeeding duration. In this study a cut-off point of score of the IIFAS scale was set a priori at 65. Mothers who scored an IIFAS score of > 65 were approximately twice as likely to be exclusively breastfeeding at six months, than those who scored < 65 scores. The median duration of exclusive breastfeeding for mothers with an IIFAS score of > 65 was also higher at 16 weeks (95 % CI 13.5, 18.5) compared with that of their counterparts at 5 weeks (95 % CI 3.2, 6.8) ($p < 0.0001$).

One of the most studied perceptions is the perceived milk insufficiency. Goosen, Mclachln and Schbl, (2014) in a cross-sectional community-based study that investigated factors impeding exclusive breastfeeding in a low-income area of the Western Cape province of South Africa, barriers to EBF identified were perception that infants need water, and gripe water and the concern that milk alone was not satisfying. Similarly Maonga *et al.* (2015) in a community based cross-sectional study that used both qualitative and quantitative methods conducted to assess the factors affecting exclusive breastfeeding among women in Muheza District Tanga Northeastern Tanzania, the perception that mothers' breast milk is insufficient for child's growth, child being thirsty and the need to introduce herbal medicine for cultural purposes were important factors for early cessation of EBF. Agunbiade, and Ogunleye, (2012), assessed constraints to exclusive breastfeeding practice among breastfeeding mothers in Southwest Nigeria and reported EBF rates of 19% among the nursing mothers. The major deterrent to the practice was identified as perception that babies continued to be hungry after breastfeeding an indication of milk insufficiency. Gewa and

Chepkemboi (2016) in a study that assessed the maternal knowledge, outcome expectancies and normative beliefs as determinants of cessation of exclusive breastfeeding in a cross-sectional study in rural Kenya reported an association between perceived benefits of EBF and EBF duration. Mothers who indicated that infants would feel hungry more quickly, gain less weight and feel thirstier when exclusively breastfed were associated with significantly higher risk of premature EBF cessation. Which may again, be an indication of milk insufficiency. Alemayehu, Haidar, and Habte (2009) investigated the determinants of exclusive breastfeeding practices in Ethiopia and also found out that mothers often considered breast milk to be insufficient. Gatti, (2009) and Petit (2008) also identified the perception that milk was insufficient as a key determinant of early complementary feeding. According to Petit (2008) who studied the perception and knowledge on exclusive breastfeeding among women attending antenatal and postnatal clinics in Mbarara hospital in Uganda, the perception milk was not enough was the main reason why women did not exclusively breastfeed.

Researchers have also studied perceived benefits of exclusive breastfeeding on both the mother and the child. Sholeye, Abosede and Salako (2015) in a cross-sectional descriptive study that assessed exclusive breastfeeding and its associated factors among 264 mother infant pairs in Sagamu, Southwest Nigeria found out that a feeling that BF had maternal benefits was associated with EBF ($p=0.044$), similarly a feeling that breastfeeding was protective against ovarian cancer was also associated with the practice ($p=0.030$). Similar findings were echoed by Gewa and Chepkemboi (2016) in a cross sectional study in rural Kenya. In their study, a one unit increase in positive perception of the impact of EBF on the mother's health, and appearance was associated with a 30 % lower risk of premature EBF cessation HR: 0.73; CI: 0.62-0.86.

Going back to formal employment (after delivery) has also been cited and perceived as a deterrent to EBF (Agunbiade, and Ogunleye, 2012, Setegn 2012, Taddele, Abebe and Fentahun 2014, Lakati 2011). This is despite the fact that nursing mothers have the option of expressing breast milk and storing it for their infants. Taddele, Abebe and Fentahun (2014) compared exclusive breastfeeding status by maternal employment in Ethiopia in a comparative cross-sectional study. According to the findings, rates of exclusive breastfeeding were lower in the employed (44%) than those of the unemployed mothers (65%). Employed mothers were 32% times less likely to practice exclusively than the unemployed mothers (OR= 0.32). Similarly in Agunbiade, and Ogunleye, (2012), the need to

return to work was associated with premature cessation of EBF. Setegn *et al* (2012) however reported unemployment to being a risk factor in premature cessation of EBF, AOR: 10.4 (95% CI: 1.51, 71.50).

2.6 Socio-economic, household food insecurity and post-partum factors influencing EBF

Various socio-economic factors have been found to influence exclusive breastfeeding among mothers; they include maternal age (Batal *et al* 2006, Lakati, *et al.*, 2011; Kimani *et al.*, 2011 & Mc Carter, 2007) marital status, (Kimani *et al.*, 2011; Ochola, 2008 & Mc Carter, 2007) education level and family income (Kimani *et al.*, 2011; Ochola 2008 & Mc Carter, 2007). Older, married or in union, more educated and women who are more financially stable are more likely to breastfeed for longer as compared with their counterparts.

Household food insecurity has also been found to influence exclusive breastfeeding. Household food insecurity is known to contribute to poor dietary intakes, nutrition and poor health outcomes and has been reported to be common in communities in which partial breastfeeding rates are high but EBF rates are low (Nyaruhucha *et al.*, 2006). It has been associated with maternal perception of breast milk insufficiency (Webb-Girard *et al.*, 2012). Furthermore a review of breast milk volumes and composition among poorly nourished communities indicated that milk volumes were lowest in communities with poor levels of nutrition and poor living conditions (Jelliffe & Jelliffe, 1978).

Other factors that influence exclusive breastfeeding relate to post-partum factors such as number of children (Para), (Batal *et al* 2006, Mc Carter, 2007 Al-Sahab 2008 and Kimani-Murage *et al.*, 2011). The more children a mother has, the more experience a mother has in breastfeeding and hence more confidence in performing the behaviour. Maternal confidence is positively associated with increased rates of exclusive breastfeeding (Denis 2002; Mutuli, Walingo & Ayado, 2012 & Mc Carter, 2007). The type of birth has also been found to influence initiation of breastfeeding which is associated with rates of EBF (Lakati, *et al.*, 2011; Ochola, 2008 & Mc Carter, 2007). Caesarean birth may delay initiation of breastfeeding after birth. Another postpartum factor influencing EBF is birth weight. LBW infants may be unable to successfully breastfeed further more extremely LBW infants in incubators cannot breastfeed (Ochola, 2008 & Mc Carter, 2007 Joshi *et al.*, 2014). Delayed breastfeeding and lack of it influences milk production and success in breastfeeding.

2.7 Community health workers and breastfeeding promotion

Community health workers or lay workers are members of the community who have received some training to promote health or to carry out some healthcare services, but are not healthcare professionals. The use of CHWs, compared to usual healthcare services: has been found to lead to an increase in the number of women who initiate to breastfeed their infants; who breastfeed their child at all; and who exclusively breastfeed, (Lewin *et al.*, 2010). They are used in the community for various health related interventions including promoting immunization uptake and breastfeeding, improving TB treatment outcomes, and reducing child morbidity and mortality (Lewin *et al.*, 2010). They have been found to be an important tool in promoting breastfeeding practice in some studies (Tyllestar *et al.*, 2011, Balaluka *et al.*, 2012).

For instance, in a randomized controlled trial by Tyllestar *et al.*, (2011), in three countries (Burkina Faso, Uganda and South Africa) rates of EBF were higher in the intervention group in which CHWs were involved compared to the control (going through the regular health care services). In Burkina Faso, 392 women were recruited and the CHWs visited the households seven times, one in the third trimester, one in weeks 1, 2, 4, 8, 16 and 20 post-partum. EBF rates at 12 weeks post-partum were significantly higher in the intervention group compared to the control group using a 7 day recall (77% and 23%) for the intervention and control groups respectively. At 24 weeks rates were 71% and 9% for the intervention and control groups respectively.

In Uganda, pregnant women were randomized into either the control or intervention (396 women in either arm). The CHWs visited the households five times, one in the late pregnancy, and one each in weeks 1, 4, 7, and 10, post-partum. The 7 day recall tool was used to collect data. The rates of EBF at 12 weeks were significantly higher in the intervention group compared to the control group (77% and 34% respectively). At 24 weeks, rates were at 51% in the intervention group compared to 11% among the control participants. Similar results were found in South Africa where women in the intervention cluster (n=535) received five household visits, one in late pregnancy and the rest between delivery and week ten. Rates at 12, and 24 weeks post-partum were 8% versus 4% and 2% versus < 1% in the intervention and control groups respectively. Rates in South Africa were however notably low.

In Balaluka *et al.* (2012) study in the DRC Congo, which analysed the impact of a community-based nutrition project in Katana health district of the Democratic Republic of

Congo from 2004 to 2006, which worked with community volunteers to raise awareness of the importance of exclusive breastfeeding among pregnant women and community leaders, higher rates were recorded in the intervention group compared to the comparison group. The duration of EBF at six months of age was higher in the intervention group as compared to the comparison group: 57.7% (95% Confidence Interval, CI, 50.9 to 64.5) versus 2.7% (95% CI, 1.1 to 6.6) ($p < 0.001$).

Agrasada *et al.* (2005) in Philippines studied first time mothers with Low Birth Weight (LBW) infants in a 3-armed randomized controlled trial. In the first intervention group CHWs with personal breastfeeding experience educated women ($n=68$) on EBF and assisted in the prevention and management of common breastfeeding complications once at days 3–5, 7–10, day 21 and 1.5 months, there after once monthly until 5.5 months. In the second intervention group, peer counsellors using the same visiting schedule as the first intervention group educated 67 mothers on basic child-care practices with some breastfeeding attention. The control group ($n=69$) received no household visits. Data was collected at hospitals during 7 scheduled appointments for all study groups. Women in the first intervention group were 6.3 times more likely to practice exclusive breastfeeding from two weeks to six months than women in the other two groups while the EBF rates were 32%, 3% and 0%, for the three groups respectfully.

2.8 Government policies on infant health

Since independence in the year 1963, the government of Kenya has given priority to elimination of disease, poverty and illiteracy (GOK, 1981). The three were identified by the founding father of the nation as the enemies of socio-economic development. After a WHO nutrition survey of 1963, under-nutrition was found to be a major problem. Nurses were trained for a 6-9 months certificate course and deployed as nutrition field workers. Policies formulated in the Ministry of Health in 1965, 1989 and 1992 dealt with the issues of costs and strategies to ensure health services had wider coverage in the entire country (GOK, 1994).

In 1965 for example a policy paper was formulated which saw fee collection in health facilities abolished, with the aim of encouraging people to seek health services from the formal sector. The fee was, however, re-introduced through a policy in 1989. The fee is one of the deterrent factors in seeking ANC services among women, with 16.7% citing too much

cost as the reason for not seeking ANC services where breastfeeding education is delivered (KNBS & ICF Macro, 2010).

In 1994, the Kenya Health Policy Framework was formulated and the National Health Sector Strategic Plan (NHSSP-1) 1999-2004 developed to operationalize the framework. The strategic plan emphasized the decentralization of the health care delivery system through distributing health services to the rural areas. Key areas it addresses have great influence on infant health. A decade later however, the targets outlined in the strategic plan have hardly been met. For example according to GOK/WHO (2004) infant mortality rates (IMR) have been on the increase. IMR was at 62 per every 1000 live births in 1993; 77 per every 1000 live birth in 2003 (KDHS, 2003) with a slight drop at 52 per 1000 live births in 2010 (KNBS & ICF Macro, 2010). A key factor in infant mortality is malnutrition.

In response to the deteriorating health the Government of Kenya through the Ministry of Public Health and Sanitation and Ministry of Medical Services (MOPHS/MOMS) launched the Second National Health Sector Strategic Plan 2005-2010 (NHSSP II) – ‘Reversing the Trends’ which aimed at reversing the declining trend in health indicators which included infant mortality rates. The strategy outlined ways of entrenching the community (level one) in the health delivery system. The community-based approach is currently being implemented through the 2008-2015 Child Survival and Development Strategy (CSDS) for Kenya. This strategy provides a mechanism through which households and communities take an active role in health-related development issues.

The community-based approach is supposed to complement the formal health system not to limit services offered. The second major intended impact of the approach is for communities to demand their rights from the formal health system for efficiency and effectiveness of services. Therefore, it is important that re-orientation of nutrition education be done for it to be delivered in a more efficient manner. Currently, nutrition education in the MCH clinic has been found irregular and minimal (Ochola, 2008).

It is, therefore, important to test the effect of a structured facility based breastfeeding nutrition education that links to the community via CHWs given that few studies have done so in the past except for Ghana. Ghana though being in sub-Saharan Africa, may not be equated with other African countries. It's the only African country that participated in the WHO study that came up with the new WHO child growth standards (WHO, 2005), so may be miles away as far as EBF promotion is concerned compared to other African Countries.

2.9 Government policies and programmes on infant health

The government of Kenya through its various Ministries has also made efforts to safeguard, Safe and appropriate maternal, infant and young child nutrition (MIYCN) through implementation of key policy guidelines, strategies, legislation of bills and strong coordination. Various legislative measures provide frameworks for implementation of programmes that are geared towards protecting and improving MIYCN. The following is a summary of legislative measures, strategies and programmes that have been instituted to promote, protect and support uptake of optimal IYCF practices in the country.

2.9.1 The National Maternal, Infant and Young Child Nutrition Strategy, 2011 – 2017

This strategy was designed to provide a strong framework for fast tracking action geared towards improved Maternal, Infant and Young Child Nutrition (MIYCN) practices with proven evidence in enhancing the health, nutrition, survival and development of infants and young children. The strategy is built on the principles of the Global IYCF strategy (WHO, 2002) which is vital in operationalizing strategies that ensure MIYCN is protected and promoted. The strategy aims at creating an enabling environment for mothers and caregivers to make and implement informed decisions on MIYCN, raise awareness on the main problems preventing optimal MIYCN, identifying approaches to deal with these challenges and to provide a framework for appropriate interventions. Through the implementation of this strategy Kenya plans to increase exclusive breastfeeding rates to 80% by the end of 2017 (Kenya National Maternal, Infant and Young Child Nutrition Strategy, 2011 – 2017).

2.9.2 Maternity protection

Maternity protection legislation is under the employment act, enacted in June 2007 and is meant to protect maternal and infants health. Under this bill, mothers are entitled for 90 days of maternity leave which should include the annual leave and paternity leave for two weeks. Further, there are efforts geared towards enacting the breastfeeding Mothers bill (Kenya gazette supplement 2017) which is hinged on the maternity protection convention and which seeks to promote breastfeeding at the workplace. The bill proposes the provision of comfortable breastfeeding/ milk expressing facilities, flexible schedules and breastfeeding breaks by all employers in Kenya. The bill is however yet to be signed into law.

2.9.3 Breast milk substitute control bill

Kenya is a signatory of the International Code of Marketing of Breast-milk Substitutes (WHO 1981). The code aimed at improving the health and nutrition of infants and young children by dealing with problems that can discourage breastfeeding. Kenya enacted the Breast Milk Substitutes (Regulation and Control) Act, in 2012 (Kenya Gazette Supplement Acts (2012)). The bill aims at the provision of safe and adequate nutrition for infants through the protecting and promoting of breastfeeding. It also ensures appropriate marketing, labelling and use of breast milk substitutes.

2.9.4 Baby-friendly hospital initiative

The Baby-friendly hospital initiative (1991), is part of Innocenti Declaration of 1990 (WHO/UNICEF 1990), which states that all governments should create an environment that enables mothers to practice EBF for the first half of infancy and to continue breastfeeding with adequate complementary foods for up to two years (WHO/UNICEF, 1990). There is evidence that rates of EBF and early initiation are higher when infants are born in hospitals that are certified as baby friendly, (WHO 2003). In Kenya, the BFHI was launched in 1992. There is a national committee of BFHI and at every hospital that is BFHI certified. In addition the Kenyan Government instituted the Baby-friendly Community Initiative in 2011. It aims at improving maternal and infant feeding practices at the community level due to the unique challenge of home deliveries. It's a seven point plan based on the BFHI and is currently being implemented in seven facilities.

2.9.5. Beyond zero campaign

Beyond zero campaign is a flagship project of the first lady of Kenya, with the aim of improving maternal and child health outcomes in the country, launched on 24 January 2013 (Beyond Zero Secretariat 2017). It focuses on five key areas: (i) Accelerating Human Immuno Deficiency Syndrome (HIV) programmes, (ii) Advocating for investment in high impact activities to promote maternal and child health and HIV control, (iii) Mobilizing men as clients, partners and agents of change, (iv) Involving communities to address barriers to accessing HIV, maternal and child health services and (v) Providing leadership, accountability and recognition to accelerate the attainment of HIV, maternal and child health targets. This programme has been instrumental in providing mobile clinics to facilities especially those in the remote areas hence facilitating hospital deliveries. Deliveries at a hospital has been associated with higher rates of EBF and early initiation (WHO 2003). The

beyond zero initiative/campaign has mobilized mobile clinics for every county in Kenya, hence taking health services especially antenatal and postnatal services closer to mothers. It may increase hospital deliveries and hence early breastfeeding initiation which is associated with prolonged duration of EBF.

2.10 Non-Governmental organizations' interventions promoting infant health

Many organizations dealing with child survival have done substantial work in the effort to improve infant feeding. Some interventions have involved men while others, grandparents in their efforts of encouraging them to offer appropriate support in infant feeding. According to the family systems theory there are intra household dynamics that may influence infant feeding and that cannot be ignored when designing interventions (USAID/IYCN, 2011). These dynamics relate to hierarchy and connectedness that are especially unique among African families. Mother –infant dyads are nested in these family systems and hence for infant and young child feeding interventions to work, issues relating to the family set-up need be considered. It's in this context fathers and grandparents have been involved in infant feeding projects since age, gender and experience play a role in decisions pertaining to child care practices. Studies have found evidence to this proposition. For example Susin & Giugliani (2008) and Pisacane *et al.*, (2005) found fathers to have an effect on EBF rates. In Kenya various interventions have been instituted involving men and grandparents. Similarly, Thuita (2010) in a study that investigated grandmothers' and men's involvement in infant and young child and maternal nutrition in Western and Eastern Provinces of Kenya, found grandmothers to hold a very powerful position within the extended family compared to both younger women and their husbands due to their widely respected expertise on maternal and child nutrition and health. She however found that men were not at all involved in direct care or nurturing of children before 2 years of age and that they valued their mother's counsel more than their wives. In Malawi similar findings were reported by Bezner *et al.*, (2008). In their study of breastfeeding, complementary feeding, and role of grandmothers, many young women were found to value and obey their mothers-in-law more on child feeding than the health care workers which demonstrated the powerful position held by mothers-in-laws in the family. The study also found out that the older women in the family were important sources of information in childcare and feeding.

The United States Agency for International Development's (USAID) Infant & Young Child Nutrition (IYCN) Project in 2009, held a two day workshop for thirty men support

group leaders selected from existing men's groups that were formed by APHIA II Western for persons living with HIV. Together the male leaders explored gender norms relating to infant feeding and caregiving practices; they also learned the importance of EBF and appropriate complementary feeding. They discussed ways to offer better support to their partners exclusive breastfeeding, further they developed action plans to integrate infant feeding content into their current activities. These learning activities encouraged men to view infant feeding as a family issue, and not solely a woman's issue (USAID/IYCN 2011). This literature highlights the importance of significant others in infant and young child feeding.

2.11 Theoretical framework

The Health Belief Model (HBM) framework was used as the perceptual screen for this study. The HBM is a theoretical framework used to understand health behaviour and possible reasons for non-compliance with recommended health action (Contento, 2007). The model postulates that an individual's perceived severity of and perceived susceptibility to a disease as well as the benefits of and barriers to taking a behavioral course of action will determine whether someone engages in a health related behavior (Janz & Becker, 1984). The perceived severity and susceptibility combine to create motivation to act, and the perceived benefits minus the perceived barriers provide a path to action (Rosenstock, 1974). Additionally, a "cue to action" such as a media message or personal correspondence or even a symptom must occur for the health relevant behavior to become an area of focus (Janz & Becker, 1984; Rosenstock, 1974). A mother's breastfeeding confidence is positively correlated with the length of breast feeding (Denis 2003). This variable is modifiable (Blyth *et al.*, 2004) and a more confident mother is more likely to choose breastfeeding, persist when confronted with difficulties, employ self-encouraging thoughts and react positively to perceived difficulties, (Denis & Faux, 1999). In a study by Cerandas *et al.* (2003) breastfeeding knowledge was strongly correlated with breastfeeding confidence/ efficacy and breastfeeding duration.

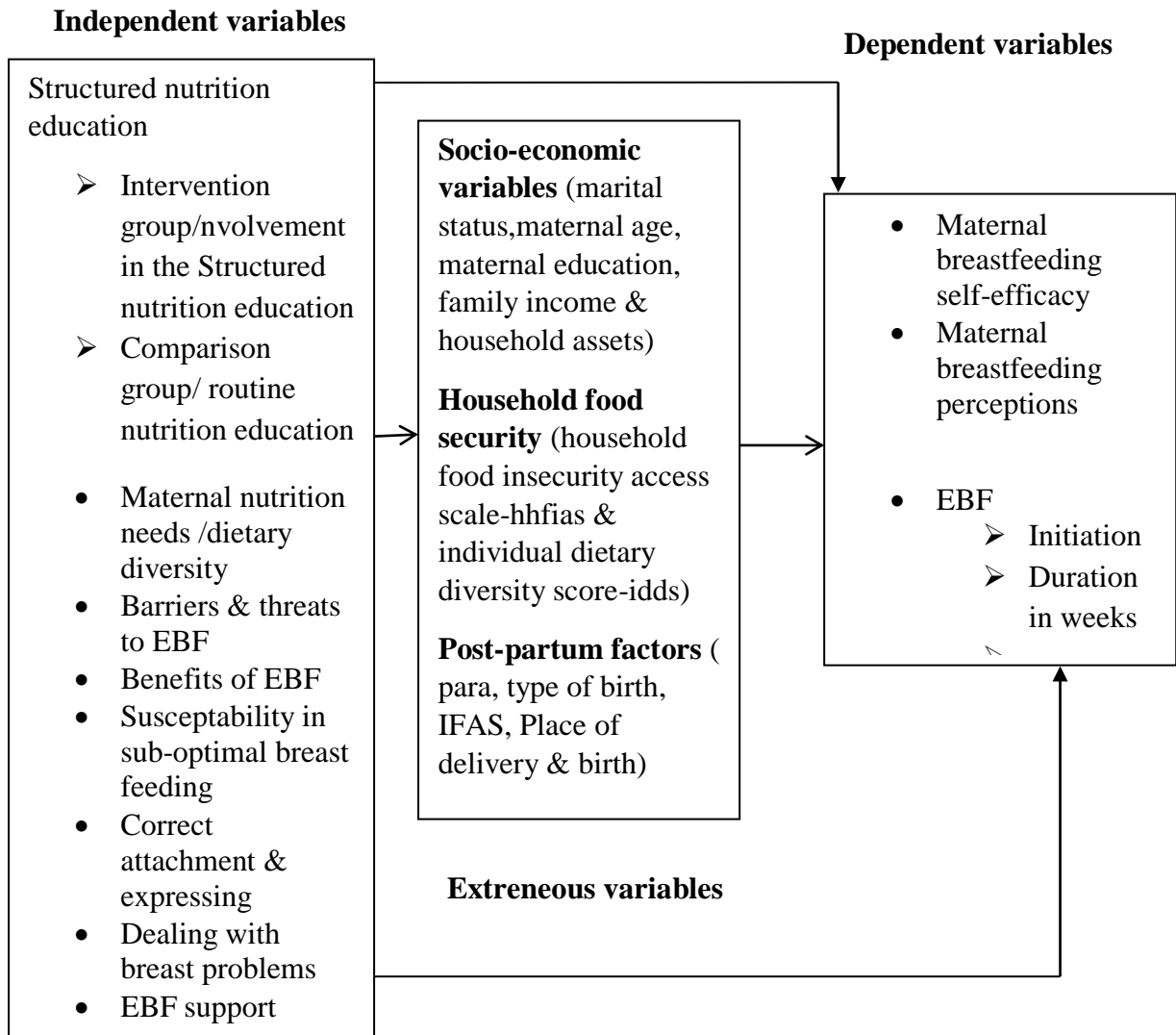
Initially, the HBM had four constructs; perceived seriousness of a disease; perceived susceptibility, perceived benefits of an action and perceived barriers to an action. It has since been modified and more constructs added to include cues to action, modifying variables and self-efficacy. For an intervention design to be useful it needs to be designed on the basis of an established theory (Contento, 2007).

2.12 Conceptual framework

In the HBM, people are most likely to practice a particular behaviour when they believe not complying is likely to result into difficulties in future. Perceptions about the susceptibility or severity of a condition are usually based on one's knowledge about a condition. Perceived susceptibility makes one adopt to a healthier behaviour and the greater the perceived risk, the greater likelihood of engaging in healthier behaviours, (Contento, 2007).

In this study the intervention protocol will be designed to structure nutrition education into topics on knowledge on nutrients of concern during lactation and pregnancy and the value of exclusive breastfeeding for the first six months. The consequences (threats) of sub-optimal nutrition and breastfeeding will be articulated to the respondents. Perceived benefits/value of behaviour in decreasing the risk of developing a condition/disease makes it easier for individuals to adopt healthy behaviour. In the intervention the advantages of exclusive breastfeeding for the first six months will be incorporated in the protocol. The protocol will also contain information on how to deal with perceived barriers outlined in the baseline data by the mothers.

The mothers' self-efficacy will be promoted by reinforcing facts such as the adequacy of breast milk for the first six months and demonstrating how to hold and position the baby during breastfeeding. Breastfeeding self-efficacy will be assessed using the Cindy-Lee Dennis BSES-S, (2003). The same scale will be used to evaluate the effects of the intervention on the breastfeeding self-efficacy. A nutrition education intervention that can help mothers gain confidence and enlighten them on the value of exclusive breast feeding is paramount for success in breastfeeding. The modifying factors (in this study the marital status, age, education, family income, household assets, Household food security and individual dietary diversity) will be assessed to determine their influence on EBF.



Independent variables

Figure 1: Conceptual framework showing the variables of the study

CHAPTER 3 RESEARCH METHODOLOGY

3.0 Introduction

This Chapter dealt with the methodology used in the study. The techniques and procedures included are the research design, the study area, information regarding instrumentation, the population, the sample selection criteria, recruitment procedures, ethical considerations and finally the projected plan for data analysis.

3.1 Research design

The study was a longitudinal, cluster randomized study involving two groups, an intervention group which was exposed to the structured nutrition education and the comparison group which went through the routine nutrition education in the MCH clinic. The study design was chosen with a major purpose of detecting the change that can be attributed to the intervention (Koh & Owen, 2000). The two groups were evaluated prior to the intervention (at baseline) during the intervention (mid-evaluation) as well as at the end of the intervention (post-test).

3.2 Study area

Kiandutu slum is in Kiambu County in Thika West District, and is located one (1) kilometer from Thika town; a town that is about 40 km in the Northeast of Nairobi. Thika town is between 3^o.53 and 1^o.45 latitudes south of equator and between 36^o.35 and 37^o.25 longitudes east of equator. It has an altitude of 1631 metres. The informal settlement occupies around 120ha of land and is home to around 13,000 people and 5 000 households (Kenya census 2009). The informal settlement has 17 villages each with a village elder (Kariuki, 2012). The health centre refers mothers to the Thika Level 5 Provincial General Hospital for deliveries since they do not have maternity services. Small scale business, informal employment and casual labour are the main livelihood strategies in this area.

3.3 Population of the study

The target population was women seeking antenatal (ANC) services in Kiandutu Health Centre. These are women of low socio-economic status which is a characteristic of populations in informal settlements (Kimani-Murage, *et al.*, 2011). The total figure of mothers seeking MCH clinic services for the first time per month is 70. (Un-published GoK health Centre records 2012).

3.4 Sample size determination and sampling procedures

3.4.1 Sample size

To obtain a representative sample, a formula used in determining a sample size for intervention studies when prevalence and effect indicators are expressed as proportions was used (Cogill, 2003).

$$n=D [(Z \alpha + Z \beta)^2 * (P_1 (1-P_1) +P_2 (1-P_2))/ (P_2-P_1)^2] \quad \text{Where:}$$

n= required minimum sample size

D= design effect

P₁=the estimated level of an indicator measured as a proportion at the baseline =13% (KDHS 2010)

P₂= the estimated level of an indicator measured as an expected proportion at the end of intervention

Z α= Z-score corresponding to the degree of confidence with which it is desired to be able to conclude that an observed change did not occur by chance=95%

Z β= Z-score corresponding to the degree of confidence with which it is desired to be certain of detecting a change of size (P₂-P₁) if one actually occurred=80%

*=multiplication

In this study, the design effect was considered at 2 for a two tailed test, this design effect is appropriate for health related studies (Chadha, 2006). The desired change in EBF duration (P₂-P₁) was set at 18% for a medium change based on a change observed in a similar study by Ochola *et al.*, (2008).

$$n=D [(Z \alpha + Z \beta)^2 * (P_1 (1-P_1) +P_2 (1-P_2))/ (P_2-P_1)^2]$$

$$n=1.5[(1.645 + 0.840)^2 * (0.13 (0.87) +0.31 (0.69))/ (0.31-0.13)^2]$$

$$n=2[\underline{(6.17522) * 0.1131 + 0. 2139}$$

$$0.0324$$

$$n=124.64 + 26\% (20 \% \text{ for general attrition and } 6\% \text{ loss from LBW}) 157 \text{ (For each group).}$$

3.4.2 Sampling procedures

The sampling frame consisted of pregnant women seeking ANC services from Kiandutu and Makongeni Health Centres.

Cluster randomization was carried out. Villages as opposed to individual women were randomized into either intervention or comparison groups. The Microsoft excel function was used to randomize the seventeen villages into either intervention or comparison. All eligible mothers in their respective villages were then enrolled into either intervention or comparison group. Recruitment of the pregnant mothers took place on continuously on a rolling basis until the desired sample size was attained. The design has been used in similar studies by Penny *et al.* (2005) which investigated the effectiveness of an educational intervention delivered through the health services and by Ochola (2008) which evaluated the effect of two counselling strategies in promoting EBF in Kibera informal settlement in Nairobi. Green/blue stickers were placed on the individuals' MCH-clinic book; green to identify those in the intervention group while blue to identify those in the comparison group. Cluster randomization is used to evaluate interventions implemented at the community level, for logistical convenience and to avoid infiltration (Hayes & Bennet 1999) hence the design was found suitable for this study.

The researcher with the help of the research assistants screened all women who sought ANC services on week days for gestation age and the village they come from. All those who met the inclusion criteria and accepted to participate in the study were enrolled into their respective groups as per the village. Recruitment continued on rolling basis until the required number of 157 in either group was achieved. The purpose of the study was explained to them and each participant that accepted to participate signed a written consent.

The inclusion criteria included being less than seven (<7) months gestation; without a history of chronic disorders such as hypertension, diabetes, HIV and tuberculosis and were more than 18 years were recruited into the study. Upon recruitment, mothers were informed of the importance of seeking ANC services for at least four visits. A folder for each woman was opened and kept by the researcher. Every time the respondent visited the MCH-clinic, the visit was numbered and recorded on her card/booklet and in the file, for the purpose of giving direction on which topic /information was to be given.

