PERINATAL MORBIDITY AND MORTALITY AMONG BABIES BORN TO WOMEN ATTENDING ANTENATAL CLINIC AT NAIVASHA DISTRICT HOSPITAL

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF DEGREE OF MASTER OF MEDICINE IN PAEDIATRICS AND CHILD HEALTH (M. Med Paediatrics), UNIVERSITY OF NAIROBI

BY

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DECLARATION

This dissertation is my original work and has not been submitted for a degree in any other university

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DEDICATION

This book is dedicated to my family for their undying support throughout my program.

My husband Simon, thank you for standing by me even when the going got really tough.

My daughters Jayda and Jardeen, thank you for understanding when mummy was frequently absent.

I love you all.

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LIST OF ABBREVIATIONS

ANC: Antenatal care clinic

CHW: Community health worker

ENND: Early neonatal death

KDHS: Kenya Demographic Health Survey

MDG: Millennium development goal

MTRH: Moi Teaching and Referral Hospital

NBU: New born unit

NDH: Naivasha District Hospital

ORS: Oral rehydration solution

PNMR: Perinatal mortality rate

PROMISE-EBF: Safety and Efficacy of Exclusive Breastfeeding Promotion in the Era of HIV in Sub-Saharan Africa

RDS: Respiratory distress syndrome

SPSS: Statistical program for the social sciences

WHO: World Health Organization

DEFINITION OF TERMS

EARLY NEONATAL MORTALITY: Refers to deaths of live born infants in the first seven days of life.

GROSS MALFORMATIONS: Refers to any easily identifiable birth defects, visible to the normal eyes without the need for investigative tests.

LOW BIRTH WEIGHT: Birth weight of less than 2500 grams.

NEONATAL PERIOD: The first 28 days of life

NON REPONDERS/ DROP- OUTS: This was defined as those who failed to answer three consecutive calls plus those who had given wrong telephone numbers and therefore could not be contacted.

PERINATAL DEATH: Pregnancy losses occurring after 28 completed weeks of gestation (stillbirths) plus deaths to live births within the first seven days of life.

PERINATAL MORTALITY RATE: The ratio of the number of the sum of foetal deaths after 28 or more weeks of gestation (stillbirths) and deaths of infants less than 7 days of age in one time period and population to the sum of the number of live births and foetal deaths after 28 or more weeks of gestation (stillbirths) in that same time period and population.

INFANT MORTALITY RATE: Probability of dying between birth and exactly one year of age, expressed per one thousand live births.

UNDER FIVE MORTALITY RATE: Probability of dying between birth and exactly five years of age, expressed per one thousand live births.

ANTENATAL CARE: Women attended at least once during pregnancy by a skilled health worker

SKILLED ATTENDANT AT DELIVERY: Percentage of births attended by skilled health personnel (doctor, nurse midwife, clinical officer)

STILLBIRTH: Baby born with no signs of life, described as never moved cried or breathed even briefly

ABSTRACT

Background: Perinatal mortality, defined as death occurring after 28 weeks gestation up to one week of life, remains the biggest contributor to infant mortality. The magnitude of mortality in Kenya is mostly described using hospital derived data. Given that only an estimated 40% of women attending antenatal clinics in Kenya deliver in hospital, it is possible that the most of these mortalities therefore go unreported. This study was conducted in Naivasha, a town with a large peri-urban and rural catchment, with a unique cosmopolitan and predominantly farming population. It targeted pregnant women attending the antenatal clinic in order to capture all birth outcomes regardless of where they occurred.

Objectives: The primary objective was to determine the prevalence of perinatal mortality and early neonatal morbidity of babies born to women attending Antenatal clinic at Naivasha District Hospital. The secondary objective was to determine the risk factors for perinatal mortality and early neonatal morbidity of babies born to women attending the clinic. The risk factors included maternal pregnancy complications, circumstances of delivery and signs of early neonatal illness.

Methods: Pregnant women attending the antenatal care clinic who were of 28 weeks gestation and beyond were recruited consecutively during their regular antenatal attendance. They were then followed up on phone to find out the outcome of their pregnancy at the end of one week post-delivery. All mortality and morbidity events in the baby were recorded using a checklist modified from the WHO verbal autopsy questionnaire.

Findings:

A total of 197 were recruited into the study. Overall there were 7(3.5%) deaths, with 4(2.0%) stillbirths and 3 (1.5%) neonatal deaths in the first week of life. The perinatal mortality was 3.5% and 57% of these deaths were still births. Twelve 12 (7.5%) babies had morbidity severe enough to warrant medical treatment or hospitalization. Early neonatal morbidity was associated with increasing maternal age, previous history of perinatal mortality, rupture of membranes longer than 12 hours and labour duration longer than 12 hours. Prematurity and inability to breastfeed were associated increased mortality. Mothers with a previous history of perinatal death were also at risk of losing their babies.

Conclusion:

There was a high perinatal mortality compared to the national average. Most of the deaths were still births.

Recommendations

Early intervention and delivery for women in prolonged rupture of membranes and prolonged labour is recommended since it carried a high risk for morbidity and mortality.

Women should be educated during pregnancy on the danger signs of early neonatal illness to ensure prompt health seeking.

A large study is recommended to characterize the mortality patterns and to evaluate the impact of home births on the perinatal mortality.

CHAPTER ONE:

INTRODUCTION AND BACKGROUND

Perinatal mortality is one of the sensitive indices of the quality of prenatal, obstetric and early neonatal care available to women and new-borns. Perinatal mortality remains a major contributor to neonatal and overall child mortality in developing countries. Further reductions in infant mortality will largely depend on decreasing deaths due to perinatal causes. A meta-analysis of the effect of skilled delivery showed a reduction by 45% of intrapartum stillbirths, using basic emergency obstetric care, and a further reduction by 75% by comprehensive obstetric care [(1)]

Accurate reporting of perinatal mortality and morbidity is necessary for adequate strategies to be put in place to try and reduce these events. This is hampered by underreporting from civil registration. In Rarieda, Kenya, it was shown that mortality estimation through civil registration was two-fold lower as compared to active surveillance in the community. This was most pronounced in the neonatal period. [(2)]

Early neonatal deaths are largely unrecognized culturally. [(3)] Neonatal deaths are less likely to be reported if the baby dies in the first hours or days after birth or is very small. [(4)] Every pregnancy counts and death occurring at the time when a woman expects to welcome a new life is devastating.

Strategies need to be put in place to try and reduce child mortality and especially target the perinatal period. Mortality and morbidity in the perinatal and neonatal period are mainly caused by preventable and treatable conditions. Interventions that benefit mothers by reducing maternal deaths and complications, as well as special attention to the physiological needs of the new born baby—resuscitation when necessary, immediate breast-feeding, warmth, hygiene (especially for delivery and cord care) and the prevention, early detection and management of major diseases—will help ensure the survival and health of new born infants. Safe and clean delivery, early detection and management of sexually transmitted diseases, infections and complications during pregnancy and delivery and taking into account the physiological needs of the new born baby, are all interventions that should be available, attainable and cost-effective. Essential Newborn Care training and training in basic neonatal resuscitation was shown to significantly reduce peri-natal mortality in India [(5)]

In babies born at home, difficulty initiating breathing is a commonly recognized problem and resuscitative measures are commonly used. However those who remain in poor condition at 5 minutes carry a much higher risk of death as was shown in Bangladesh [(6)]

Naivasha is an urban area with a large active and low scale population that largely depends on the flower farms. Majority of the population relies on health care provided by the government facilities or their respective employers. Basing this study in a public health facility s therefore intended to get a representation of the bulk of the population. Universal access for women to care in pregnancy and childbirth and care of the new born is required to improve the chances for both mother and baby. This study aims to bring to the fore the mortality as well as morbidity in this age group in the Naivasha area.

CHAPTER TWO:

2.1 LITERATURE REVIEW

Globally there has been a considerable decline in child and infant mortality in the past decade. The total number of deaths of children under5 years old fell from 12.4 million in 1990 to 8.1 million in 2009. The mortality rate in children under 5 years old has fallen correspondingly from 89 per 1000 live births in 1990 to 60 per 1000 live births in 2009, representing a reduction of about one third. [7] However, the neonatal mortality in developing countries has remained relatively unchanged [8]. Worldwide, four million infants die within the first 28 days of life each year with the highest neonatal mortality seen in sub Saharan Africa. Three quarters of these deaths occur within the first week, and more than a quarter within the first 24 hours of birth. [9] An estimated 3.2 million still births are not part of this mortality. Even as global new born death rates declined from 4.6 million deaths in 1990 to 3.3 million deaths in 2009, East African countries continued to record the highest number of infant deaths with Kenya for example recording over 40,000 infant deaths in the first month of delivery every year and ranked 13th among the 193 countries WHO member countries statistics mortality death rate.

