DETERMINANTS OF EARLY GROWTH IN PREMATURE INFANTS AFTER HOSPITAL DISCHARGE AT KITUI DISTRICT HOSPITAL

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DECLARATION

I, Diana Mawia Sammy, declare that this dissertation is my own original work and that it has not been presented for an academic award in any university or institution of higher learning.

Sign……date……

CERTIFICATE OF APPROVAL

This dissertation has been submitted with our approval as university supervisors

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DEDICATION

This work is dedicated to my family, the rock on which I stand.

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LIST OF ABBREVIATIONS AND ACRONYMS

CS	Caesarean Section
HC	Head circumference
KDH	Kitui District Hospital
KDS	Kenya Demographic Health Survey
KMC	Kangaroo Mother Care
KNH	Kenyatta National Hospital
LBWT	Low birth weight
MCH	Maternal and Child Health clinic
MDG	Millennium Development Goal
NBU	Newborn Unit
OR	Odds ratio
POPC	Pediatric Outpatient Clinic
SVD	Spontaneous Vertex Delivery
UON	University of Nairobi
WHO	World Health Organization

OPERATIONAL DEFINITIONS

FORMULA FEED	A type of commercial feed recommended for premature infants
GUARDIAN	The person who is taking care of the premature infant
NEWBORN UNIT	Specialized unit where premature infants are cared for until they reach the recommended age.
POSTNATAL PERIOD	The immediate period after the premature infant is discharged from the hospital
PREMATURE INFANT	A baby who was born before completion of nine months of pregnancy

ABSTRACT

Background: Growth restriction has been identified as one of the major complications of prematurity which eventually leads to poor outcomes in premature infants in their future. Early discharge of these infants from the hospital with their mothers as the primary caregivers puts them in to more danger since there are no established support structures and follow up care. Kitui District Hospital has markedly improved the survival of the extremely preterm infants who are the greatest risk of developing most of the complications of prematurity. The aim of this study was to establish the determinants of early growth in premature infants after hospital discharge at the Kitui District Hospital.

Methodology: Longitudinal study design was used to execute this study at the Kitui District Hospital Newborn Unit, the pediatric outpatient clinic and the Maternal and Child Health clinic. Quantitative data was collected by taking the anthropometric measurements of 112 infants and interviewing the guardians at discharge. Follow up measurement of the same parameters was repeated two weeks post discharge. Data collected was coded and analyzed using a STATA version 10.

Results: Most of the premature infants discharged from the hospital were females (60%) with the majority (54.5%) of them having being born between 33-37 weeks gestation. These infants were born to mothers aged between 20 to 29 years (63.4). Most (66.1%) mothers had only attained primary school education and were married (66.1%). Majority (92%) of these mothers attended the antenatal care clinic and had the antenatal profiles done (91.1%). They lived in the rural areas (88%). Growth deficit was determined in 72.6% of the infants who were reassessed at two weeks post discharge. There was statistically significant (P=0.024) association between the gestational age of 33-37 weeks and deficit in early growth in these infants.

Conclusion: The major determinants of early growth in premature infants after their hospital discharge at KDH was their gestational age at birth, the infants' gender and any post discharge illness. Maternal age, marital status, level of education and occupation also influenced the early growth of the premature infants.

CHAPTER ONE: INTRODUCTION

1.1 Study Background

Premature infants are babies who are born too soon but not born to die or develop a long term disability. Prematurity has been identified as the second leading cause of mortality in the under-fives and the single most important cause of mortality in the neonatal period (Liu et al. 2012). Globally, an estimated 15 million babies are born prematurely every year. This translates to more than one baby in every 10 babies delivered and accounts for more than 1.1 million deaths annually with many more occurring unaudited (WHO,2012). Preterm births have been noted to be increasing in most of the countries over the last 20 years. In the high income countries, the survival rate of the extremely preterm infants is above 90 % because these countries have identified prematurity as a priority area. However, in the middle and low income countries these babies have less than 10% survival rate (Blencowe et al. 2012). In the WHO global action report on preterm births, it has been reported that over 60% of the preterm births occur in Africa and Asia and unfortunately these continents contribute to more than 80% of the preterm mortality worldwide. Of the top 11 countries with preterm birth rate of more than 15%, nine of them are actually in the sub-Saharan Africa. It has also been noted that a premature infant born in Africa is at risk of death due to preterm complications 12 times more than in the European countries (Lawn, Davidge, et al. 2013). However this trend could be reversed with joint efforts from everyone involved and especially the families where these infants are born. Studies have shown that three quarters (75%) of these babies can be saved through feasible low cost effective interventions without relying on intensive care facilities (Lawn, Kinney, et al. 2013). In Kenya it is estimated that one in every 8 babies born is a preterm birth (Blencowe et al. 2012). Although

the government has committed itself towards the improvement of maternal and child health, the reduction of neonatal mortality rate has been minimal over the previous five years, from 35 deaths per 1000 live births in 2003 to 31 deaths per 1000 live births in the 2008/9 survey. The survey also showed that prematurity contributes to 60% of the infant mortality rate in this country (Dhs & Macro 2008).

The decision on when to discharge the premature infants to go home with their mothers has remained a challenge to the health practitioners. Currently, the physiologic stability and body weight gain are checked in addition to other individual factors to determine whether a baby is fit for home discharge. Monitoring of growth and the neurodevelopment of premature infants must be done carefully following hospital discharge to ensure that the infants and their families receive maximum support and interventions for better outcomes (Maria & Souza 2005). Key components which must be put in to consideration in the discharge planning include arrangements in place to ensure that there is follow up by a specialist and an organized support program for tracking and surveillance of the growth and development of these infants once they are discharged in to the community (Gouto et al. 2008).

The burden of preterm births has led to the sharing of incubators during hospitalization and their early discharge at 1.8 kg. Kangaroo baby care which is one of the most effective interventions has been a major contribution in the reduction of mortality due to prematurity but it has not been rolled out to all the hospitals in the country. With the recent scale up in the intensive neonatal care and increased survival of extremely preterm infants focus on follow up and family support is critical (Lawn, Davidge, et al. 2013). The support systems for the mothers who are discharged home with premature infants are not established in the communities and these infants are seen by a specialist two weeks after their discharge.

1.2 Problem statement

Although there has been a remarkable decrease in the mortality and morbidity rate of premature infants in the past three to four decades, these babies still remain vulnerable to many complications of prematurity and especially after hospital discharge (Behrman & Butler 2007). Growth deficit is one of these complications yet growth can be monitored perfectly in the communities through easy and cost effective methods. A lot of emphasis in the management of premature infants has been during their hospitalization in the special baby care unit with little or no attention on regards to their transition to their homes with their mothers. Their short and long term outcomes have also not been studied widely. Growth monitoring and especially in the postnatal period is a key predictor of later growth and neurodevelopmental outcomes in these infants (Euser et al. 2008). The period of transition from the New Born Unit (NBU) is normally a difficult time for both the family and the infant and greatly determines their later health outcomes (Susan & Susan 2010). Continued support through counselling, health education and community follow up will greatly impact on the wellbeing of these infants.

Kitui District Hospital has greatly improved the survival rate of the extremely preterm babies in the past five years with as low as 800 grams infants making it to 2000 grams and being discharged home with their mothers. The global trend of growth deficit is however being reflected in the maternal and child health clinic with most of the infants not being able to recover their birth weights by their twenty fourth day of life as recommended by WHO upon discharge from the hospital. However, literature search does not identify any data in our country as well as the Kitui District Hospital which shows growth of premature infants in their immediate postnatal period after hospital discharge and yet any complication arising at this crucial time of their life could be detrimental in their future.

1.3 study justification

According to WHO, three quarters (75%) of the mortality of premature infants can be improved with current cost effective interventions without the utilization of intensive care facilities. In Kenya where these facilities and the socio economic status of the population are limited, research embraced to identify the various gaps will pave way towards improvement in the care of these infants. Growth monitoring through the assessment of anthropometric measurements can be done cheaply in the community after hospital discharge as one of the strategies of ensuring that there is continuity of care for the premature infants. This commitment will optimize progress of these infants and move the country a step towards the achievement of the Millennium Development Goal number IV.

1.4 Benefits of the study

During the study, after the infants growth status is established their mothers were advised on the importance of follow up especially in the postnatal clinics for immunization and the Pediatric Outpatient Clinic (POPC). The Kitui District Hospital administration will be able to utilize the data obtained to formulate more hospital policies for the management of premature infants especially after their discharge. The study has established a platform on which other researchers can base their studies in the future and the author will publish the study results and add on to the existing body of knowledge.

1.5 Research questions

1. What are the infant characteristics that determine early growth in premature infants after hospital discharge at Kitui District Hospital?

2. What are the maternal characteristics that determine early growth in premature infants after hospital discharge at Kitui District Hospital?

3. What are the environmental factors that determine early growth in premature infants after hospital discharge at Kitui District Hospital?

1.6 Research hypothesis

Infant characteristics, maternal characteristics and environmental factors do not influence early growth in premature infants after hospital discharge at the Kitui District Hospital

1.7.0 Research objectives

1.7.1 Broad objective

To establish the determinants of early growth in premature infants after hospital discharge at the Kitui District Hospital

1.7.2 Specific objectives

1. To assess the anthropometric measurements of premature infants after hospital discharge at Kitui District Hospital
2. To determine the infant characteristics that influence early growth of premature infants after hospital discharge at Kitui District Hospital
3. To determine the maternal demographic and socioeconomic factors that influence early growth of premature infants after hospital discharge at Kitui District Hospital
4. To determine the environmental factors that influence early growth in premature infants after hospital discharge at the Kitui District Hospital

CHAPTER TWO: LITERATURE REVIEW

2.1 Growth pattern in premature infants

A premature infant is a baby who is born alive before 37 weeks of gestation are completed or less than 259 days since the first day of a woman's last menstrual period (WHO 1977). These infants are further categorized in to three depending on their gestational age as extremely preterm (<28 weeks), very preterm (28 weeks to <32 weeks) and moderate to late preterm (32 weeks to <37 weeks). The WHO recommends the use of the fetal-infant growth charts which have age corrected for gestation for growth monitoring of preterm infants in the first two years of their lives (WHO 2008a). These charts have the body weight (kg), body length (cm) and head circumference (cm) plotted against the gestational age of these babies. Once the baby attains two years of age the normal standardized growth chart for chronological age should be adopted. Assessment of growth in the premature infants in the neonatal period is based on changes in their anthropometric measurements. Consistence in their weight gain demonstrates optimal growth and is a valuable indicator for their growth and progress (Namiiro et al. 2012).

The growth pattern in premature infants is expected to follow a certain sequence (Euser et al. 2008). During their first week of life due to caloric and protein deficit their birth weight drops by 8-15% reaching its peak between day four and day seven. This may cause substantial growth deficit as the infant tries to adapt to the extra uterine life. From the second week of their life these infants attain early neonatal growth peak which is similar to their intrauterine growth rate. They are able to regain their birth weight between day eight and day twenty four of their life with a higher birth weight been associated with an earlier recovery. On regaining their birth weight the infants are expected to gain between 150g – 200g per week (20g-30g /kg/day) if they are less than 1.5kg. Those weighing between 1.5 kg to 2.5 kg should gain 200g – 250g per week (30g-

35g/kg/day). Growth deficit is identified if the infant does not gain at least 15g/kg/day (WHO 2008b). In Kampala, Uganda a study carried out established that there was low birth weight recovery among the low birth weight/ preterm infants. This was attributed to medical, nutritional and environmental factors. This study however did not include the body length and head circumference which are also very important indicators of growth in these infant but it did suggest the importance of carrying out more researches in the postnatal period of preterm infants (Namiiro et al. 2012). Mackay et al supported this pattern of growth in preterm infants in the very low birth weight infants. Their study established that these infants normally have an initial poor growth in all the growth parameters which is often followed by gradual catch up growth in body weight and head circumference with persistent deficit in the body length up to twenty months corrected age (Mackay et al. 2011). At Kenyatta National Hospital (KNH), a study carried out to describe the growth pattern of the VLBW infants showed that only 30% were able to reach the third percentile of the expected measurements in all the growth parameters by their expected date of delivery. Nutrition and morbidity were identified as the major determinants of the outcome of these infants. The study recommended routine fortification of mother's breast milk or addition of preterm formula and reorganized care of the sick infants (Were & Bwibo 2006). The WHO however does not recommend routine supplementation of breast milk for it has more benefits than the formula feeds (Lawn, Davidge, et al. 2013).