Sampling was carried out by applying a two stage screening process for the intervention and the comparison group similar to what was used in a similar study by Aidan,

Rafael & Lartey (2005). Initial screening of pregnant women took place during the first prenatal visit. The second screening took place after delivery during their postpartum period within the first week. It was done to ascertain whether both the mother and the infant qualified to continue in the study.

The exclusion criteria at the second screening included preterm delivery and Infants delivered less than 37 weeks gestation ,multiple births; only mothers with singletons continued in the study Low birth weight (below 2500gms). Those born with congenital disorders were also excluded.

3.5 Research instruments

The following instruments for data collection were used;

3.5.1 Questionnaire for assessing socio-economic, breastfeeding self-efficacy breastfeeding perceptions and anthropometry

The questionnaire elicited the following information; Socio economic (items adapted from KDHS, 2010) and demographic details of the respondents, perceived susceptibility/seriousness of sub-optimal breastfeeding, perceived threat, perceived benefits and barriers to exclusive breastfeeding and breastfeeding self-efficacy. Items to assess perceptions were adapted from McCarter (2007).

3.5.2 A Health form

The health form was used to record information on the anthropometric data of the mother; supplements taken during pregnancy; and foods craved and avoided during pregnancy (adapted from Ninan, 2011). The form was translated into Kiswahili and back-translated into English.

3.5.3 An individual dietary diversity questionnaire

The Individual dietary diversity score (IDDS) was used to determine the mother's diet quality. The study utilized the Food Agricultural Organization dietary diversity questionnaire (FAO/ Food and Nutrition Technical Assistance (FANTA), 2007). The approach to measuring dietary diversity is a qualitative 24-hour recall of all the foods and drinks consumed by the respondent at the individual level. The Minimum Dietary Diversity-Women [(MDD-W), (FAO/FANTA, 2014)] classification was used to particularly assess the micronutrients adequacy of the women.

3.5.4 Household food insecurity access scale

The household food insecurity access Scale (HHFIAS) is composed of a set of nine questions that has been used in different settings to distinguish food insecure from food secure households across different cultural contexts. The information generated by the HHFIAS is used to assess the prevalence of household food insecurity (access component), (FAO/FANTA, 2007). The tool is more sensitive and specific to changes in food situation than child anthropometry, and is easy to administer and analyse, (FAO/FANTA, 2007). It has been translated into Kiswahili and adopted in Kibera informal settlement by the University of Nairobi (Mwangi & Mberia, 2006).

3.5.5 Breastfeeding questionnaire

This instrument (adapted from WHO, 2002) was used to assess the infant feeding practices with an aim of capturing the duration of EBF. It contained questions to probe respondents to ascertain EBF duration and modified to include questions to assess morbidity incidents among infants. It was administered at every contact with the mother after delivery (1st, 6th, 10th 14th weeks and the 6th month).

3.5.6 Validity and reliability

Content and construct validity was ensured through the review of the tools by nutrition professionals and supervisors. The tools were translated into Kiswahili with the help of a linguist from Egerton University. Construct validity was assessed by the use of principle component factor analysis. The Kiswahili questionnaire was then back-translated into English by a neutral person who was not involved in the original translation and is not a nutrition expert, so as to reflect on any major deviations. Pilot-test of the tools was done using 10% of the sample picked from women attending MCH- clinic level 5 Provincial General Hospital but those that came from two villages, considered to be of low economic settings (Umoja and Gacagi) but attending PGH due to their proximity to the hospital. The reliability of the translated version of the Kiswahili tools was determined using internal consistency technique. In this case, score from one item was correlated with score from other items in the instruments. The Cronbach's Coefficient Alpha which is generated from of Kuder-Richardson K-R 20 formula will be computed to determine reliability. If a Coefficient of 0.7 was achieved, the instruments were considered reliable.

3.6 Data collection

3.6.1 Data collection procedures

Two research assistants were selected based on the following criteria; being qualified nutritionists, (with a Bachelor of Science in Foods Nutrition and Dietetics) and being fluent in Kiswahili and English. They were trained for 3 days. The training content included; a discussion of the purpose of the study; a review of interviewing techniques; providing explanatory information on items in the research questionnaires and how to record responses systematically in the research tools. They were also trained on taking anthropometric measurements. Standardization of the data collecting tools and procedures for both the researcher and the research assistants was accomplished through group sessions by mimicking the respondent researcher situation. Four community health workers (CHW) were also recruited and trained on IYCF using national IYCF guidelines for 3 days separately with the research assistants. To qualify, they had to be form four certificate holders and residents in the informal settlement. They assisted the researcher in follow up and delivery of nutrition education.

Data collection was done in three phases:

- Phase 1.

Involved recruitment of the respondents and administering the baseline evaluation. Data was collected using the questionnaires upon recruitment and education delivered within the first week of recruitment in their homes. The CHW guided the researcher to the respondents' homes.

- Phase 2. Intervention

This was the intervention period in which the women in the “intervention group” went through the nutrition education protocol alongside what they learnt in the MCH clinic routinely. The sessions were delivered to the pregnant women during the MCH clinic visits by the nutritionist in groups of two (2) to three (3) and during the two (2) home visits (in the 6th & 9th month) by the CHWs these numbers, months and visits were used in a similar study by Aidam, Rafael & Lartey (2005). The women were matched in groups of 2 to 3 according to the number of MCH visits. Grouping was only done if the turn up was high at the Health Centre to avoid long waiting periods. The women in the comparison group went through the usual procedure of the MCH clinic only. At 38 weeks mid-evaluation will be done for both groups. The tools used at baseline were administered for both groups. After delivery nutrition

education was offered within the first week (1st week) and at the fourth (4th) week at home by CHWs. The first week and month have been identified as very critical in encouraging mothers to continue with EBF (Lassi *et al.*, 2010). At the sixth (6th) tenth 10th and fourteenth 14th week, breastfeeding support was given and guidelines on complementary feeding also given to mothers at the fourteenth 14th week. These times correspond to the MCH visits. At every contact, after delivery, feeding patterns for the baby was assessed using the breastfeeding questionnaire, which contained the 24 hour recall.

- Phase 3. Evaluation phase.

It involved administering the post-test, which was done at the sixth (6th) month of lactation corresponding with the time mothers visit the MCH-clinic for vitamin A supplementation. Similar tools used at the baseline stage and at mid evaluation (for both groups) were administered to assess the effect of the intervention.

3.6.2 Anthropometric measurement procedures

Maternal weight was determined using a digital display Seca scale for precision and was measured to the nearest 0.1 kg with the respondents wearing minimum clothing (without jackets, sweaters scarves etc.) and with no shoes. The height was determined by the use of a stadiometer measured to the nearest 0.1cm with the respondents' barefoot standing on a wooden board placed on a horizontal surface with heels together, chin chucked and the body stretched upwards to full extent, with the head in a Frankfurt plane as described by Lee & Nieman, (2007). Both the weight and height measurements were taken at recruitment, and weight alone taken thereafter at every contact. This enabled the researcher to monitor weight gain.

The infant's length was measured at 6 weeks using an infantometre to the nearest 0.1 cm. The weight at birth and birth dates were obtained from delivery records. The weight determined those who qualified to continue in the study or not. The weight-for-age, weight-for-length and length-for-age indices were computed and transformed into Z scores using the WHO Anthro 2005 software.

The lactating mothers' weight (to the nearest 0.1kg) was taken before discharge and the weight re-measured at the 6th 10th 14th and the 6th month and the BMI values computed. To ensure quality control all the measurements were taken by the researcher and the research assistant. Each observer measured and recorded and the two readings compared. If any pair of

readings exceeded the maximum allowable difference for a given variable (weight 0.1kg, height 0.1cm for women) both observers took the measurements a second time independently recorded and compared the readings.

3.6.3 Individual dietary diversity assessment

The respondent were asked to recall a list of all the foods (meals and snacks) eaten in the previous 24 hours preceding the survey (both day and night). Upon the mention of a food/ food group the corresponding foods in the list were underlined and under the appropriate food group one was written in the column next to the food group. The researcher /research assistant then probed for snacks eaten between main meals, special foods given to the lactating/pregnant women, and for ingredients such as sugar in tea, oil in mixed dishes or fried foods. All the ingredients of a mixed dish was also noted. Once the recall was finished, the researcher/research assistant probed for food groups where no food was underlined. A zero was filled in the right hand column of the questionnaire when it is ascertained that no foods in that group were eaten. This procedure is outlined in FAO/FANTA (2007).

3.6.4 Breastfeeding self-efficacy and perceptions

To be able to measure the breastfeeding confidence among the mothers the breast feeding self-efficacy scale (short version) developed by Denis (2003) was translated into Kiswahili and backtranslated to English. The Kiswahili version was used to collect breastfeeding self-efficacy (BSE) data at baseline, at 38 weeks gestation, and at 6 months post partum. The BSES-Short Form has fourteen questions and a possible score ranging from fourteen (14) to seventy (70) with lower figures indicating less confidence and higher, more confidence. The same scale was used to evaluate the effects of the intervention on the breastfeeding self-efficacy. In this tool the respondents are asked to rate their confidence in performing 14 tasks associated with EBF in a scale of one to five (1-5). A 1 'indicating not at all confident' while the 5 'very confident'. The researcher then sums up the totals for the individual respondents.

Perceived susceptibility, threats and barriers and benefit items were adapted from McCarter (2007). Respondents were asked to rate their perceived susceptibility, threats and barriers associated with EBF in a scale of one to five (1-5). Perceived susceptibility has fourteen questions and a possible score ranging from fourteen (14) to seventy (70). Perceived threats has twelve questions and a possible score ranging from twelve (12) to sixty (60), perceived barriers has five questions and a possible score ranging from five (5) to twenty five

(25) and perceived benefit having ten questions and a possible score ranging from ten (10) to fifty (50).

3.7 Nutritional intervention protocol

The Table 1 below shows the protocol which was used to aid in structuring the nutrition education. It indicates activities that took place at specific visits during the intervention. It was adapted from Widga & Lewis (1999).

Table 1: MCH-clinic visits (pregnant & lactating mothers)

Protocol element	≤16 weeks to 24week	28wk	32 wk	37/38 wk	1 st wk 2 nd screening	1 st M (4wk)	6 th wk After birth	10 th wk After birth	14 th wk After birth	6 th month
Recruitment	X	-	--	-	X	-	-	-	-	-
Questionnaire	X	-	-	X	-	-	-	-	-	X
IDD Form	X	-	-	X	-	-	-	-	-	X
HHFIA	X	-	-	X	-	-	-	-	-	X
Health form	X	X	X	X	X	-	-	-	-	-
Teaching (10min)	-	X	X	X	X	X	-	-	-	-
Support	-	-	-	-	-	-	X	X	X	-
EBF Form	-	-	-	-	X	X	X	X	X	X
Evaluation-End	-	-	-	-	-	-	-	-	-	X

*X: Activity was carried out.

Data collection was done on recruitment at the facility, at 38 weeks gestation and at six months postpartum. Nutrition education was delivered at ≤ 28 weeks gestation (within seven days after recruitment) and at 37 weeks at home, 28th and 32nd weeks at the facility. Clients who failed to visit the MCH-clinic were followed up by phone and if they did not seek MCH-clinic services, or respond, followed up in their homes by the researcher and the community health workers (CHW).

3.8 Nutritional intervention curriculum guide

The Table 2, below shows the content of the nutrition education structured into six (6) sessions.

Table 2: Nutritional intervention curriculum guide

Visit NO#	Topic	Subject matter
1 st (≤16 to 24 weeks)	Special needs in pregnancy & lactation	Food groups and Food guide pyramid Nutrients and their local food sources Nutrient interaction/food mix Local foods & Dietary diversity
2 nd (28 weeks)	Weight gain in pregnancy How to gain weight	Recommended weight gain based on BMI, weight gain at different trimesters, Consequences of sub-optimal dietary intake.
3 rd (32 weeks)	Exclusive breastfeeding,(EBF)	EBF what is it? Value/benefits, to mothers & infants; Barriers; threats & consequences of sub-optimal EBF (susceptibility/threats)
4 th (37 weeks)	Exclusive breastfeeding	Positioning/attachment; signs of good attachment; consequences of poor attachment
DELIVERY	N/A	N/A
5 th (at 1 st wk)	Exclusive breastfeeding	Expressing of breast milk; Attachment
6 (at 4 th wk)	Breastfeeding	Indicators of successful breastfeeding; signs of a good feed; cues of satisfaction; mothers cues of milk production
7 (at 6 th wk)	Breastfeeding support	Answering Questions, Counseling/Encouraging mothers
8 (at 10 th wk)	Breastfeeding support	Answering Questions, Counseling/Encouraging mothers
9 (at 14 th wk)	Breastfeeding support & Complementary Feeding	Counseling/Encouraging mothers Tips on Complementary Feeding
10 (at 6 th M)	Post-test evaluation	Guide on complementary feeding

3.9 Ethics and quality control

Ethical clearance was obtained from Egerton University Ethics Committee (appendix viii), research permit (appendix ix) from the National Commission for Science, Technology and Innovation. Further authorization was given from the National Commission for Science, Technology and Innovation (appendix x) the District Commissioner-Thika West Sub-County (appendix xi) District Ministry of Education-Thika West Sub-County (appendix xii) and permission sought to use tools from authors McCarter-Spaulding (appendix xiii) for the perceptions scale and Cindy-lee Denis (appendix xiv) Informed signed consent was also obtained from the study respondents

3.10 Data analysis

Both descriptive and inferential statistics were used. The statistical package for social sciences computer programme (SPSS version 22) was used for computation. Means and standard deviations were generated for continuous variables and frequency distribution for the categorical variables. The Dietary diversity score was determined by using the FAO/FANTA dichotomous indicator for women with a threshold of at least five food groups out of ten. Household Food Insecurity access scale was analysed based on the FAO/FANTA classifications (food secures-none of the conditions, mildly- Q1, moderately-Q2, 3 &4 and severely food insecure-Q 5,6,7,8 & 9). Post-partum factors (Para, type of birth and birth weight) were analysed using descriptive statistics.

Means and standard deviations were computed for maternal BSES, and breastfeeding perceptions at baseline, mid and at post intervention. Independent t-tests were used to determine differences in the two groups at baseline, mid and end-line. The paired t-tests were used to determine the differences before and after the intervention for the two groups together and separately. EBF duration was assessed post intervention at 6 months. Means and standard deviations for EBF duration for both groups were computed in days while frequencies and percentages were used for the variable as a dichotomous variable (EBF/Mixed feeding). Generalized linear model was performed to establish the relationship between maternal breastfeeding self-efficacy (BSE), breastfeeding perceptions and EBF duration as a continuous variable. To determine the association of the categorical variables with EBF duration Kaplan Meier Survival Analysis was carried out. The effect of the intervention on BSE and breastfeeding perceptions and EBF duration was determined by running a multivariate generalized estimating equation (GEE) analysis while its effect on EBF duration as a dichotomous variable was determined by a binary logistic regression.

Table 3: Measurement of variables

	Objective	Independent variable	Dependent variable	Statistical analysis
Obj. 2	Assess baseline maternal breastfeeding self-efficacy and perceptions of mothers	Maternal breastfeeding self-efficacy Perceptions		Mean, SD Independent t-test
Obj. 2	Assess the end line maternal breastfeeding self-efficacy and breastfeeding perceptions	Maternal breastfeeding self-efficacy Perceptions		Mean, SD Independent t-test Paired T-test
Obj. 3	Determine the relationship between maternal BSE; maternal breastfeeding perceptions and EBF duration	Maternal breastfeeding self-efficacy; Maternal breastfeeding perceptions	EBF duration	Chi-Square Kaplan Meier Survival Analysis GLM
Obj. 4	Evaluate the effect of the intervention on maternal BSES, breastfeeding perceptions and EBF duration	Maternal BSES, breastfeeding perceptions	EBF duration	Mean, SD GEE Binary logistic regression

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This Chapter presents the results and discussion of the findings of the study as stipulated under the objectives and hypothesis in chapter one. The results are presented under the following headings based on the five objectives of the study: Validation of the tools of the study, Socio-economic, household food security and post-partum factors of mothers, baseline maternal breastfeeding self-efficacy (BSE) and breastfeeding perceptions effect of a structured nutrition education on maternal BSE, breastfeeding perceptions and EBF duration and the relationship between maternal BSE, breastfeeding perceptions, socio-economic, household food security, post-partum factors and dietary diversity.

4.2.0. The Pilot study results

4.2.1. Socio-demographic characteristics of the pilot study respondents

The socio-demographic characteristics including age of the mother, education level, household size, rent, and money spent on food and the infant's birth weight were compared between the two groups (Table 3). In all the above socio-demographic variables, there was no significant ($p>0.05$) difference between the intervention and comparison group which indicates that the two groups are homogenous any differences observed in the two groups can therefore be attributed to the intervention.

The maternal mean age was 22.81 (range 18-35 SD 4.538) with no statistical difference in the mean age in the groups ($p=0.411$). The mean birth weight in the intervention group was 3.2 ± 0.35 and in the comparison group 3.10 ± 0.35 with no significant statistical difference between the groups by the independent t-test for equality of means $p=0.399$.

Table 4: Social demographic characteristics of pilot study respondents

	All (n=42)	Intervention (n=21)	Comparison (n=21)	Fischer's Exact Test	<i>P value</i>
Education level				1.379	0.516
• Primary and below	21	13	8		
• Secondary	15	7	8		
• College and above	6	3	3		
Parity				0.371	0.542
• Multi-porous	16	7	9		
• Null parity	26	13	13		
Marital status				4.923	0.683
• Married	34	16	18		
• Single	6	5	1		
• Separated	2	1	1		
Tribe				5.330	0.279
• Kikuyu	18	8	10		
• Kamba	12	7	5		
• Kisii	2	1	1		
• Luo	4	3	1		
• Luhya	6	4	2		
House ownership				1.197	0.462
• Own House	3	1	2		
• Rental	38	21	18		
House rent (Ksh)				3.278	0.238
• <500	8	6	2		
• 501-1000	20	10	10		
• 1001-1500	11	5	6		
Expenditure on food (Ksh.)				3.359	0.070
• <200	27	13	14		
• 201-500	15	10	5		

***Data is presented as statistical significance, $p < 0.05$ by Fischer's exact test and proportions**

4.3 Validation of tools

4.3.1 Translation of the tools and face validity

To ensure content, semantic and technical equivalence were ascertained, the English version was translated into Kiswahili with the help of a Linguist from Egerton University. The Kiswahili questionnaires were then translated into English through blind back-translation by a neutral person, who was not involved in the original translation, was not familiar with the tools to reflect on any major deviations and was not a nutritionist. Blind back translation ensures semantic equivalence which ascertains that the meaning of each item remains the

same after translation into the target language, Flaherty *et al.* (1998). Translation errors were assessed by the research team for errors and additions of words that would unnecessarily change the meaning of the original tools. These procedures were consistent with the original BSES-SF methodological studies (Dai and Dennis 2003).

1) Breastfeeding self-efficacy scale-short form (BSES-SF):

Seven modifications were made to the BSES scale items (as indicated below as per the particular item). In addition the phrases on the likert scale “not at all confident”, “not confident”, “sometimes confident, “confident” and “very confident” were back-translated as “completely have no faith”, “have no faith”, “sometimes have faith”, “have faith” and “have a lot of faith” from the Kiswahili word “nina imani/ sina imani.

Original scale

Blind back-translated scale

- | | |
|---------------------------------|---|
| 1) To determine | to recognize |
| 2) To successfully cope with | to maintain breastfeeding |
| 3) Giving other feeds
months | giving other foods and drinks for the first 6 |
| 4) Properly latched | properly put on the breast |
| 5) Breastfeeding demand | breastfeeding needs |
| 12) Always deal with the fact | always contend with the fact |
| 13) When he/she is unwell | when he/she is sick |

2) Perceptions questionnaire

The phrases “Extremely unlikely”, “Very Unlikely” “somewhat likely”, “Very likely” and “Extremely likely” after back translation changed to “completely unlikely” “unlikely” “may be” “likely” and “very likely” in all the perception scales.

Susceptibility scale

In the susceptibility scale only two modifications were made in the scale as showed below

Original scale

Blind back-translated scale

- | | |
|---------------------------------|---------------------|
| 5) Sudden Infant Death Syndrome | Sudden Infant death |
| 14) CVD in adulthood | CVDs in old age |

Perceived threats

In this scale only one modification was made on item number 4.

Original scale

Blind back-translated scale

4) Sudden Infant Death Syndrome Sudden Infant death

Perceived barriers

Two modifications were made on this scale.

Original scale

- 1) Milk not adequate for baby
- 3) Do not know how to express

Blind back-translated scale

- Milk insufficiency
- Lack of knowledge on how to express

Perceived benefits

In the perceived benefits scale three modifications were made which did not have any consequences on the meaning of the individual items

Original scale

- 4) Increased convenience
- 8) Improved bonding with baby
- 9) Improved infant cognitive benefits

Blind back-translated scale

- Reduced disturbances
- Improves maternal-infant bonding
- Improves intelligence in infants

Overall semantic and technical equivalence assessments did not yield any significant differences in meaning when the original and back translated scales were compared meaning that the Kiswahili version of the tools was deemed acceptable and equivalent to the original English scales.

4.3.2 Content validity

Content validity was ensured through the review of the tools by nutrition professionals and supervisors. The research team also assessed the content of the translated tool comparing with the contextual meaning. Content equivalence is established by determining whether the content of each item of the tool is relevant to the target group (Flaherty *et al* (1998)). Content equivalence was evaluated by four nutrition experts in the study area. The criteria used in the evaluation included 3 items: (1) content relevant to ensure EBF for the first 6 months, (2) clear and concise meaning, (3) a clear distinction among the items in the questionnaire. The team agreed that all items in the perception scales were relevant and clear but three (3) modifications were done on the BSE scale as showed below.

3) *Ninaweza kumnyonyesha mtoto wangu bila kumpatia vyakula vingine* (I can always breastfeed my baby without giving other feeds) *was changed to ninaweza kumnyonyesha mtoto wangu bila kumpatia vyakula vingine hadi mwezi sita itimie* (I can always breastfeed my baby without giving other feeds until six months are over).

4) *Ninaweza kuhakikisha kuwa mtoto wangu ameshikilia titi vyema wakati wote wa kunyonyesha* (I can always ensure that my baby is properly latched on for the whole feed) *was changed to ninaweza kuhakikisha kuwa mtoto wangu ameweka titi vizuri kwa mdomo wakati wote wa kunyonyesha* (I can always ensure that my baby is holding on to the breast properly for the whole feed).

14) *Huweza kujua wakati mtoto wangu amemaliza kunyonya* (I can always tell my baby is finished breastfeeding) *was changed to huweza kujua wakati mtoto wangu ameshiba* (I can always tell when my baby is satisfied).

The team reassessed the BSE scale after the changes and agreed that the kiwashili version was clear, and relevant to the target group. The above process was carried out in a study that translated the original BSES-SF from English into the Chinese language (Dai and Dennis 2003).

4.3.3 Construct validity

Construct validity for the BSES-SF and the perception scales was assessed using the principal components factor analysis, comparison of contrasted groups, and correlations with measures of similar constructs. Principal components analysis (PCA) was chosen so as to be consistent with the original BSES-SF methodological studies (Dai and Dennis 2003 & Dennis 2003).

4.3.4 Factor analysis

1) Breast feeding self-efficacy scale (BSES-SF)

Factor analysis was used in order to evaluate the strength and patterns of correlations of individual scale items with the theoretical concepts and determine the underlying structures of the translated BSES-SF. The suitability of factor analysis for the data was evaluated by the use of the correlation matrix and found suitable since correlations exceeding 0.30 were 82% showing a strong inter item correlation, way above the 73% yielded in Dai and Dennis (2003). In addition the Kaiser-Meyer-Olkin used to measure sampling adequacy was 0.855, exceeding the recommended 0.60 (Tabachnick & Fidell, 2001). Principal component analysis was then performed with an Eigenvalue of 1.0 used to determine nontrivial factors. Three factors produced an Eigenvalue greater than 1 that explained 71.88% of the total variance in the scale (Table 5), and were retained for further rotation analysis. Factor I explained 53.58%, variance while factor 2 and 3 explained 10% and 8.30% of the variance respectively. These results differ slightly with what was observed in Dodt *et. al.*

(2012), who translated the English version into Brazilian version. In Dodt *et. al.* (2012), four factors produced an Eigenvalue greater than 1 and 50.6% variance was explained. The difference observed in the Kiswahili and Brazilian versions may be due to cultural and sample size factors. To replicate the original tool, a one factor analysis was requested and an eigenvalue of 8.17 generated and this time 58.35% of the variance explained.

Table 5: Total variance explained for BSES-SF scale

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance	% of Cumulative %	Total	Variance	% of Cumulative %	Total	Variance	% of Cumulative %
1	7.502	53.584	53.584	7.502	53.6	53.584	6.180	44.145	44.145
2	1.400	10.000	63.584	1.400	10.000	63.584	2.324	16.601	60.746
3	1.162	8.298	71.882	1.162	8.298	71.882	1.559	11.136	71.882
4	0.964	6.885	78.768	1.147					
5	0.686	4.898	83.666						
6	0.542	3.873	87.539						
7	0.419	2.993	90.531						
8	0.396	2.827	93.358						
9	0.305	2.182	95.540						
10	0.191	1.368	96.907						
11	0.155	1.107	98.015						
12	0.112	0.802	98.816						
13	0.090	0.640	99.456						
14	.076	0.544	100.000						

To allow for a more interpretable factor solution, a principal component extraction with varimax rotation (orthogonal) was performed. The varimax rotation yielded three components as indicated in the Table 6. below. Rotation converged in 10 iterations.

Table 6: Rotated component matrix for BSES-SF

S/No	Statements/Matamko	Components		
		1	2	3
1	<i>Ninaweza kutambua iwapo mtoto wangu anapata maziwa ya kutosha</i> I can always determine that my baby is getting enough milk	0.785	0.240	-0.034
2	<i>Ninaweza kupambana na shughuli ya unyonyeshaji sawa na jinsi ninavyoweza kukabilia na shughui nyinginezo</i> I can always successfully cope with breastfeeding like I have with other challenging tasks	0.562	0.329	0.113
3	<i>ninaweza kumnyonyesha mtoto wangu bila kumpatia vyakula vingine hadi mwezi sita itimie</i> I can always breastfeed my baby without giving other feeds	0.466	0.611	0.026
4	<i>Ninaweza kuhakikisha kuwa mtoto wangu ameshikilia titi vyema wakati wote wa kunyonyesha</i> I can always ensure that my baby is properly latched on for the whole feeding	0.903	0.066	-0.201
5	<i>Ninaweza kumudu hali yote ya unyonyeshaji kwa hali ya kuniridhisha</i> I can always manage the breastfeeding situation to my satisfaction	0.924	0.042	-0.145
6	<i>Ninaweza kumudu kunyonyesha hata kama mtoto wangu analia</i> I can always manage to breastfeed even if my baby is crying	0.706	0.102	0.354
7	<i>Ninaweza kuendelea kupenda kunyonyesha</i> I can always keep wanting to breastfeed	0.746	0.132	-0.015
8	<i>Ninaweza kunyonyesha hata mbele ya watu wa familia yangu bila kuona haya</i> I can always comfortably breastfeed with my family members present	0.521	-0.678	0.302
9	<i>Huweza kutosheka na kitendo cha kunyonyesha</i> I can always be satisfied with my breastfeeding experience	0.891	-0.024	-0.143
10	<i>Huweza kukubaliana na ukweli kuwa unyonyeshaji huchukua muda mwingi</i> I can always deal with the fact that breastfeeding is time consuming	0.665	-0.539	0.106
11	<i>Huweza kumaliza kumnyonyesha moto wangu kwa titi moja kabla ya kumbadilisha kwa jengine</i> I can always finish feeding my baby on one breast before switching to the other	0.320	0.160	0.873
12	<i>Huweza kuendelea kumnyonyesha mtoto wangu hata wakati hajisikii vizuri/ mgonjwa</i> I can always continue to breastfeed my baby even when he/she is unwell	0.893	-0.047	-0.119
13	<i>Huweza kukabilia na kutimiza mahitaji ya mtoto wangu ya kunyonya</i> I can always manage to keep up with my baby's breastfeeding demands	0.919	-0.083	-0.125
14	<i>Huweza kujua wakati mtoto wangu amemaliza / kutosheka kunyonya</i> I can always tell my baby is finished breastfeeding	0.614	-0.205	-0.212

* Figures > 0.5 indicate a significant contribution of the item

In component 1 all factors loaded around the breastfeeding technique and intrapersonal thoughts sub-scales with only 2 items having a factor of less than 0.5; *ninaweza kumnyonyesha mtoto wangu bila kumpatia vyakula vingine hadi mwezi sita itimie* and

Huweza kumaliza kumnyonyesha mtoto wangu kwa titi moja kabla ya kumbadilisha kwa jingine. All the 14 items loaded on this factor and ranged from 0.92 to 0.32. A 0.32 value is recommended for item retention (Tabachnick & Fidell, 2001), and therefore all items were retained. Three items loaded in component 2 relating to both confidence in the breastfeeding technique and intrapersonal thoughts. Notably there was a negative relationship between BSES-SF and the intrapersonal thoughts (ability to breastfeed in public) and one of the breastfeeding techniques (ability to EBF until 6 months). One item in the breastfeeding technique sub-scale loaded on the third component, *huweza kumaliza kumnyonyesha mtoto wangu kwa titi moja kabla ya kumbadilisha kwa jingine.*

To replicate the original methodological study (Dennis 2003), a one factor component was requested and this time, only 53.6% variance was explained and 78.6% of the items had values greater than 0.32 showing strong inter-item correlation. This differed slightly with the original study (Dennis 2003) that explained 58.35% of the variance. This difference might have been due to socio-economic and cultural differences among the two populations involved in the study and differences in the sample sizes.

2) Perceptions scales

Perceived susceptibility

Both Principal components extraction technique and principal components extraction with varimax rotation (orthogonal) were performed. Principal component analysis was performed with an Eigen value of 1.0. Three factors produced an Eigen value greater than one that explained 70.90% of the total variance in the scale, and were retained for further rotation analysis. Factor I had an Eigen value of 6.40, which explained 45.74% variance. Factor 2 had an Eigen value of 2.21, which explained 15.76% and factor 3 had an Eigen value of 1.32, and explained 9.40% of the total variance.

The Principal components extraction with varimax rotation (orthogonal) was further performed and it yielded 3 components as indicated in the Table 7 below with rotation converging in 5 iterations.