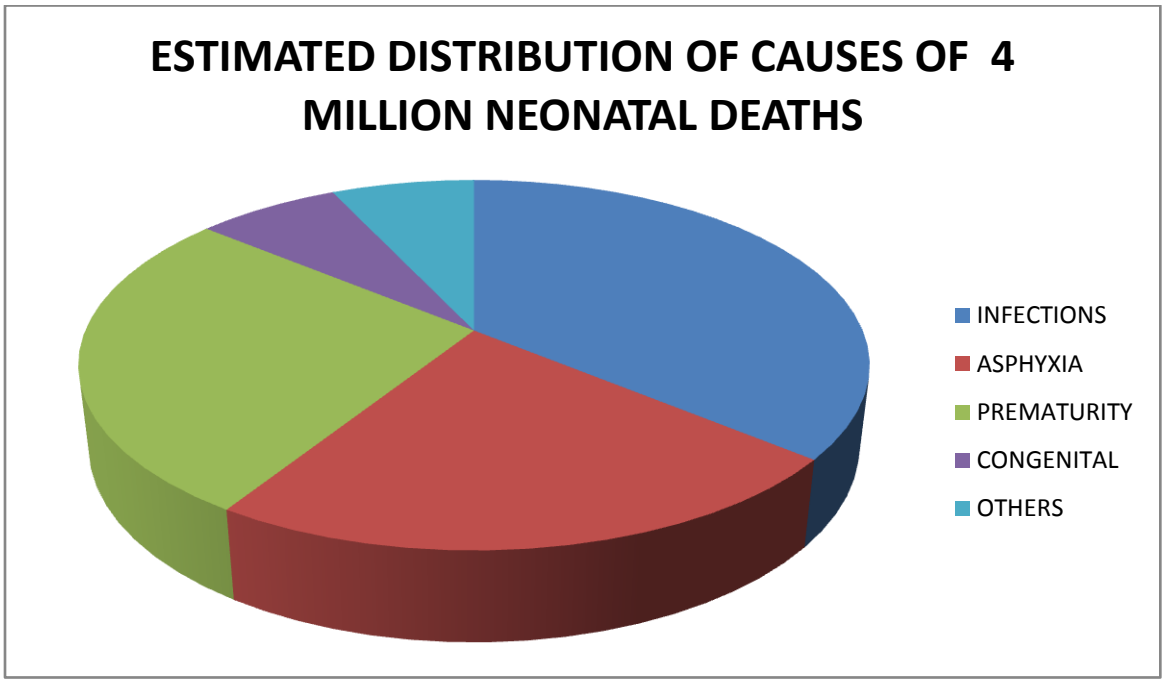


Figure 1: Estimated distribution of direct causes of 4 million neonatal deaths for the year 2000, based on vital registration data for 45 countries and modelled estimates for 147 countries.

In Kenya 1 out of 19 children born die before their first birthday with 60% of these deaths occurring before one month of age. [10] Neonatal mortality is 31 deaths per 1,000 live births, while the perinatal mortality is 37 per 1,000 live births during the same period. When these figures are compared with the preceding five year periods a very marginal decline in the statistics is noted, while these statistics remain unacceptably high.

Stillbirths:

At least 2·6 million third-trimester stillbirths occur every year, 98% of which occur in low-income and middle-income countries. Nigeria and Pakistan have the highest stillbirth rates (42 and 46 per 1000 births, respectively). Finland and Singapore have the lowest stillbirth rate (two per 1000 births). [11]

Worldwide, according to the lancet series, 1·2 million stillbirths occur during labour (intra-partum). The risk of intra-partum stillbirth for an African woman is 24 times higher than for a woman in a high-income country. Stillbirths before labour (ante partum), account for more than half (1·4 million), of all stillbirths.

According to the WHO the big five causes of stillbirth are; childbirth complications; maternal complications in pregnancy, maternal disorders especially hypertension and diabetes; foetal growth restriction and congenital abnormalities. [12] These causes are not uniform across the board. In developed world, stillbirths are largely due to unforeseen or unpreventable causes and up to 25% of stillbirths are due to unexplained causes. [13] In the developing countries including Kenya, intra-partum causes form the majority of deaths and occur due to largely preventable causes.

Skilled birth attendance is vital to protecting the health of new-borns as the majority of perinatal deaths occur during labour, delivery and within the first 48 hours after delivery. Although 90% of Kenyan women receive antenatal care during pregnancy, (85% from a medical professional and about 5 % from a traditional birth attendant) only 44% deliver with the help of a qualified health worker. [10]Therefore any complications arising are not promptly addressed. Similarly, these babies are not immediately examined and appropriate new born care given. Consequently many neonatal complications are not adequately addressed and can easily lead to death.

According to the Nairobi birth survey, pathological analysis of babies showed that 23% of deaths occurred ante partum, 38% intra-partum (fresh stillbirths) and 39%occurred within 24 hours of birth. The major causes were cord compression, cord prolapse, birth trauma and prolonged labour. Congenital malformations accounted for only 6% as compared to 24% reported in the UK.

Intrauterine infections were shown to also have a key contribution in these deaths**.** [14] In the same survey, it was found that breech delivery carried up to seven times the risk of perinatal death as compared to other modes of delivery. Other risk factors in the mother were maternal parity where primigravidae and third pregnancies were shown to carry a high risk, short maternal stature, low maternal age and booking status for delivery. Patients who were not booked to deliver at that particular facility delivered babies who were at a higher risk of dying. This was attributed to transfers due to complications, as well as delay in diagnosing preventable causes of death such as asphyxia following prolonged labour. The Nairobi birth survey was conducted three decades ago and it would be very useful to find out if the same factors play a role in mortality or whether that has changed.

Early neonatal death:

The major causes of neonatal mortality globally are; severe infections (26%), preterm birth 28% and asphyxia 23%. Neonatal tetanus accounts for a smaller proportion (7%) but is easily preventable. [4] Locally, however, the leading causes seem to differ. In Muhimbili hospital, Dar es Salaam, it was found that most early perinatal mortality was due to birth asphyxia. (37%) other causes were preterm deliveries (29%) sepsis (16%), and respiratory distress syndrome (6.4%) about 41% of the perinatal mortalities weighed 2500 grams and more. [16]

Low birth weight is an important indirect cause of perinatal mortality because of the arising complications. According to the KDHS, low birth weight babies have a 50% greater risk of dying not just in the perinatal period but before their fifth birthday. Immediate postnatal complications that can lead to death include severe hyperbilirubinaemia, sepsis, respiratory distress syndrome and birth asphyxia. In the Nairobi birth survey, low birth weight was a major contributor to perinatal mortality as three out of four babies weighing less than 1500 grams died within the first 24 hours. [16] Neonatal care and especially care of low birth weight babies has greatly improved over the years and it would be useful to know by what fraction these deaths have been reduced.

Multiple births, a common phenomenon in African populations, have been shown to be associated with adverse perinatal outcomes such as birth asphyxia, sepsis, severe hyperbilirubinemia underpinned by LBW and IUGR. The risk of adverse outcome is however significantly reduced with increasing gestational age at delivery**.**[17]

In a study done by Metaferia A.M and others in Malawi, pregnant women delivering at the hospital were recruited and followed up through delivery until discharge. All birth outcomes were recorded, so were all perinatal mortalities before discharge. It was observed that male babies, preterm births and

babies born to women, who had an earlier history of perinatal mortality, were at a higher risk of dying. However a major setback was that the babies were not followed up post discharge where probably more died. Similarly, given that about 45% of women attend antenatal clinic but deliver at home, a big proportion of babies was left out. [18]

In Burkina Faso, as part of the larger PROMISE-EBF study that aimed to promote exclusive breastfeeding, a cohort of pregnant women was recruited and followed up till 7 days post- delivery. These women were recruited in a rural community and visited by trained community recruiters up to the seventh day post-delivery. Their delivery outcomes were documented regardless of outcome or place of delivery. It was shown that babies born of primi-parous women, young mothers and those born in the dry season (associated with malaria) were more likely to die. Twins, boys and premature babies also stood a higher risk. Place of birth and distance for the health facility were not found to carry an extra risk. The study captured mortality in the community setting and hence reported a much higher mortality than that documented by community surveys and central statistics. A limitation in this study however was a cultural practice where mothers were reluctant to disclose and discuss their dead babies. [19]

A retrospective study in Nepal utilized medical records on all pregnancy outcomes and found 30% of early neonatal deaths to have been due to respiratory distress syndrome, 20% neonatal sepsis 16% congenital anomalies and 13% to birth asphyxia. [20] In sharp contrast, a population based cohort study done in southern Nepal found the leading cause to be birth asphyxia. [21]

Most early neonatal deaths, it appears, occur in the community. Early success in averting neonatal deaths is possible in settings with high mortality and weak health systems through outreach and family-community care, including health education to improve home-care practices, to create demand for skilled care, and to improve care seeking. Simultaneous expansion of clinical care for babies and mothers is essential to achieve the reduction in neonatal deaths needed to meet the Millennium Development Goal for child survival. [22]

Table 1: Comparative studies on perinatal mortality

Author	Sample size	Study design	Indicators	Key findings
Metaferia A M, et al Malawi 2004-2005 [18]	10,700	Prospective observational (pregnant women)	Mortality Assoc. with Birth weight, gestation age, sex	3.4% stillbirths 4.4% ENND Mortality higher for males, 20-37wks, previous history. No follow up post discharge.
Abdoulaye D. et al PROMISE-EBF 2006-2007 [19]	900	Prospective cohort Pregnant women	Prevalence, Factors associated with perinatal mortality	Maternal: age extremes, parity, season, Infant: birth weight, age, sex, PNMR 78.7/1000 68% stillbirths
Shrestha S, et al Nepal,2010[20]	816	retrospective	Outcomes of pregnancy	Mortality 25% RDS,LBW, breech, asphyxia

2.2JUSTIFICATION

Early neonatal deaths constitute approximately 75% of neonatal deaths, and for every early neonatal death there is at least one stillbirth; these deaths can be prevented by the same interventions. It has been shown that one third of stillbirths take place during delivery – deaths that are largely avoidable and closely linked to the place of and care provided at delivery. If under-five mortality is to be reduced, neonatal mortality, early neonatal mortality and stillbirths must be accorded increasing prominence.