Premature infants usually experience what is termed as catch-up growth (Euser et al. 2008). This is a process which occurs during the infant's first two to three years of their life and it is at its peak at 36 to 40 weeks post menstrual age. During this period growth is most rapid during the first six months of the infant's life and it may continue up to childhood or even adolescence. It is associated with better neurodevelopmental outcomes, fewer psychosocial problems in late

childhood, and reduced risk of shorter stature and especially if it occurs before 20 weeks corrected age for gestation in the preterm infants (Mackay et al. 2011). Infants who lack these catch-up growths have been shown to have higher risks of developmental delays. Delayed menarche and birth to preterm infants were some of the identified risks in girls in this category in Brazil (Goulart et al. 2011). On the other hand, rapid weight gain especially in the first month of life has been shown to increase the risk of cardiovascular and metabolic diseases such as obesity in late childhood and adolescence (Mackay et al. 2011). Some suggested strategies in this study can be employed to minimize the rapid catch up growth. They include promoting breast feeding, limiting the extent of their early growth failure and adopting the preterm reference growth charts in the monitoring of the infants until they attain two years corrected age. Growth monitoring is complicated by many factors such as the pattern of growth in these infants, the heterogeneity of this population and the controversies concerning the ideal growth of premature infants (Mackay et al. 2011).

2.2.0 Determinants of growth in premature infants

The premature infant's growth is influenced by different biological and environmental factors in both the mother and the infant (David et al. 1998). The degree of prematurity, clinical treatment practices and nutrition are some of the determinants of growth which have been identified. A low birth weight, postnatal dexamethasone, long duration of respiratory support, infections, circulatory or respiratory problems, necrotizing enterocolitis and the male gender have been associated with negative growth in these infants (Euser et al. 2008). Growth deficit in any of the indicators of growth has been demonstrated to be highly associated with the infant's gestational age. Goulart and colleagues established that different infant characteristics and maternal characteristics contributed to growth deficits in various ways. They recommended the study of

socio-demographic characteristics of the population and the nutrition of the infants in other studies since they were strongly associated with the outcomes of these infants(Goulart et al. 2011).

2.2.1 Infant characteristics

According to the KDHS 2008/9 the preterm infants have been identified as at risk group who need priority interventions. The genetic make-up and ethnicity of these infants have shown a lot of influence in their growth (Euser et al. 2008). Other factors which influence the health and survival are gender and birth weight. The male infants have been noted to have higher mortality and less chances of survival which are associated with higher incidence of complications in their mothers during pregnancy (Dhs & Macro 2008). The gestational age of the premature infant has been demonstrated in the very low birth weight infants to be a determinant of their growth and survival (Behrman & Butler 2007). These infants take the longest period to recover their birth weight and have the greatest risk of developing growth retardation (Euser et al. 2008). The weight for gestational age can assist in the identification of growth restriction especially in the postnatal period. The birth history should establish the APGAR score at one and five minutes and whether there was any resuscitation done at birth. The hospitalization history should identify the medical and therapeutic interventions, duration of hospital stay and the body weight on discharge (Goulart et al. 2011). In Kenya, Were & Bwibo at the KNH established that nutritionally enhanced enteral feeds during the first month of life led to reduced post discharge morbidity and better neurodevelopmental outcomes at two years in the VLBW infants (Were & Bwibo 2007). Other factors that have been identified include Intra Uterine Growth Restriction which is said to have a strong influence on postnatal growth pattern and the occurrence of future diseases. Complications and diseases of prematurity such as broncopulmonary dysplasia, severe

enterocolitis and chronic neuropathy are associated with increased morbidity and compromised nutrition and growth especially during the infants' first year. Another factor which should be given special attention is nutrition after hospital discharge. Optimization of nutrition will aid in catch up growth and hence enhance growth in these infants (Maria & Souza 2005).

2.2.2 Maternal characteristics

Both the biological and socio-demographic characteristics of the mother will determine the growth and development of the premature infants. The mother's age has significant contribution towards her infant's growth. If the mother is less than 18 years or older than 34 years of age these has been associated with less chance of survival of the preterm infants (Dhs & Macro 2008). Other characteristics which will influence growth of these preterm infants are the level of education and the marital status. The pregnancy history should establish the mother's habits during the pregnancy, prenatal follow up and the presence of any medical conditions. It is also important to establish whether the pregnancy was a singleton or multiple. Any corticosteroid use or premature rapture of membranes which could influence the infant's health should be elicited. The mode of delivery should be identified since it has been associated with head circumference deficit in a study done in Brazil (Goulart et al. 2011).

2.2.3 Environmental factors

These should include regional differences and the place of residence. From a previous study in Brazil, it was demonstrated that growth deficits differed depending on the regions even when the studies were carried out at the same time. Differences in the outcome of premature infants have been identified depending on the area of residence as portrayed in the KDHS2008/09 i.e. whether living in the rural or urban setting. The home environment should encompass both the structure and family support of the mother because it exerts a great influence on the growth of the infant.

The home environment will include the capabilities and experience of the primary care giver to the infant. It should also encompass the sources of support for the family and the type of the homes they live in. Utilities such as electricity and water should also be considered. Financial sources for the family, insurance cover and any involvement of social work in that family. Sibling rivalry and history of substance abuse which will also affect the growth of the infant will be important to note.

2.4 Follow up care after hospital discharge

The care of the preterm infant should be continued after their hospital discharge if their quality of life and that of their families is to be improved. For this care to be effective strong health care support and community support systems must be in place (Braga & Sena 2012).The discharge criteria for these infants should be guided by certain elements. The primary consideration should be on the infant's physiologic stability. The infant should be on full nipple feeds, gaining weight adequately and able to maintain normal body temperature while in a room setting. There should be an active program of parental involvement and preparation for the care of the infants at home. The health care team should make arrangements for a professional to visit the infant during their first week of discharge. In addition to the above, there should be an organized program of tracking and surveillance which should monitor the growth and development of these infants (Gouto et al. 2008).The continuity of care will ensure that there is timely treatment and early identification of any delay in growth and development, the study adds. Previous studies have noted that there is significant growth impairment in the very low birth weight preterm infants after hospital discharge (Mackay et al. 2011).Mackay and colleagues identified some strategies were which can also be adopted in our country for the premature infants who are discharged home with their mothers (Braga & Sena 2012). These include taking responsibility by the health

care team which discharges these preterm infants home and ensuring that there is a link to connect you to the guardians of these infants in order to improve the follow up clinic attendance. Structures should be put in place to ensure that these infants are seen by a multiprofessional team. They should begin in the first week of discharge and should be continued until their gestation corrected age is adjusted to their chronological age i.e. up to two years of age. This process should be continuous and flexible and must involve a lot of dialogue. If possible telephone contacts may be adopted in finding out the wellbeing of the infant in between the clinic visits. Partnership between the health care system, the social services and education can also strengthen this care (Braga & Sena 2012).

In Kumasi, Ghana a study was done on implementation science perception and practice of kangaroo baby care after discharge from hospital and it showed that the premature infants gained optimal weight when kangaroo baby care was practiced in the community. This study also found out that there was marked reduction in both morbidity and mortality in these babies. However, the study noted that there was insufficient evidence which could recommend routine use of kangaroo baby care in low birth infants until well designed randomized trials are done (Bergh et al. 2012). Kangaroo Mother Care (KMC) has been identified as one of the priority packages and evidence based interventions for the preterm infants. In an updated Cochrane review it was reported that KMC demonstrated reduction of up to 40% of post discharge mortality and 80% of hypothermia in infants less than 2000g and hence it should be scaled up (Lawn, Davidge, et al. 2013).

2.5 Theoretical statement

This study was based on the transactional model of development by Dr. Arnold Sameroff (Sameroff 1975). In his work, Sameroff believed that growth and development is influenced by

both nature and nurture and that the outcome is a function of both the individual characteristics and the context they are in. He proposes that the child's status at any point of their life is a function of the interaction between biologic and social influences in a bidirectional manner. Sameroff classifies the influences in to proximal and distal influences.

Proximal influences are factors that influence the child's growth and development directly such as the parent or caregiver interaction. The infants and young children mainly depend on these influences in their development.

Distal influences are the factors which influence the child's growth and development indirectly. They include factors like the family income and the type of community they live in and mainly affect the caregiver or parent's ability to provide for their children.