Table 7: Rotated component matrix for the susceptibility scale

S/NO	Statement/Matamko	Components		
		1	2	3
1	<i>Kutokua vyema</i> (Underdevelopment)	0.853	0.076	0.158
2	<i>Mafua</i> (Cold)	0.907	0.111	0.193
3	<i>Mzio</i> (Allergy)	0.738	0.028	0.239
4	<i>Pumu</i> (Asthma)	0.841	0.105	0.175
5	<i>Kifo cha ghafla</i> (Sudden Infant death syndrome)	0.503	0.418	0.364
6	<i>Kisukari</i> (Diabetes)	0.271	0.088	0.716
7	<i>Kuharisha</i> (Diarrhoea)	0.087	0.893	0.080
8	<i>Kuvimbiwa</i> (Indigestion)	-0.139	0.882	0.024
9	<i>Maradhi ya sikio</i> (Ear infection)	0.079	0.354	0.674
10	<i>Nimonia/ kichomi</i> (Pneumonia)	0.279	0.562	0.562
11	<i>Ubotuli wa kitoto</i> (Infant Botulism)	0.296	0.703	0.356
12	<i>Ugonjwa wa utandu wa ubongo</i> (Menengitis)	0.414	0.636	0.438
13	<i>Kunenepa</i> (Obesity)	0.216	0.248	0.740
14	<i>Ugojwa ya moyo uzeeni</i> (CVD in adulthood)	0.205	-0.036	0.844

* **Figures>0.5 indicate a significant contribution of the item**

Items that loaded in component 1 were factors with some congruency with problems related to child growth and those that affect development and good health (Table 7 above). Items that loaded in component 2 related to gastro intestinal infections associated with early complementary feeding (less than six months). This means that the mothers were cognizant of the fact that infection increased with early complementary feeding. On the other hand, items that loaded in component 3 related to two sub scales; being overweight/ obese and respiratory tract infections. They included *kisukari* (diabetes) *Kunenepa* and *Ugojwa ya moyo uzeeni*. Those relating to respiratory tract infections were *Maradhi ya sikio* and *nimonia*. Overall 4 sub-scales were identified; problems related to child growth and those that affect development and good health; those relating to gastro intestinal infections, being overweight/ obese and lastly those relating to respiratory tract infections.

3) Perceived threats

When subjected to the principal components extraction (PCA) the perceived threats questionnaire rotation converged in 3 iterations. Two factors produced an Eigen value greater

than 1 that explained 72.55% of the total variance in the scale, and were retained for further rotation analysis. Factor I had an Eigen value of 7.367, which explained 61.39% variance. Factor 2 had an Eigen value of 1.338, which explained 11.15% of the total variance.

The PCA with varimax rotation (orthogonal) was further performed and it yielded 2 components as indicated in the Table 8. Rotation converged in 3 iterations

Table 8: Rotated component matrix for threats scale

S/NO	Statement/ <i>Matamko</i>	Components	
		1	2
1	<i>Mafua</i> (Cold)	0.385	0.814
2	<i>Mzio</i> (Flu)	0.005	0.935
3	<i>Pumu</i> (Asthma)	0.402	0.678
4	<i>Kifo cha ghafla</i> (Sudden Infant Death Syndrome)	0.880	-0.040
5	<i>Kisukari</i> (Diabetes)	0.698	0.370
6	<i>Kuharisha</i> (Diarrhoea)	0.721	0.483
7	<i>Kuvimbiwa</i> (Indigestion)	0.700	0.523
8	<i>Maradhi ya sikio</i> (Ear Infection)	0.566	0.509
9	<i>Nimonia/Kichomi</i> (Pneumonia)	0.881	0.223
10	<i>Ubotuli wa kitoto</i> (Infant botulism)	0.777	0.402
11	<i>Ugojwa wa utandu wa ubongo</i> (Menengitis)	0.742	0.321
12	<i>Kunenepa</i> (Obesity)	0.623	0.519

* **Figures>0.5 indicate a significant contribution of the item**

Items that loaded in component 1 were factors relating to poor health as a result of infections while those that loaded in component 2 related to allergic reactions although two items relating to infections ‘*kuvimbiwa* (indigestion) and *Maradhi ya sikio* (ear infections) also loaded on this component. Two factors were therefore identified through the principal components extraction with varimax rotation; allergic reactions and general infections in childhood.

4) Perceived barriers

In this scale, similarly both principal components extraction technique and principal components extraction with varimax rotation were performed. Principal component analysis was performed with an eigenvalue of 1.0 and two factors produced an eigen value greater than 1 that explained 62.38% of the total variance in the scale, and were retained for further rotation analysis. Factor I had an eigenvalue of 1.912, which explained 38.24% variance. Factor 2 had an eigenvalue of 1.21, which explained 24.14%.

The principal components extraction with varimax rotation was further performed and it yielded 2 components as indicated in the Table 9 below. Rotation converged in 2 iterations.

Table 9: Rotated component matrix for perceived barriers scale

S/NO	Statement/ <i>Matamko</i>	Components	
		1	2
1	<i>maziwa hayamtoshi mtoto</i> (Milk not adequate for baby)	0.385	0.814
2	<i>Kurudi kazini</i> (Going back to work)	0.005	0.935
3	<i>sijui jinsi ya kukamua</i> (Do not know how to express)	0.402	0.678
4	<i>mamevyaa yangu alinikataza</i> (My mother in-law discouraged me)	0.880	-0.040
5	<i>Sababu nyingine muhimu (shangazi n.k.)</i> Other significant factors(aunties etc)	0.698	0.370

* **Figures >0.5 indicate a significant contribution of the item**

When responses were subjected to principal components analysis with a varimax rotation, they yielded two sub-scales; technique and interpersonal subscales. Items that loaded in component one are factors that related to influence from significant others (interpersonal) while items loading in component two related to technical aspects of breastfeeding such as ability to express the milk and going back to work.

5) Perceived benefits

Both Principal components extraction technique and principal components extraction with varimax rotation were also performed on this scale. Principal component analysis was performed with an Eigen value of 1.0. Three factors produced an Eigen value greater than 1 that explained 72.83% of the total variance in the scale, and were retained for further rotation analysis. Factor I had an Eigen value of 4.27, which explained 42.69% variance. Factor 2 had an Eigen value of 1.860, which explained 18.60% and factor 3 had an Eigen value of 1.15, and explained 11.54% of the total variance. Principal components extraction with varimax

rotation was further performed and it yielded 2 components as indicated in the Table 10 rotation converged in 5 iterations.

Table 10: Rotated component matrix for perceived benefits scale

S/NO	Statement/Matamko	Components		
		1	2	3
1	<i>Kuimarika kwa Afya bora ya mtoto kwa jumla</i> Improved overall infant health	0.030	0.728	0.092
2	<i>Kuimarika kwa kupunguza uzani kwa mama</i> Improved mother's weight loss	0.098	0.431	0.252
3	<i>Kuimarika kwa afya ya mama kwa jumla</i> Improved overall health of the mother	0.143	0.763	-0.198
4	<i>Kuondoa usumbufu</i> Increased convenience	0.286	0.823	-0.052
5	<i>Kutumika kama njia ya kupanga uzazi</i> Used as a birth control	0.280	0.719	0.244
6	<i>Haina gharama kama maziwa ya mkebe</i> Less expensive than formula	0.200	-0.036	0.899
7	<i>Haina chupa wala vifaa vingine vya kuoshwa</i> No bottles/ equipments to wash	0.219	0.150	0.891
8	<i>Huimarisha mshikamano wa mama na mtoto</i> Improved bonding with baby	0.885	0.269	0.179
9	<i>Kuimarisha faida za akili za mtoto</i> Improved infant cognitive benefits	0.941	0.214	0.149
10	<i>Kuimarika kwa ukuaji wa mtoto</i> Improved infant development	0.894	0.137	0.230

* *P* value>0.5 indicate a significant contribution of the item

When responses were subjected to principal components analysis with a varimax rotation, apparently all the responses with an exception of *Kuimarika kwa kupunguza uzani kwa mama* the benefit of reducing the mother's weight loaded in one component or the other.

1) Household food security access scale and Individual Dietary Diversity Scales (IDDS)

Rotation converged in 3 iterations for the Household food insecurity access scale (Table 11) while varimax rotation analysis identified two constructs being measured. All the items loaded on either of the components, with two sub scales being identified; the fear of lacking food and coping strategies.

Table 11: Rotated Component Matrix for Household food security access scale

Statement	Component	
	1	2
Did you fear you would lack food?	0.407	0.685
Did you miss what you preferred?	0.140	0.960
Did you eat monotonous Food?	0.175	0.930
Did you eat survival foods?	0.756	0.370
Were you forced to eat smaller amounts?	0.796	0.348
How many times?	0.812	0.177
Did you lack food because of resources?	0.918	0.172
Did you sleep without food?	0.887	0.181
Did you spent day and night without food?	0.856	0.140

* *P* value>0.5 indicate a significant contribution of the item

Rotation converged in 12 iterations for the IDDS tool after cereals was removed since all respondents had eaten this group of foods and had no variability. Varimax rotation analysis identified six constructs being measured with all items loading on one of the six with an exception of “other vegetables”

4.3.5 Predictive validity

1) BSES-SF

Predictive validity was evaluated by determining the relationship between the tools and exclusive breastfeeding as recommended by Nunnally & Bernstein (1994). Determining the relationship between perceptions and breastfeeding self-efficacy, and infant feeding method 6 weeks postpartum was therefore used to assess the predictive validity of the scales. Exclusive breastfeeding was defined as receiving only breastmilk with no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines. Infants who had received pre lacteal feeds were therefore considered to be predominantly breastfeeding but not being EBF.

By both Pearson Chi-Square and Fisher's Exact Test the duration of EBF in the two groups (intervention and comparison) were significantly different, with $P=.013$ and 0.023 for the two tests respectively. The BSE scores taken at 6 weeks and not at baseline were able to predict EBF duration. Meaning that scores might have been improved by the nutrition education and hence were able to influence mothers in their choices in infant feeding. Although the other perceptions were higher at 6 weeks in the intervention than in the

comparison group, they did not predict EBF duration by logistic regression as showed in Table 12 below.

Table 12: Coefficients of stepwise regression for effect BFSE in predicting EBF at 6 weeks post-partum (N = 39)

Predictors	B	S.E.	Wald	Sig.	Exp (B) OR
Totals BSE at 6 weeks	0.755	0.304	6.166	0.013*	2.127
Totals BSE recruitment	0.132	0.090	2.161	0.142	1.141

***Significant at $p < 0.05$, B= logit coefficient Exp B=odds ratio, S.E= standard errors wald= Wald chi-square test CI = Confidence Interval**

When bivariate logistic regression was performed all the perceptions and the BSE did not independently predict breastfeeding outcomes among the nursing mothers. This may imply that the one time encounter during the hospital stay after delivery may not have been adequate to impact on the mothers and since they were recruited during their last clinic visit before delivery, decisions may have already been made on how to feed their infants. The Table 13 below shows results of the multiple regression.

Table 13: Coefficients of stepwise regression for effect of BSE and perceptions in Predicting EBF at 6 weeks post-partum (n = 39)

Predictors	B	S.E.	Wald	Sig.	Exp (B) OR
Totals BSES at 6weeks	-0.342	0.207	2.74	0.098	0.710
Totals susceptibility at 6weeks	-0.165	0.078	4.45	0.035	0.848
Totals threats at 6weeks	0.184	0.098	3.51	0.061	1.202
Totals barriers at 6weeks	0.105	0.166	0.40	0.527	1.111
Totals benefits at 6weeks	0.327	0.322	1.04	0.309	1.387

***Significant at $p < 0.05$, B= logit coefficient Exp B=odds ratio, S.E= standard errors Wald= Wald chi-square test CI = Confidence Interval**

4.4 Reliability

4.4.1 Internal Consistency

The reliability of the translated version of the Kiswahili tools was determined using internal consistency technique. A score from one item was correlated with score from other items in the instruments. The Criteria used included 1) Cronbach's Coefficient Alpha which is a generated form of Kuder-Richardson K-R 20 formula was computed to determine reliability. When a Coefficient of 0.7 was achieved, the instruments were considered reliable. 2) Corrected item-total correlation, and (3) alpha estimate when an item was dropped from the scale. This criterion was used in similar studies that validated the BSES scale into the Chinese version (Dai and Dennis 2003), Handayani *et al* (2013) into Indonesia and Dodt *et al* (2012) into Brazil.

1) BSES-SF

The Cronbach's alpha coefficient for the Kiswahili version of the BSE scale was 0.909 and was not increased by more than 0.10 if any of the items were deleted. This was an indication of good correlation and compared well Dennis 2002 at 0.94. It exceeded that of Handayani *et al* (2013) of 0.77 who translated the BSES -SF into Indonesia and Dodt *et al* (2012) of 0.74 who translated the BFSE-SF into Brazil. It was slightly lower than that of Otsuka *et al*, (2014) of 0.95 in Japan. All the corrected item-total correlations were positive and above 0.30. However, only 64% of all corrected item-total correlations ranged between 0.30 and 0.70 which is recommended. This differed slightly with Dennis (2002) who recorded 73% of all corrected item-total correlations ranging between 0.30 and 0.70. The Kiswahili translated BSES-SF mean score was 60.95 ($SD \pm 10.36$), an item mean of 4.354, ranging from 3.69 to 5.595 and an item variance of 1.193, ranging from 0.539 to 2.268. Finally, the mean inter item correlation was 0.468. These results did not differ with those of the initial BSES-SF (Dennis 2002), which had a scale mean of 55.88 ($SD = 10.85$), item mean of 3.99, ranging from 3.71 to 4.13, a variance of 1.04, ranging from 0.75 to 1.56; the mean inter-item correlation was 0.55, ranging from 0.41 to 0.73 an indication that the Kiswahili translated BSES-SF was reliable for identifying mothers who were at risk of early termination of breastfeeding hence enable planning for interventions to assist them.

2) The perceived susceptibility

The Kiswahili perceived susceptibility scale had a Coefficient of 0.906, and was not increased by more than 0.10 if any of the items were deleted. This is an indication that the scale was reliable. All the corrected item-total correlations were positive and above 0.30.

With 79% of all corrected item-total correlations ranging between 0.30 and 0.70 which is recommended. The translated perceived susceptibility questionnaire mean score was 43.95 (SD \pm 12.73), with a variance of 162.10 an item mean of 3.14, ranging from 2.36 to 3.88 an item variance of 1.84, and an inter item correlation mean of 0.40.

3) Perceived threats

The Cronbach's alpha coefficient for the Kiswahili version of the perceived threats was 0.93 and was not increased by more than 0.10 if any of the items were deleted. This was an indication of a very good correlation. All the corrected item-total correlations were positive and above 0.30. However only 67% of all corrected item-total correlations ranged between the recommended 0.30 and 0.70. The translated perceived threats scale had a mean score of 46.71 (SD \pm 11.72), with a variance of 137.28 an item mean of 3.89, ranging from 3.21 to 4.36 and an item variance of 1.64, ranging from 0.84 to 2.77. Finally, the mean inter item correlation was 0.57.

4) Perceived barriers

The Kiswahili version of the perceived barriers scale Cronbach's alpha coefficient was 0.340 with five items but it was improved to 0.67 by removing "others". It was not increased by more than 0.10 if any of the items were deleted after "others" was removed. All the corrected item-total correlations were positive and above 0.30, 100% of all corrected item-total correlations ranged between 0.30 and 0.70. The translated perceived threats scale had a mean score of 8.81 (SD \pm 3.56), with a variance of 12.70 an item mean of 2.20, ranging from 1.41 to 2.93 and an item variance of 1.71, ranging from 0.69 to 2.74. The scale was therefore reliable.

5) Perceived benefits

The Cronbach's alpha coefficient for the Kiswahili version of the perceived benefits was 0.78 and was not increased by more than 0.10 if any of the items were deleted. All the corrected item-total correlations were positive and above 0.30, with all (100%) corrected item-total correlations ranging between 0.30 and 0.70. The translated tool mean score was 44.05 (SD \pm 4.99), with a variance of 24.93 an item mean of 4.41, ranging from 3.43 to 4.810 and an item variance of 0.74, ranging from 0.21 to 1.94, the mean inter item correlation was 0.34.

6) Individual Dietary Diversity Score and the Household Food Insecurity Access Scale

For the IDDS and the HFIAS tools, only the Cronbach's alpha coefficient was computed since the two have been previously validated and used in the Kenyan population and particularly in low social economic settings (Mwangi & Mbera, 2006). The Kiswahili version of the IDDS Coefficient was 0.7 and that of the HSIAS tool 0.89.

4.5. Observed changes after intervention

4.5.1 Perception and breastfeeding self-efficacy scores after the intervention

This aspect was tested by comparing the perceptions of the mothers at recruitment and after two weeks postpartum.

The mean perceptions and BSE scores are presented on table 14 and 15 respectively

Table 14: Mean perceptions and BSE scores at baseline on the pilot study

Perceptions	All (n=42)	Intervention (21)	Comparison (21)	P value
Susceptibility	44.41 ± 13.07	46.33±14.19	41.57±10.91	0.230
Threats	46.31 ± 11.98	49.28±12.00	44.14±11.11	0.157
Barriers	12.18 ± 3.84	12.52±4.08	11.90±3.55	0.503
Benefits	43.72 ± 4.99	46.71±3.38	41.38±4.97	0.001*
BSE	61.02 ± 10.27	59.71±12.80	62.19±7.28	0.445

***Data is presented as mean and standard deviation; *p*-value < 0.05 by t-test**

From the Table 14 above there were no significant statistical differences between the two groups in perceptions and the BSE other than perceptions to the benefits of exclusive breastfeeding at recruitment. After six weeks however the two group's perceptions and BSE means were statistically significant as illustrated in the Table 15 below.

Table 15: Perception at recruitment and after six weeks postpartum

	All (42) Before	All (39) After	P value
Susceptibility	44.41±13.07	53.46±14.41	0.003*
Threats	46.31±11.98	52.67±8.41	0.001*
Barriers	12.18±3.84	10.28±3.21	0.000*
Benefits	43.72±4.99	45.54±3.63	0.005*
BSES	61.03±10.27	66.59±4.15	0.001*

Data is presented as mean and standard deviation; *p*-value*Significant at < 0.05 by t-test

Perceptions which included perceptions to susceptibility and threats to the various conditions if infants were not exclusively breastfed perceived barriers and benefits to/for exclusive breastfeeding plus breastfeeding confidence as the outcome measure were analyzed using t-tests.

Score before and after were compared by paired t-test for equality of means and there were significant differences in the totals of the combined groups at six weeks postpartum, (susceptibility $P=0.001$, threats $P=0.001$, barriers $P=0.001$ benefits $P=0.005$ and BFSE $P=0.001$)

This is an indication that the structured nutrition education intervention had some effects on the mothers' perceptions.

4.5.2 Differences in infants anthropometry by study group after intervention

Information on infant anthropometry was collected from all infants during the 6 weeks postnatal visit and data on birth weight extracted from the mothers' clinic book (Table 16).

Table 16: Infant's anthropometry

	Intervention (18)	Comparison (19)	P value
Birth weight	3.28±0.35	3.15±0.35	0.248
Weight at 6 weeks	4.90±0.44	4.66±0.30	0.050*
Length at 6 weeks	55.89±0.16	55.08±0.19	0.856
BMI for age	0.45±0.91	-0.19±0.56	0.013*
Weight for Age	0.21±0.71	-0.30±0.46	0.013*
Weight for length	0.63±0.91	0.05±0.62	0.031*
Length for age	-0.22±0.39	-0.36±0.43	0.308

Data is presented as mean and standard deviation; p -value < 0.05 by t-test

The mean infant birth weight in the intervention group was 3.2 kg (± 0.35) and 3.1 kg (± 0.35) in the comparison group. Of the total 50% were females with 57.8% and 52.6% in the intervention and comparison groups respectively with no statistical difference in the two groups ($p=0.744$) while 40.5% were male with 42% and 47% in the intervention and comparison groups respectively. At six weeks the weights were 4.90 (0.44) for those in the intervention group and 4.66 (0.30) in the comparison while there was no difference in the length at 55 cm in both groups. Body mass index (BMI) for age Z-scores mean for the intervention and comparison groups was 0.45, -0.19 (t-test $p=0.013$) weight for age Z-scores 0.21, -0.30 (t-test $p=0.013$) weight for length Z-scores mean 0.63, 0.05 (t-test $p=0.031$) length for age Z-scores mean -0.22 and -0.36 (t-test $p=0.308$) respectively. There was a statistical difference between the two groups for weight for age, weight for length and BMI for age Z-scores. These results differ with Engebretsen *et al* (2014) who found no statistical difference in weight for length Z-scores in Burkina Faso and South Africa, but a statistically significant difference in Uganda. Ochola *et al* (2008) also found no statistical differences in weight among the study groups in a study that aimed at EBF promotion.

4.5.3 Differences in infant feeding practices during the first week and six weeks after birth by study group

Details of infant feeding during the first week postpartum were sought from the mothers six weeks after delivery. Information sought included period between birth and breastfeeding initiation, pre-lacteal feeds given (if any) and any other food/drink that had been given during the first week post-partum. Results revealed that one infant (5%) in the comparison group had received salty water in the first three days and none in the intervention group ($p=0.324$). Two infants in both groups received plain water in the first three days ($p=0.954$) at one week, while one and nine in the intervention and comparison groups respectively received water during the first six weeks ($p=0.002$) revealing a statistically significant difference in the two groups. The indication here is that giving water is more rampant during the first week of the infants' life.

When breastfeeding initiation information was sought, those in the comparison had a higher percentage initiating breastfeeding less than one hour as recommended compared to those in the intervention group (36.8% and 26% in the comparison and intervention groups respectively) however the difference was not statistically significant as showed on Table 17 (page 66) (Chi-square test; $p=0.190$). A majority, 68% and 42% in the intervention and comparison arms respectively initiated breastfeeding after one hour after delivery while 5% in the intervention and 21% in the comparison initiated breastfeeding at once after birth. These differences in breastfeeding initiation may have been due to the higher numbers in the intervention group that gave birth at home.

Table 17: Comparison of breastfeeding Practices by group

	Intervention	Comparison	P value
Breastfeeding initiation			0.190
At once	5.0	21.0	
<1hr	26.0	36.8	
1-24hours	68.0	42.0	
Exclusive Breastfeeding at 1week			1.000
EBF	88.88	89.47	
Predominant breastfeeding	11.11	10.53	
Exclusive Breastfeeding at 6week			0.023*
EBF	47.06	23.53	
Predominant breastfeeding	52.94	76.47	

Data is presented as proportions; statistical significance, P value < 0.05 by Chi-square test;

4.5.4 Differences in EBF status by study group

Exclusive breastfeeding was measured at the first and sixth weeks postpartum by asking mothers to list what they had given their infants and probing. In the intervention group rates of exclusive breastfeeding were 88.8% while it was 89% in the comparison arms. Both Fisher's Exact test and Continuity corrected Chi square were used to test the difference and they indicated an insignificant difference between the two groups ($p=1.000$).

After the six weeks postpartum rates of exclusive breastfeeding were 47.06% and 23.53% for the intervention group and the comparison arm respectively. There was a significant difference between the two groups ($p=0.013$) for the Continuity corrected Chi square and $p=0.023$) using the Fisher's Exact test. Refer to Table 17 above. Although there was a significant difference between the two groups the rates of EBF at 6 weeks particularly for the intervention group were very low in the context of an intervention. This suggests inadequate time for the intervention since mothers were recruited and educated during their last clinic visit and for one home visit thereafter before delivery.

4.5.5 Household food security situation by study group after the intervention

Household food security as measured by the use of the FAO/FANTA Household Food Insecurity Access Scale. A majority of the respondents were food secure, at 33.3% ($n=14$) 19% ($n=8$) were mildly food insecure, both moderately food insecure and severely food insecure were 23.8% ($n=10$). No statistically significant association was found between household food security and EBF status by the Fisher's Exact test $p=0.381$ and the difference between the groups were insignificant $p=0.307$. This deferred from results from Aimee *et al.* (2010) which observed an association between household food security and EBF duration. The difference might have been because of a small sample size in this pilot study.

4.5.6 Dietary diversity by study group after the intervention

Individual mother's dietary diversity was assessed at baseline and at six weeks postpartum with data collected using a 24 hour qualitative dietary assessment tool. No statistically significant differences were found between the two groups at the two times ($p=0.227$ at baseline and $p= 0.415$ at six weeks respectively). This is an indication that the randomization process was successful but it would also mean that nutrition education alone is not adequate in changing eating patterns of households which is supported by Ruel *et al.* (2000).

4.6 Socio-demographic characteristics of the respondents' household food security and post-partum factors of mothers for the main study.

4.6.1 Socio-economic and demographic characteristics

a) Age, body mass index (BMI), ethnicity, marital status, parity, education level, household income, and employment

Table 18 illustrates the continuous demographic characteristics for both groups that were hypothesized to potentially affect breastfeeding outcomes. The overall mean age of the sample was 24.06 years old (minimum age 18 years and maximum 38 years) intergroup means were 24.15 and 23.99 years in intervention and comparison respectively. By t-test for equality of means, the difference in mean age in the two groups was insignificant ($p>0.05$). Pre pregnancy BMI was computed from reported pre pregnancy weight and height taken at recruitment. Few participants (235; 54.5%) were able to recall their weight. There was no significant difference ($p>0.05$) between the BMI of the intervention group (23.09 ± 3.45 kg/m²) and the comparison (23.36 ± 3.867 kg/m²). An indication that most women fell under the “normal nutrition” category of 18.5 kg/m² -24.5 kg/m². The results should however be interpreted with caution since the weights of the respondents were recalls.

Table 18: Socio-demographic characteristics

	n	Study groups				Chi-Square	P-value
		All (Mean±SD)	Intervention (Mean ± SD)	Comparison (Mean ± SD)			
Age of the mothers	431	24.06±4.38	24.15±4.36	23.99±4.41	0.103	0.701	
Birth weight	348	3.15±0.48	3.14 ±0.15	3.16 ± 0.47	0.491	0.756	
BMI at recruitment	235	23.23±3.66	23.09 ± 3.45	23.36 ± 3.87	0.627	0.965.	

***Data is represented as mean and standard deviation; statistical significance, P value < 0.05 BMI-test; * Kg/m²**

Mothers were predominantly from Kikuyu ethnic community (59.4%), with no difference ($p>0.05$) between the intervention (56.8%) and comparison (61.2%) groups. The Kamba community had second largest percentage with 18.6% and inter-group percentages of 21.6% and 16.5% in intervention and comparison groups respectively. There was no significant inter group differences (Pearson Chi-square= 3.698, $p=0.718$) Those married were the majority (87.9%), and almost evenly split between having their first and subsequent pregnancies- 45% and 55%, respectively.

As shown on Table 19 below, only 1.6% of the total sample had no formal education, 30.2% had primary education while 53.8% had secondary education. Only 14.4% had tertiary education with insignificant differences ($p=0.05$). Collapsing the education levels into Primary and less, high school and more than high school, the difference persisted. In the intervention group 31.2% had primary education and less while in the comparison group it was 32.2%. Those with secondary education were 68.2% overall (68.8% in the intervention and 67.8% in the comparison group) $\chi^2=0.039$, $p=0.842$. Education levels were further collapsed into three categories; primary and below, secondary and above secondary. Those with primary school education and below were 40.8%, 45.2% overall had secondary education while those with education above secondary school were 13.9% overall. The differences remained insignificant at Pearson Chi square $p=0.130$.

Table 19: Percentage distribution of socio-economic and demographic characteristics of the study participants

	Intervention (n=176)	Comparison (n=255)	All (n=431)	χ^2^*	P-value*
Ethnicity				3.698	0.718
Kikuyu	56.8%	61.2%	59.4%		
Kamba	21.6%	16.5%	18.6%		
Luyha/Kisii	6.3%	8.6%	7.7%		
Luo	7.4%	5.5%	6.3%		
Meru	2.3%	3.1%	2.8%		
Embu	4.0%	3.1%	3.5%		
Others	1.7%	2.0%	1.9%		
Marital Status				1.042	0.307
Married	87.5%	90.6%	89.3%		
Single/Separated/Divorced	12.5%	9.4%	10.7%		
Type of employment				1.549	0.671
Informal	21%	25.1%	23.4%		
Formal	5.7%	3.9%	4.6%		
Business	22.7%	22.7%	22.7%		
None	50.6%	48.2%	49.2%		
Parity				0.117	0.733
Primi-parous	52.8%	54.5%	53.8%		
Multi-parous	47.2%	45.5%	46.2%		
Education Level				0.039	0.842
≤ Primary	40.1%	41.2%	40.7%		
>Primary	59.9%	58.8%	59.3%		
1) Household Income					0.096
<3900	3.4%	6.3%	5.1%	10.754	
3901-7800	12.5%	14.5%	13.7%		
7801-11700	16.5%	24.7%	21.3%		
11701-15600	42%	30.6%	35.3%		
15601-19500	11.9%	12.9%	12.5%		
19501-23 400	13.6%	10.6%	11.8%		
>23400	0.0%	0.4%	0.2%		
2) Household Income					0.708
≤11700	43.7%	45.7%	44.7%	3.568	
>11700	56.3%	54.3%	55.3%		

- **Comparison between intervention and comparison group using Chi-square test; significance level, $P < 0.05$**

Education level is an important variable as studies have showed associations between this variable with rates of exclusive breastfeeding, (Setegn *et al.*, 2011, Vieira *et al.*, 2013, and Liben. 2016). Low maternal education levels have been associated with early weaning, (Wijndaele *et al.*, 2009 and Das *et al.*, 2013). It was therefore important that this variable is measured to establish its association or lack of, in this study.

The household income variable was assessed by asking respondents to estimate how much the household received in a month. Seven classifications were designed (<3900; 3901-7800; 7801-11 700; 11701-15600; 15601-19500; 19501-23400 and >23400 KES). The highest percentage of participants earned between 11,701- 15600 KSh per month (42% and 30.6% in the intervention and comparison groups respectively. The intervention and comparison groups did not show any significant difference in income ($\chi^2=10.754$, $p=0.096$). The income classification was collapsed into a dichotomous variable [Kenya shilling (KES) <11700 and above 11700). Those below KES 11700 were 40.6% (33.5% and 45.5% in the intervention and comparison groups respectively) while those above 11700 KES were 59.4%. (56.3% and 54.5% in the intervention and comparison groups respectively (1 US \$ is equivalent to 100 KES). Between group differences remained insignificant ($p=0.05$). The randomization process was therefore successful.

This variable was assessed in this study as household income levels have been associated both positively (Kimani-Murage *et al.*, 2011; Ochola, 2008 & Mc Carter, 2007), and negatively (GDHS 2015 and GDHS, 2014) with rates of exclusive breastfeeding in studies. Household income is correlated with EBF in a later discussion in this write-up.

When the respondents' employment was investigated, four classifications were arrived at from the data obtained since it had not been categorized a priori (as showed on Table 19). They included informal; formal; business and none for non-paid up engagements like housewives. No significant differences within groups was observed ($\chi^2=1.549$, $p=0.671$).

This variable was similarly assessed to be able to find out if it influenced EBF and mothers' perceptions on EBF (discussed later in this chapter). Formal employment has been associated with duration of EBF (Taddele, Abebe and Fentahun, 2014) since it deprives mothers time required for breastfeeding especially when they work far away from their homes, which often is the case since maternity leave is only 90 working days. Similarly informal employment especially among the urban poor deprives mother-infants dyads of the time required for EBF. The main concern for this group of people is often a source of livelihoods which is often limited. They often work for long hours under circumstances which are not conducive even if they were to carry their infants, which often is not the case.