To improve survival rates and to monitor the effects of public health interventions in this vulnerable group, accurate, up-to date estimates of perinatal mortality rates are essential. Kenya, like many other developing countries, lacks a comprehensive vital registration systems and child mortality has to be estimated using data collected in household surveys such as the Demographic and Health Surveys. Even with this system in place, underreporting and inaccurate recording still remains a big problem and hence limits the utility of such data. This data also fails to look at the regional variability and it is possible that the perinatal mortality rate for Naivasha alone is very different from the national estimates

With an estimated forty per cent of women delivering with the help of a skilled health worker, little is known about the delivery outcomes of women who don't come to deliver their babies in hospital, except those who come to have their babies vaccinated following a successful outcome. This study examined all the perinatal morbidity and mortality regardless of where it occured. Most estimation of perinatal mortality fails to account for babies who are born outside health facilities, and the study aimed to find and account for this group as well.

Naivasha is a small urban area with several public health facilities and it was very useful to know if the perinatal mortality rate was any different from the country estimates, if the same risk factors for mortality applied here and if there were any other factors unique to this population. Knowing the severity of perinatal morbidity and mortality and where it is occurring will act as a measure of the quality of healthcare, since it perinatal mortality is wastage that can be largely avoided.

It was the aim of this study to collect information that would act as a baseline and help influence policy change in line with achieving MDG4.

CHAPTER THREE:

METHODOLOGY

3.1 Objectives

3.1.1 Broad objective:

Determine the perinatal morbidity and mortality among babies born to women attending Antenatal Clinic at the Naivasha District Hospital

3.1.2 Specific Objectives;

1. Determine the prevalence of perinatal mortality and early neonatal morbidity among babies born to women attending ANC at Naivasha District Hospital.
2. Determine the risk factors for perinatal mortality and early and neonatal morbidity among babies born to women attending ANC at Naivasha District Hospital. The risk factors included maternal pregnancy complications, circumstances of delivery and signs of early neonatal illness.

3.2 Study design

A prospective survey

3.3 Study area

This study was carried out in the MCH clinics, Labour ward and delivery units, and NBU and antenatal wards at the Naivasha District Hospital. Naivasha District Hospital is a level IV hospital and is the main primary as well as referral facility in Naivasha District and its environs (North Kiambu, North Narok, South Kinangop and Gilgil. Monthly data summaries from 2011 indicated that there were 10-20 vaginal deliveries per day (approx. 3 to 6 thousand/year) and 200 daily attendances to the MCNH. There were 5 to 10 admissions to the new-born unit daily. The hospital had a staff capacity of 250 and a bed capacity of 167. The catchment population was approximately 500,000. The hospital conducted an antenatal care clinic from Monday to Friday due to the large numbers of mothers. It was estimated that about forty per cent of the women attending this clinic and were booked to deliver at this hospital actually did so. The rest preferred to deliver at the nearby catholic hospital, travel to Kijabe Mission Hospital or deliver at home. However, most of them brought back their babies for immunization and monitoring together with their postnatal review.

3.4 Study period

September 2012 to February 2013

3.5 Study population

- Pregnant women attending antenatal clinic at Naivasha District Hospital.
- Babies born to the recruited pregnant women during the period of study. This included all births, whether the babies were born dead or alive.

3.6 Sampling and Recruitment of participants

3.6.1 Sample size calculation

- Fischer's formula for prevalence

$$N=d^2 (1-p)(p)/a^2$$

Where: $a^2=0.06$ precision around the mean

P=the proportion of babies dying by age 7 days plus stillborn babies (This was estimated to be 214.2/1000 from hospital records)

d=1.96 (normal deviate corresponding to 95% confidence interval)

Thus $N=1.96^2 x0.786x0.214/0.06x0.06$

$$N=180$$

The minimum no of participants was to be **180**

Adjustment for non-response and drop- out was done by addition of 10% of the sample size; hence the adjusted sample size was **200** participants.

3.6.2 Inclusion criteria

1. Confirmed pregnancy with gestation by dates and/ or by first trimester ultrasound of at least 28 weeks
2. Available on phone(either self or reliable contact who is willing to facilitate communication)
3. Signed informed consent

3.7 Recruitment procedure

All Women attending the antenatal clinic and the high risk clinic that met the inclusion criteria and gave consent were recruited into the study. Their day telephone contact details were recorded separately and they were told to expect a call from the researcher on their expected day of delivery. This was regardless of where delivery took place and that they should continue with their delivery plans as they willed. They were also encouraged to call if the delivery occurred earlier than expected. Demographic details and data regarding their risk factors were collected at this point using the mothers' recruitment questionnaire.

On the expected day of delivery, each woman was called up and an enquiry made on her status. If she had delivered, the first section of the pregnancy outcome/ baby questionnaire was completed. The second section was completed when the baby was eight days old. If the woman had not delivered at the time, she was contacted a week later, but was encouraged to call if delivery occurred earlier. Each woman was called a minimum of 3 times at different times of day and if she was not found even once then she was declared a drop- out.

Mothers who delivered away from hospital were asked on phone whether they had a live birth or a stillbirth (defined as a baby who never cried/ established breathing at the time of birth). This was the primary outcome. The morbidity checklist was used to show possible risk factors that contributed to death, for the babies who were born alive but died within seven days. Mothers who delivered in other health facilities were asked to give details of birth weight and status of the baby at birth, whether alive or dead. Information on morbidity was obtained and abstracted on to the questionnaire. The mothers of all living babies who were born at home were encouraged to visit the hospital by the end of one week of life for weighing and a final examination. It was not possible to examine the babies whose mothers were not brought to hospital by the end of the first week of life and hence it was documented that such babies were not examined.

3.8 Measured outcomes

a) The primary outcome was mortality. This will be defined by the proportion of babies who were not alive by the end of eight days post- delivery. They were categorized as
    - Still birth: defined as babies who never cried, or established spontaneous breathing at the time of birth.
    - Early neonatal death: defined as a baby who was shown born alive, but died within the first seven days of life.

b) Secondary outcomes

i. Prevalence of morbidity was be ascertained by the proportion of babies who were perceived to be unwell by the mother and had a positive response to any of the questions regarding morbidity on the baby's questionnaire. The anticipated major categories of morbidity included: neonatal infection, neonatal jaundice and complications of prematurity

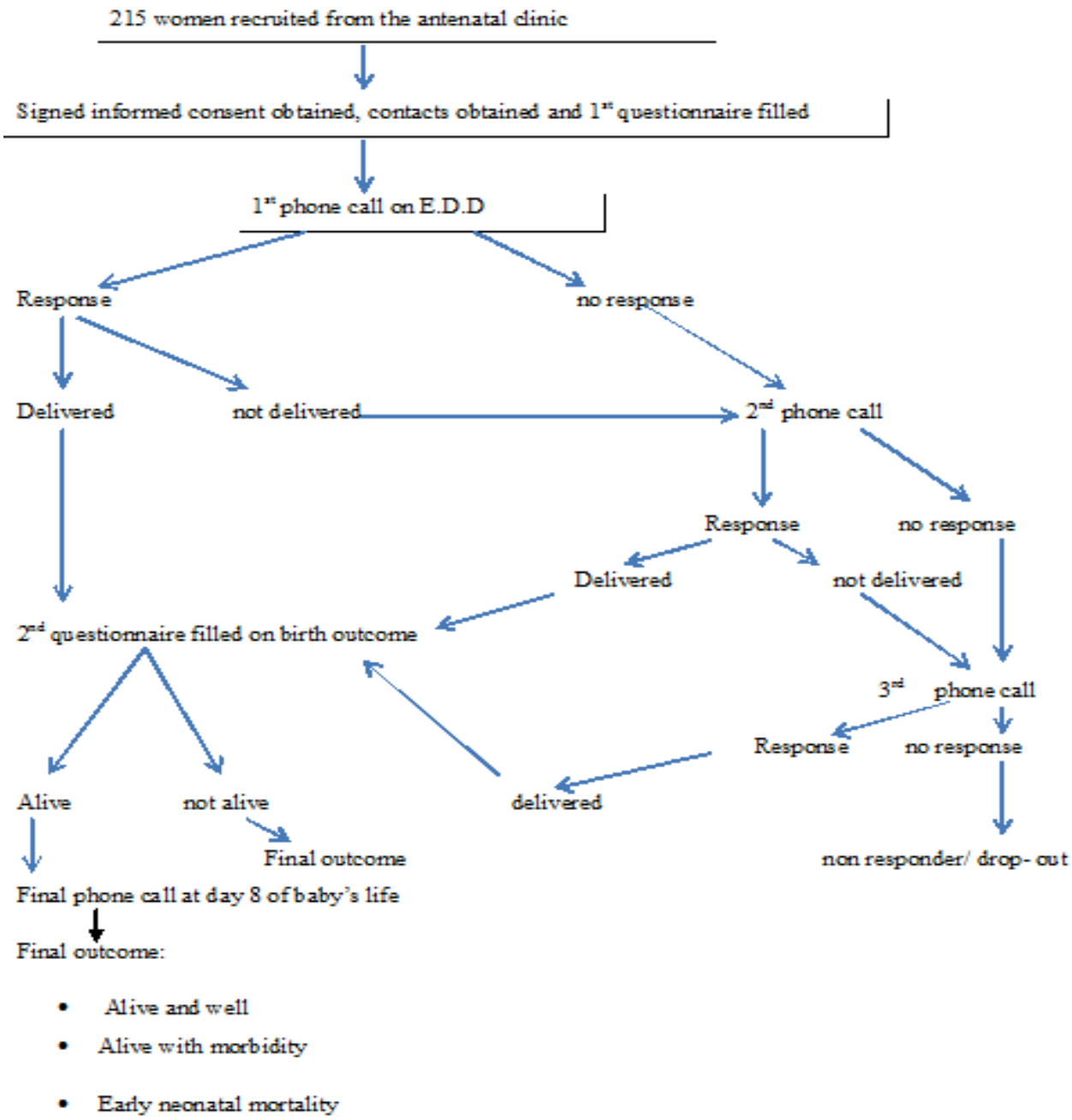
ii. Risk factors were defined by characteristics common to the babies who died as compared to those who were alive at day eight of life. Based on previous studies, these were expected to include:

a. Maternal risk factors: duration of labour, interval between rupture of membranes and actual delivery, place of delivery, who conducted the delivery, maternal occupation, previous history of adverse pregnancy outcome, intra-partum events such as haemorrhage, breech delivery and mode of delivery.