2.6 Conceptual framework

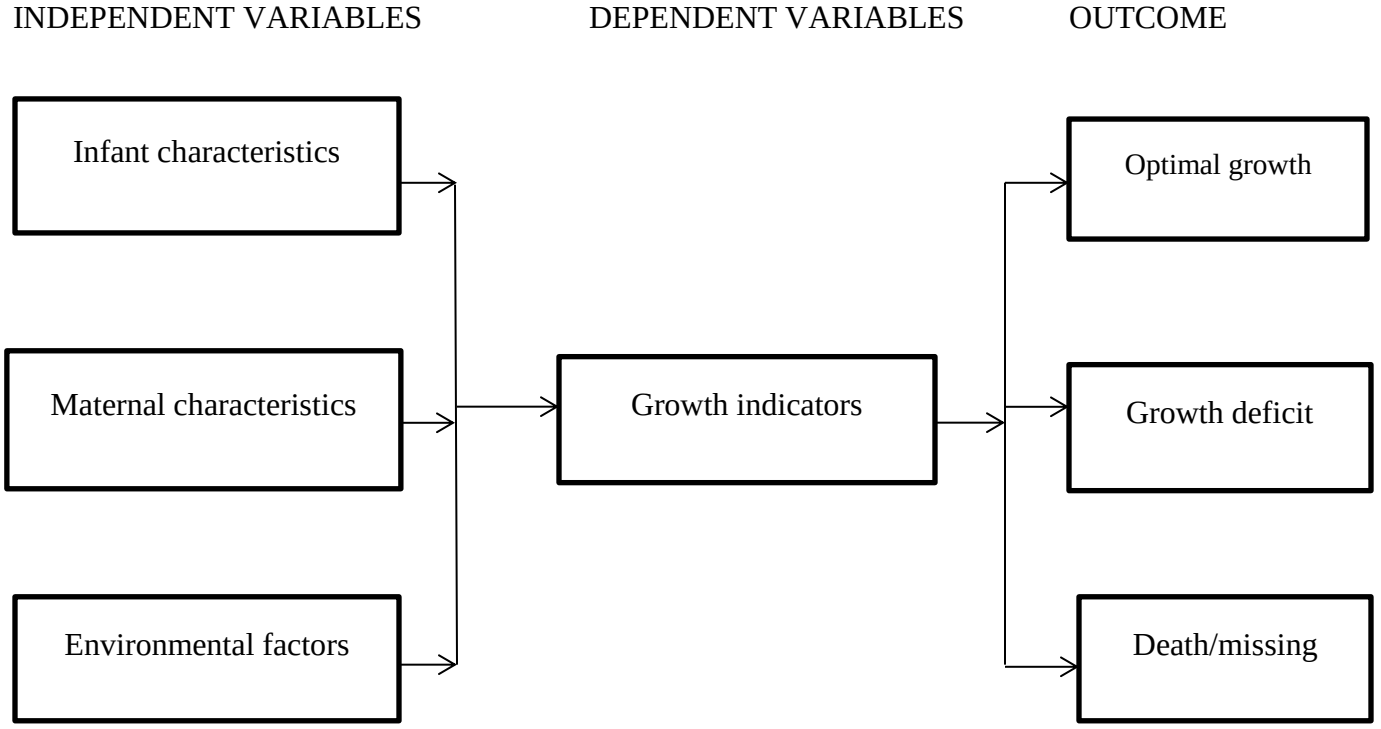

Figure 1: Conceptual framework

2.7 Operational framework

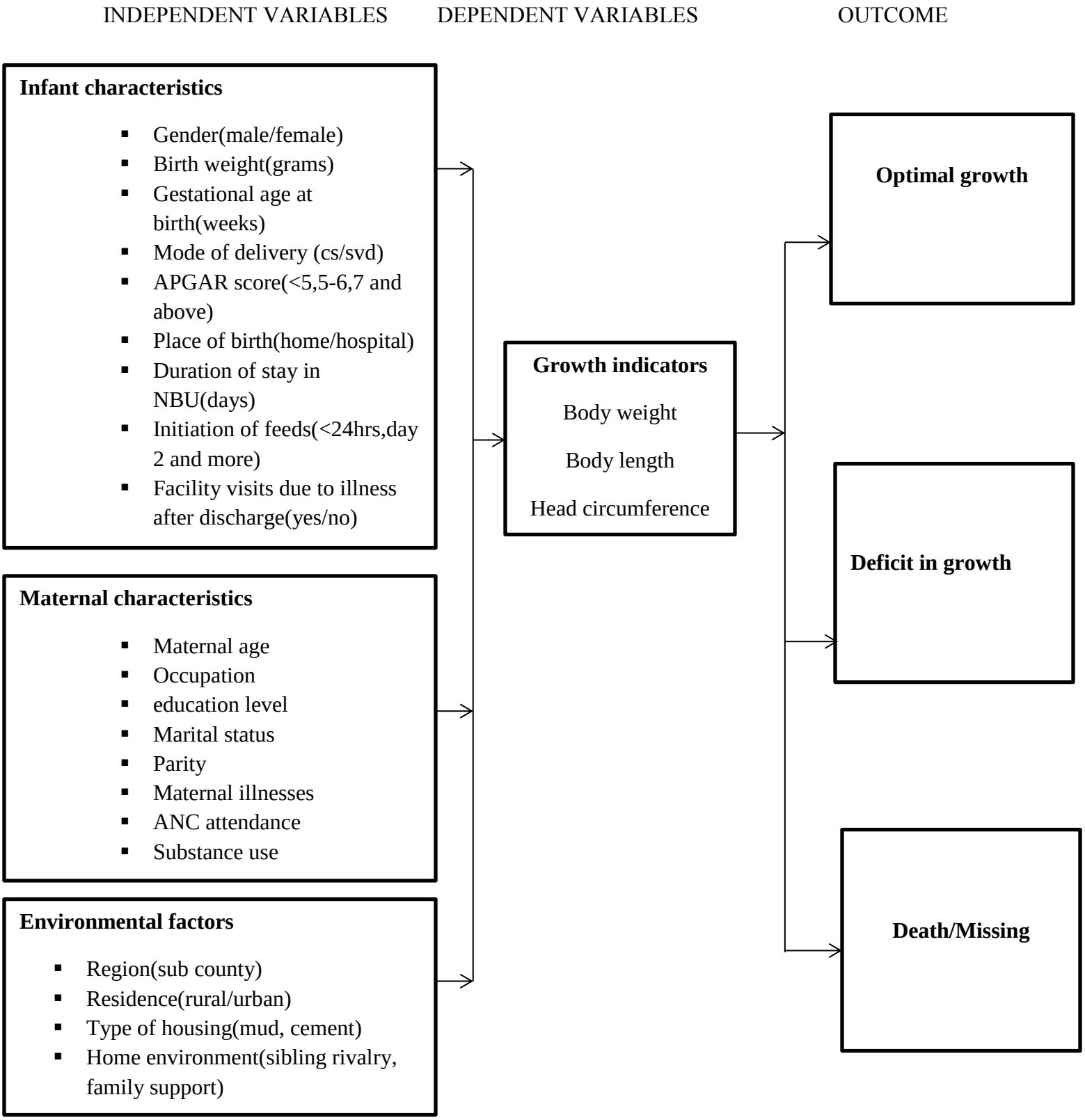

Figure 2: Operational framework

CHAPTER THREE: METHODOLOGY

3.1 Study design

Longitudinal study design was adopted to execute this study. During the period of April 2014 and June 2014, the researcher enrolled premature infants for the study in the newborn unit (NBU) by taking their anthropometric measurements at discharge. These infants were then followed in the Pediatric Outpatient Clinic (POPC) and the Maternal and Child Health clinic (MCH) two weeks after their hospital discharge at the Kitui District Hospital.

3.2 Study area description

The study was carried out at Kitui District Hospital in Kitui County. This hospital is the county referral hospital which serves the former Kitui and Mwingi districts. It has a capacity of 200 beds and 44 cots with a total of nine inpatient wards. The hospital NBU has a capacity of 15 infants although most of the time it accommodated about 20 babies and it is managed by a pediatrician, a medical officer and six nurses. It has been recognized to have one of the best run Newborn Unit in the region with a neonatal mortality rate of 12.5%.

3.3.0 Study population

The study subjects were all the infants who were born at Kitui District Hospital during the months of April, May and June 2014

3.3.1 Inclusion criteria

This study included all the premature infants admitted and discharged from the hospital NBU and their mothers had consented for participation in the study.

3.3.2 Exclusion criteria

The study excluded any premature infants who had been born with any congenital anomalies that adversely affected their growth. Also excluded were premature infants whose mothers declined to participate in the study.

3.4 Sample size calculation

The following formula for prevalence studies by Fisher et al, (1998)was used to determine the sample size (Mugenda & Mugenda 1999).

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

Whereby,

n= the desired sample size

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

P= the prevalence of premature birth at the KDH

=10% of the total deliveries per month

P= 0.1

q= 1.0-p

= 0.9

d= level of precision (set at +/-0.05(0.5%)

Therefore

$$n = \frac{(1.96)^2 \times (0.1) \times (0.9)}{(0.05)^2}$$

$n = 138$

Since the population was less than 10000 participants, the following Cochrane's modification of the above formula will be adopted

$nf = n / (1+ n/N)$

Whereby,

$nf = 138/ (1+138/600)$

$= 112$

Therefore

Desired sample size = 112 premature infants

3.5 Sampling technique

Successive sampling technique was used for the recruitment of study participants. All the premature infants who were discharged from the newborn unit between the months of April 2014 and June 2014were enrolled for the study until a sample size of 112 was reached.

3.6 Research instruments/tools

A structured questionnaire (refer appendix 2) was used to aid in the data collection.

3.7.0 Data collection methods

The premature infants who were discharged from the NBU had their body weight, body length and head circumference taken after the written consent from the guardian has been obtained and the procedure had been explained to them. The researcher held a 15 to 20 minutes questionnaire guided interview with the guardians and confirmed the information obtained from the infant's inpatient files, the discharge summary and the mother and child road to health booklet. These measurements were taken again at two weeks post discharge. The differences in the anthropometric measurements and the data collected from the interviews were utilized by the researcher to establish the various determinants of early growth in the infants.

3.7.1 Body weight

Body weight was measured using a pediatric weighing scale. The researcher explained the procedure to the guardian and prepared the infant's weighing scale by placing it on a firm flat surface. The mother was then requested to assist in undressing the baby and placing him/her carefully on the weighing scale. The researcher then adjusted the weighing scale to balance the body weight of the infant once the baby stabilized. The weight where the scale was at equilibrium was the baby's weight. The baby was then handed over to the mother for dressing. The assistant could also assist in recording the baby's body weight both on the pediatric outpatient card and the researcher's record.

3.7.2 Body length

Body length was measured using an infant meter which was a fixed head board with a movable footboard. The infant meter was placed on a firm flat surface preferably a table to avoid unnecessary bending. The researcher explained the procedure to the mother and prepared the board. The baby was then placed horizontally on the horizontal board. The assistant would stand

at the head board and assist by holding the infants head in position by gently cupping her hands over the infant's ears. The researcher stood on the side and held the baby's legs straight with the use of gentle pressure on the knees by using one hand, the shoulders and hips were aligned at right angles to the body's long axis and the other hand moved the footboard. With the baby's head in the Frankfurt vertical position (plane) in which an imaginary vertical line from the ear canal to the lower boarder of the eye socket were perpendicular to the horizontal board. The sole of the feet were placed flat on the board with the toes pointing upwards. The measurements were then recorded to the last completed five millimeters.

3.7.3 Head circumference

This was taken with the help of a tape measure which is a plastic tape calibrated in centimeters and millimeters. With the infant on the mothers lap and the head uncovered, the researcher explained the procedure to the mother. The tape measure was held with the calibrated side on the outside and the zero-end in the inferior position. It is was then looped and slipped over the infants head and positioned from above the eyebrows at the front and the furthest protuberance of the skull. Once the tape measure was in position, it was tightened to compress the hair and the skin but not to cause the infant discomfort. The reading was then taken to the last completed millimeter and the infant redressed. The assistant would assist in recording the reading in the infant's records and the researcher's questionnaires. The researcher would thank the mother and ensure that the infant was left comfortable.

Maximum allowed differences were 5mm for length, 1mm for head circumference and 50g for weight. To minimize bias, both the researcher and the assistant would read the measurements independently and their average reading is what was recorded.

These procedures were carried out after the infants had received all the services in the POPC or MCH and they were ready to leave the clinic for home so that the researcher would not interfere with the usual running of services in the clinics. During discharge at the NBU these infants were enrolled after they had been discharged and they were leaving either to the postnatal wards or home with their mothers.

3.8 Questionnaire administration

A structured questionnaire was used to guide an interview by the researcher to elicit information about the infant characteristics, maternal characteristics and the environmental factors which had been formulated (Refer appendix 2). The study assistance was trained for two weeks by the researcher before she could participate in the assistance of taking the anthropometric measurements and recording of the data in the questionnaires.

3.9.0 Data management and analysis

3.9.1 Data management

The researcher collected data by interviewing the infants' guardians and filling in structured questionnaires. The anthropometric measurements were also taken and recorded. The data was cleaned and validated to get a clean data set which was exported in to a statistical package format using STATA version 10. The clean dataset was stored in the computer hard drive for analysis. Back up files in folders were stored in a flash disc and a compact disc to avoid data loss just in case the computer fails. The completed questionnaires were stored in lockable drawers and the researcher kept the key with her always so as to ensure that confidentiality is maintained.

3.9.2 Data analysis

Data was analyzed using STATA (statistics and data software) version 10. Univariate analysis was used for descriptive analysis of the infant characteristics, maternal characteristics and environmental factors. The continuous variables which were normally distributed were analyzed using the mean while those found to not to follow the normal distribution were analyzed using the median and interquartile ranges. Categorical data such as sex, marital status and maternal occupation was analyzed by the use of proportions.

Bivariate analysis to show statistical associations between categorical variables such as sexes, mode of deliver, place of birth and maternal age was done using Z scores. Odds ratio, prevalence ratio and 95% confidence interval were used to estimate the strength of association between the independent (infant and maternal characteristics) and dependent variables (anthropometric measurements). The threshold for statistical significance was set at $\alpha = 0.05$ and a two sided P value at 95% confidence Interval. Distribution of categorical variables was compared using Pearson's chi-squared test.

3.10 Ethical considerations

Ethical approval was sought at the Kenyatta National Hospital Ethics and University of Nairobi Research Committee (KNH/UON-ERC) and the Kitui District hospital administration. A written informed consent was obtained from the guardians to the premature infants after being given clear explanation about the study. Each participant in the study was given a code between 001-112 for identification during the entire study period which also appeared in all the questionnaires and the mother's antenatal booklet for easy follow up. The study participants signed the written consent at their own free will without any coercion and they were free to withdraw from the

study any time without any victimization. All the information collected was kept confidential only shared with the relevant parties.

3.11 Study limitations

Due to the limited time duration allocated for the study, it was not be possible to follow up the premature infants more than once so as to establish their later growth and outcomes. The researcher was also not able to carry out home visits to verify the information given by the guardians but it is hoped that they offered accurate information. The data collected was only reflective of the situation in Kitui District Hospital and therefore difficult to generalize the findings.

CHAPTER FOUR: STUDY RESULTS

4.1 Introduction

This chapter presents both the descriptive and inferential analytic results of the study. These results were obtained from anthropometric measurements and questionnaire guided interview of 112 infants and their guardians at the NBU, POPC and the MCH at the KDH. Both the infant and maternal demographic characteristics have been presented as well as the socioeconomic factors and environmental factors obtained during the study. Associations between the different variables have been outlined and multivariate analysis of the most significant variables highlighted.

4.2.0 Infant characteristics

4.2.1 Infants' gender

Female infants accounted for 60% (n = 67) of the participants compared to males who represented 40% (n = 45) of participants giving a male-to-female ratio of 1: 1.5.

4.2.2 Gestational age at birth

The majority of the infants were between 33 and 37 completed weeks of gestation at 54.6% with 7.1% aged below 28 weeks (figure 3).

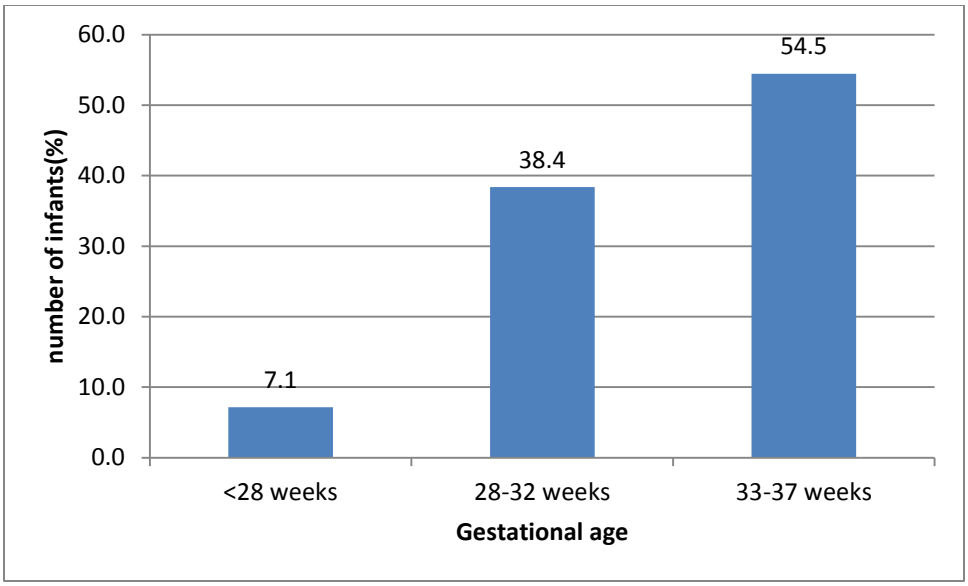

Figure 3: Gestational ages at birth

4.2.3 Birth history

As shown in table 1, 77% of the infants were born through spontaneous vertex delivery (SVD). Most (83.9%) of these infants were born in the health facilities with only 18.1% having been born at home and were all reported to have cried at birth. Those born in the health facility, majority of them had an APGAR score of more than 7 at 87.5% and only a few scored between 5 and 6 at 12.5% at five minutes. Most (74.5%) of these infants were not resuscitated at birth.