Parity was assessed as a dichotomous variable (Prim gravid/Multiparous). Between group findings were not significantly different ($\chi^2= 0.117$ $p=0.733$), and almost evenly split within the intervention group (prim gravid 52.8% and 47.2% multiparous).

All the socio-economic variables yielded non-significant differences, an indication that the randomization process was successful hence differences in results in the two groups after the intervention can be attributed to the effect of the intervention.

b) Asset ownership

Table 20, is a summary of the assets owned by the respondents in the study. Ownership of some consumer goods may influence the knowledge levels and hence health status of a household. For instance owning a television set or radio exposes household members to health education programmes and advertisements which in turn may positively influence decision making of especially the care givers. These goods are also a good indicator of a household's socio-economic status. According to the results ownership of a mobile phone is almost universal, it is followed by the radio and then the television set.

Table 20: Household possessions percentage of households with various possessions by study group

Possessions	Study Group			P- Value
	Intervention (n 176)%	Comparison Group (n 255)%	Totals (n 431)%	
Wall Clock	26.1	26.3	26.2	0.974
Radio	80.1	85.5	83.3	0.141
Television	64.2	74.5	70.3	0.021*
Mobile phone	90.9	94.1	92.8	0.205
Refrigerator	2.8	2.0	2.3	0.551
Solar panel	5.1	2.7	3.7	0.201
Bicycle	26.7	27.8	27.4	0.794
Animal drawn cart	0.6	2.0	1.4	0.225
Motorcycle	9.7	14.5	12.5	0.135
Car-track	4.0	2.7	3.2	0.478
Ownership of dwelling	11.9	12.9	12.5	0.756
Ownership of land on dwelling	17.6	18.0	17.9	0.910
	4.0	4.3	4.2	0.864
Ownership of farm animals	9.7	8.6	9	0.740
Ownership of milk animals Chicken	19.9	16.1	17.6	0.308

*Comparison between intervention and comparison group using Chi-square test; significance level, P<0.05

The findings are similar to those of KNBS & ICF Macro, (2014) which indicate that 94% of households possess a mobile phone (more than 9 in 10 urban households) in Kenya. In this study 92.8% of households possessed a mobile phone. Eighty three percent of households had a radio, and seventy percent had a television set. The figures are slightly higher than those recorded by (KNBS & ICF Macro, 2014) for the two items in urban areas (74% and 56%, respectively).

As in the KNBS & ICF Macro, (2014) report bicycles are the most common means of transport owned by households. Means of transportation is an important variable in seeking health care. Twenty-seven percent of households own a bicycle compared to both motorcycles (12.5%) and car/truck (3.2%). Ownership of agricultural land, place of dwelling and farm animals was rare among this population which was understandable given that this was a low resource settlement. There were no significant differences between the intervention and comparison groups except for ownership of a television set ($p=0.021$) with a bigger percentage in the comparison group having this garget

4.3.2 Household food security

Table 21 illustrates results for household food security. This variable was measured by evaluating respondent's individual dietary diversity (IDDS) and food security status (using the Household food insecurity access scale (HHFIAS) which has four categories; food secure, mildly food insecure, moderately food insecure and severely food insecure.

a) Dietary diversity during pregnancy

Dietary diversity among the women was analyzed as a dichotomous variable according to the global dietary diversity indicator for women (the Minimum Dietary Diversity for Women by FAO/FANTA, 2014) This indicator categorizes dietary diversity into two; more than 5 and less than five food groups and is used for assessing food quality with a specific interest on micronutrients. Dietary diversity was assessed both at pregnancy (during the four visits) and during the 6th week, 10th week 14th week and 6 month visits post-partum. At recruitment, there was insignificant ($\chi^2= 35.321$, $p=0.345$) difference among the two groups in regards to IDD score. Over half 64.65% (65.6%, in the intervention and 63.7% in the comparison group) had low IDDS meaning, they had below 5 food groups while only 34% (31.8% in the intervention and 36.2% in the comparison groups) had over 5 food groups. There were however significant differences ($p\leq 0.05$) in the subsequent visits. During the second visit overall 59.1% had a low IDDS compared to 40.8%. In the third visit there was almost evenly split between having low diversity and high diversity- 52.6% and 47.3%,

respectively. Between group percentages were 43.9% and 56% for low and high diversity for the intervention group and 60.3% and 39.6% for the comparison group. Finally during the fourth visit, overall 47.2% had a low IDDS while 52.8% (65.1% and 41.9% in the intervention and comparison group respectively) had adequate IDDS (information on Table 21). The finding implies that the intervention may have had an effect on dietary diversity among the intervention group.

Table 21: Percentage of households by the various food security categories and dietary diversity by study group

Food security situation	Study groups			P-Value
	Intervention (n 176)%	Comparison Group (n 255)%	Totals (n 431)%	
Household food security				
Food secure	51.7	40	44.7	0.062
Mildly food insecure	14.2	16.1	15.3	
Moderately food insecure	16.5	25.5	21.8	
Severely food insecure	17.6	18.5	18.1	
Dietary Diversity (during pregnancy)				
1 st visit				
Low	65.6	63.7	64.7	0.345
Adequate	31.8	36.2	34	
2 nd visit				
Low	52.46	64.3	59.1	0.021*
Adequate	47.5	35.6	40.9	
3 rd visit				
Low	43.9	60.3	52.6	0.003*
Adequate	56	39.6	47.3	
4 th visit				
Low	34.8	67.6	47.2	0.000*
Adequate	65.1	41.9	52.8	
Dietary Diversity (during lactation)				
At 6 weeks				
Low	26.8	21	23.7	0.241
Adequate	73	78.8	76.2	
At 10 weeks				
Low	28	28.7	28.4	1.000
Adequate	71.9	71.2	71.5	
At 14 weeks				
Low	49.3	36.2	42.1	0.023*
Adequate	50.6	63.8	57.8	
At 6 months				
Low	34.7	31.95	33.2	0.605
Adequate	65.3	68.05	66.7	

*Comparison between intervention and comparison group using Chi-square test; significance level, $P < 0.05$

b) Dietary diversity during lactation

Dietary diversity was analysed (Table 21 above) and between groups differences determined. Intervention versus comparison group showed insignificant differences in three of the four visits at 6 weeks, 10 weeks and 6 months by Fisher's Exact test ($p = 0.241$, 1.000 , and 0.605 , respectively) but the difference was significant at 14 weeks post-partum by Fisher's Exact test $p = 0.023$. The overall rate at 6 weeks was 23.7% for the low IDDS while those who recorded adequate IDDS was 76.2% overall. At 10 weeks the overall rate for the low IDDS was 28.4% and those that had adequate IDDS were 71.5%. At the 14th week visit low IDDS for all the study respondents was 42.1% (49.3 and 36.2% in the intervention and comparison group respectively) while those who had adequate IDDS were 57.8% (50.6% and 63.8% in the intervention and comparison group respectively). At 6 months, 33.2% (34.7 and 31.95% in the intervention and comparison group) had low IDDS while 66.7% (65.3% and 68.05%) of the mothers' diet had a high IDDS as showed on Table 21. The dietary diversity of the mothers was much higher post-partum compared to the pregnancy period, which may give an implication that mothers are more concerned with their dietary intake during lactation as compared to the pregnancy period. The statistical significance at 14 weeks may have been by coincidence given the trend above.

c) Food access

Household food access is a component of household food security. In this study food access was measured using the Household Food Insecurity Access Scale (HHFIAS). Food secure households were 44.8% with between group rates of 51.7% and 40% in the intervention and comparison group, mildly food insecure households were 15.3%, those with moderate food insecurity were 21.8% while those with severe food insecurity were 18.1%. The between groups differences were statistically insignificant by $\chi^2 = 7.341$, $p = 0.62$ (Table 21). However although the group differences were statistically insignificant, it is important to note that slightly below half 44.7% of the respondents were food secure, meaning that a majority of the mothers were food insecure.

4.6.3 Intrapartum/postpartum factors

Table 22 shows the intra-partum/post-partum factors that were hypothesized to influence breastfeeding. Baby birth weight in kilograms and measured as a continuous variable yielded non-significant differences between the groups ($p = 0.756$) by t test for equality of means.

Table 22: Percentage distribution of Intra-partum/ postpartum factors characteristics of the study participants

Intra-partum/ Postpartum factors	Intervention (n 176)%	Comparison Group (n 255)%	All (n 431)%	χ^2	p- Value
Haemoglobin levels				0.145	0.703
Low	12	13.6	12.8		
High	88	86.4	87.2		
Type of Birth				0.202	0.653
Normal	96.1	96.9	96.6		
Caesarian	3.9	3.1	3.4		
Iron/Folic tablet intake				1.745	0.627
<30 tablets	49.3	56.3	53.3		
31-60 tablets	24.6	21.1	22.6		
61-90 tablets	19.7	17.9	18.7		
>90 tablets	6.3	4.7	5.4		
Pre-lacteal feeds				3.103	0.684
None	83.7	81.4	82.4		
Water	10.5	13.6	12.1		
Gripe water	1.3	1.7	1.5		
Formula	3.9	2.8	3.3		
Salty water	0.7	0.0	0.3		
Glucose water	0.0	0.6	0.3		
Pre-lacteal feeds (Dichotomous)				0.155	0.694
Yes	16.5	18.4	17.5		
No	83.5	81.6	82.5		
No of Clinic visits				7.814	0.005*
<4	31.4	52.8	42.1		
>4	68.6	47.2	57.9		
Initiation of Breast feeding				0.160	0.690
<1 hour	58.2	60.3	59.3		
>1 hour	41.8	39.7	40.6		
Mean and SD				F	t-test/P value
Birth Weight	n=151 3.14±0.48	n=197 3.16±0.47	n=347 3.15±0.48	0.452	0.756
Gestation at 1st visit in weeks	n=175 22.71±4.96	n=254 22.83±4.79	n=429 22.78±4.85	0.292	0.798

*Comparison between intervention and comparison group using chi-square test; significance level, $P < 0.05$

This variable has been found to influence rates of EBF with higher birth weight being associated with higher rates of EBF in some studies. Flaherman *et. al.* (2013) in a randomized trial determined the effect of birth weight and other predictors available at birth on any breastfeeding and exclusive breastfeeding through 3 months. Birth weight was strongly associated with exclusive breastfeeding through 3 months (odds ratio = 6.23 [95% confidence

interval = 2.27-17.1] per kilogram birth weight), even after adjusting for maternal college education and maternal plan to breastfeed exclusively. This variable was therefore measured in this study, to establish its association or lack of it with EBF.

Overall, the mean gestation age at recruitment was 22.78 weeks while the group means were (22.71 and 22.83) for the intervention and comparison groups respectively, they did not reveal any statistically significant differences ($p=0.798$) by t-test for equality of means. The median and mode month at first visit was 24 months gestation. Gestation age at first antenatal visit has been found to be a factor in EBF success (Ochola 2008) hence measured in this study and findings are presented in a later discussion.

Mode of delivery was measured as a dichotomous variable as those that had a normal verses caesarean delivery. The analysis yielded insignificant findings between groups ($\chi^2=0.202$, $p=0.653$). This study found rates of early timely initiation of breast feeding low. Slightly over nineteen point six (19.6%), and nineteen percent (19%) of mothers initiated breastfeeding immediately after delivery (intervention verses comparison groups respectively), thirty eight point eight percent (38.6%) and forty one point four (41.4%) within the first hour after birth (intervention verses comparison groups respectively), while 41.8% and 39.7% were initiated BF late (> one hour after birth), in the intervention and comparison groups respectively. The differences between the groups were insignificant by Pearson Chi square 0.273, $p=0.872$).

Further, 40.5% and 38.3% (in the intervention and comparison group respectively) of those who initiated BF late put their babies to the breasts within one day of birth while 1.3% and 1.7% (in the intervention and comparison group respectively) initiated breast feeding after one day of delivery. The overall rate in the two groups' was 59.3% (< one hour after birth) and 40.7% (> one hour after birth). These results are consistent with national rates according to the KNBS & ICF Macro, (2014) of 62% (< one hour after birth) and also similar to those obtained by Setegn, Gerbaba and Belachew (2011) among mothers in Bale Goba District, South East Ethiopia of 52.4% in Ethiopia and 53% Uganda according to the UDHS (2011).

Caesarean delivery has been significantly associated with early supplementation (giving prelacteal feeds) avoidance of colostrum and significantly with a delay in breastfeeding initiation (>1 hour after birth) in various studies, (Patil *et al.* 2015, Lakati, *et al.* 2011; Ochola, 2008 & Mc Carter, 2007). This variable was therefore considered likely to influence EBF hence measured to ascertain its association or lack of it with the outcome variable.

Pre-lacteal feeds or early supplementation are foods/drinks given within the first three days of delivery. Over 80% of the mothers did not give pre-lacteal feeds in both groups (83.7% and 81.4%) in the intervention and comparison group respectively. Water was the most common pre-lacteal feed given by 12% of the mothers overall (10.5% and 13.6%) in the intervention and comparison group respectively. The other pre-lacteal feeds given were formula given by 3.33% of the mothers (3.9% and 3.96%) gripe water given by 1.5% of the mothers (1.3% and 1.7%) in the intervention and comparison group respectively. Salty water was also given by one mother in the intervention group and glucose water given by a mother in the comparison group. The differences between the groups were insignificant by Pearson Chi square 3.103, $p=0.684$). Giving pre-lacteal feeds has been found to affect EBF duration (Lakati, *et al.*, 2011; Ochola, 2008). This variable was therefore considered likely to influence EBF hence measured to

Use of Folic/iron supplements during pregnancy was categorized according to the number of tablets consumed by the mothers as follows; <30, 31-60; 61-90 >90. Between group differences were insignificant. Over 50% of the women took less than 30 tablets during their entire pregnancy period thus 53.3% (49.3% and 56.3%) intervention verses comparison group. Very few mothers; 5.4% took the recommended dosage of over 90 tablets (6.3% and 4.7%) intervention verses comparison groups compared to 8% nationally (KDHS 2014). The low intake of folic/Iron supplements during pregnancy can predispose mothers to anaemia.

Hemoglobin (Hb) levels were measured as a dichotomous variable with 11.9g/dl and below being categorized as low and above 12g/dl being categorized as normal. Comparison versus intervention group showed no significant differences in the hemoglobin levels by Fisher's exact test ($p =0.721$). Over 80% of the mothers 87.2% (88% and 86.4%) in the intervention verses the comparison groups had normal hemoglobin levels with 12.8% having low hemoglobin levels. There was however significance difference between the groups ($p=0.005$) with those in the intervention more likely to attend ANC clinic more.

4.7 Baseline breastfeeding self-efficacy (BSE) and breastfeeding perceptions scores

Figure 2 summarises BSE and perceptions scores at baseline (recruitment). The total score of the BSES-short form is 70 and the mean scores for the two groups were 60.99 ± 8.81 (n=176) for the intervention group and 59.98 ± 9.68 (n=255) for the comparison group. Intervention versus comparison group showed no significant differences in maternal breastfeeding self-efficacy by t-test for equality of means ($t=1.10$, df 429 $p=0.271$). There

was therefore no significant difference in the BSE scores for mothers in the intervention and comparison group.

Perceptions to breastfeeding on the other hand were measured using four main themes, perceptions to susceptibility of conditions likely in sup-optimal breastfeeding; threats of these conditions to the life of the infant; perceived barriers to exclusive breastfeeding and finally the perceived benefits of exclusive breastfeeding to the mothers and infants. Perceived susceptibility scale had a total score of 70 and the mean scores were 45.95 ± 13.02 (n=176) for the intervention group and 45.26 ± 13.82 (n=255) for the comparison group. The perceived threats scale had a total score of 60 and the mean scores of the two groups were 47.72 ± 11.51 (n=176) for the intervention group and 46.48 ± 11.15 (n=255) for the comparison group. The perceived barriers scale had a total score of 20 and the mean scores of the two groups were 9.80 ± 4.21 (n=176) for the intervention group and 9.84 ± 4.50 (n=255) for the comparison group. The perceived benefits scale had a total score of 50 and the mean scores of the two groups were 43.33 ± 5.13 (n=176) for the intervention group and 43.09 ± 5.62 (n=255) for the comparison group. Intervention versus comparison group showed no significant differences in maternal breastfeeding perceptions by t-test for equality of means ($t=0.519$, df 429 $p=0.604$, $t=1.119$, df 429 $p=0.264$, $t=-0.094$, df 429 $p=0.926$, $t=0.458$, df 429 $p=0.647$) for susceptibility, threats, barriers and benefits respectively at baseline. The results imply that the randomization process was successful.

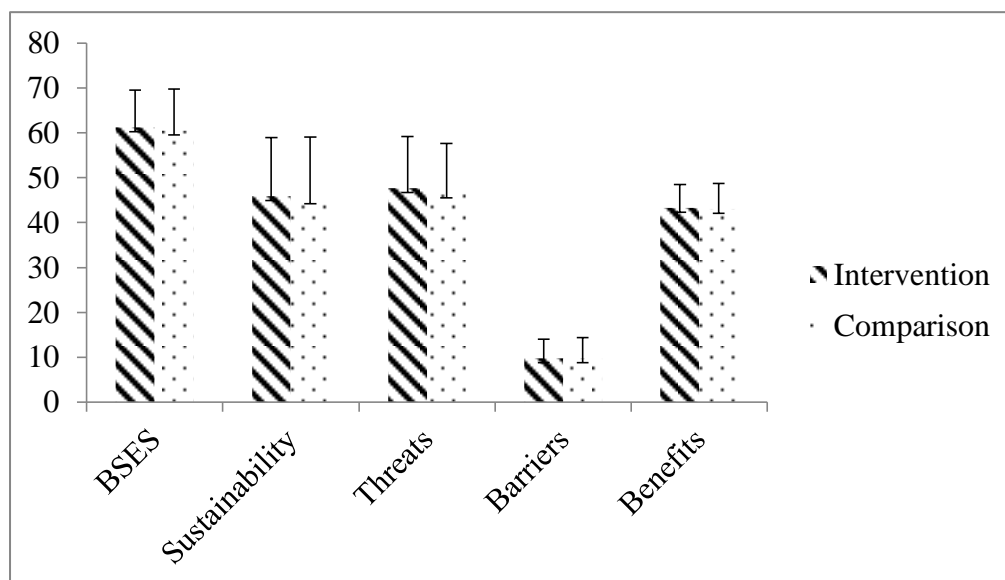


Figure 2: Comparison between the groups in perceptions at baseline

4.8. Endline maternal breastfeeding self-efficacy and perceptions of mothers in Kiandutu informal settlement.

4.8.1 Endline maternal breastfeeding self-efficacy

Figure 3. Summarizes the perceptions and BSES scores at baseline (34th week) before delivery (37th week) and after six months postpartum. Changes that could be attributed to the structured nutrition education intervention were observed on the maternal breastfeeding self-efficacy (BSE) when BSES-SF scores at 34th week gestation (baseline) at 37th week gestation or just before delivery (midline) and at 6 months post partum (endline) were compared. To compare the means between the two groups, independent t-tests were performed. Intervention versus comparison group showed no significant differences at the 34th week gestation (baseline) but the findings were significant both at midline and at end-line by t-test for equality of means ($t=3.816$, $df\ 351$ $p=0.001$, $t=4.095$, $df\ 316$ $p=0.001$) at midline and end-line respectively. Comparing the overall BSE scores at baseline and end-line by paired t-test (before and after), the differences were significant giving the implication that the intervention had meaningful effect on BSES of the mothers. The combined baseline mean of 60.35 ± 9.606 and the end- line mean of 63.32 ± 6.905 were significantly different with a mean difference of 2.962, $t=6.083$ and $df\ 317$, $p=0.001$. The before and after scores for the two groups separately also revealed significant differences. The baseline and end line mean of 60.92 ± 8.719 and 65.57 ± 5.289 respectively for the intervention group yielded a significant difference, $t=6.710$ $df\ (146)$ $p=0.001$ and a mean difference of 4.646. Baseline and end-line mean of 60.80 ± 9.226 and 62.70 ± 6.455 for the comparison group, likewise yielded a significant difference, $t=2.637$ $df\ (170)$ $p=0.009$ and a mean difference of 1.900. The implication here is that, there was an increase in BSES in the two groups although the increase was larger in the intervention group. The hypothesis that there were no significant differences in BSE, before and after was therefore rejected.

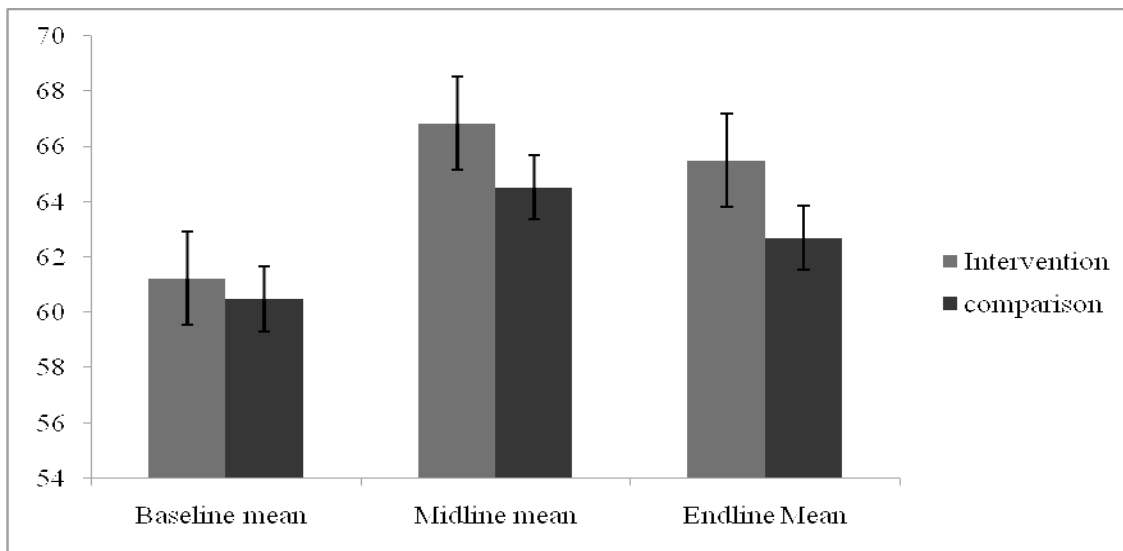


Figure 3: Comparison between the groups in BSE at baseline at mid line and after intervention

4.8.2 Endline maternal breastfeeding perceptions

Table 23. below, gives a summary of differences and changes in mean scores of maternal breastfeeding perceptions at baseline, mid line and end-line. Intervention versus comparison group analysis showed no significant differences between groups at baseline, ($t=0.519, df 429 p=0.604$; $t=1.119, df 429 p=0.264$; $t=-0.094, df 429 p=0.926$; $t=0.458, df 429 p=0.647$) by t-test for equality of means for susceptibility, threats, barriers and benefits respectively.

Table 23: Perception and BSE scores at recruitment, mid and at 6 months post-partum

Perceptions	Intervention (n=176)	Comparison (n=255)	P value
Susceptibility			
Baseline	45.95±13.02	45.26±13.82	0.604
Mid	60.35±10.38	50.27±13.89	0.001*
End	64.75±6.86	51.62±12.31	0.001*
Threats			
Baseline	47.72. ±11.51	46.48±11.15	0.926
Mid	56.68±5.88	51.30±9.79	0.001*
End	58.35±3.68	52.94±8.27	0.001*
Barriers			
Baseline	9.80±4.21	9.84±4.50	0.264
Mid	6.14±2.93	7.38±3.44	0.001*
End	6.57±2.96	7.84±2.89	0.001*
Benefits			
Baseline	43.33±5.13	43.09±5.62	0.647
Mid	44.57±2.65	43.50±2.94	0.001*
End	49.17±2.43	46.94±3.33	0.001*
BSES			
Baseline	60.99±8.81	59.98±9.68	0.394
Mid	66.26±5.68	63.80±6.26	0.001*
End	64.99±6.13	61.88±7.22	0.001*
Perceptions (Baseline and after intervention for the two groups)			
	At Baseline (n=319)	After intervention (n=319)	P value
Susceptibility	45.49±13.98	57.45±12.07	0.001*
Threats	47.10±11.505	55.45±7.069	0.001*
Barriers	9.84±4.44	7.26±2.988	0.001*
Benefits	43.40±5.376	47.98±3.144	0.001*
BSES	60.35±9.61	63.32±6.91	0.001*
BSES (Intervention group before and after)	60.92±8.72	65.57±5.29	0.001*
BSES(Comparison group before and after)	60.80±9.23	62.70±6.45	0.009*

**Data is presented as mean and standard deviation; statistical significance, p-value < 0.05 by t-test*

Analysis at mid-line showed significant differences between intervention and comparison groups by t-test for equality of means ($t=7.467$ and $df\ 344$, $p=0.001$; $t=5.985$, $df\ 343$, $p=0.001$; $t=-3.547$ and $df\ 344$, $p=0.001$; $t=3.499$ and $df\ 340$, $p=0.001$) for susceptibility, threats, barriers and benefits respectively. At the end-line, analysis likewise produced significant differences, by t-test for equality of means ($p=0.001$) for all the perception themes with the following values, $t=11.518$ $df\ 317$; $t=7.394$ $df\ 319$; -3.894 $df\ 322$ and $t=6.720$ $df\ 315$ for susceptibility, threats, barriers and benefits respectively. When before and after the intervention scores were analyzed by the paired t-test combining the comparison and intervention groups, significant differences were obtained for all the perception themes $p=0.001$ with mean differences of $(-12.22 \pm 12.71$ $t= -17.18$ $df\ 318$; -8.346 ± 9.38 , $t= -15.941$

df 320, 2.59 ± 4.770 $t=9.51$ df 316, and -3.29 ± 4.72 $t= -12.43$ df 323) for susceptibility, threats, barriers and benefits respectively. The implication here is that the intervention had meaningful positive influence on maternal breastfeeding perceptions and hence the hypothesis that there were no significant differences in breastfeeding perceptions, before and after was therefore rejected.

4.9 Relationship between maternal breastfeeding self-efficacy (BSE), breastfeeding perceptions and EBF duration

4.9.1 Relationship between maternal breastfeeding self-efficacy (BSE) and EBF duration

Table 24. summarizes the results obtained after running a generalized linear model to establish the relationship between maternal breastfeeding self-efficacy (BSE), and EBF duration. Maternal breastfeeding self-efficacy (BSE) had a positive relationship with EBF duration ($p=0.001$). Mothers in the intervention group were 15.95 times more likely to exclusively breastfeed compared to those in the comparison group (95% CI 11.25-20.65). Further mothers having a higher BSE score were 2 times (log odds; 2.067; 95% CI 1.75 – 2.39, $p=0.001$) more likely to exclusively breastfeed compared to mothers with lower BSE scores (Table 24). Being in the intervention group and having a higher BSE and a lower barrier score increased the likelihood of exclusively breastfeeding.

This indicates that interventions or efforts geared towards improving EBF need to target factors that can influence BSE of mothers. This may mean emphasizing the value of EBF during the first six months to the mother, impressing on her that it is possible while assisting her to acquire the necessary skills in breastfeeding such as correct positioning and attachment.

Table 24: The relationship between BSE and EBF by a generalized linear model

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	37.53	16.16	5.85	69.21	5.39	1	0.020*
[Time=1]	10.50	3.26	4.11	16.89	10.38	1	0.001*
[Time=2]	-7.23	3.05	-13.21	-1.25	5.62	1	0.018*
[Time=3]	0 ^a	.	.	.	.	.	.
[Group=1]	15.95	2.40	11.25	20.65	44.26	1	0.001*
[Group=2]	0 ^a	.	.	.	.	.	.
BSES	2.067	0.16	1.75	2.39	160.47	1	0.001*
Susceptibility	0.149	0.12	-0.08	0.38	1.61	1	0.205
Threats	-0.108	0.17	-0.44	0.22	0.421	1	0.516
Barriers	-2.512	0.32	-3.15	-1.88	60.53	1	0.001*
Benefits	-0.517	0.30	-1.11	0.073	2.95	1	0.086
(Scale)	1199.95 ^b	55.38	1096.17	1313.55			

Dependent Variable: EBF Days * Significant at $p=0.05$ Model: (Intercept), Time, Group, BSES, Susceptibility, Threats, Barriers, Benefits

a. Set to zero because this parameter is redundant. b. Maximum likelihood estimate.

Numerous studies have yielded similar significant relationships between BSE scores with EBF duration (Wilhelm *et al.*, 2008, Otsuka *et al.*, 2008, Mccarter-Spaulding & Gore 2009 and Henshaw *et al.*, 2015, Tsai, Huang and Lee 2015). Other factors that have been reported to influence EBF duration in other studies such as socio-economic and demographic factors are not easily modifiable and hence may not provide opportunities for interventions (O'Brien, Buikstra & Hegney, 2008) maternal self-efficacy however is modifiable (Bai *et al.*, 2010). In the present study, the structured nutrition education was able to improve the respondents BSE scores and consequently improved the duration of EBF for those mothers who were in the intervention group.

4.9.2 Relationship between breastfeeding perceptions and EBF duration

Similarly to determine the relationship between breastfeeding perceptions and EBF duration, a generalized linear model was run and the model results are showed on Table 24 above. Only barriers to EBF yielded a positive relation with EBF. Mothers with a higher barrier score had a 2 times decreasing likelihood of exclusively breastfeeding (log odds - 2.512; 95% CI -3.15– -1.88, $p=0.001$) compared to mothers with a lower barrier scores (Table 24). The barriers investigated in the current study were perception of milk insufficiency, going back to work, inability to express and influences from significant others

(the four formed a composite score with a range of 5-20). These are the barriers known to affect EBF from literature. This results show that many mothers are not able to exclusively breastfeed due to impeding factors. While this may be the case, noticeably all these factors measured in this study can easily be intervened for. For instance, one of the main barriers was the perception of milk insufficiency which can be dealt with by giving correct information to mothers. The barrier concerning return to work can be dealt with through legislation. The Breastfeeding bill (GOK 2017) which seeks to legislate provisions relating to breastfeeding mothers at the work place is already in parliament. The bill seeks to ensure that breastfeeding mothers are accorded appropriate facilities to enable them express milk while at work.