b. Neonatal risk factors: These included:

- Gross malformations at birth, as easily identified by the mother.
- Asphyxia, defined as failure to establish spontaneous breathing within 5 minutes of birth, as adapted from the WHO verbal autopsy questionnaire
- Sepsis, defined by presence of fever, septic spots and infected umbilical stump, as adapted from the WHO verbal autopsy questionnaire.
- Early breastfeeding problems, and mode of feeding
- Extremes of birth weight (low birth weight or large babies). Those born at home with no weight taken were asked to estimate the baby's size compared with a normal average sized new-born baby. It was however be stated that that baby was not weighed.
- Dehydration and diarrhoea
- Convulsions
- Jaundice
- Respiratory complications, defined by cough, fast breathing and difficulty breathing

Figure 2: Flow diagram of recruitment procedure



3.9 Tools

- Pre-tested interviewer administered mothers' questionnaire was administered to the pregnant woman at first contact at the time of recruitment.

- A baby's questionnaire was used to collect information about delivery, elicit signs of illness, and to identify possible factors leading to death. This was derived from the WHO verbal autopsy questionnaire.

3.10 Quality control

Information collected during the telephone interviews was verified during person to person interview whenever that was. This was done for the women who will be delivered at the hospital, or visited the hospital within the first one week of delivery. All filled questionnaires will be kept under lock and key to avoid data losses.

Double data entry was done to avoid data losses and incorrect entry.

DATA MANAGEMENT AND STATISTICAL ANALYSIS

The data was entered using Microsoft access database and statistical analysis done using SPSS version 17. Descriptive analysis of maternal data, peri-partum data and new-born data were conducted independently using measures of central tendency and measures of spread for continuous data and frequency distributions for categorical data. After conducting descriptive analysis home births were excluded from further analysis because of the missing information around the delivery of newborns. Chi-square tests were used to show bivariate association between categorical variables. The outcomes (morbidity and mortality) were compared against the risk factors using multiple logistic regression analyses to identify significant predictors of mortality and morbidity. A cut-off value of 0.05 was considered statistically significant in interpreting p values.

ETHICAL CONSIDERATIONS

The study was conducted after written approval by the Department of Paediatrics and Child Health, University of Nairobi, and the Kenyatta National Hospital Scientific and Ethical Review Committee.

The purpose of the Study was explained to the women or Guardians (in case of underage girls) with a view to obtaining Written Consent prior to enrolling any pregnant woman in the study. The study included only mothers who had given signed informed consent.

Strict Confidentiality was observed throughout the entire study period, held in trust by participating investigators, research staff and the study institutions. The Study Participants were given study identification numbers and no personal identification data was recorded.

There was no added cost to the patient. All those who were found to be ill were counselled and referred for appropriate care to facilities of choice.

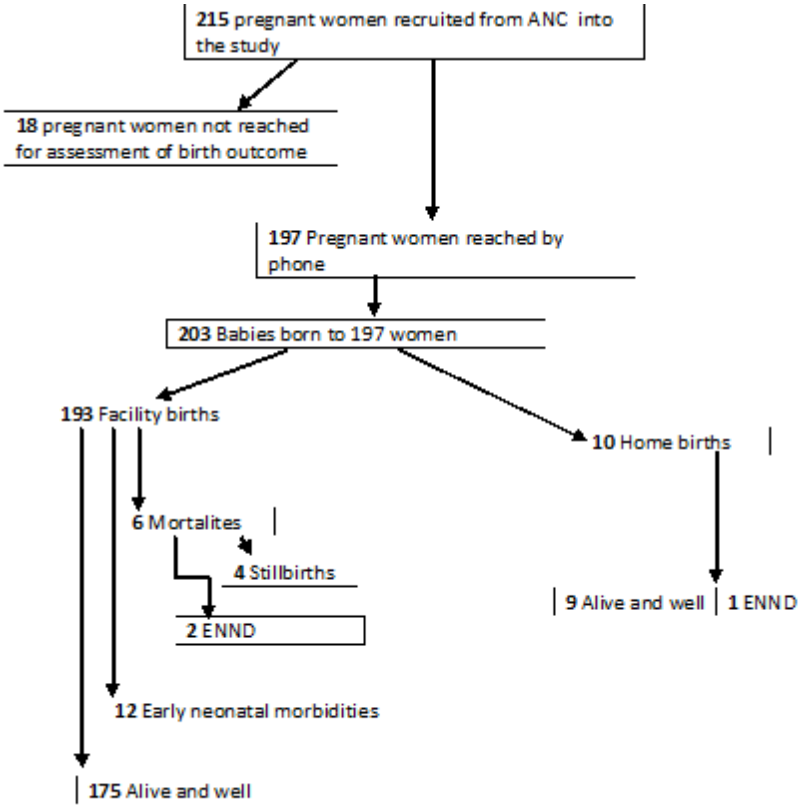
CHAPTER FOUR:

4.1 RESULTS

4.1.1 Study population

A total of 197 mothers participated in the study to its completion. 203 babies were born to these mothers. All the women were recruited by face to face interview in the ANC clinic. All follow up was done on phone using numbers provide by the women.

FIGURE 3: Study population



4.1.2 Maternal characteristics

The mean age of the 197 mothers was 25.7 years (SD 6.9). Ninety eight percent of mothers had attended formal schooling with 94 (47.7%) completing primary education and 76(38.6%) having secondary education (Table 2). Most mothers professed Christianity with 164 (83.3%) reporting that they were Protestants. Twenty four (11.8%) mothers had an obstetric ultrasound performed during ANC visits.

Table 2: Characteristics of mothers attending ANC at Naivasha DH

	Frequency (n = 197)	Per cent
Formal education		
Primary	94	47.7
Post-primary/vocational	4	2.0
Secondary/A- level	76	38.6
College (middle level)	16	8.1
University	3	1.5
Parity		
Primigravida	80	40.6
Parity 1-4	111	53.4
Para 5 and more	6	3.0
Age		
<20 years	18	9.1
20- 34 years	165	83.7
>35 years	14	7.1
Previous history of perinatal death		
Yes	12	6.0
No	185	94.0

4.1.3 Delivery information

Table 3 presents details about the delivery of the babies in Naivasha District Hospital. Most (89.2%) of the deliveries were vaginal and out of the 181 vaginal deliveries 175 were spontaneous vertex deliveries while 6 deliveries were breech deliveries. Three of the 20 caesarean sections were elective and the remaining 17 were done as emergency. Ninety four percent of births were singleton and three babies were preterm born before 37 completed weeks of gestation.

The majority of women had a hospital delivery 157 (77%) within a public health facility, 36 (17.7%) at private health facilities and only 10 (4.9%) births occurred at home. Eight out of these ten mothers who delivered at home reported that the nearest health facility was too far from their home. Costs of maternity care, family or cultural issues and closure of facilities were not reported as barriers to health facility

deliveries. Most (52.5%) mothers reported that membranes ruptured during labour and labour lasted less than 12 hours in 89.1% of mothers.

Table 3: Information on deliveries by women attending ANC at Naivasha District Hospital (N= 203 delivery outcomes)

	Frequency (%)
Mode of Delivery	
Vaginal delivery	183 (89.2%)
Caesarean section	20 (9.2%)
Presence of complications (late pregnancy/ labour)	46 (22.7%)
Number of babies at birth	
Singleton	191 (94.1%)
Multiple	12 (5.9%)
Place of delivery	
Home	10 (4.9%)
Public Hospital	157 (77.3%)
Private hospital/mission/nursing home	36 (17.7%)
Timing of Rupture of membranes	
Before labour	87 (42.9%)
During labour	106 (52.2%)
At delivery	10 (4.9%)
Duration between rupture and labour onset (n = 87)	
Less than 24 hours	73 (84.6%)
24 hours or more	14 (15.4%)
Duration of labour	
Less than 12 hours	181 (89.1%)
Twelve hours or more	22 (10.9%)

4.1.4 Delivery outcomes

A total of 203 newborn babies delivered by women attending ANC at Naivasha District Hospital by 197 mothers were included in the analysis. One hundred and ninety one of these deliveries were singleton births and the remaining 6 mothers delivered twins. The basic characteristics of the babies are summarized in the following sections.

4.1.5 Newborn characteristics

Ten births occurred at home, out of which one baby died but none was ill in the perinatal period. The home births were excluded from subsequent analysis except for prevalence, due to incomplete data. Out of the 193 facility births 102 (52.9%) babies were male. The range for gestational age was between 32 and 42 weeks and the average gestational age was 39 weeks (SD = 1.6). One hundred and eighty nine (97.9%) babies born in hospital breathed spontaneously, among them 157 (83.1%) initiated breathing immediately while 32(19.2%) required some resuscitation to start breathing (Table 4).

All facility births had a birth weight and 78.8% weighed between 2500 and 3000 grams. The mean birth weight was 2933.7 grams (SD = 471.3). As shown in table 4 two babies had congenital malformations and these malformations involved the legs only.