Table 1: Birth history of the premature infants

	Frequency	Percent
Mode of delivery		
SVD	87	77.7
CS	25	22.3
APGAR (1 min)		
5 to 6	12	12.5
7 to 10	84	87.5
APGAR (5 min)		
5 to 6	1	1.0
7 to 10	95	99.0
Place of delivery		
Health facility	94	83.9
Home births	18	16.1
Number of home births that cried at birth	18	16.1
Resuscitation at birth		
Yes	14	25.0
No	70	62.5
Not verifiable	14	12.5

4.2.4 Hospitalization history

The length of hospital stay among the premature infants varied greatly with 30% having been hospitalized for less than three days and only 10% having had to stay for more than a month.

Majority (53.6%) of the infants started their first feeds from day 2 or 3 and very few began feeding between days 4 to 7 at only 5%. Mostly the infants were being fed on breast milk (92.9%).

Table 2: Hospitalization history of the premature infants

	Frequency	Percent
Length of hospital stay		
Less than 3 days	33	30.8
4 to 7	20	18.7
8 to 14	15	14.0
15 to 28	28	26.2
Above 28	11	10.3
Feeds initiation		
Immediately	11	9.8
Within 24 hours	36	32.1
Day 2-3	60	53.6
Day 4-7	5	4.5
Current feeds		
Breast milk	104	92.9
Formula milk	1	0.9
Breast and formula milk	5	4.5
Not stated	2	1.8

4.2.5 Post discharge illness

Figure 4 below shows that great percentages (88.3%) of the infants were reported to have been well since discharge.

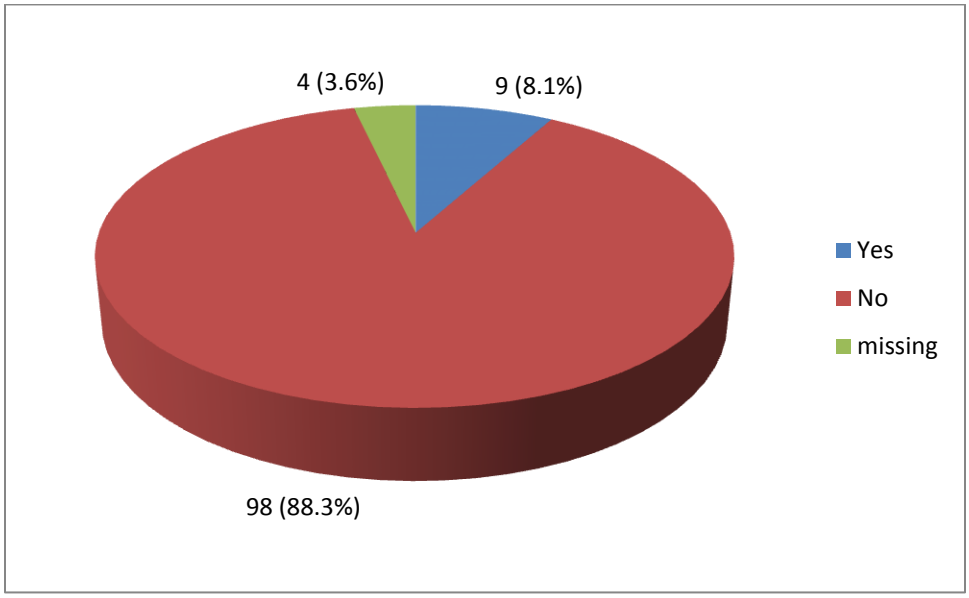

Figure 4: Illness of the premature infants after hospital discharge

4.3.0 Maternal characteristics

4.3.1 Maternal age

Majority (73.9%) of the infants' mothers were between the ages of 20-29 years. Very few (2.7%) were above 40 years of age as shown in figure 5.

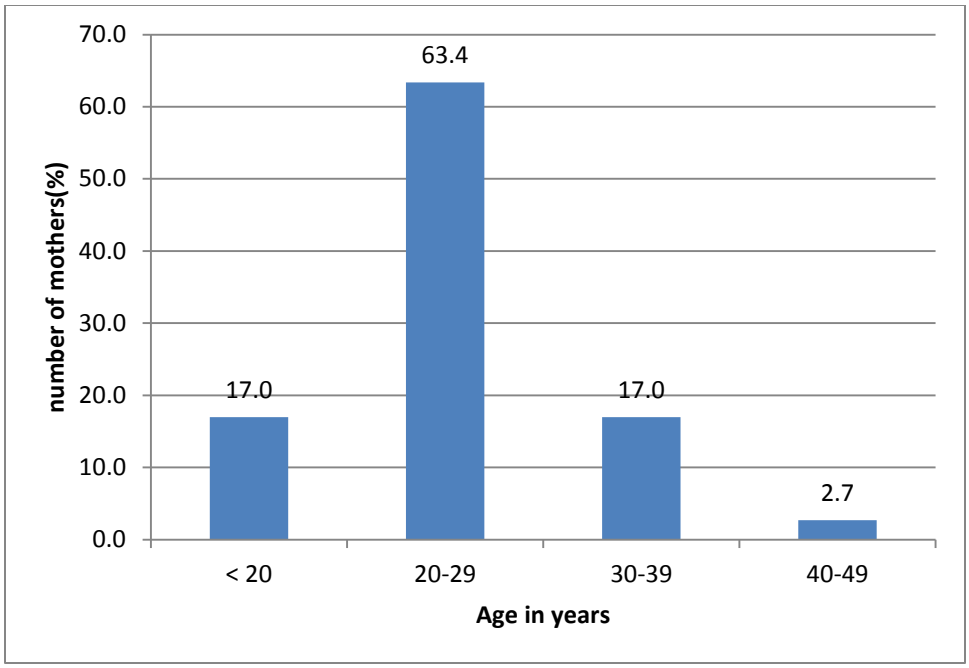

Figure 5: Distribution of the ages of the infants' mothers

4.3.2 Maternal socio-demographic characteristics

Half of the participants were first time mothers who were married (66%) and living with their husbands (86.5%) as shown in table 3 below.

Table 3: Mothers' socio-demographic characteristics

Parity	Frequency	Percent
1	56	50.0
2 to 3	51	45.5
4 to 5	4	3.6
> 5	1	0.9
Marital status		
Single	37	33.0
Married	74	66.1
Religion		
Christian	106	94.6
Muslim	6	5.4

4.3.3 Maternal education

A great percentage (66.1%) of the mothers had only attained primary school education and very few (6.3%) had tertiary education (figure 6).

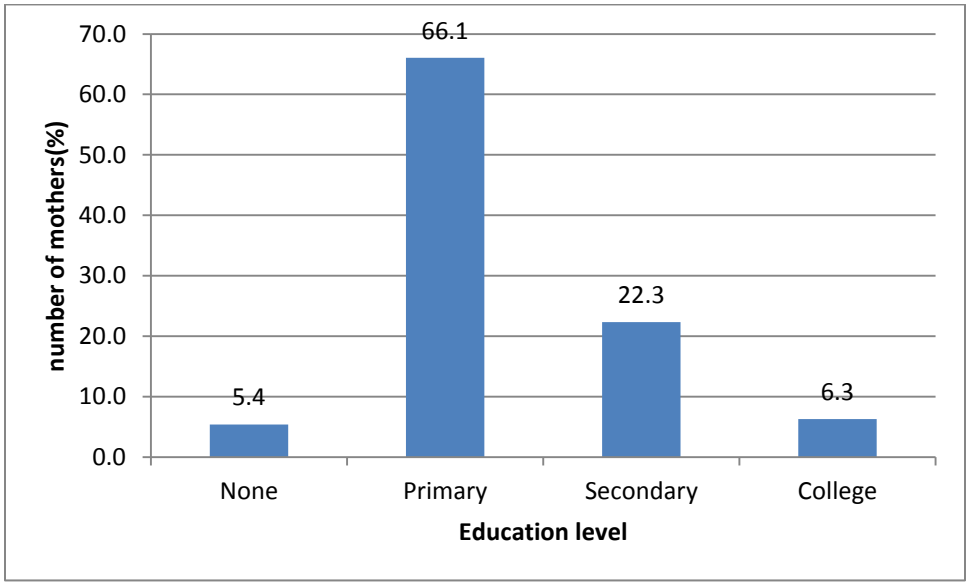

Fig. 6: Mothers' education levels

4.3.4 Mothers' occupation

Most (35%) mothers were housewives and peasant farmers (21%). Only a few (4%) mothers had formal employment as shown in figure 7.

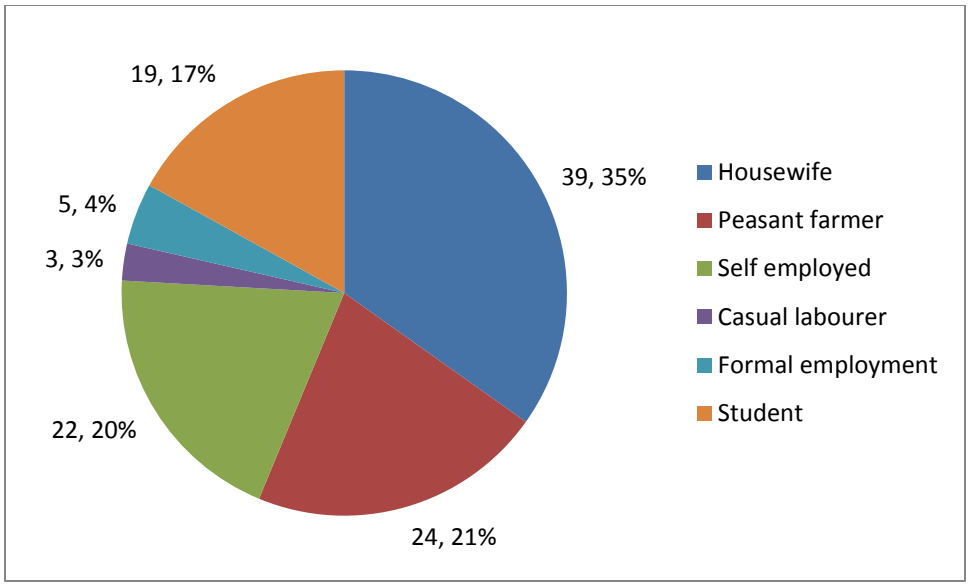

Figure 7: Mothers' occupation

4.3.5 Mothers spouses' occupation

Figure 8 below shows that more than half (56%) of the mothers' spouses were self- employed and only a few (16%) had formal employment.

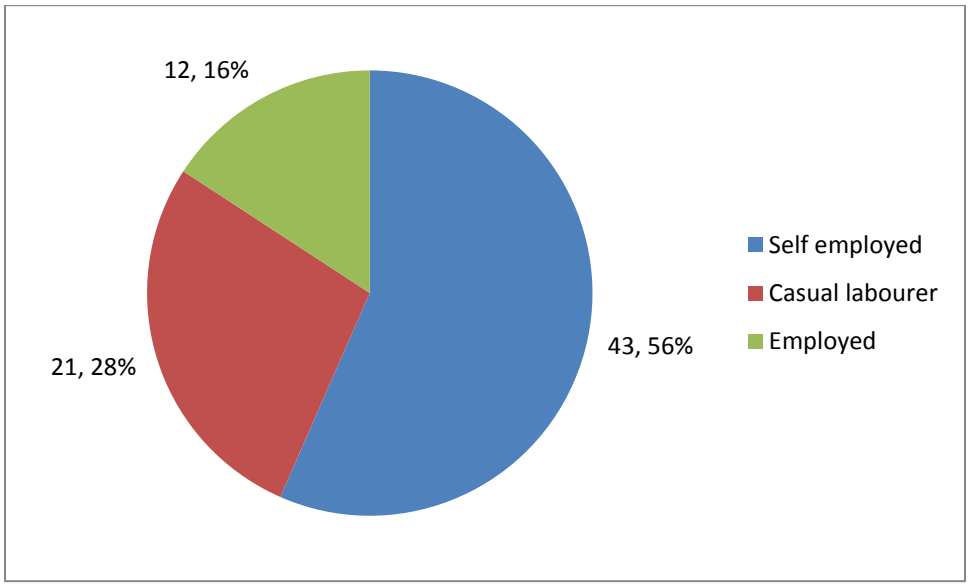

Figure 8: Mothers spouses' occupation

4.4 Pregnancy history

From the table 4 below most of the mothers had at least attended ANC once (92%) but only 31.5% had managed to achieve the recommended four visits or more. More than half (63.7%) of these mothers had started their ANC during their second trimester of the pregnancy. Only a few of the mothers had suffered medical or obstetric complications during their pregnancy (23.4%).