Many studies have found similar findings for example, Goosen, Mclachln and Schbl (2014) in South Africa investigated factors impeding exclusive breastfeeding in a low-income area and found out that perceptions that infants needed water and the concern that milk alone is not satisfying to an infant, negatively influenced EBF duration. Similarly, Agunbiade, and Ogunleye (2012), in a study that sought to determine the constraints to exclusive breastfeeding practice among breastfeeding mothers in Southwest Nigeria found out that exclusive breastfeeding was considered demanding and hence very small proportion (19%) of the mothers practiced it. The major constraints identified to EBF were the perception that babies continued to be hungry after breastfeeding (29%), fear of babies becoming addicted to breast milk (26%), pressure from mother-in-law (25%), pains in the breast (25%), and the need to return to work (24%). Another study that sought factors associated with EBF at 6 months likewise reported similar results. In this study that sought factors associated with EBF of Mothers in Sagamu, Southwest Nigeria found out that maternal perception predicted EBF at 6 months (Sholeye *et al.*, 2015). In this study, about 25% were pressurized by relatives to stop EBF hence significant others are an important barrier. Other barriers for not breastfeeding exclusively included, a perceived difficult work schedule, poor partner support and perceived weight loss. In another study in Western Kenya that sought to determine the psychosocial factors influencing breastfeeding behaviour of mothers attending home-based clinics (Mutuli, Walingo & Ayado, 2012), a mother's partner, family members and society were the disapproving social referents towards optimal breastfeeding. Similarly, Okanda *et al.* (2014) found out that women who were not living with the infant's father were more likely to exclusively breastfeed ($p= 0.04$) up to 5.5 months post-partum.

4.9.3 Association between socio-economic factors verses EBF duration

Selected socio-economic predictors of EBF duration were also analyzed for significance by Kaplan Meier survival analysis and results compared to Chi square analysis (Table 25 below).

Table 25: Cross tabulation of socio-demographic variables verses EBF

	EBF (n=194)%	Mixed feeding (n= 133)%	Totals (n=327)%	Chi-Square	p-value
Ethnicity				1.580	0.812
Kikuyu	29.2	70.8	100		
Kamba	30.0	70.0	100		
Luyha/Kisii	20.0	80.0	100		
EmbuMeru	37.5	62.5	100		
Others	28.6	71.4	100		
Marital Status				0.977	0.323
Married	21.8	71.9	100		
Single/Separated/Divorced	36.4	63.6	100		
Employment				3.205	0.361
Informal	24.7	75.3	100		
Formal	43.8	56.2	100		
Business	33.3	66.7	100		
None	27.6	72.4	100		
Parity				0.329	0.566
Primi-parous	27.5	72.5	100		
Multi-parous	30.4	69.6	100		
Education Level				31.044	0.001*
≤ Primary					
>Primary	8.0	92.0	100		
	38.5	61.5	100		
Household Income				1.362	0.043*
≤11700					
>11700	25.5	74.5	100		
	31.5	68.5	100		
Group					0.001*
Intervention	45.3	54.7	100	35.449	
Comparison	15.0	85.0	100		
Sex					
Boy	30.1	69.9	100	0.58	0.810
Girl	28.8	71.2	100		

Chi square test for categorical data *Significant at $p < 0.05$

They included, ethnicity, marital status, type of employment, parity, education level, household income group of study and the sex of the infant (Table 25 above). In the present study, ethnicity did not significantly predict EBF duration by Kaplan Meier survival analysis

(Figure 4 below). A log rank test run to determine if there were differences in the survival distribution for the different ethnic groups revealed statistically insignificant differences, a log rank= 4.018, df 4 $p < 0.726$. There was congruency with the Chi-square test as shown on Table 25 although other studies have reported a relationship. People living in urban areas adopt new habits from different communities and this could have been the case in Kiandutu hence yielding insignificant relationship.

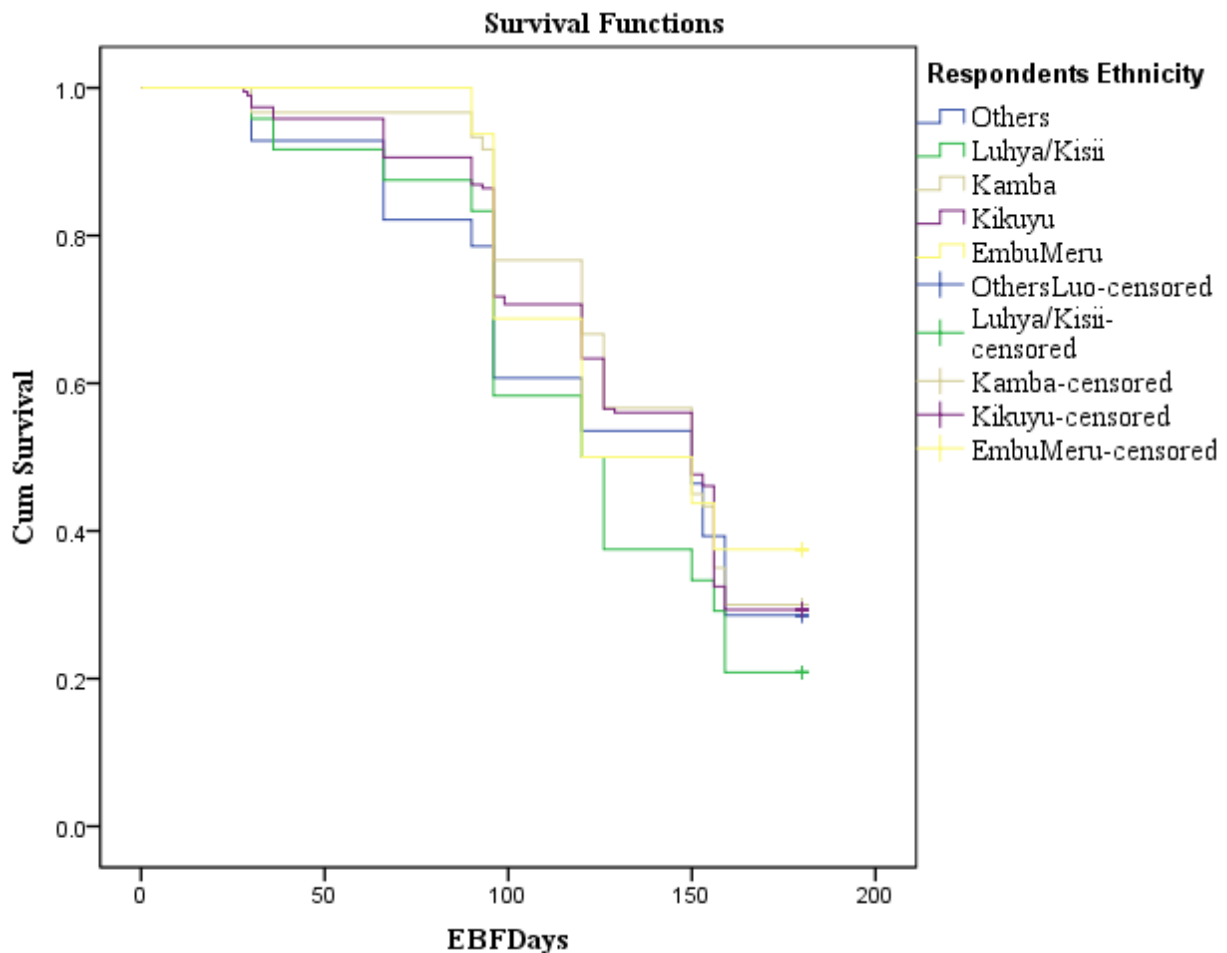


Figure 4: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups for different tribes

The findings are different from results from a study carried out in a similar low social economic setting by Kimani-Murage *et al.* (2011) in Korogocho and Viwandani slums but in congruence with results from a study done by Watson (2013). Kimani-Murage *et al.* (2011) in Korogocho and Viwandani slums found out Luos, Luhyas and other ethnic groups more likely to introduce foods early as compared to those from the Kikuyu ethnic group. However, Watson (2013) found no difference between ethnic communities. Watson (2013) sought to

determine the influence of ethnicity on breastfeeding duration in a low social economic setting in Nairobi-Kenya and compared four ethnic groups, (Kamba, Kikuyu, Luo, and Maasai). Results revealed that cultural grouping significantly predicted breastfeeding duration ($F [3] = 2.97, p= 0.04, t= 0.162$). The mean total duration of breastfeeding was 12.08 months for the Kamba, 15.60 months for the Kikuyu, 17.11 months for the Luo, and 5.22 months for the Maasai. Insignificant difference in mean duration of breastfeeding was found between the Kikuyu versus the Luo, the Kikuyu versus the Kamba, or the Kamba versus the Luo. The findings revealed that the Maasai mothers breastfed for a significantly shorter duration than mothers from the other three ethnic groups (Watson 2013).

Cultural practices passed over generations in a specific ethnic group may have a profound impact on how and when a mother decides to wean her child (Watson 2013). Borade, & Hanumante (2008), also allude to the fact that undesirable socio-cultural beliefs are negatively associated with duration of EBF. This was not found to be the case in the present study which may have been due to social interactions and cultural adaptations from the various communities. It might have been the case also because the majority of the women were from the kikuyu ethnic community in the present study which (59.4%).

The educational level of respondents when collapsed into below and above primary level positively predicted EBF duration by both test of equality of survival distribution for the different levels of education of respondents (Figure 5) Log rank = 57.984, (1) $p < 0.001$) and Chi-square test as seen on Table 25 ($\chi^2(1) =31.044, p=0.001$). Mothers with a post primary education level were more likely to exclusively breastfeed for longer than mothers who had primary and below education levels. It implies that mothers with more education are able to put into practice information they receive since they may have better understanding of implications of their actions.

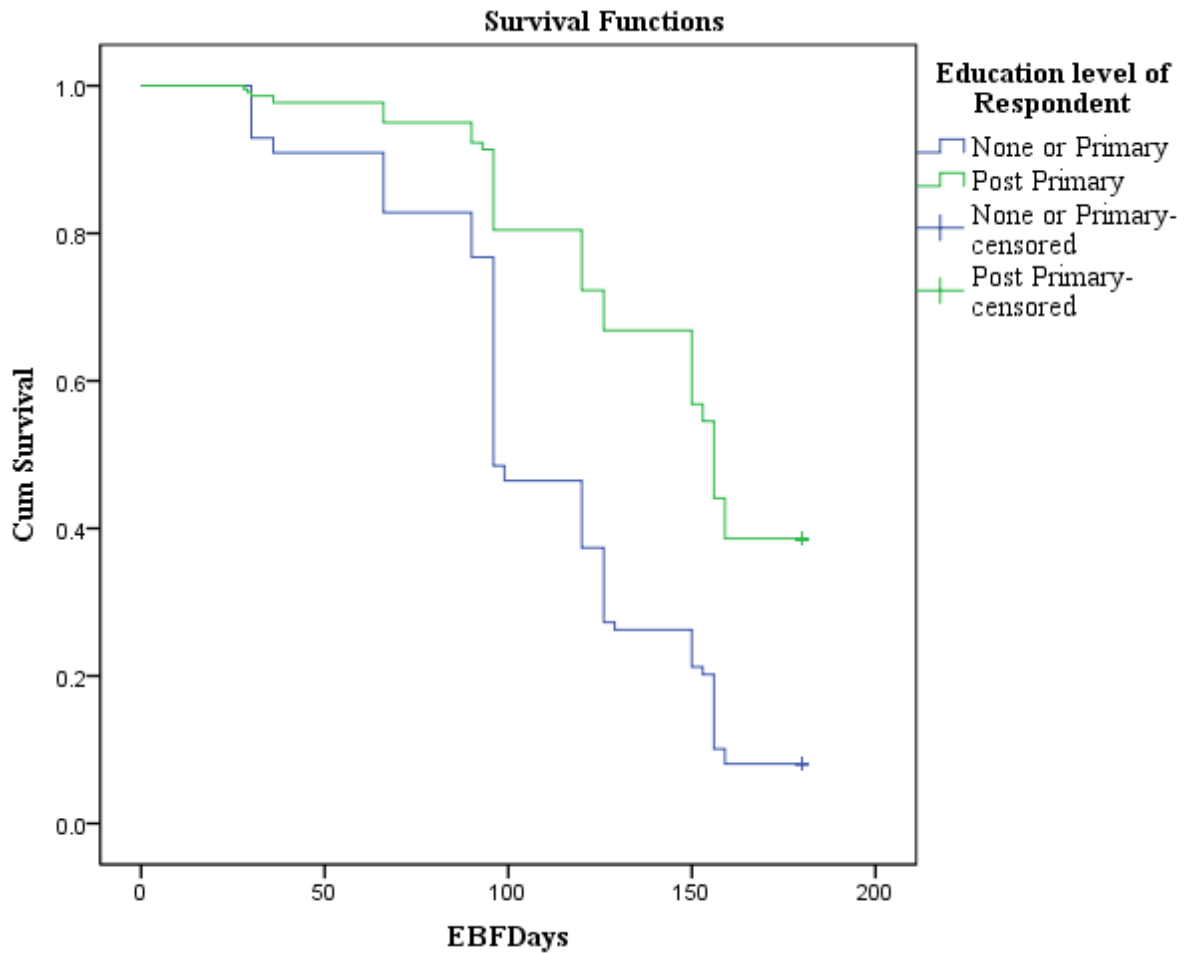


Figure 5: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for different education levels

These findings are similar to those of Agampodi *et al.* (2009), Kimani-Murage *et al.* (2011), Qureshi, *et al.* (2011), Setegn *et al.* (2011), Nyanga *et al.* (2012) and Vieira *et al.* (2013). Vieira *et al.* (2013), in a prospective cohort study investigated the duration and determinants of EBF in a Brazilian population and found mothers having less than or equal to 8 years of maternal schooling was associated with discontinuation of EBF (HR 1.34, 95% CI 1.17-1.53). In contrast, Amadhila (2005), Maundu (2007), and Lawal, & Ajao (2015) found no association between maternal education level and EBF duration. Some indicate a negative correlation with increased years of education (Chudasama & Kavishwar, 2007 and KNBS & ICF Macro, 2010) but others indicate a positive association with increased years of schooling. In KNBS & ICF Macro, (2010) for example, 0.5% mothers with secondary education and above exclusively breastfed their children compared to 0.6% among mothers with no education. In contrast, studies (Agampodi *et al.* 2009, Kimani-Murage *et al.* 2011, Qureshi, *et al.* 2011, Setegn *et al.* 2011, Nyanga *et al.* 2012, Vieira *et al.* 2013, Dashti *et al.* 2014, Liben

2016 and Sholeye *et al.* 2015) reported positive associations between the two variables. According to Kimani-Murage *et al.* (2011), women who had at least secondary level education had 10% lower hazards of introducing foods early while in Qureshi, *et al.* (2011), in a study that utilized community volunteers to promote exclusive breastfeeding in Sokoto State, Nigeria found mothers with more education more likely to EBF at 6 months ($p=0.001$). In the study above, community volunteers educated mothers about breastfeeding during home visits. The indication here is that improved maternal education enhances the understanding of mothers and their appreciation of proper infant feeding especially EBF and hence, is likely to adhere to instructions they receive. However, studies have shown that infant feeding practices can be improved, by mediating the low maternal education levels with infant feeding knowledge by other means such as through health workers, CHWs and mass media.

There was congruence between the findings for income levels by Kaplan Meier survival (Figure 6) and Chi Square analysis (Table 25). The test of equality of survival distribution for the different income levels of respondents gave significant differences between the different income levels Log rank =38.588, (1) $p <0.001$ and Chi square test χ^2 (1) = 4.086, $p=0.043$). The findings agree with Thairu *et al.* (2005), who allude to the fact that the choice of infant feeding method is influenced by the economic condition of the individual, the family and country. Mc Carter (2007), Ochola (2008), Ayisi *et al.* (2014), Joshi *et al.* (2014) and Kimani-Murage *et al.* (2015) also found household income to have an association with EBF duration. In a descriptive cross sectional study done in Kangemi-Nairobi by Ayisi *et al.* (2014), on factors associated with exclusive breastfeeding among infants aged 0-6 months in a peri-urban low income settlement of Kangemi, mothers from households with high monthly income were more likely to practice exclusive breastfeeding ($p=0.003$, OR=4.731). Joshi *et al.* (2014) on the other hand in a multivariate analysis, wealth quintile: richer (AOR = 2.40, 95% CI: 0.94, 6.16) showed evidence of a positive association with EBF.

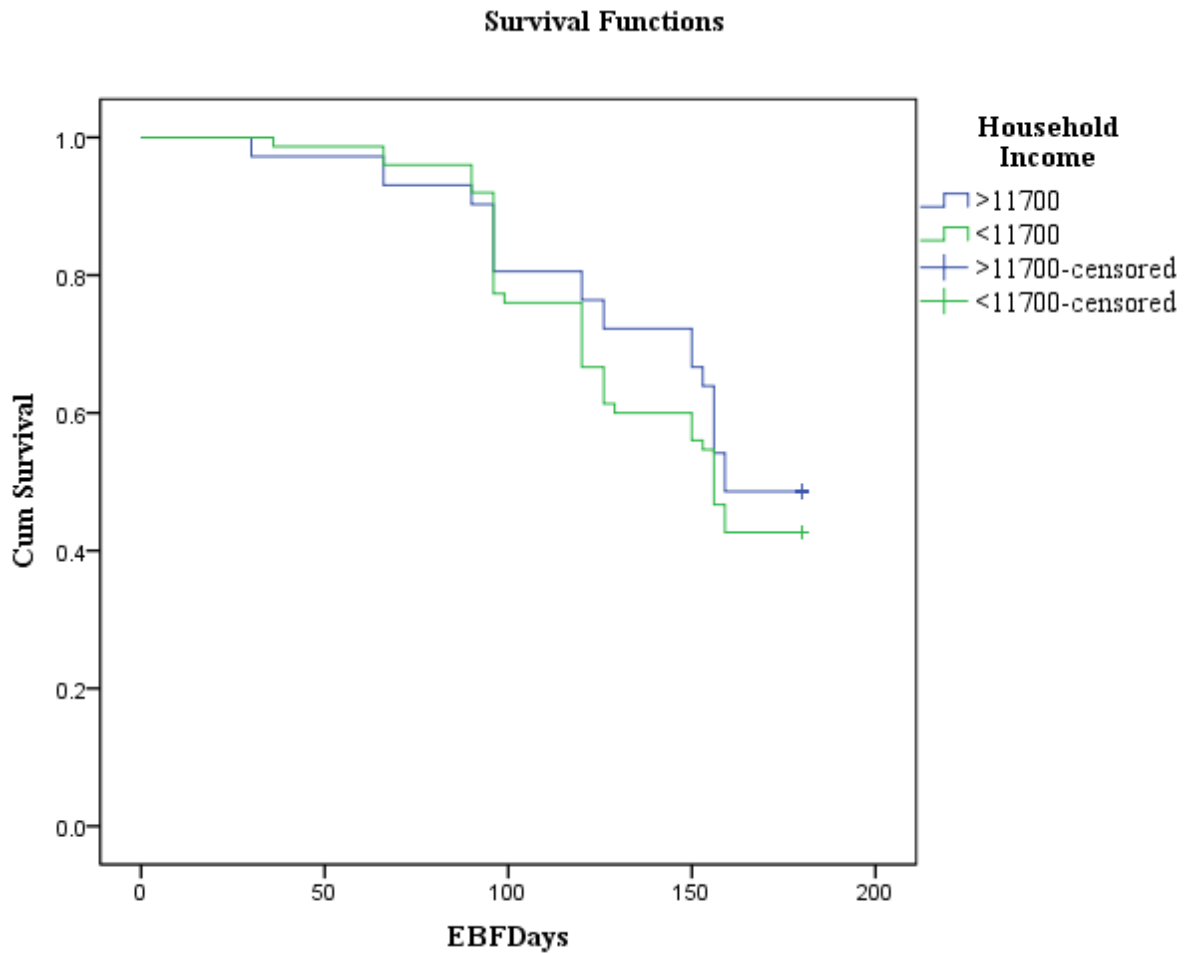


Figure 6: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for different income level

Insignificant differences were obtained in the analysis of the two tests for null parity (prim gravid)/ multiparity dichotomous variable, (Figure 7) a Log rank= 0.821, (1) $p < 0.365$) and Chi square test χ^2 (1) 0.329, $p=0.566$) as on Table 24. For some reasons past performance accomplishments that are known in literature did not influence the duration of EBF in this study. It may be that many of the respondents had not previously exclusively breastfed successfully for six months.

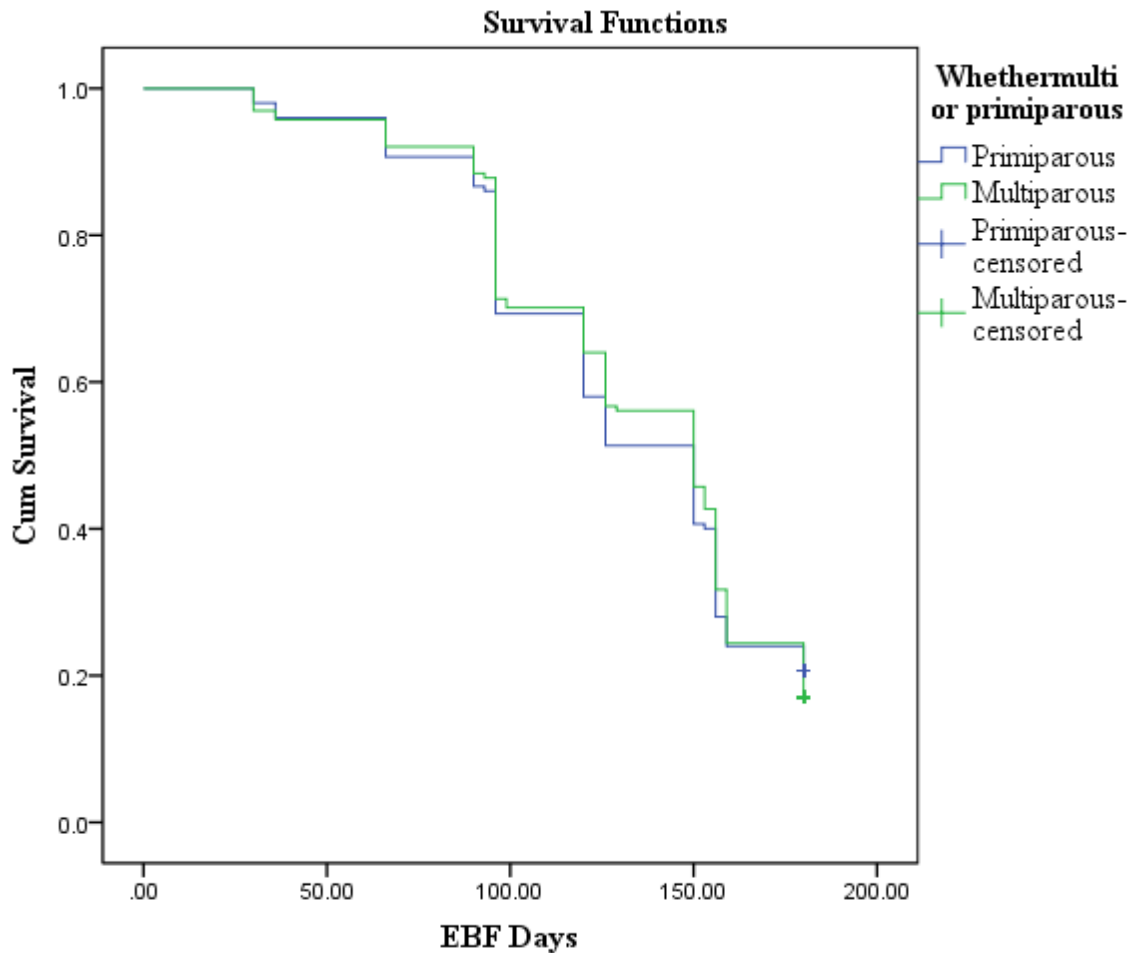


Figure 7: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for whether multi or primi parous

Other studies however have found associations between parity and EBF duration, (Mc Carter, 2007, Kimani-Murage *et al.*, 2011, Qureshi, *et al.*, 2011 and Dashti *et al.*, 2014). Dashti *et al.* (2014) for example in a study that investigated the predictors of breastfeeding duration among women in Kuwait in a prospective cohort study found higher parity to be positively associated with EBF duration. Qureshi, *et al.* (2011) on the other hand used community volunteers to promote exclusive breastfeeding in Sokoto State, Nigeria and found a statistically significant difference between nulli-parous and multi-parous ($p=0.05$). Okanda *et al.* (2014) in a clinical trial in Kisumu Kenya found women who had ≥ 3 previous births more likely to exclusively breastfeed at 5.5 months post-partum, ($P<0.01$). In some studies, parity has been found to influence maternal breastfeeding self-efficacy positively and hence duration of exclusivity (Baghurst *et al.*, 2007, Gregory *et al.*, 2008, and Mccarter-Spaulding & Gore 2009). The insignificance association of parity and EBF duration in the present study

may be as a result of the higher education levels among the younger mothers. Education level was statistically associated with EBF in the current study and may have mediated effects of parity coupled with the effect of the intervention.

4.9.4 The association between household food security, and EBF duration

In this study, food secure households were 44.8% (51.7% in the intervention and 40% in the comparison group), mildly food insecure households were 15.3% (14.2% in the intervention and 16.1% in the comparison group). The moderate food insecure households were 21.8% (16.5% in the intervention and 25.5% in the comparison group) while households with severe food insecurity were 18.1% (17.6% in the intervention and 18.4% in the comparison group). Differences in the two groups were insignificant.

Household food security as a predictor of EBF duration was analyzed for significance by Kaplan Meier survival analysis (Figure 8) and results compared to those of Chi Square analysis. The differences in this separate analysis were significant, by Kaplan Meier survival analysis (log rank=218.701, $df = 4$, $p = .001$) and by Chi Square analysis (Pearson Chi square 121.494, $p=0.001$). The findings indicate that food security is an important aspect in EBF and that the more food secure a mother is the greater likelihood that she will successfully EBF for six months.

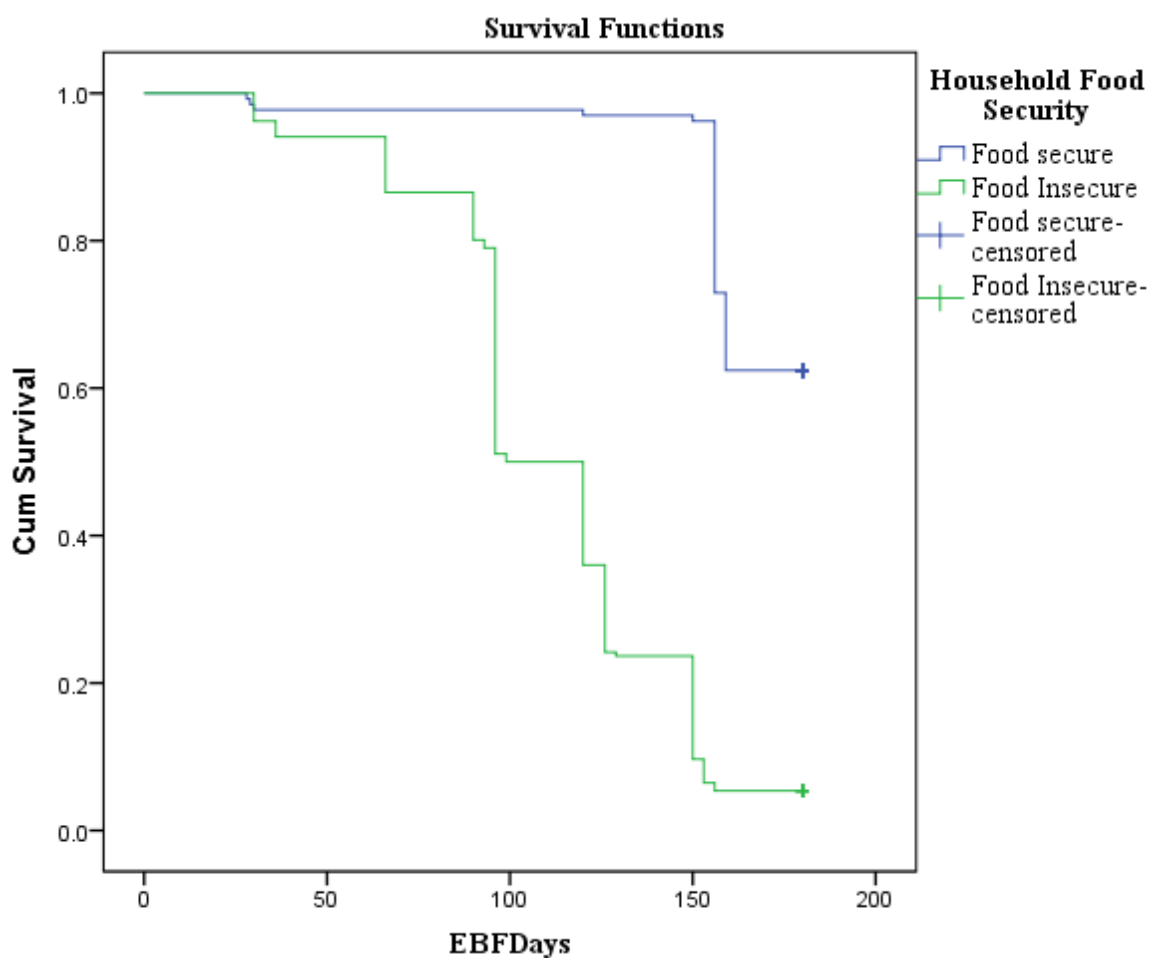


Figure 8: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for whether food secure or food insecure.

These results are similar with findings from a study by Webb-Girard *et al.* (2012) who documented the association of food insecurity with beliefs and attitudes towards exclusive breastfeeding (EBF) among low social economic status urban Kenyan women. In their study Webb-Girard *et al.* (2012), results revealed that women in food insecure households had significantly greater odds of believing that breast milk would be insufficient for 6 months [odds ratio (OR), 2.6; 95% confidence interval (95% CI), 1.0, 6.8], that women need adequate food to support EBF for 6 months (OR, 2.6; 95% CI, 1.0, 6.7) and that they would be unable to follow advice to EBF for 6 months (OR, 3.2; 95% CI, 1.3, 8.3). Household food insecurity is associated with the perception that breast milk is insufficient. It is known to contribute to poor dietary intakes and hence poor nutrition and health outcomes and has been found to be common in populations with high partial breastfeeding rates but where EBF rates are low (Nyaruhucha *et al.*, 2006).

4.9.5 The association between Intra-partum/post-partum factors and EBF duration

(a) The association between sex of the child and EBF duration

Figure 9. below shows the Kaplan Meier survival analysis for the test of equality of survival distribution for the different levels of sex of child. The analysis yielded insignificant association with the outcome, Log rank= 0.05 (1) $p = 0.822$ SD 2.284 (boy=3.344, girl=3.135) lower limit 129.298 and the upper limit=138.249 (boys lower limit=126.746, boys upper limit=139.854 girls lower limit=128.064, upper limit=140.354); Beslow 0.001 df (1) $p=0.995$ and ($\chi^2= 0.033$, $p=0.856$). The mean duration for EBF for boys was slightly lower than for girls at 4.443 months while for girls 4.474 although this difference was insignificant.