Table 4: Basic characteristics of babies born to mothers at Naivasha District Hospital (N= 193)

	Frequency (%) N = 193
Sex (n = 193)	
Male	102(52.9%)
Female	91(47.1%)
Baby breathed spontaneously/ cried	189(97.9%)
Initiated breathing (n = 189)	
Immediately	157(83.1%)
<2 minutes	24(12.7%)
2- 10 minutes	8(4.2%)
Required resuscitation	32(19.2%)
Birth weight (n = 193)	
1500 - 2500G	28(14.5%)
2500 - 3500g	152(78.8%)
>3500g	13(6.7%)
Presence of congenital malformations (n = 193)	1(0.5%)

This is data reported by the mother

4.1.6 Prevalence of perinatal mortality

There were a total of 7 (3.5%) perinatal deaths among babies of mothers attending Naivasha District Hospital ANC. Figure 3 shows the distribution of these perinatal deaths. The outcomes of delivery included 4 (2%) still births and 3 (1.5%) early neonatal deaths. Thus the still births accounted for 57% of the perinatal mortality. The risk of perinatal mortality among the babies born in hospital was 31/1000 (6

mortalities out of 193 births) while that of babies born at home was 100/1000 (1 mortality out of 10 births). This is a 3-fold increased risk of mortality among home deliveries however, the difference in mortality was not statistically significant; OR 3.75 CI (0.07-34.67). The risk for ENND for the babies born at home was 100/1000 compared to 31/1000 in babies born in hospital OR 10.7 CI 0.2-217.7 p= 0.1. The power was 62%, insufficient to show significance.

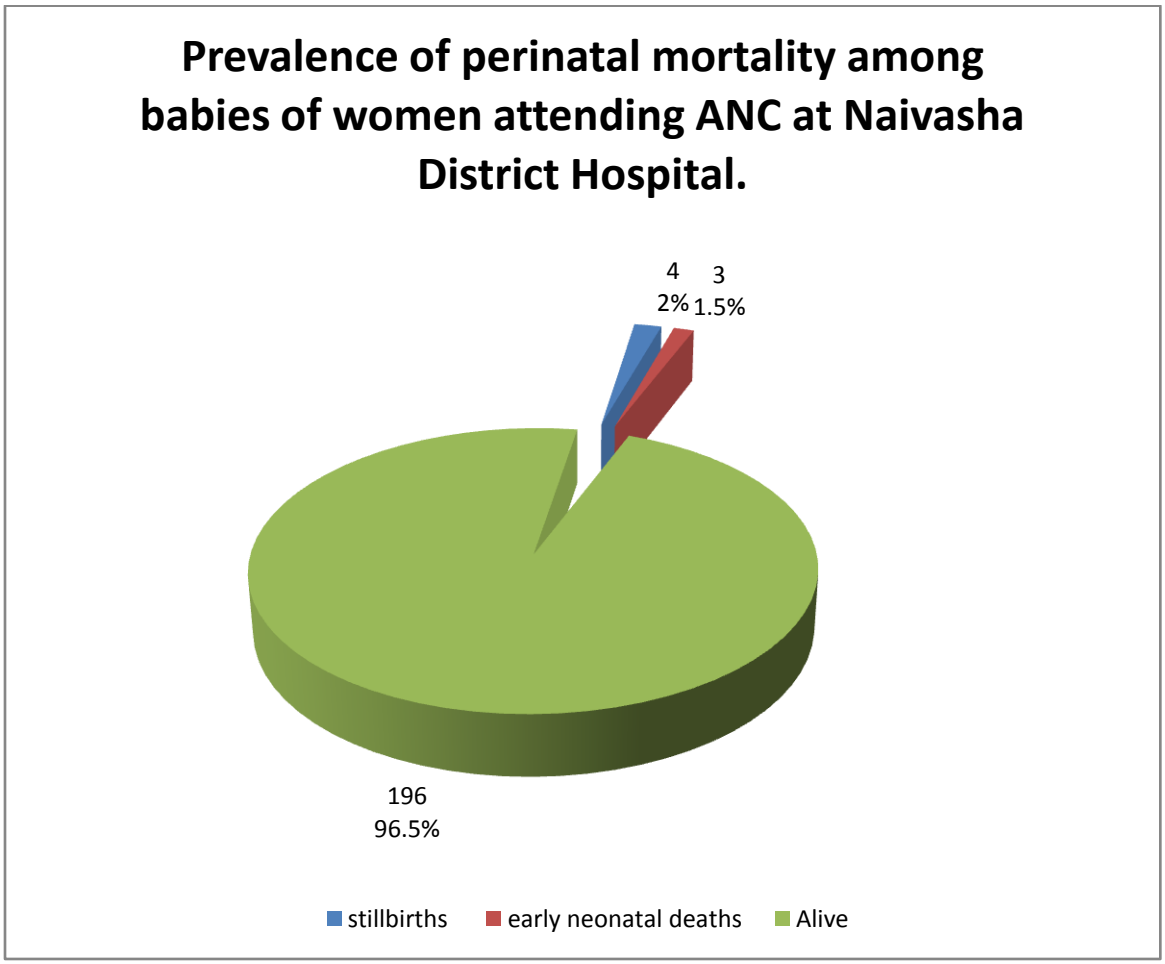


Figure 4: Prevalence of perinatal mortality among babies of mothers attending ANC at Naivasha District Hospital

Table 5: Circumstances of the perinatal mortalities at Naivasha District Hospital

Baby	Gestational age at delivery	Significant maternal illness	Events at delivery	Events until death
1	Term	Severe uncontrolled hypertension	Born term via SVD. Resuscitated for 10 minutes by bag and mask with no spontaneous breathing	Fresh stillbirth
2	33 weeks	Eclampsia convulsions	Born at 33 weeks gestation via SVD. Delivered in less than 12 hours	Fresh stillbirth
3	Term	None reported	Born at term via SVD Had prolonged second stage Breathing established after 10 minutes resuscitation	Severe respiratory distress Remained unresponsive with no cry Died after two days in nursery
4	36 weeks	Severe hypertension and haemorrhage	Born at 36 weeks gestation via emergency c- section	Fresh stillbirth
5	33 weeks	uncontrolled hypertension	Born at 33 weeks gestation	Fresh stillbirth
6	33 weeks	None reported	Born at home at 33 weeks gestation following precipitate labour less than 30 minutes Breathed after about 5 minutes of vigorous stimulation and taken to hospital	Died in hospital after one day
7	34 weeks	None reported	Born at 34 weeks gestation via spontaneous breech Ruptured Membranes more than 12 hours before labour Prolonged 2nd stage of delivery Resuscitated for more than 5 minutes before breathing	Died within 24 hours

There were 7 perinatal deaths among them 5 (71%) were born before 37 completed weeks of gestation and 4 (57%) of them had gestation age $\leq$ 34 weeks. In addition 4 (57%) of these 7 perinatal deaths were in mothers with uncontrolled pregnancy related hypertension.

4.1.7 Risk factors for neonatal mortality

Table 6 shows the associations between neonatal risk factors and perinatal mortality. The two children diagnosed in hospital with birth asphyxia died during the early neonatal period ($p < 0.001$). Prematurity ($p = 0.001$) was significantly associated with perinatal mortality. There were two cases of gross malformation which was easily recognizable by the mother. Both babies with congenital malformations were alive at the time of discharge.

Fourteen babies were reported to have been unwell during the neonatal period. Among the 14 ill babies' levels of consciousness showed a significant association with perinatal mortality with the 2 unresponsive babies dying in the early neonatal none of the ill and responsive babies died ($p = 0.011$). Clinical diagnosis of neonatal sepsis defined by clinical signs including fever, and septic spots were present in 8 out of the 14 sick infants. Sepsis diagnosis was not statistically significantly associated with early neonatal mortality ($p = 0.17$), neither was fast breathing ($p = 0.28$) nor yellowing of eyes ($p = 0.47$).

Table 6: Neonatal factors and perinatal mortality risk in babies born to mothers attending ANC at Naivasha DH (N =193 facility births; n= hospital births with perinatal morbidity)

	Delivery outcome		P value
	Alive	Died	
Birth asphyxia (n=193)			
Yes	0	3(100%)	< 0.001
No	187(98.4%)	3(1.6%)	
Prematurity (n=193)			
Yes	0	2(100%)	0.001
No	187(97.9%)	4(2.1%)	
Sepsis (n = 14)			
Yes	8(100%)	0	0.17
No	4(66.7%)	2(33.3%)	
Fast breathing (n = 14)			
Yes	1(50%)	1(50%)	0.28
No	11(91.7%)	1(8.3%)	
Yellow eyes (n = 14)			
Yes	6(100%)	0	0.47
No	6(75%)	2(25%)	
Unresponsiveness (n = 14)			
Yes	0	2(100%)	0.011
No	12(100%)	0	

4.1.8 Prevalence of perinatal morbidity

Figure 4 shows the prevalence of perinatal morbidity among children of mothers who attended ANC at Naivasha District Hospital. Twelve (7.5%) mothers reported that their babies had been ill during the perinatal period and they had sought care during the illness episode. These babies were alive at the end of the study. Two more babies who were born in hospital were reported ill and later died. The perinatal morbidity was calculated as a fraction of the total live births in this study.