Table 4: Pregnancy history of the infant's mothers

	Frequency	Percent
Visited ANC clinic during pregnancy	103	92.0
Number of ANC visits		
Four times and more	35	31.3
< four	68	60.7
none	9	8.0
Timing of first ANC visit		
First trimester	33	32.4
Second trimester	65	63.7
Third trimester	4	3.9
Suffered any medical or obstetric condition	26	23.2
Antenatal profiles done	102	91.1
Serology status		
Negative	105	93.8
Positive	2	1.8
Not tested	5	4.5

Table 4 continued

	Frequency	Percentage
Type of pregnancy		
Singleton	94	83.93
Multiple	18	16.07
Labor induction done	4	3.57
Suffered illness during puerperium	5	4.5
Puerperal illness affected infant care (mixed feeding)	4	3.6
Payment of medical bills		
Mother had insurance cover	99	88.4
Personal saving	1	0.9
Spouse	7	6.3
Relative	5	4.5
History of preterm birth	3	2.7

4.5 Knowledge and practice of care of the small baby

Most(92.9%) of the mothers reported to have been feeding their infants at least eight times or more in the past 24 hours and they relied on the infants' cry as their guide to feeding. A great percentage (98.2%) reported to be practising hand washing during the feeding of the infants. Most mothers were neither aware of danger signs in infants (67%) nor kangaroo baby care (66.1%). Even those who had heard about KMC very few practiced it at home as shown in table 5.

Table 5: Knowledge and practice of care of the small baby

	Frequency	Percent
Frequency of infant feeding in last 24 hours		
< Eight times	5	4.4
More than eight times	104	92.9
Not stated	3	2.7
What guides you on when to feed infant		
Infant's cry	104	92.9
Hunger cues	3	2.7
Schedule	2	1.8
Others	3	2.7
Hand washing during infant feeding		
Yes	110	98.2
No	2	1.8
Aware of danger signs in infants		
Yes	37	33.2
No	75	67.0
Infant on both iron and vitamin D supplements		
Yes	92	82.9
No	16	14.4
Not stated	3	2.7
Aware of kangaroo baby care		
Yes	36	32.1
No	74	66.1
Not stated	2	1.8
Home practice of kangaroo baby care		
Yes	6	16.6
No	30	83.3

4.6.0 Environmental factors

4.6.1 Area of residence

Most of the mothers lived in the rural areas as shown in figure 9.

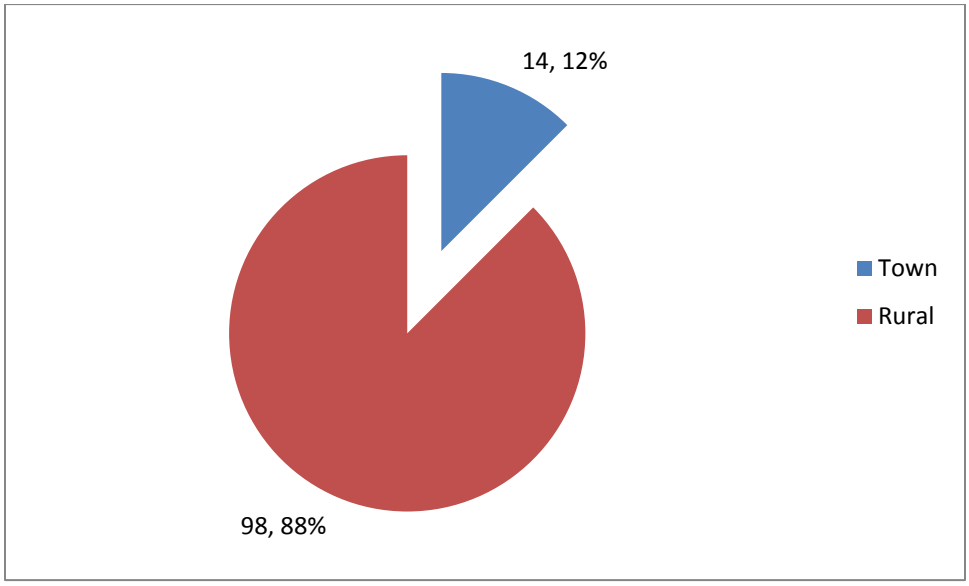

Figure 9: Area of residence

4.6.2 Time duration to walk to the nearest health facilities

As shown in figure 10 below, about half (51.8%) of the mothers would spend 15 to 30 minutes to walk to the nearest health facility. Only 3.6% of them would need to walk for 10 minutes or less to the health facilities.

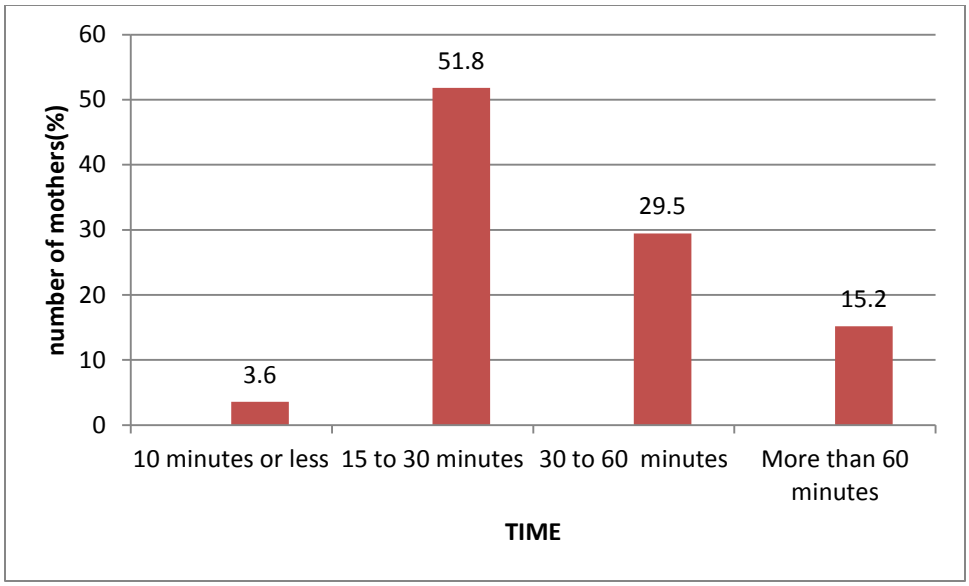

Figure 10: Time duration taken by mothers to walk to the nearest health facility

4.6.3 Home environment after hospital discharge

Most of the mothers lived in cemented houses (69.6%) and the rest in bricks and mud (30.4%). Many (65.2%) of these houses had two or more partitions and were shared by three or more people. Majority (97.3%) of these mothers were the primary care givers to their infants with most of them being assisted by relatives (95.5%) as illustrated in figure 6.

Table 6: Home environment of premature infants after discharge

	Frequency	Percent
Type of housing		
Mud	34	30.4
cemented	78	69.6
Number of partitions		
None	12	10.7
One	27	24.1
Two and more	73	65.2
Number of people sharing house		
Three or less	39	34.8
More than three	73	65.2
Mother as the primary caregiver to the infant		
Yes	109	97.3
No	3	2.7
Assistant in the care of infant		
Spouse	7	6.4
House help	4	3.6
Relative	94	85.5
None	5	4.6

4.7.0 Early growth in premature infants after discharge

Changes in body weight, head circumference and body length were used to assess early growth patterns of premature infants in the study, with measurements taken on discharge and at two-week follow-up. Of the 112 participating infants, 106 (94.6%) were available for assessment at follow-up. The six participants who were not reassessed at follow-up were due to 2 (1.8%) neonatal deaths and 4 (3.6 %) losses to follow-up at two weeks.

4.7.1 Body weight

Figure 11 shows the median weights on discharge from the NBU for the infants born prematurely and their median weights at two-week follow up. There was a statistically significant increase in body weight between NBU discharge and week 2 follow-up with median body weights of 1880 grams (IQR 1830-2270) and 2215 grams (IQR 1950-2500), respectively (p value < 0.001).

Of the 106 infants assessed at two weeks 77 (72.6%) were determined to have growth deficit (average weight gain below 15-20 g/kg/ day) and 29 (27.4%) infants had optimal growth (average weight gain of 15-20 g/kg/ day and above).

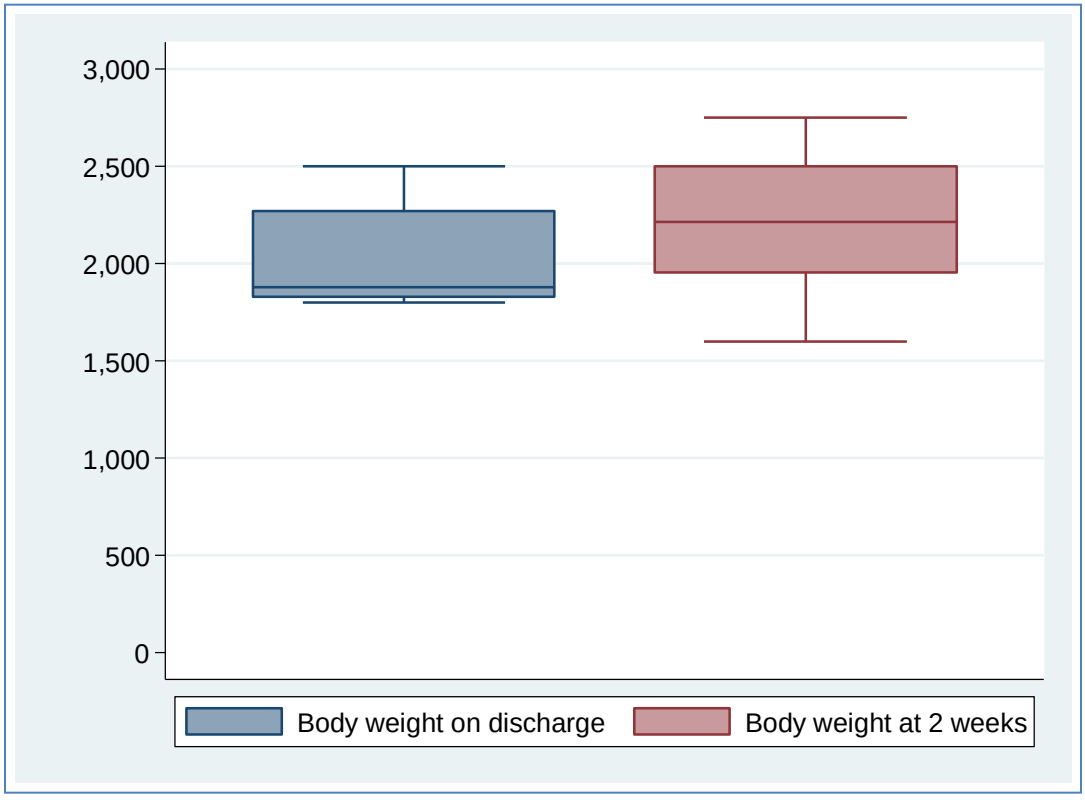

Figure 11: Changes in body weight in premature infants after hospital discharge

4.7.2 Head circumference and body length

The median body length of premature infants increased significantly from 44 cm (IQR 42.5-46.3) to 44.8 (IQR 43-47) between NBU discharge and reassessment done at two weeks ($p < 0.001$), figure 4. Similarly, median head circumference increased from 33.2 cm (IQR 32-34.3) to 33.5 cm (IQR 32.6 -34.8), $p < 0.001$ as shown in figure 12 below.