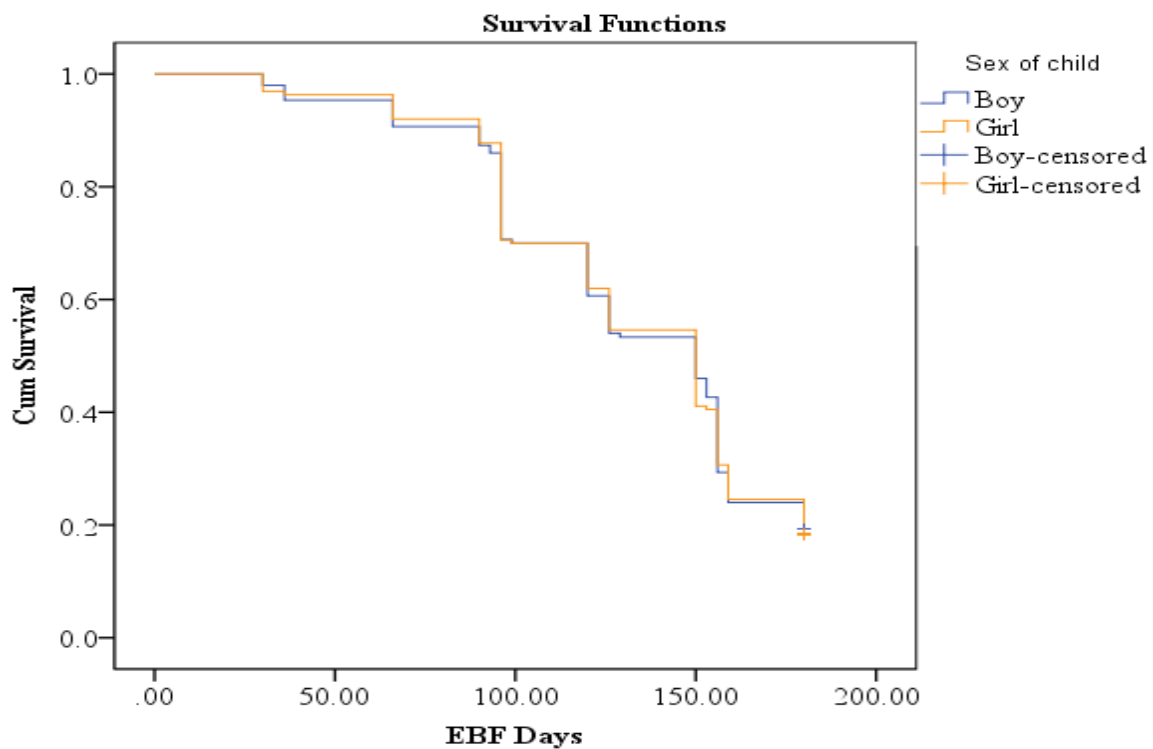


Figure 9: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups for different sexes

These results are similar to observations made by Watson (2013) in Mathare slum in Kenya, who found no association between the two variables. Some studies however, have documented an association between the sex of a child and EBF duration (Kimani-Murage *et al.*, 2011 and Okanda *et al.*, 2014). Mixed feeding was found to be more common for male than for female infants ($p= 0.04$) in a clinical trial in Kisumu-Kenya (Okanda *et al.*, 2014) and similar findings were obtained in Kimani-Murage *et al.* (2011). There is a general perception among mothers that indicate that boys suckle and are more demanding than girls.

This is illustrated by a mother in one of the open ended questions among mothers in the comparison group, (*Vijana si kama wasichana, kijana anaweza kukuangusha, mtoto wangu wakwaanza alikuwa msichana na hata kama sikumnyonyesha mpaka miezi sita, hakunisumbua. Lakini huyu analialia kila wakati, ilinimbinde kumpea unji akiwa miezi tatu na nusu*). “Boys are not like girls, a boy can drain your energy. My first child was a girl and she was not troublesome, although I did not EBF her for six months, for this one I had to introduce porridge at three and half months of age”. The above theme was repeated severally in the open ended questions in both groups and could explain why boys may be given complementary feeds earlier than girls as seen above in Okanda *et al.* (2014) and Kimani-Murage *et al.* (2011).

(b) The association between mode of delivery and EBF duration,

The present study did not reveal a significant association between the mode of delivery and EBF duration (Figure 10). Kaplan Meier survival analysis for the test of equality of survival distribution for the different levels of type of birth gave insignificant association with the outcome variable. In the table of test statistic, both tests (log rank $p=0.435$ and Wilcoxon $p=0.970$) revealed an insignificant association. By the Fischer’s Exact test, it was also insignificant $p=0.475$. This may have been because an overwhelming majority (96.6%) had normal birth in the two groups in the present study.

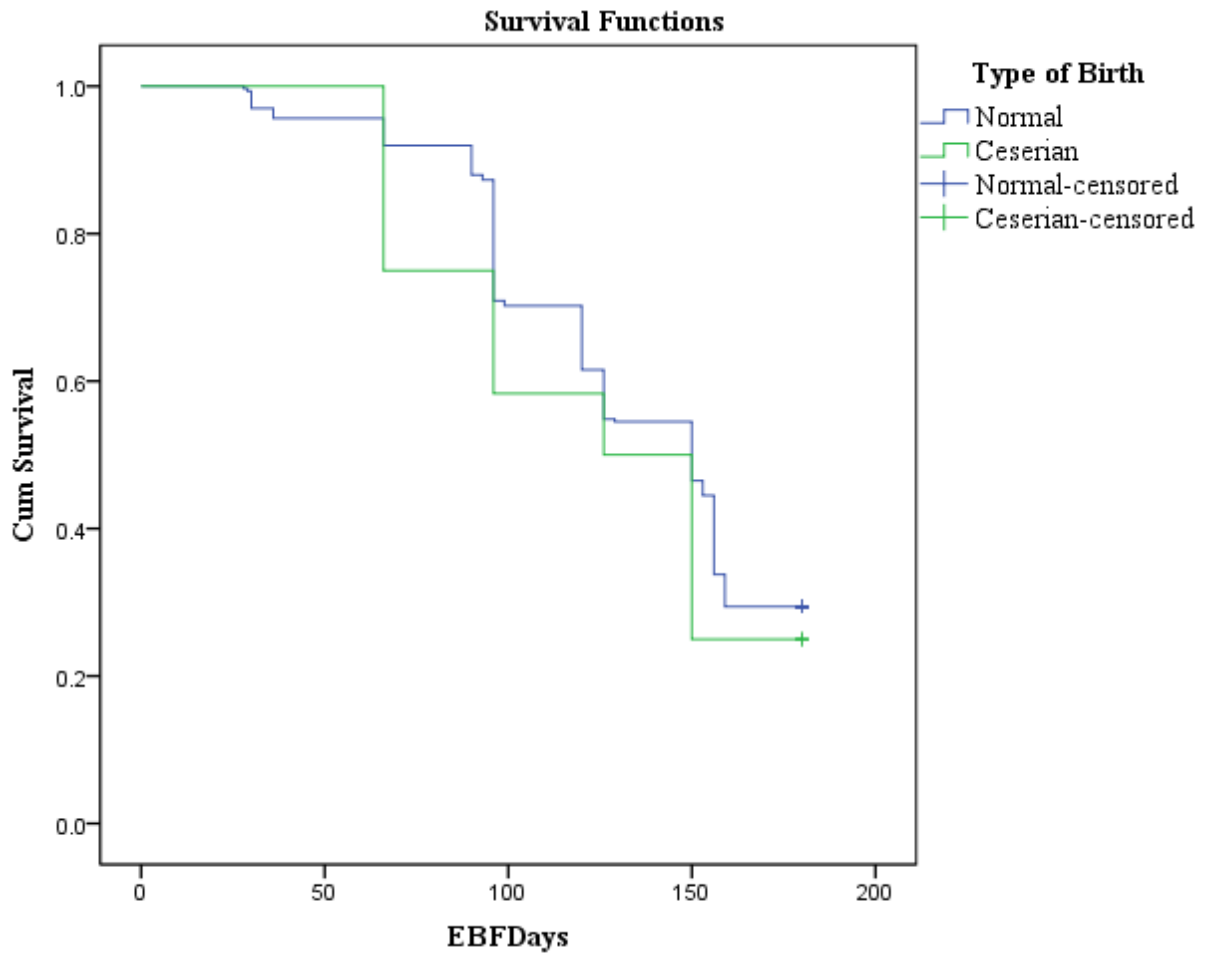


Figure 10: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups for different birth types

This variable has been found to influence EBF duration in other studies, (Lakati, *et al.*, 2011; Ochola, 2008, Mc Carter, 2007 and Joshi *et al.*, 2014). Joshi *et al.* (2014) for example found some evidence of an association between EBF and having a caesarean delivery (OR = 0.47, 95% CI: 0.21, 1.06).

(c) Baby birth weight

In the present study, the association between birth weight and EBF duration was insignificant and did not predict the outcome variable. A multivariate analysis done to determine the predictive value of gestation age in months at first clinic, BMI for age at 6 months and birth weight on EBF in days produced insignificant findings. The level of correlation (R) was positive but weak at 0.6 with ($p=0.863$). All the predictor variables were insignificant (age in months at first clinic $p=0.824$, BMI for age at 6 months $p=0.507$ and birth weight $p=0.742$ the model, $EBF= 0.432$ (BMI) -0.125 (gestation at first clinic visit)

+1.824 (birth weight) did not predict EBF. This variable was further categorized into ≤ 3 and ≥ 3 and was significant $p=0.052$. It means that even for mothers with small infants in the study set up were more likely to start complementary feeding earlier than those with bigger infants.

Some studies have found birth weight to have associations with EBF such as Kimani-Murage *et al.*, (2011) and Flaherman *et al.*, (2013). According to Flaherman *et al.* (2013), birth weight was strongly associated with exclusive breastfeeding through 3 months (OR 6.23, 95% CI 2.27-17.1) per kilogram birth weight, even after adjusting for maternal college education and maternal intention to breastfeed exclusively (Flaherman *et al.*, 2013). The study showed that mothers of smaller newborns were more likely to receive formula before 3 months. The findings of the present study may have revealed insignificant associations between birth weight and EBF due to the fact that the mean (3.15 kgs) birth weight in the two groups, was within the expected weight at birth, hence did not cause concern to the mothers to the extent of introducing other foods early.

(d) The association between giving pre-lacteal feeds and EBF duration

The study found significant association between giving pre-lacteal feeds and EBF by Kaplan Meier survival analysis (Figure 11) with a p -value for both tests, (Log-Rank = (1) 11.269, $p=0.001$ and Wilcoxon=0. 0.001). These results were compared by use of Chi Square analysis for the same variables and the association between the two variables was still significant ($\chi^2 =13.160$, $p=0.001$). The mean EBF duration for those in the intervention group giving pre-lacteal feeds was 3.6 months while those who did not give any pre-lacteal feeds was 4.8 months. A similar trend was observed in the comparison group. Those that gave pre-lacteal feeds had a mean EBF duration of 3.5 months while those that did not give with a mean EBF duration of 4.3 months. These findings are in agreement with those of Lakati *et al.* (2011) and Ochola (2008). Breastfeeding/ suckling generally stimulate milk production, so that the more a baby suckles, the more milk is produced. When an infant is given pre-lacteal feeds, he/she suckles less and breast-milk takes longer to 'come in' and it is more difficult to establish breastfeeding. This in essence has been found to interfere with the duration of breastfeeding especially EBF duration.

According to the KNBS & ICF Macro, (2010) mothers with secondary education were less likely to give pre-lacteal feeds compared to those with primary education. This may be because higher education exposes mothers to more health education or because they are less ignorant so able to apply health related messages. On the other hand, boys as compared to girls were also likely to receive pre-lacteal feeds which may have a cultural bearing.

Furthermore, those from low income households are more likely to give pre-lacteal feeds compared to their counterparts. The later may relate to higher literacy among those of higher socio-economic levels which may act as a deterrent to giving pre-lacteal feeds. Similar findings were obtained in the present study in respect to two of the above factors. Income log rank (1, n = 268) = 8.215, $p = 0.004$ and education level long rank (1, n = 268) = 7.081, $p = 0.008$.

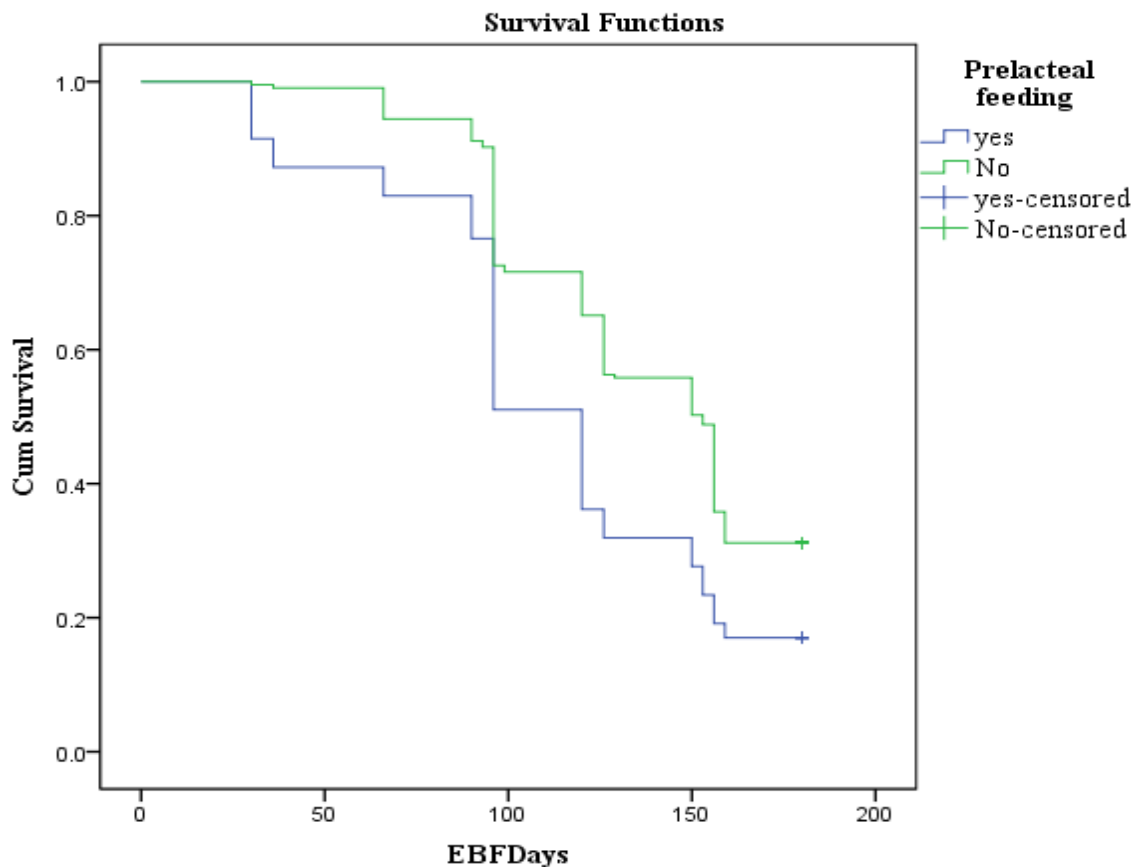


Figure 11: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups for whether pre lacteal feeds were given or not

(e) The association between the number of Folic/iron supplements taken and EBF duration

Figure 12. illustrates the Kaplan Meier survival analysis for the test of equality of survival distribution for the different number of Folic/iron tablets taken by individual mothers. The analysis gave insignificant association with the outcome variable, (log rank 6.168, n = 292, $p = 0.013$), Wilcoxon $p=0.008$. These findings have not been earlier documented and they are of importance. The number of Folic/iron tablets taken may be associated with the haemoglobin levels of a mother which in turn may influence ability of mothers to perform various tasks such as breastfeeding. This may explain therefore this

association that was found. Giving Folic/iron tablets is one of the interventions implemented at the antenatal clinic for the mothers to mitigate against the rampant rates of anaemia in Kenya by the Ministry of Health. Differences in folic/iron tablet intake in the two groups was statistically insignificant by Chi-Square test ($p=0.627$).

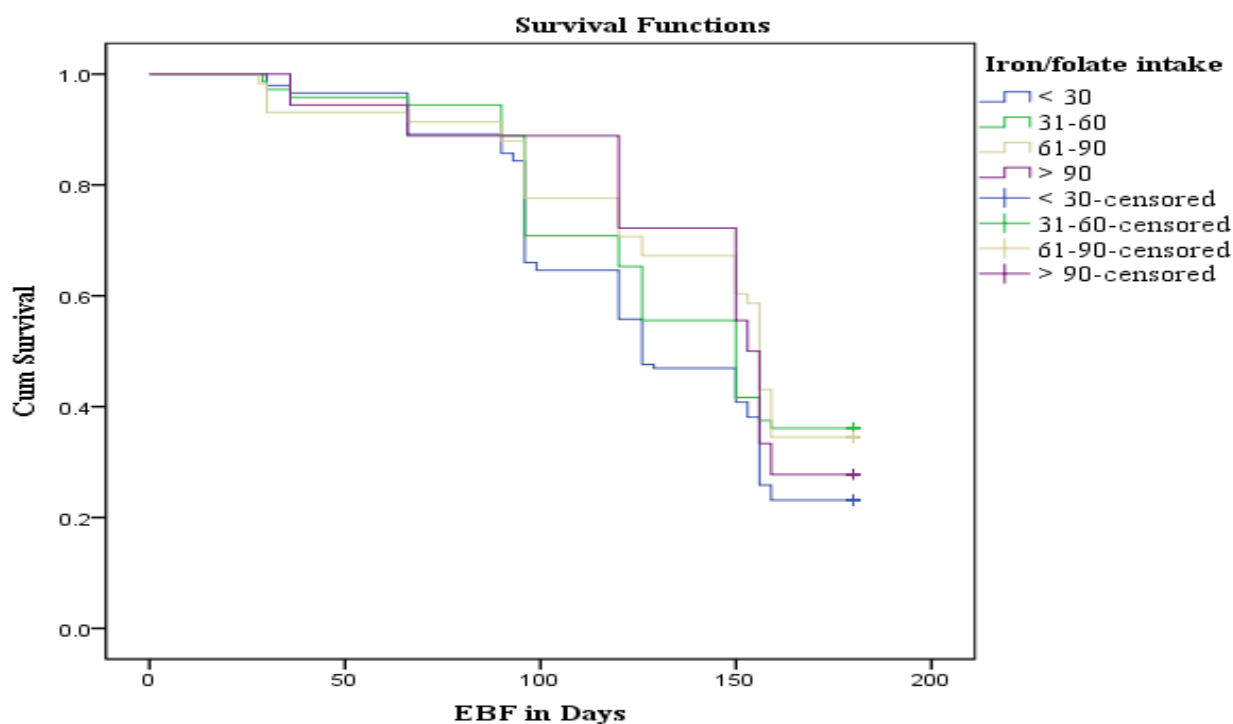


Figure 12: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups for different number of day's folic was taken

(f) The association of Haemoglobin level of respondents and EBF duration

Kaplan Meier survival analysis for the test of equality of survival distribution for the different haemoglobin (HB) levels of individual mothers (Figure 13) gave significant association with the outcome variable (log rank 7.722, $n = 271$, $p = 0.005$), Wilcoxon $p=0.012$. The findings were similarly significant by Chi-Square analysis, $X^2 (1, N = 271) = 5.333$, $p = 0.021$. Mothers who had a normal haemoglobin level according to the WHO classification (low= ≤ 11.9 gms/dl and normal= ≥ 12 gms/dl) were more likely to exclusively breastfeed for longer. The mean duration of EBF for those with low HB was 4.2 months while for those with normal HB was 4.5 months. The haemoglobin levels reported in the present study were obtained from the mothers clinic book and were taken at varying times (different trimesters) depending on the timing of the first clinic visit for the mothers. The results therefore are interpreted with caution. The low HB levels are not a surprise given that majority of the women (53.3%) took less than 30 tablets of folic acid during their entire pregnancy period (Table 21). Similar findings have not been reported to predict EBF duration

other than in a study in Embu-Kenya by Azizi-Egrari *et al.* (2004) whose analysis revealed that anaemic mothers spent less time holding and caring for their infants as compared to non-anaemic mothers. This may be due to the fact that anaemic people are often weak and not able to carry out their normal duties due to low oxygen supply in the body. Those with low HB were 12.8% (12% and 13.6% in the intervention and comparison groups respectively), while those with normal HB were 87.2% (88% and 86.4% in the intervention and comparison groups respectively). The differences between the two groups as noted earlier were statistically insignificant by Chi-Square test ($p=0.703$).

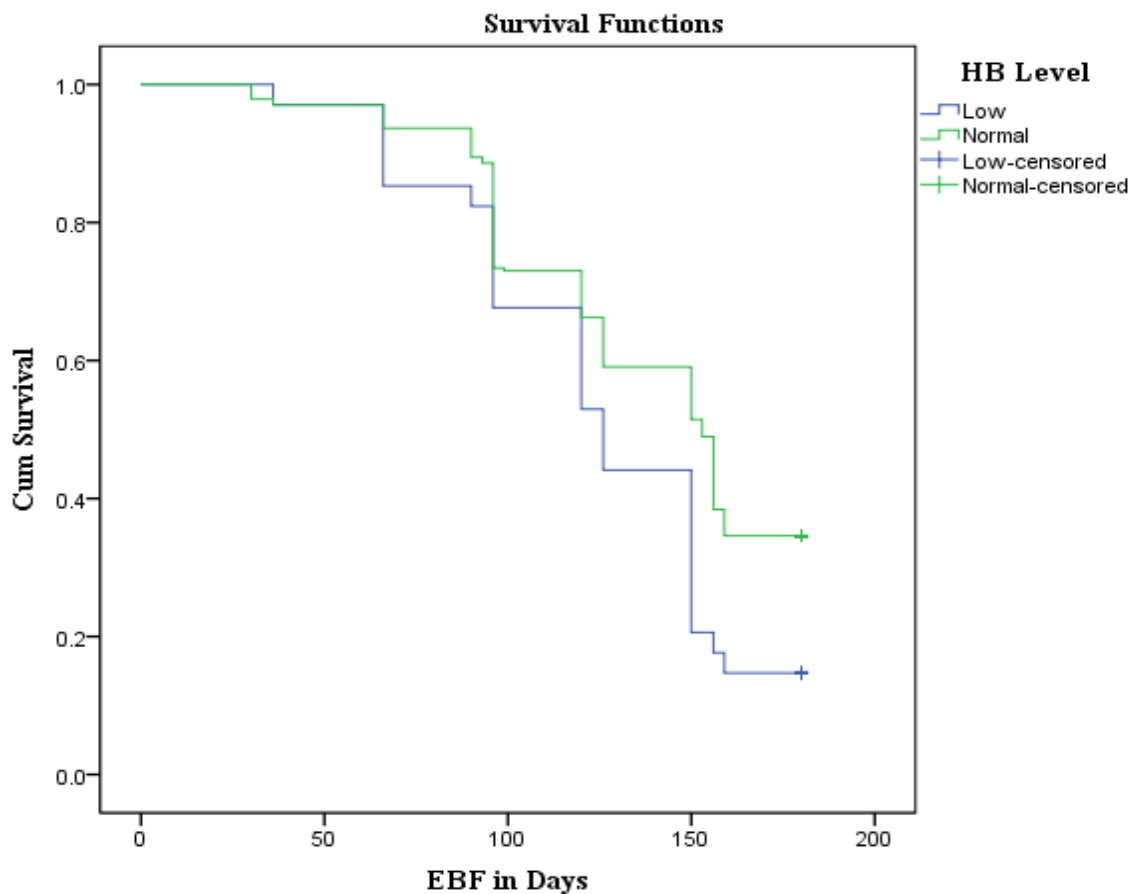


Figure 13: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for whether HB levels were low or normal

(g) The association between initiation of breastfeeding and EBF duration

The mean duration of EBF was 4.6 months both for those who initiated breastfeeding early and those who initiated breastfeeding after one hour. There was no statistically significant association with the outcome variable, (log rank 0.747, $n = 292$, $p = 0.387$), Wilcoxon $p=0.781$ and also with the chi-square test $\chi^2=2.352$ $p=0.125$ as showed on Figure 14.

Although early initiation of breastfeeding has been associated with EBF duration the present study did not demonstrate this. For example Tsai, Huang & Lee (2015), for example, found out that later initiation (hazard ratio=1.53; 95%) was a predictive factor in EBF cessation among first-time mothers' in a prospective study. The observation in the present study may have been different since those in the comparison group had higher rates of early initiation (< one hour of birth) yet they were not involved in the intervention. It would therefore mean that the single most important predictor of EBF duration was involvement in the intervention.

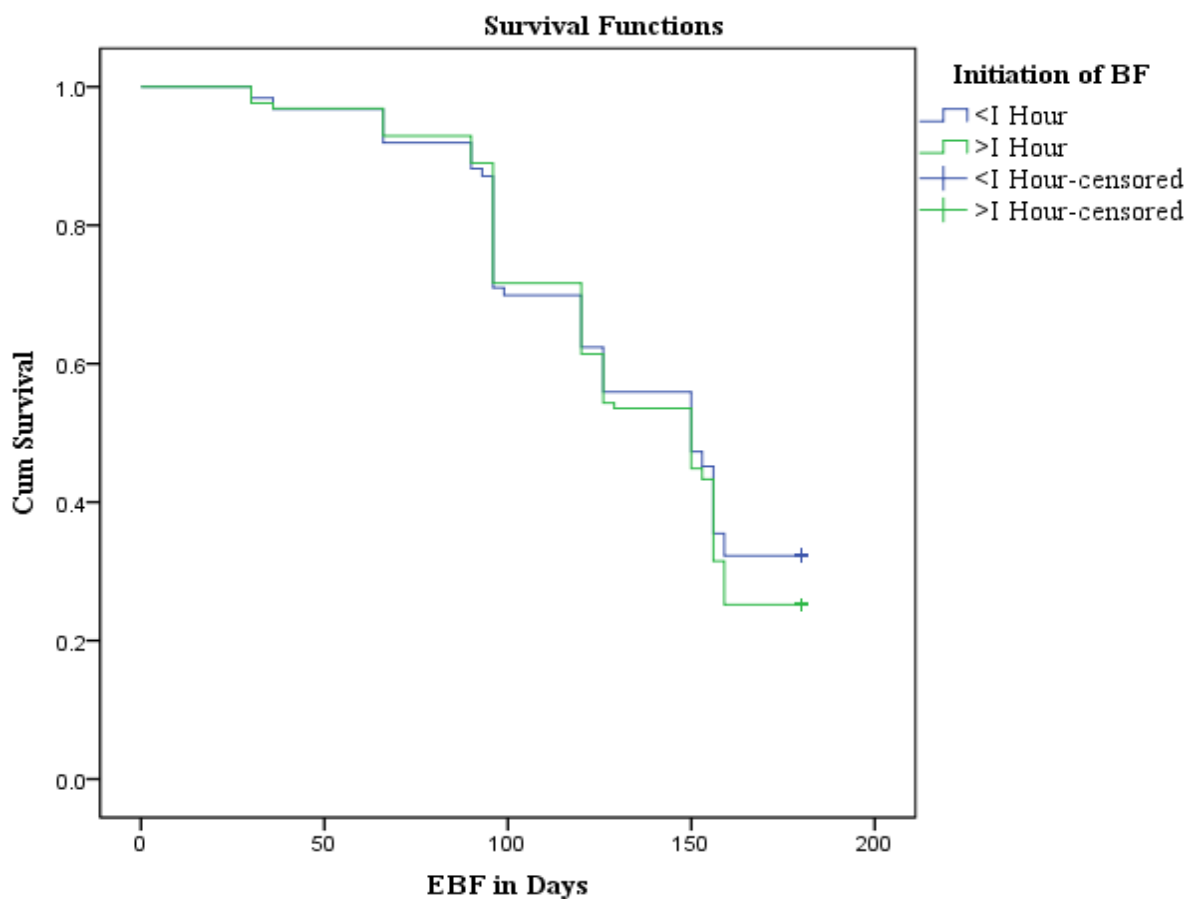


Figure 14: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days for different times in BF Initiation

Further a binary logistic regression was performed to ascertain socio-economic and post/intra-partum factors that were independently associated with EBF (Table 26). Covariates were selected for entry into the model from the variables found to be significant at univariate level (cut-off for model entry was set at $p \leq 0.05$, a priori). The following qualified for entry; group (being in the intervention or not); mothers education level; household income;

haemoglobin level; giving pre-lacteal feeds and household food security. The logistic regression model was statistically significant and was able to explain 70.7% (Nagelkerke R^2) of the variance of EBF and correctly classified 89.9% of the respondents. Mothers with secondary education and above were 4.75 times more likely to exclusively breastfeed than those who had primary education and below. The odds of being in the comparison group was associated with a 85% less likelihood of exclusively breastfeeding (OR 0.146 at 95% CI 0.056-0.378), while the odds of being food insecure had a 97% unlikelihood of exclusively breastfeeding (OR 0.032 at 95% CI 0.011-0.093).

Table 26: Socio economic and post-partum factors influencing EBF duration

	Wald	df	p	Exp (B)	95% C.I.for EXP(B)	
					Lower	Upper
Group(1)	15.683	1	0.001*	0.146	0.056	0.378
Mothers education level(1)	7.696	1	0.006*	4.754	1.580	14.300
Household Income (1)	3.123	1	0.077	0.422	0.162	1.099
HB level(1)	0.549	1	0.459	1.935	0.388	11.084
Giving prelacteal feeds(1)	0.072	1	0.789	0.827	0.205	3.332
Household food security (1)	39.921	1	0.001*	0.032	0.011	0.093
Constant	30.213	1	0.000	55.153		

**P < 0.05, significant using binary logistic regression, -haemoglobin level, CI- Confidence level, Exp (B) -Odds Ratio*

The results indicate that education is an important factor in ensuring EBF. It is therefore important to ensure that where education levels are low or illiteracy rates are high, interventions geared towards creating awareness on infant feeding that target care givers are designed and implemented. This will mitigate against illiteracy. The same applies to ensuring household food security and enhancing a mother's BSE. Interventions that aim at enhancing mothers BSE household food security should also be designed and implemented.

4.10 Effect of the structured nutrition education intervention on maternal breastfeeding self-efficacy (BSE) and EBF duration

4.10.1 Effect of Intervention on maternal breastfeeding self-efficacy (BSE)

To determine the effect of the structured nutrition education intervention on maternal breastfeeding self-efficacy (BSE) a multivariate generalized estimating equation (GEE) analysis was performed. Generalized Estimating Equations (GEE) are appropriate when dealing with correlated data search as mother-infant pairs, when handling data that is not

normally distributed and when having repeated assessments on the same individuals over a period of time. Generalized Estimating Equations are also appropriate when handling data with missing values (Liang and Zeger 1993, Zeger and Liang 1992). The ability to specify a non-normal distribution and to allow for analysis of repeated measurements, made GEE an appropriate model for this data set which was skewed to the right, was correlated and had repeated measures from the same individuals. The BSE generated count data which was not normally distributed. The GEE analysis was used in a similar study in Otsuka *et al.* (2014) in Brazil which determined the effect of an intervention designed to improve BSE scores in breastfeeding friendly Hospital initiative (BFHI) certified hospitals and non-certified hospitals.