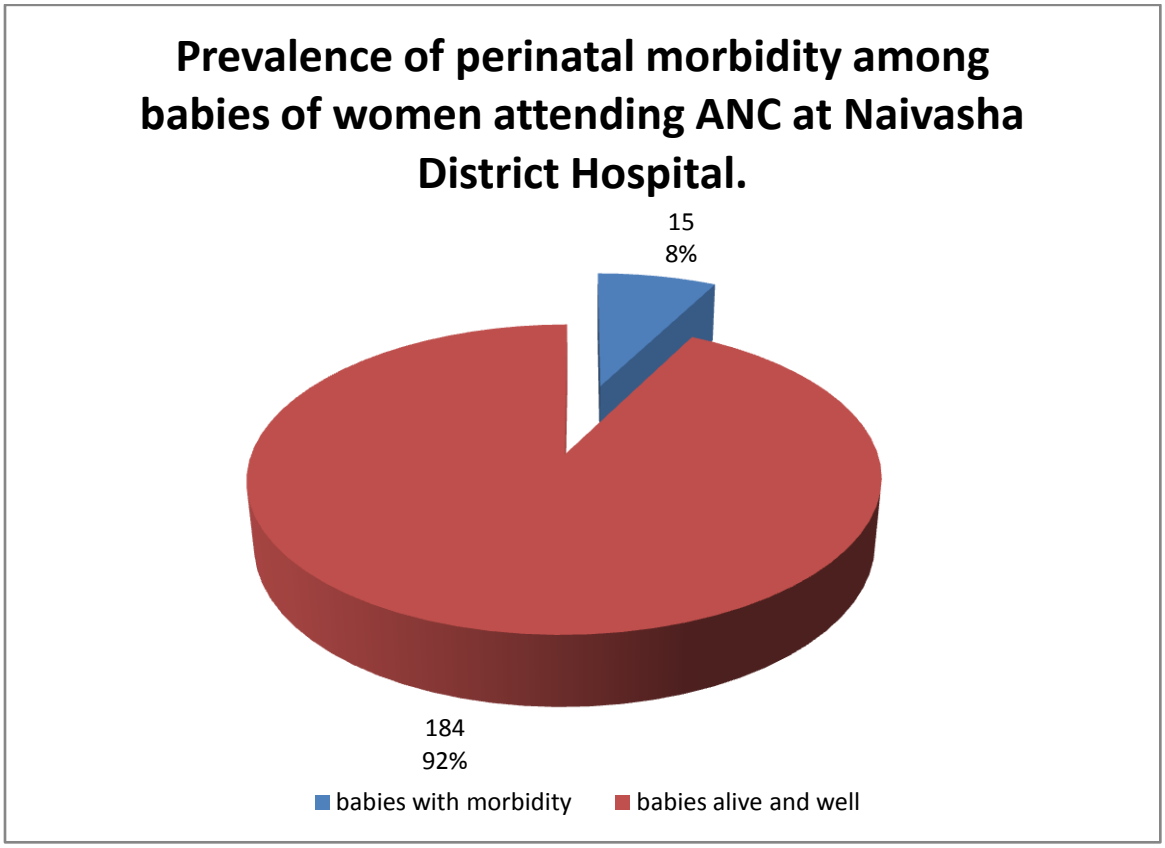


Figure 5: Prevalence of Perinatal morbidity among infants of mothers attending ANC at Naivasha District Hospital

4.1.9 Risk factors for perinatal morbidity

4.1.9.1 Neonatal factors

Table 7 shows association between neonatal factors and occurrence of perinatal morbidity. Inability to suckle ($p<0.001$) and prolonged labour ($p<0.03$) were both significantly associated with perinatal morbidity. Four (33.3%) babies born after prolonged labour were ill compared to 6(8.1%) of births for which labour lasted less than 24 hours.

4.1.9.2 Maternal factors

Babies born one day or more after rupture of membranes were more likely to present with perinatal morbidity compared to those born on the day that membranes ruptured (33.3% versus 7.9%, p = 0.03). Duration of labour was also significantly associated with perinatal morbidity with 28.6% of neonates whose mothers laboured for more than 12 hours presenting with perinatal morbidity compared to 3.7% of neonates whose mothers laboured for less than 12 hours (p = 0.001). Twenty per cent babies delivered through breech delivery presented with perinatal morbidity compared to 5.6% of SVD and 10.5% of CS deliveries who also had perinatal morbidity (p = 0.14).

Maternal age was associated with perinatal mortality OR 1.16 (95% CI 1.04-1.3), p value = 0.01, with the odds of perinatal mortality increasing by 12% for each additional year of maternal age.

None of the infants born to mothers who had had an ultrasound performed during pregnancy had perinatal morbidity. Overall, perinatal mortality risk did not differ significantly between infants born to mothers investigated with ultrasound (0%) and mother not undergoing investigation (7.0%), p = 0.37. Similarly, history of a previous birth (parity) was not associated with mortality.

Twelve mothers reported having previously lost an infant in during perinatal period. One of these mothers had lost two infants. There was a significant association between previous infant mortality and current perinatal mortality (p = 0.022).

Table 7: Comparison of babies who experienced perinatal illness to those who did not (N= 186 facility births, excluding mortalities)

	Perinatal morbidity		P value
	Yes n=12	No n=174	
Ability to suckle			
Yes	8(4.8%)	171(95.5%)	< 0.001
No	4(57.1%)	3(42.8%)	
Time in labour before delivery			
Less than one day	8(8.1%)	166(91.9%)	0.03
One day or more	4(33.3%)	8(66.7%)	
Interval between membrane rupture and delivery			
Less than one day	9(7.9%)	167(92.1%)	0.03
One day or more	3(33.3%)	7(66.7%)	
Duration of labour			
Less than 12 hours	6(3.7%)	159(96.3%)	0.001
Twelve hours or more	6(28.6%)	15(71.4%)	
Delivery mode			
Spontaneous Vertex Delivery	9(5.6%)	153(94.4%)	0.14
Breech delivery	1(20%)	4(80%)	
Caesarean section	2(10.5%)	17(89.5%)	
Previous birth			
Yes	7(5.8%)	99(94.2%)	0.95
No	5(6.3%)	75(93.7%)	
ANC ultrasound performed			
Yes	0(0%)	23(100%)	0.37
No	12(7.3%)	151(92.6%)	
Mother had a previous perinatal death			
Yes	3(27.3%)	8(72.7%)	0.022
No	9(5.1%)	166(94.8%)	

4.2 DISCUSSION

Perinatal mortality in this study was 3.5%. This was comparable to a prospective community based study done in Sudan which showed 5.2% mortality.[23] A hospital based study done in Blantyre Malawi as part of the PROMISE- EBF had a perinatal mortality of 7.9 %[18]. The Malawi study recruited women from 20 weeks gestation and as a result had a higher prematurity rate, and hence the higher mortality may be explained by complications of prematurity. The PROMISE EBF study also had a community based study in northern Uganda[24] where follow up of pregnant women from gestation 7 months and above demonstrated a perinatal mortality of with 19 per 1000 stillbirth rate and 22 per 1000 live births early neonatal mortality risk. These figures suggest that the babies at home are much less likely to be ill and therefore are at a lower risk of dying.

The stillbirth rate in this study was higher than the early neonatal mortality, 2% and 1.5% respectively. This was slightly lower than the country estimates by WHO.[25] None the less, it would have been very useful if data from community surveys was available for comparison. It suggests that the perinatal mortality is a gross underestimation if it does not accurately capture these deaths.

The morbidity rate in this study was 7.5%. Its assessment was based on mothers' subjective recognition and therefore was prone to gross underreporting. Causality could not be assessed given that no diagnostic assessment was done. Babies born after prolonged rupture of membranes had the highest occurrence of septic spots and fever (indicative of sepsis). The proportion of babies with possible sepsis was much lower possibly because most sepsis occurred after one week of life, which was beyond the scope of this study.

Asphyxia and prematurity were the strongest risk factors for mortality. The diagnosis of asphyxia was assigned by the clinician and was defined by low apgar scores at five minutes and clinical signs. This study did not define criteria for diagnosis of asphyxia. Most of the babies who had signs indicative of asphyxia (unconsciousness and inability to breastfeed) died, probably because only severe asphyxia was accurately recognized by the mothers. It was impossible to attribute these deaths purely to asphyxia. These findings compare closely with an a retrospective study done at Muhimbili hospital where asphyxia and prematurity accounted for the biggest proportion of early neonatal death (37% and 29% respectively), while neonatal sepsis accounted for 16% and respiratory distress syndrome only 6.4% of the deaths. [15]In MTRH, the leading neonatal complications were asphyxia and prematurity resulting in 17% and 13% of all neonatal deaths, respectively. These factors often occur in combinations and cannot be considered individually.

Most mortality (70%) occurred within the first 24 hours of birth, with the remaining deaths occurring before three days of life. This is in keeping with the global estimates on perinatal mortality where 75% of neonatal deaths occur before seven days of life with the highest risk of death being within the first 24 hours. [9]Strategies to reduce mortality in this category of patients should therefore aim at early and accurate recognition of signs of illness as well as prompt institution of appropriate care.

Inability to breastfeed and unresponsiveness were found to be strong predictors of mortality. These were reported by mothers and these findings could not be separated from asphyxia, prematurity or severe neonatal sepsis. However, these were signs that were easily recognizable by the mother and can be a very useful danger signs if taught to mothers.

The mothers' age in this study ranged from 16 years to 40 years with an average maternal age of 25.4 (SD 5.3). Most mothers were younger than 25 years and 65(36%) were primigravidae. Very few were teenage mothers, which would probably explain the significant association between maternal age and mortality with increasing risk of mortality as the mother's age increased. In the Sudan study babies born to teenagers and women aged greater than 34 years were associated with a two -fold risk of early neonatal death. In a retrospective study done at MTRH Kenya, 51% of early neonatal mortality was found to occur in babies whose mothers were 15-24 years of age.[26]

The level of literacy was very high with over 95% of mothers having completed at least primary education. The illiterate population was not significant to make a comparison of risk. In Sudan, illiteracy was associated with increased neonatal death. The high rate of literacy in this study population was also associated with high ownership and utilization of mobile telephones, increased consultation with the researcher on danger signs and choice of place of delivery.