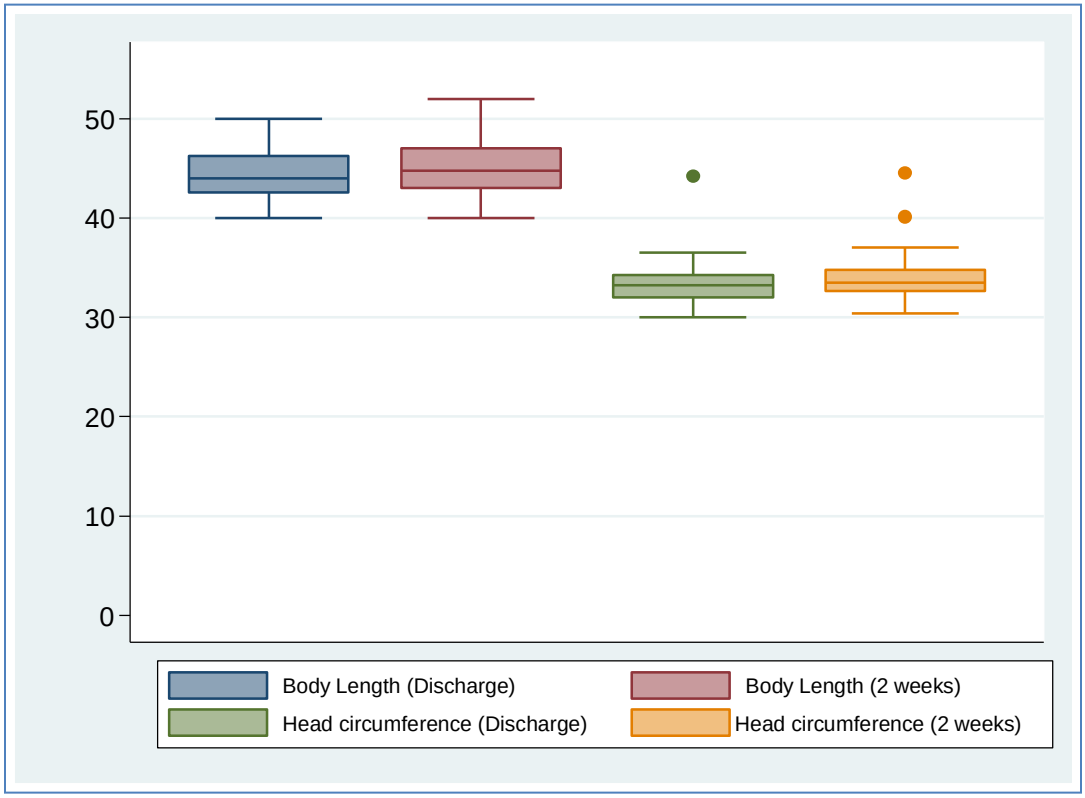

Figure 12: Changes in body length and HC in premature infants after hospital discharge

4.8 Early growth versus infant demographics

Early growth in premature infants showed statistically significant association with gestation age at birth (Table 7). Infants delivered during 33-37 weeks of gestation had higher odds (OR = 2.97, 95% CI 1.05-9.21) of growth deficits compared to infants delivered at 28-32 weeks. There were

no associations between growth deficit and infant's gender (p = 0.124) or mode of delivery (p = 0.06).

Although not significant, the female gender was more likely to develop deficit in growth (OR=2.08 CI 2.08-5.26). Among the infants who gained weight optimally, the females were 55.8%. Similarly, infants who were between 33-37 weeks gestation accounted for 48.1% of the infants who gained weight optimally. Infants born via spontaneous vertex delivery (71.4%) gained body weight more than those born via caesarian section.

Table 7: Association between early growth and infant demographics

	Early growth of preterm infants (n = 106)		**OR**	**95% Confidence Interval**		**P value**
	Deficit	Optimal				
Gender						
Male	8(27.6)	34(44.2)	1.00			
Female	21(72.4)	43(55.8)	2.08	0.82	5.26	0.124
Gestation age at birth						
< 28 weeks	0(0.0)	5(6.5)	NA	NA	NA	NA
28-32 weeks	7(24.1)	35(45.5)	1.00			
33-37 weeks	22(75.9)	37(48.1)	2.97	1.05	9.21	0.024
Mode of delivery						
SVD	26(89.7)	55(71.4)	1.00			
CS	3(10.3)	22(28.6)	0.29	0.08	1.05	0.060

4.9 Early growth versus hospitalization and feeding history

From table 8, early growth deficit was not significantly associated with the length of hospital stay prior to discharge or duration before initiation of feeding after delivery. Most (92.9%) infants were currently feeding on breast milk although their current feeds were not significantly associated with growth deficit. Similarly, reported illness post discharge did not show associations with growth deficits ($p = 0.455$).

Although there was no statistical significance ($p=0.06$), infants who stayed in the hospital for 2 to 3 weeks tended to gain weight equally better as those who stayed for less than three days. Those infants whose feeding was initiated between day 2 and 3 (61%) gained weight better. Almost all (92.2%) of the breastfed infants had optimal growth. Infants who were reported to have been well after discharge showed better outcome, 92.2% showed optimal growth.

Table 8: Association between early growth, hospitalization and feeding history

	Early growth of preterm infants (n = 106)		**OR**	**95% Confidence Interval**		**P value**
	Deficit	Optimal				
Length of stay						
Less than 3 days	12(46.2)	20(26.3)	1.00			
4 to 7	8(30.8)	12(15.8)	1.11	0.35	3.49	0.857
8 to 14	1(3.8)	13(17.1)	0.13	0.01	1.11	0.062
15 to 28	4(15.4)	22(28.9)	0.3	0.08	1.09	0.068
Above 28	1(3.8)	9(11.8)	0.19	0.02	1.65	0.131
Feeds initiation						
Immediately	3(10.3)	7(9.1)	1.00			
Within 24 hours	14(48.3)	20(26.0)	1.63	0.36	7.43	0.526
Day 2-3	11(37.9)	47(61.0)	0.55	0.12	2.46	0.43
Day 4-7	1(3.4)	3(3.9)	0.78	0.06	10.86	0.852
Current feeds						
Breast milk	29(100.0)	71(92.2)	NA	-	-	-
Other feeds	0(0.0)	6(7.8)	NA	-	-	-
Infant feeding mode						
Breastfeeding only	28(96.6)	67(87.0)	1.00			
Other feeding modes	1(3.4)	10(13.0)	0.24	0.03	1.96	0.182
Post discharge illness						
Yes	1(3.6)	6(7.8)	1.00			
No	27(96.4)	71(92.2)	2.28	0.26	19.84	0.455

4.10 Early growth versus maternal demographics

Table 9 compares growth deficits in infants according to maternal demographic characteristics. None of the maternal demographics was significantly associated with growth deficits in premature infants two weeks post discharge.

Though not statistically significant (p=0.13), maternal age of 20-29 years was associated with optimal weight gain (63.6%) while those who were < 20 years (13%) were associated with very minimal growth. Married (71.4%) mothers' infants gained weight better and also infants whose mothers had some formal education (95%). Similarly infants whose mothers were house wives gained weight more than others who were involved in other activities or employed.

Table 9: Association between early growth and maternal demographics

	Early growth of preterm infants (n = 106)		**OR**	**95% Confidence Interval**		**P value**
	Deficit	Optimal				
Maternal age						
< 20 years	8(27.6)	10(13.0)	1			
20-29 years	17(58.6)	49(63.6)	0.43	0.15	1.28	0.13
30-39 years	4(13.8)	15(19.5)	0.33	0.08	1.41	0.136
40-49 years	0(0.0)	3(3.9)	NA	-	-	-
Marital status						
Single	13(44.8)	21(27.3)	1.00			
Married	16(55.2)	55(71.4)	0.47	0.19	1.14	0.096
Education						
None	4(13.8)	3(3.9)	1.00			
Primary	18(62.1)	53(68.8)	0.25	0.05	1.25	0.092
Secondary	6(20.7)	16(20.8)	0.28	0.05	1.65	0.159
Tertiary	1(3.4)	5(6.5)	0.15	0.01	2.05	0.155
Occupation						
Housewife	9(31.0)	28(36.4)	1.00			
Peasant	5(17.2)	18(23.4)	0.86	0.25	3	0.818
Self employed	7(24.1)	14(18.2)	1.56	0.48	5.05	0.462
Casual	0(0.0)	2(2.6)	NA	-	-	-
Formal employment	1(3.4)	4(5.2)	0.78	0.08	7.89	0.832
Other	7(24.1)	11(14.3)	1.98	0.59	6.63	0.268
Source of income						
Salary	1(3.4)	4(5.2)	1.00			
Farming	3(10.3)	16(20.8)	0.75	0.06	9.27	0.823

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

5.1 .1 Introduction

This chapter gives a detailed discussion of the study findings and compares them with those from prior studies. The aim of the study was to establish the determinants of early growth in premature infants after hospital discharge at the Kitui District Hospital. The different factors which were analyzed in the study have been elaborated and the early growth of the premature infants discussed in details.

5.1.2 Characteristics of the study population

Infant characteristics

From the study, the female gender took the dominance of the infants who were discharged from the hospital. This confirms what has already been found in the KDHS 2008/09, that the male gender has a less chance of survival. The moderate to late preterm (33-37 weeks) infants were the majority (54%) of these infants. These results show that the situation in KDH could be a reflection of the situation in the whole country. As a third world country, where the preterm babies have a 12 fold increase to succumb to death (Lawn, Davidge, et al. 2013), the survival rate of the extremely preterm babies could still be very low giving the false impression that most of the premature infants were at an older gestation.

The extremely preterm infants have been reported to have a less chance of survival as well as growth retardation (Bertino et al. 2008). This could have been the reason of the low percentage of the premature infants below 28 weeks gestation at discharge in KDH. Most (87%) of the infants were born in the health facilities hence their enhanced chances of survival. This was a

good indicator of the good health seeking behavior in pregnant mothers in Kenya due to increased awareness of the vulnerability of pregnant mothers and children under five campaigns. The ministry of Health's efforts in working towards the achievement of the MDG V which aims at reducing maternal mortality rates by encouraging facility delivery and skilled birth attendance had made some good progress here. This improved greatly the outcomes of the pregnancies which in turn promoted the achievement of MDG IV via reduction of neonatal mortality rates.

These infants mostly had an APGAR score of more than 7 (87.5%) and were born via SVD (77.7%). The hospital stay varied according to the birth weight with the extremely low birth weight infants taking the longest duration of hospitalization of more than 28 days. These findings agree with what Euser and colleagues had established that the extremely low birth weight infants take the longest period to recover their birth weight (Euser et al. 2008). These infants were mostly feeding on breast milk only (92.9%) without any fortification or supplementation using preterm formula feeds. Although a study carried out in KNH established that nutritionally enhanced enteral feeds in the first month of life in the VLBW infants influenced their outcome, the WHO only recommends breast milk as the best feeding option and the mothers embraced it willingly (Were & Bwibo 2007). Majority(88.3%) of these infants were reported to have been well since their hospital discharge. This could be attributed to the good infection prevention practices that the mothers had been taught during their infants' admission in the NBU.

Maternal characteristics

The maternal age of the mothers ranged from 14 to 41 years but the majority (63.4%) of them were between 20 and 29 years. This age group has been associated with better survival of preterm infants according to KDHS 2008/09). Half of the mothers had their infants as their first

child and were married (66.1%). Being young and their baby being their first born could have contributed largely to the survival of these infants since they dedicated all their time and resources only to this one infant.

Majority of these mothers had only managed to attain primary education (66.1%) and had no formal employment. A good number (17%) of these mothers were students who had dropped out of school due to the pregnancy and depended on their parents for support. The married mothers had their husbands being mostly self-employed (56%) or casual laborers (28%). These study findings fill the gap that had been identified by Goulart et al. They had recommended a study on the socio-demographic characteristics of the populations and nutrition of premature infants because they were strongly associated with their outcomes (Goulart et al. 2011).

Most (92%) mothers had at least attended one ANC clinic but had not managed to make it for the four recommended visits. This was attributed to their lateness in their first clinic attendance which was mainly during the second trimester (63.7%). Antenatal profiles were all done for most of the mothers because they had the Output Based Approach (OBA) cards which covered for all their pregnancy expenses up to six weeks postnatal. Majority (83.9%) of the pregnancies were singleton although multiple births have been associated with premature births (Dhs & Macro 2008). Contrary to the situation in the country where only 44% of the deliveries are in the health facility, 83.9% of these infants were born in the health facilities. This is recommendable and could be attributed to the better survival of these infants.