Table 27: The effect of the intervention on BSE

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	53.25	4.84	43.75	62.74	120.88	1	0.001*
[Time=1.00]	-3.06	0.52	-4.07	-2.05	34.90	1	0.001*
[Time=2.00]	1.40	0.34	0.73	2.06	17.04	1	0.001*
[Time=3.00]	0 ^a	.	.	.	.	.	.
[Group=1]	1.41	0.68	0.08	2.75	4.31	1	0.038*
[Group=2]	0 ^a	.	.	.	.	.	.
[Edu_Wife=1]	-3.92	0.86	-5.60	-2.24	20.93	1	0.001*
[Edu_Wife=2]	0 ^a	.	.	.	.	.	.
[Income=1]	1.93	0.70	0.56	3.30	7.59	1	0.006*
[Income=2]	0 ^a	.	.	.	.	.	.
[HFIAS_2=1]	2.49	0.62	1.27	3.70	16.14	1	0.001*
[HFIAS_2=2]	0 ^a	.	.	.	.	.	.
HB (Scale)	0.73	0.38	-0.02	1.47	3.67	1	0.055

Dependent Variable: BSE; Model: (Intercept), Time, Group, Edu_Wife, Income, Food security, Haemoglobin level.

a. Set to zero because this parameter is redundant

For our study time and group were added in the model to enable compare the two groups at different times (baseline, midline and end-line). Other factors known to influence EBF from this study (at univariate level) were considered likely to influence the effect of the

intervention hence were added into the model as showed on Table 27 above. The cut off for model entry was $p \leq 0.05$ set a priori.

The findings suggest that the structured nutrition education intervention improved breastfeeding self-efficacy. Mothers in the intervention group were 1.41 times likely to have higher BSE scores than those in the comparison group. With a significance of $p=0.038$ (log odds 1.41, 95% CI 0.08-2.75). Other factors that had an influence on the BSE scores were mother's education level, household income and household food security. A mothers decreasing education level was negatively associated with a -3.92 less likelihood of having a higher BSE score (log odds -3.92, 95% CI -5.60 to -2.24) while being food secure was associated with a 2 times (log odds 2.49, 95% CI 1.27-3.70, $p=0.001$) more likelihood of having a higher BSE score. The BSE scores increased over time during the period of the study. There was a decreasing likelihood (log odds -3.06, 95% CI -4.07 to -2.05 $p=0.001$) that baseline BSE scores would be higher than the endline BSE scores.

There is evidence to conclude that being in the intervention group had an effect on the maternal breastfeeding self-efficacy (BSE). Furthermore, with significant values ($p=0.001$) after controlling for time (baseline, midline and end-line), the structured nutrition education intervention improved the BSE scores from baseline to 6 months post-partum. This effect can be attributed to the intervention since there were insignificant differences in all the variables assessed at baseline among the study groups.

The intervention created awareness on the appropriateness of EBF for the first six months. It supported mothers and answered their questions on breastfeeding issues arising during the intervention period. Interventions that give appropriate messages on EBF are therefore likely to enhance mothers BSE which in turn increases rates of EBF.

4.10.2 Effect of the intervention on maternal breastfeeding perceptions

The effect of the structured nutrition education intervention on maternal breastfeeding perceptions was determined by performing a multivariate generalized estimating equation (GEE) analysis for all the perceptions (susceptibility, threats, barriers and benefits). Being in the intervention group had an effect on all the maternal breastfeeding perceptions with all the variables yielding p value of less than 0.05 with an exception of barriers (susceptibility $p=0.001$, log odds 6.93, 95% CI 4.25-9.61; threats $p=0.001$, log odds 3.00, 95% CI 1.21-4.80; barriers $p=0.243$, log odds -0.361, 95% CI -0.97-0.25; benefits $p=0.027$, log odds 0.844, 95% CI, 0.098-1.60). The intervention therefore, was able to enhance all the breastfeeding perceptions (susceptibility, threats, benefits and barriers, 6.93, 3.00, -0.361 and 0.844 times

respectively). Being in the intervention decreased the likelihood of having a higher score in barriers by 64% although the effect was insignificant ($p= 0.243$). Mothers in the comparison group had a higher likelihood of having higher scores in this perception.

It was also evident that the structured nutrition education intervention improved maternal breastfeeding perceptions over the entire period of the study. Perception scores were more likely to be higher at endline and midline than at the baseline with all values yielding significant p values of less than 0.05-0.001 with the GEE model. Since all the variables yielded insignificant differences at baseline this effect can be attributed to the intervention.

4.10.3 Effect of intervention on breastfeeding duration

Duration of exclusive breastfeeding was analyzed by Kaplan Meier survival analysis for the main study variable (Fig 15). More mothers were still exclusively breastfeeding at six months in the Intervention group (45.3%) compared to the comparison group (15.0%), therefore at univariate level rates in the intervention were higher compared to those in the comparison group. The mean duration was 142.717 days for the intervention group (± 3.322) verses 125.876 days (± 3.017) in the comparison group with an overall mean of 133.653 days (± 2.279). A log rank test was run to determine if there were significant differences in the survival distribution for the different groups (intervention and comparison). The survival distributions for the two groups were statistically and significantly different, log rank 20.277, (1, n=314) $p < 0.001$).

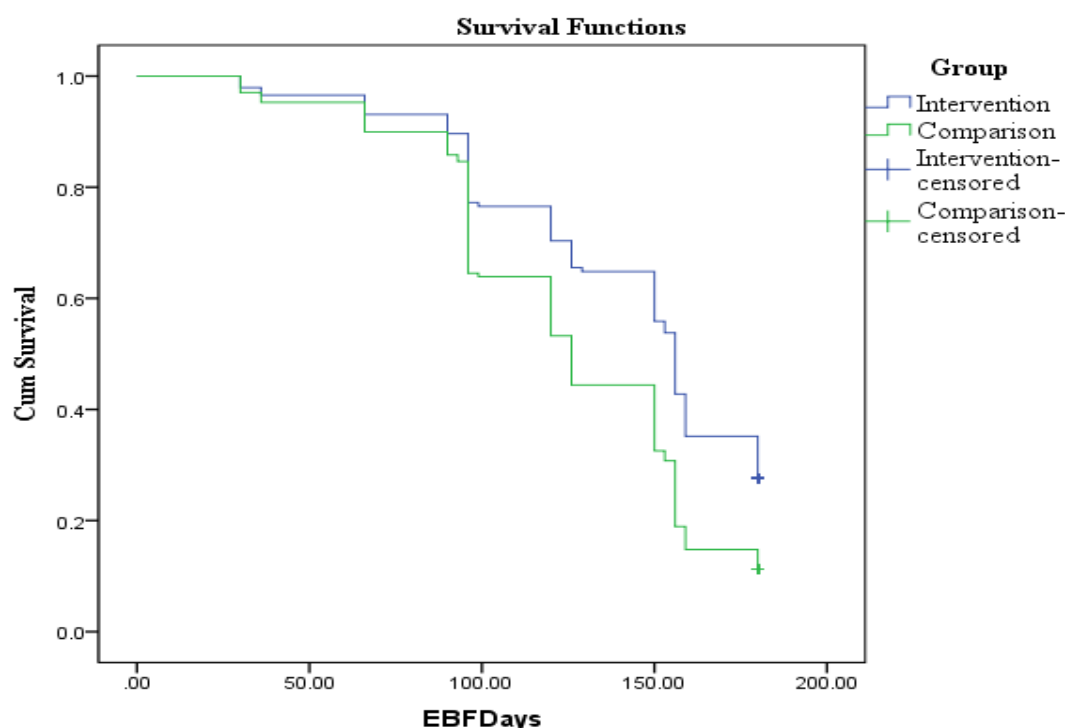


Figure 15: Kaplan Meier Survival Analysis for Duration of EBF of comparison versus intervention groups in days

Analysis using the GEE was further carried out to determine the effect of the intervention on the exclusive breastfeeding as a continuous variable (Table 28). Covariates that were significant at univariate level were added into the model. These factors included, time, BSE and the perceptions towards exclusive breastfeeding, household income, and household food security. The cut-off for model entry was $p \leq 0.05$, set a priori.

Mothers in the intervention were 10 times more likely to exclusively breastfeed for longer, compared to those in the comparison group. (Log odds, 10.32, 95% CI of 14.08-31.76, $p=0.001$). However the most significant factor associated with exclusive breastfeeding in this model was household food security (Log odds, 45.44, 95% CI of 39.26-51.62, $p=0.001$). Other significant factors were the mothers education level, decreasing formal education attainment was negatively associated with a -13.76 times less likelihood of exclusive breastfeeding (Log odds, -13.76, 95% CI -20.57 to -6.95, $p=0.001$). Mothers with a higher BSE scores were 1.11 more times likely to EBF (Log odds, 1.11, 95% CI 0.67-1.55 $p=0.001$) at the same time the intervention group reduced perceptions of barriers to EBF. Higher scores in barriers reduced the likelihood of EBF by -1.26 times (Log odds, -1.26, 95% CI -1.86 to -0.67, $p=0.001$).

Table 28: Effect of structured nutrition education intervention on EBF

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	85.75	17.95	50.5	120.93	22.82	1	0.001*
[Time=1.00]	2.72	1.91	-1.01	6.46	2.04	1	0.153
[Time=2.00]	-5.98	1.77	-9.46	-2.51	11.39	1	0.001*
[Time=3.00]	0 ^a	.	.	.	.	.	.
[Group=1]	10.32	3.10	4.26	16.39	11.12	1	0.001*
[Group=2]	0 ^a	.	.	.	.	.	.
[Edu_Mother=1]	-13.76	3.47	-20.57	-6.95	15.70	1	0.001*
[Edu_Mother=2]	0 ^a	.	.	.	.	.	.
[Income=1]	0.612	2.87	-5.01	6.23	0.046	1	0.831
[Income=2]	0 ^a	.	.	.	.	.	.
[Food Security=1]	45.44	3.15	39.26	51.62	207.47	1	0.001*
[Food security=2]	0 ^a	.	.	.	.	.	.
BSE	1.11	0.22	0.67	1.55	24.60	1	0.001*
Susceptibility	0.034	0.13	-0.23	0.30	0.06	1	0.803
Threats	-0.013	0.16	-0.34	0.31	0.01	1	0.937
Barriers	-1.26	0.30	-1.85	-0.67	17.56	1	0.001*
Benefits	-0.67	0.34	-1.35	0.003	3.81	1	0.051
(Scale)	688.18						

*Significant at 0.05 Dependent variable: EBF days, Model: (Intercept), Time, Group, Income categorical, Household food security, BSES, Susceptibility, Threats, Barriers, and Benefits.

^a. Set at Zero because this parameter is redundant; ^b. Maximum likelihood estimate

There is an indication that the intervention had some significant effect on EBF rates even at the bivariate level. This effect can be attributed to the intervention since all the above variables were not significantly different at baseline between the two groups. Since decreasing barrier scores was associated with a higher likelihood of higher rates of EBF effort geared towards increasing mothers BSE and reducing barriers that hinder mothers in their efforts to breastfeed need to be adapted.

Similar results have been recorded in other studies. For instance Qureshi, *et al.* (2011), used community volunteers to promote exclusive breastfeeding in Sokoto State, Nigeria and after counselling, all infants up to 6 months of age were exclusively breastfed in the intervention group. Tyllestar *et al.* (2011), in a study that involved three countries (Burkina Faso, Uganda and South Africa) also found rates of EBF higher in intervention groups. The intervention that involved home visits and nutrition education using CHWs found the intervention arm to have higher rates of EBF compared to the control arms. Furthermore

Agrasada *et al.* (2005) in Manilla Philippines used CHWs with personal breastfeeding experience to educate women (n=68) on EBF and assisted in the prevention and management of common breastfeeding complications during home visits. Exclusive breastfeeding rates were 32%, for the intervention arm, 3% for the 2nd arm that intervened on basic child-care practices with some breastfeeding attention using peer counsellors during home visits and 0%, for the 3rd (control) group which received usual care.

To determine the effect of the intervention on EBF rates when this outcome variable was collapsed into a dichotomous variable, a bivariate logistic regression was run. The logistic regression model was statistically significant and was able to explain 71.2% (Nagelkerke R^2) of the variance of EBF and correctly classified 90.1% of the respondents. Four factors (being in the intervention group, mother's education level, BSE and barriers to EBF) were found to significantly influence EBF (Table 29 below).

Table 29: Independent factors influencing EBF duration

		B	Wald	df	P	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Step 1 ^a	Group(1)	1.79	0.44	1	0.001*	0.167	0.07	0.40
	Edu_Wife(1)	1.27	0.57	1	0.027*	3.55	1.15	10.93
	Income (1)	0.79	0.45	1	0.069	0.45	0.19	1.06
	BSE_End	1.45	0.14	1	0.001*	1.04	0.49	0.84
	Food Security (1)	0.96	0.56	1	0.086	0.38	0.13	1.15
	Barriers_End	0.43	0.15	1	0.005*	1.53	1.14	2.06
	Constant	30.30	9.54	1	0.001*	1.448E+13	0.07	0.40

**P* < 0.05, significant using binary logistic regression, *BSES*-Breastfeeding self-efficacy, *HB* -haemoglobin level, *CI*- Confidence level, *Exp (B)* -Odds Ratio

Mothers in the comparison group were 83% less likely (OR=0.167, 95% CI 0.07 – 0.40, $p=0.001$) to exclusively breastfeed compared to mothers in the intervention group. More educated mothers were on the other hand 3.55 times more likely to exclusively breastfeed compared to mothers in the comparison group (OR 3.55 at 95% CI 1.15-10.93). Having a higher BSE score at end line similarly increased the likelihood of exclusive breastfeeding for six months by 1.04 times compared to the comparison group (OR 1.04 at 95% CI 0.49-0.84). Furthermore mothers with higher barrier perceptions were 1.53 times less likely to EBF for six months compared to those whose barrier perceptions were lower (OR1.53 at 95% CI 1.14-

2.06). Household food security however yielded an insignificant association with EBF with the logistic regression.

From the above results a mothers BSE and perceptions on barriers (inability to exclusively breastfeed for the first six months for one reason or the other) are key to the success of EBF and should be targeted in the design and implementation of interventions geared towards improving infant feeding, particularly EBF, especially where mothers have low level of education.

4.11 Hypothesis Testing

The following hypothesis were tested at $\alpha= 0.05$ significance level;

4.11.1 Hypothesis one: Differences in BSE and Breastfeeding perceptions between the intervention and comparison groups at baseline.

H_{01} There is no difference in BSE and breastfeeding perceptions for mothers in the intervention and comparison groups at baseline

An independent t-test was carried out to test whether the baseline means for the two groups (intervention and comparison) were different; the formula was as below,

$$t = \frac{\bar{X}_i - \bar{X}_c}{Sp \sqrt{\left[\frac{1}{n_i} + \frac{1}{n_c}\right]}}$$

Where;

\bar{X}_i = the BSE mean scores of the intervention group

\bar{X}_c = the BSE mean scores of the comparison group

Sp = pooled standard deviation

n_i = sample size of the intervention group

n_c = Sample size of the comparison group

Intervention mean was 60.99 ± 8.81 for the BSE-Scores ($s=0.66$ $n=176$) while it was 59.98 ± 9.68 ($s=0.61$, $n=255$) for the comparison group.

The perception means for susceptibility (45.95 ± 13.02 , $s= 0.98$, $n=176$ verses 45.26 ± 13.82 $s= 0.87$, $n=255$) threats (47.72 ± 11.51 $s=0.87$, $n=176$ verses 46.48 ± 11.15 $s= 0.70$ $n=255$) perceived barriers (9.80 ± 4.21 $s=0.32$, $n=176$ verses 9.84 ± 4.50 $s= 0.28$, $n=255$) and the perceived benefits (43.33 ± 5.13 $s=0.39$, $n=176$ verses 43.09 ± 5.62 $s=0.35$, $n=255$) for

the intervention versus comparison group showed no significant differences in maternal breastfeeding perceptions by t-test for equality of means ($t=0.519$, $df\ 429$ $p=0.604$, $t=1.119$, $df\ 429$ $p=0.264$, $t=-0.094$, $df\ 429$ $p=0.926$, $t=0.458$, $df\ 429$ $p=0.647$) for susceptibility, threats, barriers and benefits respectively at baseline.

The results of the independent t-test show that all the p values were greater than the alpha value of 0.05 at 95% CI. There were therefore no significant differences in the BSE and breastfeeding perceptions between the two groups. This means that the null hypothesis is accepted and the conclusion is made that there was no difference in the BSE-scores and breastfeeding perceptions of the two groups at baseline.

4.11.2 Hypothesis two: Differences in BSE and breastfeeding perceptions between the intervention and comparison groups at end line.

H₀₂ There is no difference in BSE and breastfeeding perceptions for mothers in the intervention and comparison groups after the intervention

A paired t- test was run to determine if there were differences in BSE and breastfeeding perceptions for mothers in the intervention and comparison groups after the intervention.

The model;

$$t = \frac{\bar{X}_i - \bar{X}_c}{\sqrt{\frac{Var_i + Var_c}{n_i + n_c}}}$$

Where;

\bar{X}_i = the BSE mean scores of the intervention group

\bar{X}_c = the BSE mean scores of the comparison group

Var_i = the variance of the intervention group

Var_c = the variance of the comparison group

n_i = sample size of the intervention group

n_c = sample size of the comparison group

The means of the BSE and breastfeeding perceptions were compared at the end of the intervention. The before and after mean of the BSE of 60.35 ± 9.606 and 63.32 ± 6.905 were significantly different with a mean difference of 2.962, $t=6.083$ and $df\ 317$, $p=0.001$.

When before and after the intervention scores were analyzed by the paired t-test significant differences were obtained for all the perception themes $p=0.001$ with mean differences of $(-12.22 \pm 12.71 t= -17.18 df 318; -8.346 \pm 9.38, t= -15.941 df 320, 2.59 \pm 4.770 t=9.51 df 316, \text{ and } -3.29 \pm 4.72 t= -12.43 df 323)$ for susceptibility, threats, barriers and benefits respectively. This means that the null hypothesis is rejected and the conclusion is made that there was a significant difference in the BSE-scores and breastfeeding perceptions of the two groups at end-line.

4.11.3 Hypothesis three: Relationship between BSE and Breastfeeding perceptions and EBF duration

H_{03} There is no relationship between BSE; breastfeeding perceptions and EBF duration

A generalized linear model was run to determine the relationship between the maternal BSE and breastfeeding perceptions and results revealed a significant relationship between BSE, barriers and EBF. The relationship was insignificant for all the other breastfeeding perceptions.

$$Y = \alpha + \beta\chi_1 + \beta\chi_2 + \beta\chi_3 + \dots \beta\chi_n$$

The model below, yielded a significant relationship with the dependent variable

$Y = 37.53 + 10.50 (\text{Time 1}) - 7.23 (\text{Time 2}) + 15.95 (\text{intervention group}) + 2.07 (\text{BSE}) - 2.51(\text{Barriers})$. The null hypothesis is rejected for BSES and barriers but accepted for susceptibility, threats and benefits. It means that maternal BSE and the believe that it is not possible to exclusively breastfeed for 6 months due to one factor or the other are important factors in whether a mother exclusively breastfeeds for the first six months or not.

4.11.4 Hypothesis four: Effect of the intervention on the BSE breastfeeding perceptions and EBF duration

H_{04} The structured nutrition education does not have any effect on BSE; breastfeeding perceptions and EBF duration

A generalized estimating equation was run to determine the effect of the intervention on

BSE, breastfeeding perception and duration of EBF measured in days as a continuous variable and it revealed a statistically significant effect.

GEE equation utilized the linear link hence the model below applied

$$Y = \alpha + \beta\chi_1 + \beta\chi_2 + \beta\chi_3 + \dots + \beta\chi_n$$

The model, $Y = 53.25 - 3.06$ (Time 1) $+ 1.40$ (Time 2) $+ 1.41$ (Intervention group) $- 3.92$ (Mothers education level) $+ 1.93$ (Household income) $+ 2.49$ (HB) $+ 0.20$ (Mother's age) revealed a significant effect of the intervention on BSE.

The GEE analysis likewise yielded a statistically significant effect on all the maternal breastfeeding perceptions ($p \leq 0.05$) over time. The null hypothesis is therefore rejected.

The generalized estimating equation was further done to determine if the intervention had any effect on the EBF duration in days as a continuous variable.

The model, $Y = 85.75 + 2.72$ (Time 1) $- 5.98$ (Time 2) $+ 10.32$ (Intervention group) $+ 45.44$ (Household food security) $- 13.76$ (Mother' education)) $+ 1.11$ (BSE) $- 1.26$ (Barriers) revealed a significant effect of the intervention on BSE.

A binary logistic regression was also run to determine the effect of the intervention on the

duration of EBF as a dichotomous variable. The model below revealed a statistically significant effect;

$$\text{logit}(p) = \log(p/(1-p)) = \beta_0 + \beta_1 * x_1 + \dots + \beta_k * x_k$$

The model;

$\text{logit}(p) = 30.30$ (constant) $+ 0.167$ (group) $+ 1.04$ (BSE-End) $+ 1.53$ (Barriers _End) revealed a significant effect of the intervention on the EBF duration. The factors found to have an independent association with the dependent variable (duration of EBF) when measured as a dichotomous variable were; being in the intervention group; BSE and barriers both at the end of the intervention. The null hypothesis that the intervention had no effect on the BSE, breastfeeding perception and duration of EBF was therefore rejected.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to evaluate the effects of structured nutrition education on maternal perceptions and exclusive breastfeeding duration in Kiandutu Health Centre. The study was based on five research objectives. The hypotheses were tested with two cluster randomized groups. This chapter presents the conclusions drawn from the findings and the recommendations for the government, policy makers programme leaders and researchers.

5.2 Conclusions

5.2.1 Adaption and validation of the nutrition education protocol, perceptions and breastfeeding self-efficacy scale-short form.

The Nutrition education protocol, BSES-short form and the breastfeeding perceptions scales were validated and adapted. They were found to be valid, reliable and applicable to the population that was studied.

5.2.2 Maternal breastfeeding self-efficacy (BSE) and breastfeeding perceptions at baseline

There were no differences in the mean BSE and breastfeeding perceptions scores between the intervention and comparison groups at baseline.

5.2.3 Maternal breastfeeding self-efficacy (BSE) and breastfeeding perceptions at end-line

There was a significant difference in the rate of change in the BSE and breastfeeding perception scores for the two groups when the before and after the intervention scores were compared by the paired t-test. Significant differences were obtained for the BSES-SF and all the perception themes. The results show that the intervention had some effect on the BSE and perceptions in the two groups.

5.2.4 The relationship between maternal breastfeeding self-efficacy (BSE), breastfeeding perceptions, socio-economic, household food security, post-partum factors and EBF duration

Maternal breastfeeding self-efficacy (BSE) had a positive relationship with EBF duration using a generalized linear model, however only one perception, barriers yielded a relationship with EBF.

Being in the intervention group likewise, yielded a positive relationship. Mothers were more likely to exclusively breastfeed if they were in the intervention as compared to being in the comparison group.

Among the socio-economic and post/intra partum variables assessed, mother's education level, household income, haemoglobin levels, number of clinic visits, not giving pre-lacteal feeds and household food security were associated with a higher duration of EBF.

After running a bivariate logistic regression to determine if the categorical variables above remained significantly associated with the dependent variable (EBF) only being in the intervention, mother's education level and household food security remained significantly associated with EBF.

5.2.5 Effect of the structured nutrition education intervention on maternal breastfeeding perceptions self-efficacy (BSE) and EBF duration

The last objective of the study was to determine if the intervention had an effect on the maternal breastfeeding self-efficacy (BSE), perceptions and EBF duration. The intervention was found to have a significant effect on the BSE, EBF duration and all the maternal breastfeeding perceptions except for barriers. Although the structured nutrition education had some effect on the barriers the effect was insignificant. Mothers in the intervention were more likely to have a higher BSE and exclusively breastfeed for a longer duration

5.3 Recommendations

- i. The BSES-SF was applicable to the population that was studied however further research is needed to test its ability to be generalized in rural areas and to further establish predictive validity with larger samples by researchers in the area of infant and maternal nutrition.

- ii. The BSE and perceived barriers were able to predict EBD duration in this study. Health care workers should therefore make every effort to improve the breastfeeding confidence of mothers, emphasize the benefits of EBF for the first half of infancy and support mothers so as to reduce barriers to EBF. The Breastfeeding Mothers Bill, 2017 should also be enacted into law to remove some of the barriers working mothers face in their quest to exclusively breastfeed.
- iii. Structured nutrition education should be made possible to mitigate against low levels of education while instilling in mothers the importance of EBF. These should incorporate provision of consistent advice on how to improve maternal BSE and right perceptions towards BF by all health care workers. Further the Ministry of Health (through the nutrition directorate) can develop partnerships with mobile phone service providers for dissemination of short text messages that help build mothers' confidence in breastfeeding. The text messages can be developed using the BSES-SF. The messages can be disseminated on monthly bases.
- iv. The study recommends that a link between the antenatal clinic (ANC) at the health care facility and CHWs be established by Hospital management boards. This will ensure follow up of mothers in the promotion of optimal breast feeding and to offer support to the mothers in dealing with challenges of EBF. This will support the promotion of the Baby Friendly Community Initiative (BFCI) which is envisioned in the Maternal Infant and Young Child Nutrition (MIYCN) Strategy 2012-2017 by the ministry of Health-Kenya. These cadres of health workers were influential in promoting EBF in the present study. Follow up of mothers by CHWs may have contributed towards enhancing the BSE of mother's hence longer EBF duration among mothers in the intervention group.
- v. Strategies to increase mothers' iron/ folic supplements intake should be initiated in the study area and similar settings. The hospital health care workers should utilize innovative ways to encourage mothers to take recommended numbers during pregnancy. Medical researchers should also explore avenues through which IFAS should be administered other than the oral route which many mothers claim to induce nausea hence avoids taking

these supplements all together. Haemoglobin levels were associated with EBF duration in this study

- vi. Mechanisms and programmes that can enable the urban poor to make a living hence improve their economic status and may be food security need to be planned and implemented in this area and similar settings. This can be made possible through the office of the social worker at the various hospitals.

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APPENDICES

Appendix (i)

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

EFFECTS OF STRUCTURED NUTRITION EDUCATION ON MATERNAL PERCEPTIONS, AND EXCLUSIVE BREASTFEEDING DURATION IN KIANDUTU HEALTH CENTRE, THIKA –KENYA

REFERENCE NUMBER:

PRINCIPAL INVESTIGATOR: Ms. Dorothy Mituki- Mungiria

ADDRESS: Department of Human Nutrition,
Egerton University,
P.O.Box 536,
Egerton.

CONTACT NUMBER: 0722-333 133

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or doctor any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Committee for Human Research at Egerton University and the National Council for Science & Technology;

What is this research study all about?

It is estimated that interventions aimed at promoting optimal breastfeeding have the ability to prevent 13% of child deaths and increase the National GDP by 3%. Studies have also indicated that structured prenatal and perinatal nutrition education can increase rates of exclusive breastfeeding. The proposed study aims at developing a nutrition education protocol that can facilitate nutrition promotion by nutritionist in the MCH clinics. It is also hoped that the nutrition education intervention will lead to increased rates of exclusive

breastfeeding for the first six months hence among this community and hence contribute towards achieving MDG four and contribute towards achieving the vision 2030.

Why have you been invited to participate?

You have been invited to take part in this research because you are a member of this community a mother and expecting a baby. As a member of this community your opinions on pertinent issues touching on infant feeding and especially EBF will be of immense importance to this research.

What will your responsibilities be?

Your responsibility will be to attend MCH clinic when required and give information on your feeding habits and that of your baby.

Will you benefit from taking part in this research?

You will be privileged to be part of a team that will go through a structured nutrition education intervention; you will benefit in the form of gaining information and will also be part of a team that will enable validating of the Nutrition education protocol.

Are there any risks involved in your taking part in this research?

No. This research seeks for your opinion in assessing possible factors that influence breastfeeding in this community

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study. But, your transport will be covered for each study visit. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

You can contact Ms. Dorothy Mituki- Mungiria at telephone 0722 333 133 if you have any further queries or encounter any problems.

- **You can contact the Committee for Human Research at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed.**
- **You will receive a copy of consent form for your own records.**

Declaration by participant

By signing below, I agree to take part in this research study.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized to take part.
- I may choose to leave the study at any time and will not be penalized or prejudiced in any way.
- I understand that all information collected in this research shall be confidential and that it shall not be used to increment me whatsoever.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) on (date)

.....

Signature of participant

.....

Signature of witness

Declaration by investigator

I (name) declare that:

- I explained the information in this document to
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above

Signed at (place) on (date)

.....

Signature of investigator

.....

Signature of witness

Appendix (ii)

Questionnaire

Division----- Location----- Village-----

Age----- Gestation Age----- Marital status-----

1) Household data

N O#	Name(s)	Age	Household head	Education. Level	Family Income	Occupation	Employment
			1) Husband 2) Wife 3)son 4)Daughter 5)G/daughter 6)G/son 7) Others	1)None 2)Primary 3)Secondary 4)Tertiary 5)University	1)Married 2)Single 3)Separate 4)Divorce 5)		

2) Household possessions

Do you have any of the following items?

Possessions	YES (√)	NO (×)
Clock		
Radio		
Television		
Mobile telephone		
Non- Mobile telephone		
Refrigerator		
Solar Panel		
Bicycle		
Animal drawn cart		
Motor cycle		
Car/truck		
Ownership of dwelling		
Ownership of Agricultural land		
Ownership of farm animals (Bulls/ horses/donkeys		
Ownership of milk producing animals (cow/goat/)		
Ownership of Chicken		

3) Perceived susceptibility

The following are ailments common to babies not exclusively breastfeed

In a scale of 1-5 rate how likely you think your baby may experience these ailments

Ailment in Babies not exclusively breastfeed	Extremely unlikely my child would ever suffer this ailment (1)	Very Unlikely (2)	Some what my child would ever suffer this ailment (3)	Very Likely (4)	Extremely likely my child would ever suffer this ailment (5)
Underdevelopment*					
Colds					
Allergies					
Asthma					
Sudden Infant Death Syndrome					
Diabetes					
Diarrhoea					
Indigestion					
Ear infection					
Pneumonia					
Infant Botulism					
Meningitis					
Obesity in adulthood					
CVD in adulthood					

4) Perceived threats

The following are ailments common to babies not exclusively breastfeed

In a scale of 1-5 rate how serious you think these ailments are

Ailment in Babies not exclusively breastfeed	Extremely unlikely my child would ever suffer this ailment (1)	Very Unlikely (2)	Some what my child would ever suffer this ailment (3)	Very Likely (4)	Extremely likely my child would ever suffer this ailment (5)
Colds					
Allergies					
Asthma					
Sudden Infant Death Syndrome					
Diabetes					
Diarrhoea					
Indigestion					
Ear infection					
Pneumonia					
Infant Botulism					
Meningitis					
Obesity					

5) Perceived barriers

Please rate the following barriers according to how much they can discourage you from exclusive breastfeeding

In a scale of 1-5 rate how the identified barriers would influence your breastfeeding for the first six months

Barrier for breastfeeding exclusively	Extremely unlikely my child would ever suffer this ailment (1)	Very Unlikely (2)	Some what my child would ever suffer this ailment (3)	Very Likely (4)	Extremely likely my child would ever suffer this ailment (5)
Milk not adequate for baby					
Going back to work					
Do not know how to express					
My mother in-law discouraged me					
Other significant factors(aunties etc)					

6) Perceived benefits

The following is a list of potential benefits of EBF. In a scale of 1-5 please rate them according to whether or not they would encourage you to breastfeed for the first six months or not.