In this population, hospital delivery stood at 95%, up from the estimated national average of 44% (KDHS).All deliveries in the health facility were conducted by a skilled health worker. Hospital delivery, by a skilled health care worker is the single most effective way of reducing perinatal and early neonatal morbidity and mortality. 77% of those who attended ANC at the NDH went back there to deliver, 18% delivered in other health facilities while only 5% delivered at home. Without tracing it may be assumed that only 77%delivered in a health facility. In this study however, there was no significant association between the mortality or morbidity and place of delivery. All women who delivered at home had planned to deliver in a health facility and cited lack of transport and insecurity as reasons for not making it to hospital. All babies born at home were taken to hospital and weighed within one week of life and this probably reduced their risk of mortality.

There was no association between the place of delivery and the outcome which is indicative of good facility utilization, and is way above the estimated national average of 44% according to KDHS. This is attributable to the fact that the studied population was women who stayed within a short distance from the hospital and could therefore easily attend the antenatal care clinic. It was therefore very easy for them to choose and come to deliver at the hospital.

Owing to the fact that many of the flower farms provided maternity services to their employees, only very few of the participants had worked in flower farms in the preceding one year and so no sub-analysis was done for this subset that might have additional risk factors.

Mothers who had a previous history of perinatal mortality were more likely to have mortality. This has been demonstrated in other studies,[23'27] and is attributable to maternal risk factors that are likely to recur.

Low ultrasound screening (12.9%) was noted in this study. Ultrasound screening and detection of intrauterine growth restriction has been shown to allow for early intervention and therefore significantly reduce stillbirth rates and to some degree, intra-partum deaths due to foetal status.[28] However, in this study, perinatal mortality risk did not differ significantly between infants born to mothers investigated with ultrasound (5%) and mother not undergoing investigation (5.4%), p = 1.00. It is possible that the proportion of women screened by ultrasound was too small to make a significant comparison.

None of the babies born twins in this study died. All the twins in the study had a birth weight above 1500g therefore no comparison could be made with low birth weight twins. In the Sudan study, twins weighing 1500g and above had a higher risk of dying compared to those with birth weight less than 1500g when one on one comparison was made with singleton babies of equivalent birth weight. The Malawi study had also demonstrated an increased risk of mortality in twin births. The number of twins in this study was too small to make a comparison with the singleton births.

Prolonged rupture of membranes was associated with significant risk of morbidity in the neonate, with the commonest presentation being septic spots with fever. In the MTRH study, prolonged rupture of membranes was found to be the leading maternal complication resulting in early neonatal death.

All the mortalities in this study occurred in hospital. One of the babies who died was born at home but taken to hospital because of difficulty in breathing which was attributed to asphyxia. This indicates that the mother was able to recognize danger signs and therefore seek health care.

4.3 CONCLUSION

Perinatal mortality rate was 3.5%, which was comparable to that from earlier studies in Uganda, Sudan and Malawi.

Stillbirths accounted for a bigger portion of perinatal death, 2.5% versus 1% early neonatal mortality.

Majority of women who attended antenatal clinic at Naivasha District hospital delivered in a health facility. Those who did not deliver in a health facility did so out of need rather than by choice.

Mortality occurred in hospital, even for those who were born at home, indicating commendable health seeking habits. However those who were brought ill died shortly after and it is likely that they were severely ill at the time of admission.

Babies who were born of mothers after prolonged labour and prolonged rupture of membranes were at a higher risk of illness within the first one week of life. Mothers who had hypertension in pregnancy or labour were at high risk of delivering stillbirths. Babies who were premature, who suffered asphyxia, those who were unresponsive and unable to breastfeed were at high risk of dying.

4.4 RECOMMENDATIONS

Active surveillance of maternal hypertension as well as prompt treatment should be undertaken to reduce its impact on stillbirths.

Women should be educated during pregnancy on the danger signs of early neonatal illness to ensure prompt health seeking. Most of the babies who were perceived as ill by the mothers died because they were already severely ill at presentation to a health facility.

Early intervention and delivery for women in prolonged rupture of membranes and prolonged labour is recommended since it carried a high risk for morbidity and mortality. Majority of the babies who needed help breathing and who were unresponsive and unable to feed were born to mothers who had laboured for more than twelve hours.

Maternal education on early neonatal feeding and recognition of illness should be undertaken. Many mothers used the researcher's number as a helpline to consult on feeding problems, how to detect illness in their neonates and where to get help. It was observed that a knowledge gap existed between the time of

discharge post-delivery and the six week immunization visit. Establishing a helpline for this purpose would also be helpful.

A larger study should be carried out to evaluate further the risk of mortality in babies born at home.

4.5 LIMITATIONS

Contacts for antenatal care attendees were not recorded and a comprehensive list of all was not available. Sampling was therefore not possible and the women were recruited as they came.

Some women gave wrong telephone numbers leading to collapse in communication before the final outcome and therefore had to be considered as drop outs.

Fluctuating network connection in certain areas meant calling hours had to be adjusted and the call attempts had to be made many more times. This lead to a delay in the data collection and in a few cases the final outcome was not recorded until three weeks of age.

Due to the short duration of the study and limited funding, it was not possible to visit the mothers whose babies had been ill or died for a person to person interview. Therefore the information was extracted using the verbal questionnaire modified from the WHO verbal autopsy questionnaire. The information was therefore entirely based on the mother's perception of illness.

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APPENDIX 1: CONSENT FORM

A). CONSENT EXPLANATION

Dear parent/ guardian;

My name is Dr. Christine Manyasi, a Master's student at the University of Nairobi, School of Medicine. I am conducting a research study to find out the about illness and deaths of babies born to women attending the Naivasha District Hospital antenatal care clinic, as part fulfilment for the degree of M.med paediatrics. The results of this study will be used to improve services offered to pregnant women as well as their newborn babies in order to improve their survival. Study data will be coded so that it will not be linked to your name. All information obtained in the course of this study will be held in confidence. There are no direct benefits to you as an individual participant. I would like to include you and your baby as a participant. This is voluntary and your decision on whether to participate or not will not prejudice your baby's care in any way. There are no risks involved except the time you will take in answering the questions. It will take about 20 minutes of your time plus I will need to talk to you again on phone every two weeks until your baby is a week old.

For any questions/ clarification, contact the principle investigator on:

P.O. BOX 26447-00100, Nairobi, Kenya

Telephone number: 0722384594

E-mail address: nmanyasi@yahoo.com

You can also contact KNH/UON-ERC on:

P.O.BOX 19676 00202, Nairobi, Kenya.
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke

B). CONSENT FORM

I Miss/Mrs..... being a person aged 18 years and over, having read/ been explained to the above and in the knowledge that it is voluntary, do hereby give consent for myself/ my baby to participate in this study.

I understand that I/ my baby have the right to withdraw from the research at any time, for any reason, without penalty or harm.

.....

Patient/ Parent/ Guardian's signature

Date: .....

.....

Investigator's signature

Date: .....

APPENDIX 2: **PERINATAL MORBIDITY AND MORTALITY IN BABIES BORN TO WOMEN ATTENDING ANC AT NAIVASHA DISTRICT HOSPITAL**

MOTHERS' QUESTIONNAIRE

Identification number:

Questionnaire number:

Contact point:

No.	Question	Coding category	skip
1.	How old were you at your last birthday?	Age in completed years …….	
2.	Have you ever attended school	Yes……1 No …….. 2	
3.	What is the highest level of school you attended (years of completed education)	Primary……. 1 post-primary/vocational ……. 2 secondary/'a' level ……3 College (middle level)……. 4 University …….5	
4.	Have you worked on a flower farm in the last one year?	Yes……..1 No……2	If no, go to Q.6
5.	What was your work at the flower farm?	Tending to flowers …….. 1 Clerical work……2 Other work not involving flowers….. 3	
6.	What is your religion	roman catholic…… 1 Protestant/other Christian……. 2 Muslim……..3 No religion……... 4 other…….(specify)	
6.	When was the first day of your last menstrual period?	Date/ month/ year -----/----------/-------	
7.	Based on the above calculation when is your expected date of delivery?	Date/ month/ year ---------/--------/----------	
8.	Have you had an ultrasound to confirm the age of your pregnancy?	Yes…… 1 No……. 2	If no,skip to 10.
9.	Based on the result of that		

	ultrasound, when is your expected date of delivery?	Expected date of delivery(date/ month/year) ----------/--------/----------	
10.	Have you ever given birth	Yes……..1 No ……..2	→

11. I would like to record all your births, whether alive or not, starting with the first.(record twins triplets etc. in separate rows)

Pregnancy order	Were any of these births twins? 1= singleton 2= twin/ multiple	Gender 1= boy 2= girl	Outcome 1= alive 2= stillborn	Current status? 1= alive 2=dead	IF DEAD How old was he/ she at death? Completed days/or months or years	comments
i.						
ii.						
iii.						
iv.						
v.						
vi.						
vii.						
viii.						

APPENDIX 3: PERINATAL MORBIDITY AND MORTALITY IN BABIES BORN TO WOMEN ATTENDING ANC AT NAIVASHA DISTRICT HOSPITAL

BABY'S QUESTIONNAIRE

Questionnaire number----------

Section 1: Background information

1.1 Identification number of mother_____

1.2 Mode of interview 1. On phone 2. Face to face

Section 2: Information about the delivery

2.1 Date of birth of child: ___/___/___ (dd/ mm/ yy)

2.2 Expected date of birth ___/___/___(dd/mm/yy)

2.3 Gestation at birth---------- weeks

2.4 Where did you give birth to your baby?

1. Home
2. Public hospital
3. Public health Centre
4. Public dispensary
5. Other public facility…..(specify)
6. Private hospital/ mission / nursing home
7. Private clinic
8. Other private facility (specify)…….