Mothers reported to have been practising good care of their infants at home as instructed before discharge. Majority (92.9%) of the mothers fed their babies more than eight times in a day and they were using the infants' cry as their guide. Very few (1.8%) followed a feeding schedule or

used hunger cues. They stopped feeding when the infant detached from the breast (83.8%). They did practice hand washing and restricted many visitors from handling their infants. Most (72.3%) mothers would touch the infant to elicit if they were feeling cold and kept them warm by clothing. Most mothers were neither aware of danger signs in the infant (67%) nor kangaroo baby care (66.1%). This could be associated to their low education level or limited awareness to KMC and its benefit. Most (82.9%) infants were on both iron and vitamin D supplements which the mothers had purchased but some of them did not know why their infants were taking them,

Environmental factors

Most of the mothers lived in the rural areas (88%). This could have been due to the fact that the hospital was the major referral hospital for all the other facilities in the region for incubator care of the preterm infants. The time duration taken by most mothers to get to the nearest health facility was between 15 to 30 minutes with only a few having had to travel for more than an hour. This region through the ministry of health has been able to offer accessible health care to the community by ensuring that the level 1(dispensary) facilities are operational. Majority (69.9%) of the mothers lived in cemented houses which had many partitions and were shared by more than three family members. This could be associated to the low socio-economic status of most families. Most (97.3%) mothers were the primary caregivers to their infants being assisted by relatives since they were living with their extended families. Many of the mothers were not aware of sibling rivalry but this was mainly because this was their first child.

5.1.3 Early growth of the premature infants

The study findings elicited that 77 (72.6%) infants out of the 106 who were reassessed two weeks post discharge had a deficit in growth. Although they had a statistically significant

increase in body weight of IQR 1950-2500 with a median of 2215 grams, these infants were unable to attain the recommended WHO optimal growth rate for preterm babies of at least 15g/kg/day (WHO 2008b). The finding that deficit in growth in premature infants after hospital discharge at the KDH was of great importance since research has shown that the growth of premature infants in the postnatal period is a good indicator of their future growth and neurodevelopmental outcomes (Bertino et al. 2008). These infants have also been known to be prone to growth retardation and require to be followed up to two years corrected for gestational age. Although the body length and head circumference also increased significantly, the study duration was not adequate to make any conclusions as to whether the infants had attained optimal growth or not. The body length increased from 44 cm (IQR 42.5-46.3) to 44.8 (IQR 43-47) while the head circumference also increased from 33.2 cm (IQR 32-34.3) to 33.5 cm (IQR 32.6 -34.8), $p < 0.001$ in the 106 (94.6%) infants reassessed.

5.1.4 Early growth versus gestational age at birth

There was a great association between the early growth of premature infants and their gestational age at birth. Infants delivered during 33-37 weeks of gestation had higher odds (OR = 2.97, 95% CI 1.05-9.21) of growth deficits compared to infants delivered at 28-32 weeks. These results support the study findings from Butler and Behrman who found out that the gestational age was a major determinant of growth (Behrman & Butler 2007). Contrary to a study by Euser and colleagues who found out that the extremely preterm infants had the greatest possibility of developing deficit in growth, this study found out that it was the moderate to late preterm infants who had the deficit (Euser et al. 2008). However, this same category of infants demonstrated optimal growth (48.1%) slightly higher than the very preterm infants. In Kenya, currently the discharge criterion is based upon the attainment of body weight of 1800g among other factors.

Premature infants who are born between 1800g and 2500g are therefore legible for home discharge and this could be a major challenge both to the mother and the infant which could be responsible for the deficit.

Although not significant, this study showed that the female infants were more likely to develop deficit in growth unlike their male counter parts (OR=2.08 CI0.8-0.124) but among the ones who gained body weight optimally they were the majority (55.8%). Spontaneous vertex delivery

(71.4%) also gave better outcome as compared to CS. This could be attributed to the lack of exposure to anesthesia and early feeding of the infants. Short hospital stay (OR=1.11 CI 0.35-3.49) and post discharge illness increased the likelihood of developing deficit in growth (OR=2.28 C I0.26-19.84) although not significant. Hospital stay of between 3 and 4 weeks was associated with better optimal growth which could be due to the continued support of these mothers and training on how to care for their infant during the hospitalization period. Infants whose feeds were started from day 2 or 3 also gave better growth than those who were fed later. These were infants who mainly did not portray any signs of complications during their first 24 hours on admission which is usually a good indicator of good prognosis. Infants who were being exclusively breastfed (92.2%) tended to gain weight better than their counter parts who were mixed fed. This only emphasizes that breast milk is still the best feed for these infants.

5.1.5 Early growth versus maternal and environmental characteristics

The study findings did not elicit any statistically significant association between premature infants' early growth and either maternal socio-demographic characteristics or environmental factors. Although not statistically significant (P=0.13), the study findings elicited that mothers who were between 20-29 years (63.6%) of age, their infants tended to attain optimal growth

better than those below 20 years or between 30-39 years. This could be due to the fact that the very young mothers were students while those above 30 years of age probably had other children to take care of and hence there was divided attention. According to the KDHS 2008/9 maternal age has been identified as a major determinant of growth in prior studies in premature infants (Dhs & Macro 2008). From the findings, most(63.6%) of the mothers were between the ages of 20-29 years which could have contributed to the better survival and growth in their infants up to this period.

From the study findings, being married was attributed to better growth of the infant though not significant (P=0.096). Family support is always paramount in the care of these infants which could have been offered by the spouses unlike the infants whose mothers were dependent on relatives. The stay home mothers (house wives) had their babies gaining weight better than the others who were either in business or employed. However, mothers who were self -employed or students had a higher chance of their infants developing growth deficit (OR=1.56 CI 0.48-5.05, OR=1.98CI 0.59-6.63) although not significant. Similarly, any type of formal education (95.6%) demonstrated better growth in these infants unlike in the mothers who had no education at all. Any mother who had been in school was able to get most of the instructions given by the health care providers as well as remember and follow them after discharge unlike the ones who had not had any exposure in school.

In this study, most mothers also lived in the rural areas and their type of housing was almost similar making it difficult to identify any factors which could have contributed to the deficit in growth.

5.2 CONCLUSION

1. More female infants were surviving up to discharge at Kitui District Hospital
2. Gestational age of between 33-37 weeks at birth was a major determinant of early growth in premature infants after hospital discharge at the Kitui District Hospital
3. A longer hospital stay, spontaneous vertex delivery and exclusive breast feeding were associated with better outcome in early growth of premature infants after hospital discharge
4. Post discharge illness and late initiation of feeds influenced negatively the growth of the premature infants after hospital discharge at the KDH.
5. Maternal age of between 20-29 years, being married and having any formal education promoted better growth in premature infants

5.3 RECOMMENDATIONS

1. The KDH should develop an educational package for mothers to premature infants with emphasis on more attention to infants born at gestational age of 33-37 weeks or short hospital stay and follow up clinic attendance.
2. KDH should establish a tracking system for the premature infants who are discharged from the hospital to enable close monitoring of their growth and outcome
3. Further research should be carried out to follow up premature infants for two years or more KDH to establish their later growth and outcomes.
4. The Kitui county administration should prioritize premature infants as one of the key areas to be supported in the beyond zero campaign.

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APPENDICES

APPENDIX 1(A): INFORMED CONSENT

Consent explanation

Study title: Determinants of early growth in premature infants after hospital discharge at Kitui District Hospital

Introduction

Dear respondent,

My name is Diana Mawia Sammy. I am a student in the School of Nursing sciences at the University of Nairobi. I am undertaking a research on **the determinants of early growth in premature infants after hospital discharge at Kitui District Hospital.** This research has been approved by the KNH-UON Ethics and Research Committee and the KDH administration.

Objective of the study

The aim of this study will be to establish the determinants of early growth in premature infants after hospital discharge from the newborn unit and attending the pediatric outpatient clinic.

Risks and benefits

The study will involve minimal risks such as discomfort to the infant during the taking of the anthropometric measurements. This will be minimized by ensuring that the procedure will be carried out in a warm room away from draught and it will also take the shortest time possible. Some of the questions may be personal but you are free to decline to respond to any of the

questions. Health education will be offered to all the mothers with particular attention to their different areas of need. If the infant presents to the clinic with any danger sign he/she will be stabilized first then referred to a pediatrician before being enrolled in to the study. There will be no monetary gains offered to you or any favor if you accept to participate. The information obtained will be utilized to make hospital policies which will be beneficial to premature infants in the hospital in future.

Confidentiality

Confidentiality will be observed by not asking you to identify yourself by your name or the infant's and the information will only be shared with the relevant persons. I would also wish to request for your permission to go through your infant's hospital records to confirm some of the information. The researcher will use codes to identify the participants in order to link them with their results or for follow up purposes and the data collected will only be accessible to the researcher. Access to the data after submission will only be through application to the Kitui District hospital administration.

Voluntarism

You are free to choose on whether to participate in the study or not and there will be no penalties. You can also choose to withdraw from the study any time and there will be no victimization to you or to your child.

Information sharing

The clinically important findings obtained will be made available to the relevant teams involved in the management of the premature infants the hospital. The study findings will be presented to

the newborn staffs at the Kitui District Hospital as well as the Ministry of Health and the Prime – K partners who will have spearheaded the research. The results from the study will be available in the hospital in case you would wish get feedback after the study. You can also ask any question on regards to your rights during your participation in the study or anything that is not clear.

Study procedure

The study will involve the taking of measurements of the infant's body weight, body length and head circumference. It will also involve a 15-20 minute interview by the researcher who will be recording the information as it is.

Follow up

The study will involve a follow up of the infant post discharge at two weeks. This will coincide with the return dates in to the POPC in order to save the guardian on any extra expenses.

Researcher's contacts

For any clarifications or questions you are free to contact the researcher through the mobile number 0720704436 or the supervisor 0733469283 or the secretary to the KNH/UON-ERC via the telephone number 2726300 Ext 44102

Consent declaration

I, the guardian to this infant do consent that I have read and understood the above information regarding this study and the researcher has also clarified any concerns I had. I would wish to participate with my infant.

Guardians signature/ thumb print……

Date …….

Researcher's sign……..

Date ……..

Witnesses' sign…….

Date …….

KIAMBATISHO 1(B): FOMU YA MAELEZO KUHUSU IDHINI

Utafiti: Ni mambo gani yanayochangia kukua kwa watoto wanaozaliwa mapema baada ya kuruhusiwa kwenda nyambani katika hospitali ya wilaya ya kitui.

kielezo

Kwa mhusika,

Jina langu ni Diana Mawia Sammy. Mimi ni mwanafunzi kutoka shule ya uuguzi katika chuo kikuu cha Nairobi. Ninafanya utafiti kuhusi mambo yanayochangia katika kukua kwa watoto wanaozaliwa mapema baada ya kuruhusiwa kwenda nyumbani.Utafiti huu umeidhinishwa na Kamati ya Maadili yaUtafiti ya hospitali kuu ya Kenyatta pamo jana Chuo Kikuu cha Nairobi. Kamati ya Hospitali hii ya Kitui pia wamenikubalia.

Lengo la utafiti: Utafiti huu utatambua mambo yanayochangia katika kukua kwa watoto waliozaliwa mapema baada ya kupewa ruhusa kutoka hospitalini. Hawa ni watoto ambao huwa wanafuatiliwa kwa kliniki cha watoto waliokuwa wagonjwa katika hospitali ya wilayaya Kitui.

Fidia na madhara

Utafiti huu unaweza kukufanya uhisi kama tunaingilia maisha yako ya kibinafsi ama kusumbua mototo wako. Sio lazima uyajibu maswali yote na hata hivyo tutahakikisha mototo amehudumiwa haraka iwezekanavyo. Kama utakubali kushiriki katika utafiti huu,utatarajiwa kujibu maswali ambayo yako katika fomu niliyounda lakini hutalazimishwa kujibu swalia mbalo hutaki.

Kujihusisha kwa mhusika

Kushiriki kwako kutakuwa kwa hiari na uko huru kukatisha mahojiano wakati wowote ule bila adhabu au kutotendewa haki. Jambo lolote ambalo utaulizwa katika utafiti huu tungependa kukuhakikishia ya kwamba lolote litakalosemwa au kuandikwa litawekwa kwa siri.

Usiri wa utafiti

Hakuna kujitambulisha kwa majina yako au ya mtoto wako mahali popote katika fomu hizi. Hakuna malipo yeyote utapewa kwa kushiriki katika utafiti huu,walakini kama motto wako au wewe binafsi una matatizo yeyote mtashughulikiwa na kupewa mawaidha yanayofaa. Ningeomba pia kuangalia rekodi za motto wako ambazo amekuwa akitibiwa nazo humu hospitalini.

Kusambazwa kwa majibu

Matokeo ya utafiti huu yatakuwa yanaweza kupatikana katika ofisi ya mkuu wa hospitali hii na utakuwa na haki ya kujulishwa wakati wowote ule. Uko huru kuuliza maswali yeyote kuhusiana na haki yako kama mshiriki katika utafiti huu au jambo linguine lile ambalo hujaelewa.