Perceived benefits For exclusive breastfeeding	Extremely unlikely (1)	Very Unlikely (2)	Some what (3)	Very likely (4)	Extremely likely (5)
Improved overall infant health					
Improved mother's weight loss					
Improved overall health of the mother					
Increased convenience					
Used as a birth control					
Less expensive than formula					
No bottles/ equipments to wash					
Improved bonding with baby					
Improved infant cognitive benefits					
Improved infant development					

7) Cues to action

i; How did you learn about the benefits of EBF for the first six months?

ii; How did you learn about the benefits of optimal diet?

8) Breastfeeding self efficacy scale-short form

For each of the following statements, please choose the answer that best describes how confident you are with breastfeeding your expected baby. Please mark your answer by circling.

1=not at all confident 2= not very confident 3=sometimes confident
 4=confident 5=very confident

		(1)	(2)	(3)	(4)	(5)
1	I can always determine that my baby is getting enough milk					
2	I can always successfully cope with breastfeeding like I have with other challenging tasks					
3	I can always breastfeeding my baby without giving other feeds					
4	I can always ensure that my baby is properly latched on for the whole feeding					
5	I can always manage the breastfeeding situation to my satisfaction					
6	I can always manage to breastfeed even if my baby is crying					
7	I can always keep wanting to breastfeed					
8	I can always comfortably breastfeed with my family members present					
9	I can always be satisfied with my breastfeeding experience					
10	I can always deal with the fact that breastfeeding is time consuming					
11	I can always finish feeding my baby on one breast before switching to the other					
12	I can always continue to breastfeed my baby even when he/she is unwell					
13	I can always manage to keep up with my baby's breastfeeding demands					
14	I can always tell my baby is finished breastfeeding					

Appendix (iii)

Health assessment card

Date----- NO of Visit-----

Village/Cluster : _____ Height : _____
Name: _____ Pre-pregnant weight : _____
Age : _____ Date of last menstrual cycle : _____
Para of pregnancy : _____
Religion : _____ Telephone Number: _____

1. Anthropometric measurement of the expectant women

Month & weeks of pregnancy	Weight in kg	Complications if any
4		
5		
6		
7		
8		
9		

2) Foods included during pregnancy

S.NO	Foods included	Reason for inclusion
1		
2		
3		
4		
5		
9		

3) Foods avoided during pregnancy

S.NO	Foods Avoided	Reasons for avoiding
4		
5		
6		
7		
8		
9		

4) **Dietary intake**

A 24 hour recall

Time	Place eaten	Food/Drink, Description & Cooking Method	Amount Eaten	Wt Equivalent
Probe for alcohol Yes/No Probe for sickness Y/N If yes did it affect appetite? How? Was food intake unusual Yes/No Was it a feast/ Occasional? Yes/No Are you on any multi-vitamins? Yes/No If yes Which?				

5) Are you taking any nutrient supplementation as prescribed by the physician ?

Yes No

If yes, details

S.NO	Nutrient composition	Frequency/day
1	Iron	
2	Iron & Folate	
3	Iron , Folate & Vitamin c	
4	Iron , Folate & calcium	
5	calcium	
6	Others (specify)	

6) Interval between previous and present pregnancy-----

7) Type of birth

a. Normal

b. Caesarean

8) Anthropometric measurements of the new born of the present pregnancy

a. Weight ----- b. Recumbent length

Appendix (iv)

Individual Dietary diversity questionnaire

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

Q NO	Food Group	Examples	YES(1)/NO (0)
1	CEREALS	Bread, biscuits or any food made from millet, sorghum, maize, rice, wheat (insert local foods e.g ugali, rice porridge)	
2	VITAMIN A RICH VEGETABLES AND TUBERS	Pumpkin, carrots, squash, sweet potatoes (orange fleshed)	
3	WHITE TUBERS & ROOTS	White potatoes, white yams, cassava or foods made from roots	
4	DARK LEAFY GREEN VEGETABLES	Dark green leafy vegetables, including wild ones locally available vitamin A rich leaves such as cassava leaves	
5	OTHER VEGETABLES	Other vegetables including wild ones	
6	VITAMIN A RICH FRUITS	Ripe mangoes, papayas other locally available vitamin A –rich fruits	
7	OTHER FRUITS	Other fruits including wild fruits	
8	ORGAN MEAT (IRON RICH)	Liver, kidney, heart or other organ meats or blood based foods	
9	FRESH MEATS	Beef pork, lamp, goat, rabbit, wild game, chicken, duck or other birds	
10	EGGS		
11	FISH	Fresh or dried fish or shellfish	
12	LEGUMES, NUTS & SEEDS	Beans peas, lentils, nuts, seeds or foods made from these	
13	MILK & MILK PRODUCTS	Milk, cheese, yogurt or other milk products	
14	OILS & FATS	Oil, fats or butter added to food or used for cooking	
15	SWEETS	Sugar Honey, sweetened soda or sugary foods such as chocolates, sweets or candies	
16	COFFEE/TEA	Tea (black, green herbal) or coffee	
			Yes(1)/ No (0)
A	Was yesterday a celebration or a feast day where you ate unusual foods?		
B	Did you go to the local market yesterday?		
C	Did you eat anything outside the home?		

Appendix (v)

Household food insecurity Access Scale (HFIAS)

For the questions that follow, respondents should give a YES or NO answer. If it is a yes, the respondent is asked to indicate the number of times the event occurred; i) Rarely (once or twice) ii) sometimes (3-10 times) iii) often (more than 10 times) in the last one month			
	Question	Response NO YES: (1, / 2/ 3)	Code
1	Did you have any fear that your household would lack enough food?		
2	Have you or anyone in your household missed eating any of the kinds of foods you preferred because of a lack of resources? (e.g. of preferred foods Rice, chapatti, eggs, milk....)		
3	Have you or anyone in your household been forced to reduce the use of different varieties of food because resources were not enough (e.g Ugali& kales instead of ugali & meat..... give examples)		
4	Did you or anyone in your household eat what they did not really want because of lack of resources (e.g. eating porridge instead of a meal? Ugali with salt, wild roots		
5	Have you or anyone in your household been forced to eat smaller amounts of food than you would usually due to lack of enough food?		
6	Have you or anyone in your household been forced to reduce the number of times you eat in a day due to lack of enough food?		
7	Has there been a time when there was no food at all in your house because of a lack of resources to obtain food		
8	Have you or anyone in your household slept without being satisfied because food was not enough or it lacked completely?		
9	Have you or anyone in your household gone a whole day and night without eating anything at all because food was not enough or it lacked completely		

Appendix (vi)

BREASTFEEDING QUESTIONNAIRE

Date of interview..... Name of child.....Weight (Kgs).....Height.....

Date of birth.....

- 1) What was the first feed given to the baby after birth? -----What other feeds are given in the first three days after birth-----WHY? -----
- 2) How many times in the last 24-hrs have you feed your baby?-----
- 3) Did you give your baby colostrum/liquid that comes from the breast in the first three days after delivery? If YES why----- and if NO why?-----
- 4) How soon was the baby put to the breast after birth?.....
- 5) Some people say that babies can survive on breastmilk alone without even water.
 - a) Do you believe a baby can survive on breast milk alone without even water?-----
 - b) If YES, for how long?
 - c) Is it a common practice to give babies breastmilk without even water in this community?----- Probe for reasons for the response.-----
- 6) Since this time yesterday, has (name) been breast-fed? Yes ----No-----
If yes, was this (name)'s main source of food? Yes----- No-----
- 7) Since this time yesterday, did (name) receive any of the following: Answer Yes or No
 - Vitamins,----- mineral supplements,----- medicine-----
 - Plain water-----Sweetened or flavored water ----- Fruit juice ----- Tea-----
 - Infant formula----- Tinned/powdered-----fresh milk-----
 - Solid or semi-solid food-----Oral Rehydration Salts (ORS)-----
 - Other (specify:
8. Since this time yesterday, did (name) drink anything from a bottle with a nipple/teat?
Yes----- No-----
If yes, please describe:.....
- 9) In the last 24 hours have you left the baby home alone? Yes----- No-----
If yes, what was the child feed on in your absence?-----
- 10) Has the child suffered any illness in the last two weeks?
If yes, did the child suffer from?-----
If yes what action did you take?-----

11) Please indicate food items you have given your baby in the last one week

Day	Food	Ingredients
Sunday		
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		

12) Have you experienced excessive crying from your child in the last one week? Yes-
No-----

If yes what did you give your child?-----

13) Note any deaths during the intervention period-----

Appendix (vii)

Nutrition education guide

Healthy Beginnings “MAMA”



”Mama” needs a healthy diet for herself and the unborn baby.

A healthy diet is based on high levels of Plant foods, lots of Vegetables, Fruits, Cereals, Legumes & relatively small amounts of Milk, Meat, Chicken and Eggs

Session 1

Nutrition in pregnancy & lactation

Group 1: Breads, cereals, rice and pasta (6-11 servings)

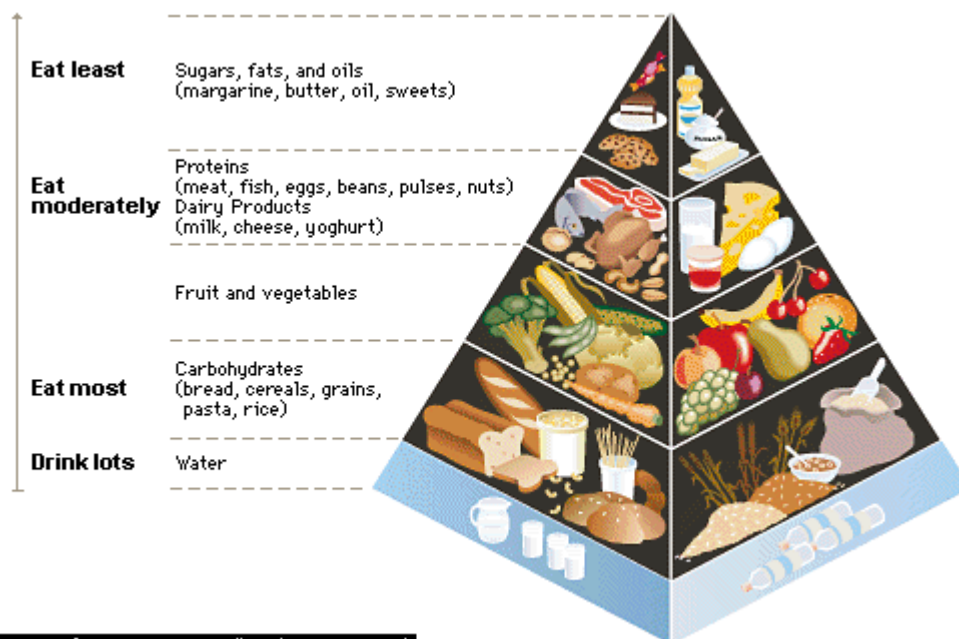
Group 2: Vegetables (3-5 servings)

Group 3: Fruits (2-4 servings)

Group 4: Meat, poultry, fish, dry beans, eggs etc

Group 5: Milk, yoghurt, cheese (2-3 servings)

Group 6: Fats, oils and sweets (use sparingly).



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A healthy diet is based on high levels of Plant foods, lots of Vegetables, Fruits, Cereals, Legumes & relatively small amounts of Milk, Meat, Chicken and Eggs

- Cereals; bread, ugali, rice, potatoes sweet potatoes, (flours enriched with amaranth flour)
- Arrowroots (6-11) portions
- 1 slice of bread
- ½ cup cooked Rice
- 1 medium potato
- Unrefined best choice Variety even better
- (Vitamin. C, the B's, Calcium, Zinc, Iron)

Vegetables and fruits (5) portions, about 400g

- 1 cup of green leafy vegetables (Amaranth, Spinach, Sukuma Wiki, etc)
- 1 medium tomato
- 160ml of fresh juice (Carrot juice / Orange juice)
- 1 medium Mango
- Fruits in season best: they are fresh, cheap & nutrient dense
- *Traditional vegetables a resource.*
- (Folate, Iron, Vitamin C, Fibre, Flavonoids)

Milk & the milk products (3portions?) a day

- 1-cup (200ml) yoghurt
- 1 glass (300ml) of milk
- Rich in Calcium- for bones & teeth

Meats/ poultry/fish& legumes (2 portions)/ day

- 1 cup (150-200g) of cooked beans
- 2eggs
- 70-80g cooked meat
- Rich in Iron, Vitamin, A, D, E &K

Oils and fats, sugar salt,

- Use sparingly

Water

6-8 glasses a day will do the cleaning

For iron

- Lean meats, offal meats,
- Green leafy vegetables Beans, peas, ++++ an orange- (any fruit rich in vitamin c) a good mix

General guidelines

Inadequate nutrition before pregnancy may lead to the following

- Higher prevalence of low birth rate.
- Intra-uterine growth retardation
- Increased miscarriages
- Increased maternal death
- Inadequate nutrient stores for effective lactation
- Inadequate placental development.

It is recommended that a woman who intends to get pregnant should take folate supplements at least six months before. A well balanced diet, which is supplied by a wide range of foods, should be provided. Iron and calcium particularly are important.

Iron is supplied by organ meat and dark green vegetables; these should be accompanied by citrus fruits. Calcium is supplied by milk and milk products.

Nutrient Interaction

- Some foods should not be eaten together while others should be eaten together for better absorption
- Avoid tea/coffee/ cocoa immediately after meals especially iron rich foods
- Eat an orange (or any other Vitamin C rich foods) after a iron rich meal

Items/foods to avoid at all costs

Alcohol/cigarettes/over the counter drugs

Session 2

Weight Gain in pregnancy & Consequences of sub-optimal dietary intake

Adequate diet is reflected through weight gain in pregnancy. A healthy, well nourished woman gains about 12-15kgs during pregnancy. Inadequate diet may lead to **Low birth weight (LBW) & intra uterine growth retardation (IUGR).**

BMI (Kgs/m²)	Recommended weight gain
Low (BMI <18.5)	12.5-18
Normal (BMI 18.5-24.9)	11.5-16
High (BMI ≥ 25-29.9)	7-11.5
Obese (BMI ≥30.0)	5-7

Too much weight should be avoided to minimize excessive postpartum weight retention and associated health risk factors

Guidelines to weight gain

A total of 2200 Kcal should be taken by a mature woman.

The following dietary practices to improve the nutrition of women are recommended at all times;

- Eat three meals a day and a snack in between meals using locally available foods
- Diversify the diet to improve on quality & provide micronutrients.
- Ensure a daily intake of fruits & vegetables
- Consume animal proteins.

In pregnancy the above should be followed:

- Increase food intake to cater for an increased energy demand, which is about + 300 calories, especially during the last times (last 3 months of pregnancy)
- Take general amounts of the complex carbohydrates (unrefined carbohydrates), which are rich in micronutrients & fibre.
- Increase your protein intake with about 10 to 15gm per day with a good amount being supplied by animal products
- Fruit and vegetables in generous amounts – to cater for increased demands for
 - ✓ Folate (Folic acid)
 - ✓ Vitamin c
 - ✓ Vitamin B complex (B₁B₂B₃)
 - ✓ Vitamin B₆ B₁₂ D, E, and K
 - ✓ Fibre to avoid constipation

Often times with consultation with ones physician, the following supplements are given

- ✓ Vitamin A
- ✓ Iron
- ✓ Other nutrients

The above list plus the following are important for a lactating woman,

- Additional Energy equivalent to + 600 Calories during the 1st 6 Months of lactation or an equivalent of an extra meal in a day; + 400 Calories in the next 6 months.
 - Protein + 15 grams per day in the 1st 6months
 - Protein + 12grm in the next 6 Months
 - A generous amount of complex carbohydrates
 - Lipids, at least 30 % of total Calories
 - Vitamins and minerals
 - Composition of breast milk will vary as far as B₁, B₂, B₆, A, Iodine & selenium is concerned—is concerned so the above source should be adequate
 - Adequate of others like folate, D Ca, Fe, Cu, Zn is important because inadequacy will – compromise the mother’s health as her stores will be depleted to maintain a constant supply in Breast milk.

Session 3

Exclusive breastfeeding

Definition

An infant is considered to be exclusively breastfed if he/she receives only breastmilk with no other liquids or solids, with the exception of drops or syrups consisting of vitamins, mineral supplements, or medicines.

Benefits

- ✓ It contains exactly the *nutrients* that a baby needs;
- ✓ It is easily digested and efficiently used by the baby's body;
- ✓ It protects a baby against infection.
- ✓ All other milks are different, and not as good for a human baby.

The other advantages of *breastfeeding* are that:

- ✓ It costs less than artificial feeding;
- ✓ It helps a mother and baby to *bond* - that is, to develop a close, loving relationship;
- ✓ It helps a baby's development;
- ✓ It can help to delay a new pregnancy;
- ✓ It protects a mother's health:
- ✓ It helps the uterus to return to its previous size. This helps to reduce bleeding, and may help
- ✓ to prevent anaemia;
- ✓ Breastfeeding also reduces the risk of ovarian cancer, and possibly breast cancer, in the mother.

Barriers to EBF

- ✓ Milk not adequate
- ✓ Going back to work
- ✓ Do not know how to express
- ✓ Inadequate food for the mother

Threats if EBF is not done

More likelihood of various childhood and later adult diseases including

Diarrhoea; May lose weight & not grow a health way;

Colds; Allergies; Asthma; Sudden infant death syndrome; Diabetes; indigestion; Ear infection; Pneumonia; Infant botulism; Meningitis; Obesity

Susceptibility of infants not EBF/ Consequences of sub-optimal breastfeeding

Infants who are not exclusively breast fed for the first six months have more risks to the following conditions; Diarrhoea; May lose weight & not grow a health way;

Colds; Allergies; Asthma; Sudden infant death syndrome; Diabetes; indigestion; Ear infection; Pneumonia; Infant botulism; Meningitis; Obesity

A mother's confidence

Every mother can produce adequate milk with frequent emptying to feed her infant for the first six months. It's the best foundation you can lay for your infant to ensure intelligence better health, growth and development.

Session 4

Exclusive Breastfeeding

Positioning/ attachment

Attachment to the breast

- Should take much of the areola and the underlying tissues into his mouth.
- The lactiferous sinuses are included in these underlying tissues.
- Should stretch the breast tissue out to form a long `teat'.
- The baby should suck from the breast, not the nipple.
- The tongue should be forward, over his lower gums, and beneath the lactiferous sinuses.
- His tongue should be cupped round the `teat' of breast tissue.
- If a baby takes the breast into his mouth in this way, he can suckle in the right way.
- He/she is well attached

Signs of good attachment

- The baby's chin touching the breast.
- His mouth wide open.
(This is important with large breasts, but less important with thin breasts.)
- His lower lip turned outwards.
- His cheeks round, or flattened against his mother's breast.
- More areola above the baby's mouth than below it.
- The breast looking rounded during a feed.

Consequences of poor attachment

- The baby may cause pain and damage to the nipple.
- nipple suckling is painful for his mother and may cause sore nipples and cracks
- The baby does not remove breastmilk effectively.

Ineffective suckling may lead to

- The breasts may become engorged.
- The baby may be unsatisfied, because the breastmilk comes slowly.
- He may cry a lot, and want to feed often, or for a very long time at each feed.
- The baby may not get enough breastmilk and lead to the mother not producing enough milk
- He may be so frustrated that he refuses to feed altogether.
- He may fail to gain weight.

The breasts may make less milk, because the milk is not removed. `more suckling makes more milk'. More suckling makes more milk if a baby is well attached, suckling effectively, and allowed to finish a feed, so that he removes the milk. In this case, if he suckles more often, the breasts will make more milk.

Factors that promote milk production

- The mother feels good about herself
- The baby is well attached to the breast so that he suckles effectively

- The baby suckles as often and for as long as he wants
- The environment supports breastfeeding
- Initiating breastfeeding within the first 30 minutes

Session 5

Exclusive breastfeeding

Expressing breast milk

This is done for various reasons;

If the mother has to be away for some times (eg work); to keep up the supply of the breast milk if the baby is ill or not sucking as fast; to relieve engorgement or blocked duct; to feed a LBW baby who cannot breastfeed; if the baby is weak or is taking longer than usual to learn to suckle or mother has an inverted nipple;

Process

- Wash hands with soap and water & prepare a clean container
- Gently massage breasts in a circular motion
- Position thumb on the upper edge of the areola and the other fingers on the underside of the breast behind the areola
- Press the areola behind the nipple between the fingers and the thumb
- Collect the milk in the container
- Express one breast for at least 3-5 minutes until the flow slows, then express other side, then repeat both sides again (20-30 minutes total)
- Warm the milk on a water bath
- Give the baby from a clean cup- bring cup to the babies lower lip and allow baby to take small amounts of milk. Do not pour milk into the baby's mouth.
- Do not use bottle & tit. They are unsafe to use because they are difficult to wash and can be easily contaminated.

Session 6

Indicators of successful breastfeeding

Signs of a good feed

- The baby taking slow deep sucks.

This is an important sign that a baby is getting breastmilk. He is well attached to the breast, and suckling effectively.

A baby usually takes a few quick sucks to start the oxytocin reflex. Then as the milk starts flowing and his mouth fills with milk, his sucks become deeper and slower. Then he pauses, and starts again with a few quick sucks.

- The baby swallowing so that you can see or hear it.

If a baby swallows, it means that he is getting breastmilk. Sometimes you can hear swallowing; sometimes it is easier to see swallowing.

- The baby 'gulping' as he swallows.

Gulps are very loud swallowing sounds, when a lot of fluid is being swallowed at once.

This is a sign that a baby is getting a lot of milk. It sometimes means that his mother has an oversupply, and her baby is getting too much milk too fast. Oversupply is sometimes the cause of breastfeeding difficulties.

Cues for satisfaction

- The baby releasing the breast himself, and looking satisfied and sleepy.

Mothers 'cues

- Milk dripping or spraying out of a mother's breasts.

This shows that she has an active oxytocin reflex.

If milk does not flow out, however, it does not mean that her reflex is not active.

- Uterine pains during breastfeeds for the first few days.

These are called *afterpains*. They are another sign of an active oxytocin reflex.

- Breasts which are full before and soft after a feed, showing that the baby is removing breast milk.
- Breasts which are very full or engorged all the time, showing that the baby is probably not removing breast milk effectively.
- Healthy looking skin of the nipples and breast.,
- Red skin or fissures which show that there is a problem.

Nipple looking squashed or with a line across the tip or down the side as the baby releases the breast. This is a sign of poor attachment.

Introduction of complementary feeds

After six months the baby will need other foods in addition to breast milk

Suggested sequence

6 months: Start with soft foods 2-3 times a day. Start with 2-3 tablespoons per feed. Introduce cereals mixed with breast or other animal milk then pureed vegetables followed by fruits. Food should be thick enough so that it does not run off the spoon.

7-8 months: Give cereals, mashed vegetables & fruits. Feed 3 times a day. Gradually increase the amount of food to $\frac{1}{2}$ of a 250ml cup. Babies have small stomachs & can only eat small amounts at each feed

Thicken the food as he grows older. Use breast milk or other milk to ensure he can easily swallow. Include a food from each group in at least one meal per day or as often as possible o ensure variety & hence quality.

9-11 months: Feed the child 4 times a day (3 meals & 1 snack) Snacks should not replace meals & good snacks provide energy and nutrients. At this time the baby should begin to eat finger foods e.g. pieces of ripe mangoes & papaya. Give $\frac{3}{4}$ of 250 ml cup at each feed. Include a food from each group in at least one meal per day or as often as possible o ensure variety & hence quality. Add small amounts of oil to the baby's food. Minced meats soft cooked eggs chicken & legumes may be given. Omit canned foods & fruits and honey. Honey may be a source of botulism clostridium

12-24 months: Continue to introduce multi-mix of various foods & give transitional diets from the family table. Give 5 meals a day (3 meals & 2 snacks). Give $\frac{3}{4}$ of 250 ml cup at each feed. Include a food from each group in at least one meal per day or as often as possible

o ensure variety & hence quality. Add small amounts of oil to the baby's food. Minced meats soft cooked eggs chicken & legumes may be given.

At 12 months other solid foods can be given as many times as possible each day

Factors to consider

- Introduce one food at a time
- Give time for familiarization with one food
- Give small amounts of every new food & increase gradually
- Use thin consistency at first & thicken gradually
- If a strong dislike is demonstrated withdraw & reintroduce later
- At first strained cereals, vegetables & fruits are given then solids are introduced as tolerated
- Avoid seasoning

Appendix (viii) Ethical clearance certificate

EGERTON

TEL: (051) 2217937
FAC: 051-221792



UNIVERSITY

P. O. BOX 536
EGERTON

Ref: EU/DVRE/028

June 7, 2013

Dorothy M. Mutuki-Mungiria
P.O. Box 536,
EGERTON

RE: APPLICATION FOR ETHICAL APPROVAL OF RESEARCH PROJECT

Reference is made to your application for ethical clearance of your research project entitled "*Effects of Structured Nutrition Education on Maternal Perceptions, and Exclusive Breastfeeding Duration in Kiandutu Health Centre, Thika-Kenya*"

This is to inform you that your application was reviewed on 7th June 2013 and it was noted that due consideration were given to the following ethical issues that would arise from the conduct of the study:

- i) That participants will be over 16 years of age
- ii) That confidentiality of participants will be safeguarded
- iii) That participation will be entirely voluntary

Your Research Project has therefore been given Ethical Clearance.

Please further note that the Standard Operating Procedures (SOPs) requires that you submit progress report after the field work and a copy of the final report of your study to the Committee.

Prof. M. K. Limo
CHAIRMAN – RESEARCH ETHICS COMMITTEE

c.c. DVC (R&E)
Director Research
MKL/pao

Egerton University is ISO 9001:2008 Certified

Appendix (ix) Research permit

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

PAGE 3

Research Permit No. NCST/RCD/12A/013/04

Date of issue: 17th June, 2013

Fee received: KSH. 2000

I hereby certify that:

Name of Applicant/Institution: Prof. Dr. Wambui Wangari

Institution: Egerton University


P.O. Box: 535, 20115, Egerton

Location: Thika West District

Province: Kiambu

on the topic: Effects of structures, nutrition education on maternal perceptions and exclusive breastfeeding duration in Kiambu Health Centre, Thika, Kenya

for a period ending: 31st December, 2014.




Wambui Wangari

Applicant's Signature

For Secretary
National Council for
Science & Technology

Appendix (x) Research Authorization

REPUBLIC OF KENYA



NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349, 254-020-2673550
Mobile: 0713 788 787 , 0735 404 245
Fax: 254-020-2213215
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: **NCST/RCD/12A/013/64** Date: **17th June 2013**

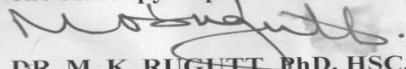
Dorothy Mituki-Mungiria
Egerton University
P.O Box 536-20115
Egerton.

RE: RESEARCH AUTHORIZATION

Following your application dated **15th May, 2013** for authority to carry out research on ***“Effects of structured nutrition education on maternal perceptions and exclusive breastfeeding duration in Kiandutu Health Centre, Thika- Kenya.”*** I am pleased to inform you that you have been authorized to undertake research in **Thika West District** for a period ending **31st December, 2014**.

You are advised to report to **the District Commissioner, District Education Officer and Medical Officer of Health, Thika West District** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


DR. M. K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY


Copy to:
The District Commissioner
The District Education Officer
The Medical Officer of Health
Thika West District.

“The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development”.

Appendix (xi) Research Authorization (District Commissioner)

OFFICE OF THE PRESIDENT
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telegrams: "DISTRICTER", Thika
Telephone: Thika 067-21222 and 21884
Fax: 067-31199



THE DEPUTY COUNTY COMMISSIONER
THIKA WEST SUB-COUNTY
P. O Box 128-01000
THIKA

When replaying please quote


Ref: CORR.3/4/VOL.VIII/151 **Date: 28th AUGUST, 2013**

Dorothy Mituki Mungiria
Egerton University
P .O. Box 536 – 20115
EGERTON

RE: RESEARCH AUTHORIZATION

Following your request for authority to carry out research in Thika West Sub-County on ***"Effects of structured nutrition and exclusive breastfeeding duration in Kiandutu Health Centre in Thika West Sub-County"***, you are hereby granted permission to undertake your research for a period ending 31st December, 2014.

The purpose of this letter is therefore to introduce ^{to} the relevant departments to accord you necessary assistance.



E. M. Wekesa (Mrs)
For: Deputy County Commissioner
THIKA WEST SUB-COUNTY

c:

District Education Officer
Thika West

District Medical Officer of Health &

District Medical Superintendent
Thika Level 5 Hospital

Appendix (xii) Research Authorization (District Education Officer)

MINISTRY OF EDUCATION

Telephone (067) 31398 / 31272 (D.L)
FAX: (067) 31272
When Replying please quote



DISTRICT EDUCATION OFFICE

**THIKA WEST DISTRICT
P.O. BOX 262,
THIKA.**

REF : THK/ADM/250/VOL.II/(8)

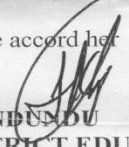
26th August 2013

The Medical Officer in charge
Kiandutu Health Centre

REF: RESEARCH AUTHORIZATION – DOROTHY MITUKI MUNGIRIA

The above mentioned is a student at Egerton University. The office has authorized her to carry out research on **“Effects of structured nutrition education on maternal perceptions and exclusive breastfeeding duration in Kiandutu Health Centre, Thika-Kenya”**

Please accord her the necessary assistance.


**J M NJUNDU
DISTRICT EDUCATION OFFICER
THIKA WEST**

Appendix (xiii) Permission to use the perception scale

mccarter@spaulding.cc

To

[Muthoni Mituki](#)

Mar 23 at 2:48 PM

You are welcome to use the tool, and I'd love to hear your results.

Good luck in your work!

Deb McCarter-Spaulding.

Appendix (xiv) Permission to use the Breastfeeding self-efficacy scale-short form

[Cindy-Lee Dennis <cindylee.dennis@utoronto.ca>](mailto:cindylee.dennis@utoronto.ca)

To

[Muthoni Mituki](#)

May 4 at 10:59 PM

Thank you for your email. The short-form for my scale is BSES-SF not BFSE-SF. The translated items appear accurate but there is no way for me to tell as I cannot read Kiswahili. You cannot publish my scale or items nor can you distribute the translated version. However, I do give you permission to publish the results from my scale. Does that sound acceptable?

Warm regards,

Cindy-Lee