2.4.2 *(If yes in 2.4.1*) Why didn't you deliver in a health facility?

Tick all relevant answers.

1. Cost too much
2. Facility not open
3. Too far/ no transportation
4. Don't trust facility
5. No female provider at the facility
6. Husband/ family didn't allow
7. Not necessary
8. Not customary
9. Other (specify)…….

2.5 Who assisted the delivery?

1. Doctor/ clinical officer
2. Nurse/ midwife
3. Traditional birth attendant
4. Community health worker
5. Relative/ friend
6. No one

2.6. What was the mode of delivery?

1. Spontaneous vertex delivery
2. Spontaneous breech delivery
3. Emergency Caeserian section
4. Elective/ planned Caeserian section

2.7 Was the late part of the pregnancy, labour or delivery complicated (did you experience any health problems that were not part of the normal process)?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.3)*

2.7.1. *(If yes ask):* What complications occurred during late pregnancy, labour or delivery? (Record all responses)

1. Mother had convulsions
2. Child delivered feet first
3. Excessive bleeding
4. Emergency Caesarean section
5. Multiple delivery
6. Other (specify) _____

2.7.2 Was there anything else?

2.8 Did the waters break before labour or during labour?

1. Before 2. During 3.Waters never broke 4. Don't know

(If waters did not break before, go to question 4.5)

2.8.1 (*If waters broke before labour ask*): How much time before labour did the waters break?

1. Less than one day
2. One day or more

2.9. How much time did the labour and delivery take?

(*Note: labour begins when contractions are no more than 10 minutes apart.*)

1. Less than 12 hours
2. Twelve hours or more

2.10. Was the child a singleton or multiple birth? ((*If two or more children are born at the same time, it is counted as a multiple birth, even if one or more of the babies are born dead*).

1. Singleton
2. multiple

Section 3: Condition of the baby post delivery

3.1 Was the baby able to breathe after birth?

(Note: *This does not include gasps or very brief efforts to breathe*)

1. Yes 2. No 3. Don't know

3.1.1How soon after birth was the baby able to breathe on his/ her own?

1. Immediately
2. In less than 2 minutes
3. More 2 but less than 10 minutes
4. More than10 minutes (specify how long)----------

3.1.2Was any help needed before the baby could start breathing?

1. Yes
2. No

3.1.3What intervention was done before the baby started breathing?

1. Cleaning and wrapping
2. Vigorous stimulation such as slapping,
3. An adult had to breathe for the baby (mouth to mouth, or bag and mask)
4. Any other (specify)

3.2 Was the baby able to cry after birth?

1. Yes 2. No 3. Don't know

3.3 Was the baby able to suckle (or bottle feed) in a normal way after birth?

1. Yes 2. No 3. Don't know

3.4 What was the sex of the baby?

1. Male 2. Female

3.5 Was the baby weighed at birth?

1. Yes
2. No (see Q. 3.5.2)

3.5.1. If yes how much did he/she weigh (grams?)

1. Less than 1500g
2. 1500- 2500g
3. 2500g – 3500g
4. > 3500g
5. don't know

3.5.2 If not weighed at the time of birth, was the baby:

1. Very small?
2. Smaller than usual?
3. About average?
4. Larger than usual?

3.6 Were there any bruises or marks of injury on the baby's body at birth?

1. Yes 2. No 3. Don't know

3.7 Was there any part of the baby's body that was not well formed at birth?)

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.8)*

3.7.1 *(If yes ask):* What part(s) was/ were not well formed?

1. Head 3. Arms/hands
2. Body 4. Legs/feet

3.7.2 Were there any other parts that were not well formed? ……..

3.8 What was the baby fed on from birth?

1. Breast milk 2. Formula 3. Cow milk 4. other (specify)_____

3.9 Is your baby alive and well?

1. Yes 2. No

Section 4:

A. Follow up at day 7

4.1 Has your baby been well since birth?

1.Yes 2. No *(if no, proceed to morbidity/ mortality section)*

B. Morbidity (Open history question)

4.2. Could you tell me about the child's illness?

Prompt: Was there anything else?

_____

_____

_____

_____

_____

4.3 Was care sought outside the home while he/she had this illness?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to section 3.4*)

4.3.1 (*If yes ask:*) Where or from whom did you seek care? *(Record all responses)*

1. Traditional healer . . . . . .
2. Religious leader . . . . . .
3. Government hospital . . . . . .
4. Governmental health center or clinic . . . . . .
5. Community-based practitioner associated with health system including (TBA's)
6. Private physician . . . . . .
7. Pharmacy, drug seller, store, market . . . . . .
8. Other provider . . . . . .
9. Relative, friend (outside household) . . . . . .

C: Morbidity

4.4 Did the baby stop being able to suckle in a normal way?

1. Yes 2.No 3. Don't know

(*If "No" or "Don't know", go to question 4.12*)

4.4.1 *(If yes ask):* How long did the baby stop suckling?

1. Less than one day
2. One day or more
3. Don't know

4.5 Did the baby stop being able to cry?

1. Yes 2.No 3. Don't know

(*If "No" or "Don't know", go to question 4.14*)

4.5.1 *(If yes ask):* How long did the baby stop crying?

1. Less than one day
2. One day or more

4.6 During the illness did the baby have spasms or convulsions?

1. Yes 2. No 3. Don't know

4.7 During the illness, did he/she become unresponsive/ unconscious?

1. Yes 2. No 3. Don't know

4.8 During the illness, did he/she have a bulging fontanelle?

1. Yes 2. No 3. Don't know

4.9 During the illness, did he/she have yellow eyes?

1. Yes 2. No 3. Don't know

4.10 During the illness, did he/she have redness or drainage from the umbilical cord stump?

1. Yes 2. No 3. Don't know

4.11 During the illness, did he/she have areas of skin that were red and hot?

1. Yes 2. No 3. Don't know

4.12 During the illness, did he/she have a skin rash with bumps containing pus?

1. Yes 2. No 3. Don't know

4.13 During the illness, did he/she have a fever (was the baby hot to touch)?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.22*)

4.13.1 *(If fever, ask):* How many days did the fever last? __ __ days

4.14 During the illness, did he/she have frequent loose or liquid stools?

1. Yes 2. No 3. Don't know

(If *"No" or "Don't know", go to question 4.23*)

4.14.1 For how many days did he/she have loose or liquid stools? __ __ days

4.14.2 Do you feel that this represented more loose or liquid stools than usual for that child?

1. Yes 2. No 3. Don't know

4.14.3 Was there visible blood in the loose or liquid stools?

1. Yes 2. No 3. Don't know

4.14.4 During the time with loose or liquid stools did the baby receive any of the following?

a) A fluid made from powder in a sachet called ORS?

1. Yes 2.No 3.Don't know

b) Homemade sugar and salt solution?

1. Yes 2.No 3.Don't know

c) Another home-made liquid e.g porridge, milk, juice, etc?

1. Yes 2. No 3. Don't know

4.15 During the illness, did he/she have a cough?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.24*)

4.15.1 *(If yes ask):* For how many days did the cough last? . . . . . __ __days

4.16 During the illness, did he/she have difficulty breathing?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.25*)

4.16.1 *(If yes ask):* For how many days did the difficulty breathing last? __ __ days

4.17 During the illness, did the child have fast breathing?

1. Yes 2. No 3. Don't know

(*If "No" or "Don't know", go to question 4.26)*

4.17.1 *(If yes ask):* For how many days did the fast breathing last? __ __ days

4.18 During the illness, did the baby ever stop breathing for a long time, and start again?

1. Yes 2. No 3. Don't know

4.19 During the illness did he/she have noisy breathing?

1. Yes 2. No 3. Don't know

4.20 During the illness that led to death, did his/her nostrils flare with breathing?

1. Yes 2. No 3. Don't know

Section 5: Mortality

5.1 What was the date of the baby's death? ___/___/___(dd/mm/yy)

5.2 How old was the baby when he/she died? ---- Days

5.3 Where did the baby die? (*Tick relevant box*)

1. Hospital
2. Other health facility
3. On route to hospital or health facility
4. Home
5. Other (specify) _____

5.4 What was the length of time the child was ill before he/she died? __ __days

Drop box: what was the possible cause of death? Tick all applicable

1. **birth asphyxia**
2. **prematurity**
3. **neonatal sepsis**
4. **congenital malformations**

END OF INTERVIEW

THANK RESPONDENT(S) FOR THEIR COOPERATION

APPENDIX 4: BUDGET

ITEM NO.	BUDGET ITEM	UNIT COST(Kshs.)	QUANTITY	TOTAL COST
1.	**Proposal development**			
	Notebooks	100	10	1,000.00
	Pens	15	30	450.00
	Printing questionnaires and consent documents	10	50 pages	500.00
	Photocopying questionnaires and consent documents	3	25 pages by 200	15,000.00
	IEBC clearance	1000	1	1,000.00
	Sub-total			**17,950.00**
2.	**Data collection and analysis**			
	Transport (investigator)	1000	2 trips	2,000.00
	Accommodation	800	30 days	24,000.00
	Telephone follow up cost	5/= a minute , 10 minutes, twice	200 women	20,000.00
	Research assistant	500/ day	60 days	30,000.00
	Statistician fee	10,000	1	10,000.00
	Subsistence	2000	30	60,000.00
	Sub-total			**146,000.00**
3.	**Research dissemination**			
	Posters – faculty Hospital feedback	3000 3000	3 1	6,000.00 3,000.00
4.	**Final report writing** Printing Photocopying Binding	 10 3 500	 100 500 6	 1,000.00 1,500.00 3,000.00
	Sub-total			**14,500.00**
	GRAND TOTAL			**178,450.00**