Jinsi utafiti utavyotendeka

Utafiti huu unahitaji muda wa dakika 15-20 wa mahojiano kuhusu mtoto wako, afya yako na mazingira mnaoishi nyumbani. Mtoto wako atapimwa uzani, urefu na kimo cha kichwa chake.

Ufuasi wa wahusika

Mtoto wako anahitaji kufuatiliwa baada ya wiki mbili baadaye atakapopewa ruhusa kutoka kwa chumba cha watoto waliozaliwa mapema. Huu ni muda ambao anahitajika kuletwa katika kliniki cha watoto wagonjwa wanaopewa ruhusa kutoka katika hospitali hii. Hii itasaidia kuhakikisha kuwa wewe kama mlinzi wa mototo hutakuja hospitalini kama motto wako haji kuonekana.

Anwani ya mtafiti

Kama una maswali, mapendekezo au ufafanuzi wowote kuhusu utafiti huu unaweza kuwasiliana na mpelelezi mkuu kupitia kwa nambari ya simu 0720704436 au msimamizi wa mtafiti, 0733469283 ama Katibu mkuu wa KNH/UON-ERC 2726300/44102

Asante kwa kuutumia muda wako kuyasoma haya maelezo.

Ridhaa ya kushiriki utafiti

Mimi, kam amlezi wa motto huyu, ninakubali ya kwamba nimeyasoma na kuyaelewa maelezo yaliyo hapa juu na ningependa kushiriki kwa hiari yangu.

Sahihi ya mhusika…….tarehe……

Mtafiti mkuu…….tarehe……

APPENDIX 2: STUDY QUESTIONNAIRE

STUDY TOPIC: DETERMINANTS OF EARLY GROWTH IN PREMATURE INFANTS AFTER HOSPITAL DISCHARGE AT KITUI DISTRICT HOSPITAL

Questionnaire number: ……..

Date ……

Introduction

This session will take 15-20 minutes to accomplish. You will be interviewed as the questionnaire is filled. Your responses will be recorded just the way you will have put them. If you do not have a response you can skip to the next question. Thank you.

SECTION A: INFANT CHARACTERISTICS

1.0 Demographic data

1.1 Gender ☐ Male ☐ Female

1.2 Age in weeks ……..

1.3 Anthropometric measurements:

NBU: weight……..length…….HC……

Two weeks later: weight……length…….HC…….

2.0 Birth history

2.1 Gestation in weeks at birth……..

2.2 Birth weight in grams.…….

2.3 Mode of delivery ☐ SVD ☐ CS Others, specify……

2.4 Apgar score: at one minute……..At five minutes…….

2.5 If the infant was born at home, did the baby cry after birth?

☐ Yes ☐ No

2.6 Was there any resuscitation done immediately after the infant was born?

☐ Yes ☐ No

2.7 If yes, which one of the following?

☐ Ambubagging + stimulation

☐ Ambubagging + cardiac massage

☐ Ambubagging + cardiac massage + 10% dextrose

☐ Others, specify

3.0 Hospitalization history

3.1 Number of days admitted in the NBU …….

3.2 Medical diagnosis made (confirm with discharge summary)…….

3.3 What were the medical interventions given to the infant?

☐ Drugs + intravenous fluids

☐ Drugs + intravenous fluids + phototherapy

☐ Drugs + intravenous fluids + phototherapy + nutritional support

☐ Others specify…….

4.0 Feeding history

4.1 When did your infant start feeding after birth?

☐ Immediately ☐ Within 24 hours

☐ Day 2-3 ☐ Day 4-7

☐ Others, specify……

4.2 What are you currently feeding your infant on?

☐ Breast milk

☐ Formula milk

☐ Breast milk + formula milk

☐ Breast milk + cow's milk

☐ Others specify……

4.3 What is the mode of feeding of the infant?

☐ Breastfeeding only ☐ Breastfeeding + cup feeding

☐ Breastfeeding + bottle feeding ☐ Cup feeding only

☐ Bottle feeding only ☐ others, specify……

5.0 Infant's well being

5.1 Has the infant been ill since discharge?

☐ Yes ☐ no

5.2 If yes, how many times?

☐ Once ☐ twice ☐ thrice ☐ more than three times

5.2 What was the infant suffering from?

☐ Refusal to feed ☐ hotness of body

☐ Difficult arousal ☐ convulsions

☐ Vomiting everything ☐ others, specify…….

5.3 What did you do when your infant fell sick?

☐ Took the infant to the hospital

☐ Observed the baby closely

☐ Purchased drugs for the infant from the chemist

☐ Sought for help from a friend

☐ Others specify……..

SECTION B: Maternal characteristics

6.0 Demographic and socioeconomic factors

6.1 Age in years.....

6.2 Parity…….

6.3 Marital status

☐ Single ☐ Married ☐ Divorced ☐ Widowed

6.4 Religion

☐ Christian ☐ Muslim ☐ others (specify)……

6.5 What is the highest level of education you have attained?

☐ None ☐ Primary ☐ secondary ☐ college ☐ university

6.6 What is your occupation?

☐ Housewife ☐ Peasant farmer

☐ Self-employed ☐ Casual laborer

☐ Formal employment (specify) ……

6.7 What is your primary source of income?

☐ Salary ☐ Farming ☐ Parents

☐ Business ☐ Spouse ☐ Others, specify……

If married:

6.8 Husband's age in years ……..

6.9 What is your husband's occupation?

☐ Unemployed ☐ Self-employed

☐ Casual laborer ☐ Employed (specify)……..

6.10 Do you both live together with your husband?

☐ Yes ☐ No

7.0 Pregnancy history

7.1 Did you visit any antenatal clinic?

☐ Yes ☐ No

7.2 If no, statewhy.....

7.3 How many times did you visit the antenatal clinic during pregnancy?

☐ One ☐ Two ☐ Three

☐ Four ☐ More than four

7.4 If less than four times, state why.....

7.5 At what gestation was your first antenatal visit?

☐ First trimester ☐ Second trimester ☐ Third trimester

7.6Did you suffer from any medical or obstetric condition during the pregnancy?

☐ Yes ☐ No

7.7If yes, which one? ……

7.8 Were the antenatal profiles done?

☐ Yes ☐ No

7.9 If no, state why…….....

7.10 What is your serology status?

☐ Negative ☐ Positive ☐ Not tested

7.11 If not tested, state why.....

7.12What type of pregnancy was it?

☐ Singleton ☐ multiple

☐ Others specify……

7.13 Was the labor induced?

☐ Yes ☐ No

7.14 If yes, what was the indication? .....

7.15 Where did you deliver your infant?

☐ Home ☐ Health facility

☐ Others, specify……

7.16 Did you suffer from any illness during puerperium?

☐ Yes ☐ No

7.17 If yes, how did it affect your infant care?

☐ Delayed feeding ☐ Lack of milk

☐ Mixed feeding ☐ Poor weight gain

☐ Others, specify……

7.18 Do you have any insurance cover?

☐ Yes ☐ No

7.19 If no, who settled the hospital bill?

☐ Personal savings ☐ Spouse

☐ Relative ☐ Social worker

7.20 Do you have any history of preterm birth?

☐ Yes ☐ No

7.21 If yes, how many of your children were born preterm?

☐ One ☐ Two

☐ Three ☐ More than three

7.22 What is your previous birth interval?

☐ Less than 12 months ☐ 12-18 months

☐ 19-24 months ☐ More than 24 months

7.23 Do you take any substance of abuse?

☐ Yes ☐ No

7.24 If yes specify …….

8.0 Knowledge and practice of the care of the small baby

8.1 how many times have you fed the infant in the last twenty four hours?

☐ Three ☐ Four ☐ Six

☐ Eight ☐ More than 8 times

8.2 What guides you on when to feed your infant?

☐ Infant's cry ☐ hunger cues

☐ Schedule ☐ others specify……

8.3 What are some of the hunger cues you know of? ……..

8.4 How do you know that the infant has fed enough?

☐ Infant refuses to breastfeed

☐ When the breasts no longer produce milk

☐ When the infant takes the required amount if milk

☐ Others, specify…….

8.5 Do you wash your hands during the infant's feeding?

☐ Yes ☐ No

8.6 If no, why? .....

8.7 Do you restrict any people from handling your infant?

☐ Yes ☐ No

8.8 If no, why? .....

8.9 Where are the infant's utensils and clothes stored at home?

☐ Together with other family members' ☐ In a separate place

8.10 How do you know if your infant is feeling cold?

☐ Crying a lot ☐ cold on touch

☐ Shivering ☐ refusal to breastfeed

☐ Others, specify ……..

8.11 Where do you check to know if the infant is feeling cold?

☐ Face ☐ Extremities

☐ Chest ☐ Abdomen ☐ Don't know

8.12How do you provide warmth to the infant?

☐ Clothing ☐ Room warming

☐ Breastfeeding ☐ Skin to skin care

8.13 Have you heard about danger signs in infants?

☐ Yes ☐ No

8.14 If yes, which ones?

☐ Refusal to feed ☐ vomiting everything

☐ High fever ☐ difficult arousal

☐ Convulsions ☐ others, specify……

8.15 Is the infant on both iron and vitamin D supplements?

☐ Yes ☐ No

8.16If no, explain why ……

8.17 Have heard about kangaroo baby care?

☐ Yes ☐ No

8.18 If yes do you practice it at home?

☐ Yes ☐ No

8.19 If no, why?

☐ Busy with household chores ☐ usually at work

☐ Don't know the benefits ☐ No reason

☐ Others, specify……

SECTION C: ENVIRONMENTAL FACTORS

9.1 Area of residence

☐ Town ☐ Rural

9.2 Walking distance to the nearest health facility

☐ 10 minutes or fewer ☐ 15-30 minutes

☐ 30-60 minutes ☐ more than 60 minutes

9.3 Type of housing

☐ Bricks and mud ☐ cemented

9.4 Number of partitions

☐ None ☐ One

☐ Two ☐ More than two

9.5 Number of people who share the house?

☐ Two ☐ Three ☐ More than three

9.6Are you the primary caregiver to the infant at home?

☐ Yes ☐ No

9.7 Who assists you in the caring of the infant?

☐ Spouse ☐ House help

☐ Relative ☐ Others, specify……

9.8 What is your source of information regarding the care of your premature infant?

☐ Health care providers ☐ Media ☐ Relatives

☐ Friends ☐ Reading ☐ others specify…….....

9.9 How has the arrival of the infant affected the wellbeing of the other children?

…….....

9.10 What do you think has contributed to the promotion/ deficit of growth in your infant and why? .....

…….

End.

Thank you.

APPENDIX 3: APPROVAL LETTER FROM KNH/UON-ERC

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254 020) 2726300 Ext 44355

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Fax: 725372
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/91 Link:www.uonbi.ac.ke/activities/KNHUoN 8th April 2014

Sammy Diana Mawia
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Diana

RESEARCH PROPOSAL: DETERMINANTS OF EARLY GROWTH IN PREMATURE INFANTS AFTER HOSPITAL DISCHARGE AT KITUI DISTRICT HOSPITAL (P48/01/2014)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and approved your above proposal. The approval periods are 8th April 2014 to 7th April 2015.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN.

Protect to Discover

Yours sincerely

PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

c.c. The Chairperson, KNH/UoN-ERC
The Deputy Director CS, KNH
The Principal, College of Health Sciences, UoN
The Director, School of Nursing Sciences, UoN
The Assistant Director, Health Information, KNH
Supervisor: Dr. Margaret Chege, School of Nursing Sciences, UoN

APPENDIX 4: APPROVAL LETTER FROM KDH

MEDICAL SUPERINTENDENT
KITUI DISTRICT HOSPITAL
P.O. Box 22 [illegible]
15 APR 2014
TEL: [illegible]
MOBILE: 0716972 082
Email: [illegible]

Diana Mawia Sammy,

University of Nairobi,

School of Nursing Sciences,

Nairobi.

14th April 2014

The Medical superintendent,

Kitui District Hospital,

P.O Box 22-90200,

Kitui.

Dear sir/madam,

RE: APPLICATION FOR RESEARCH AUTHORISATION IN YOUR INSTITUTION

I am a post graduate student in the School of Nursing Sciences at the University of Nairobi who wishes to carry out a research on ***'the determinants of early growth in premature infants after hospital discharge at the Kitui District Hospital'***. I wish to request for permission to carry out the research in your institution and attached here in, is the approval letter from the UON-KNH Ethics and Research Committee.

Your positive consideration will be greatly appreciated.

Thank you.

Yours faithfully,

Diana Mawia Sammy

Email: mawiasd@gmail.com

Phone: 0720704436

Cc Nursing Officer I/C

Approved for A. [illegible] [illegible] - inchange

Seen 22/4/2014 Please accord her the necessary support in various [illegible]

22 APR 2014
KITUI DISTRICT HOSPITAL