PERCEIVED DETERMINANTS OF POOR OUTCOME OF NEONATAL SEPSIS AT PEADIATRIC UNIT OF KENYATTA NATIONAL HOSPITAL

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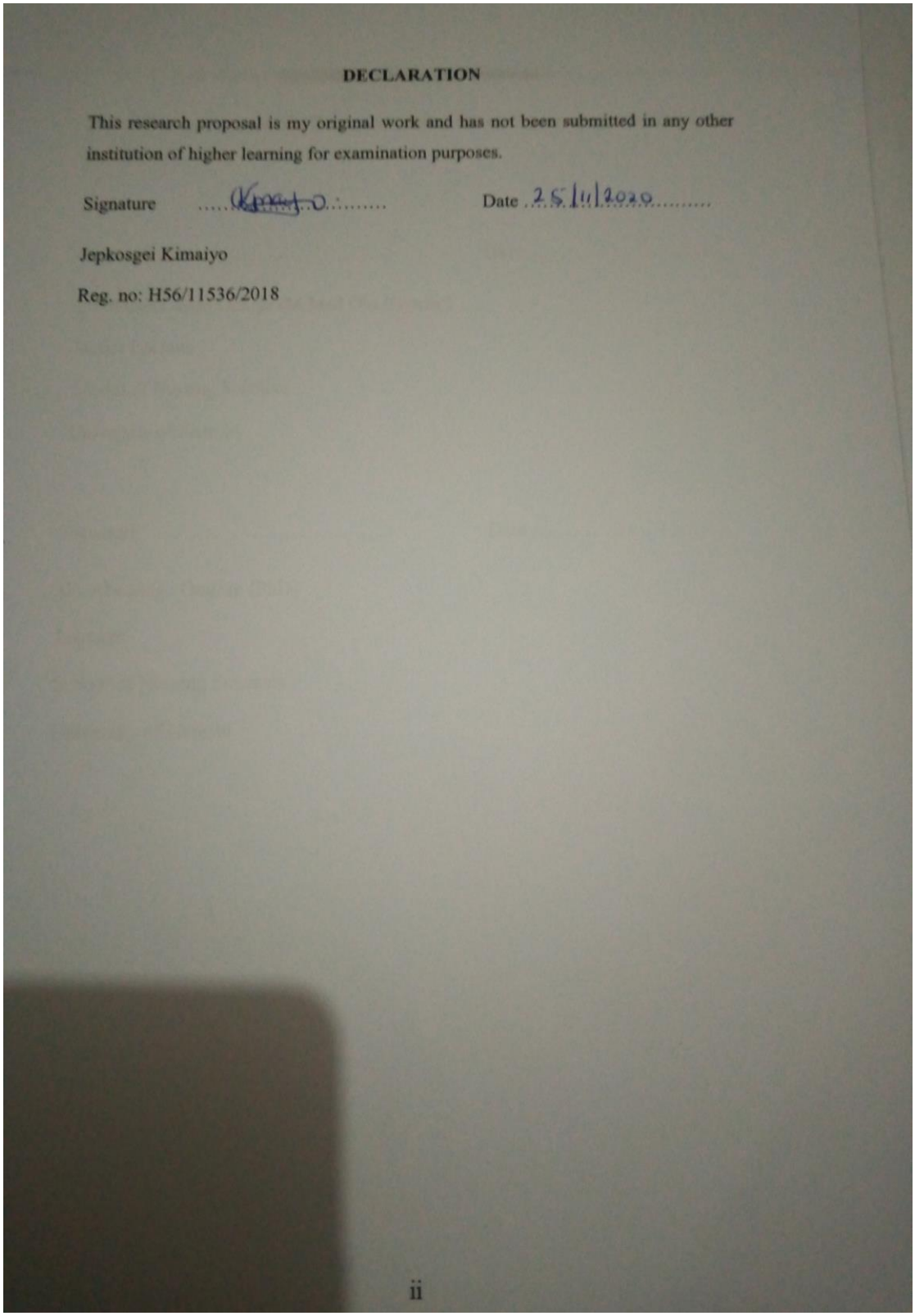
DECLARATION



DECLARATION

This research proposal is my original work and has not been submitted in any other institution of higher learning for examination purposes.

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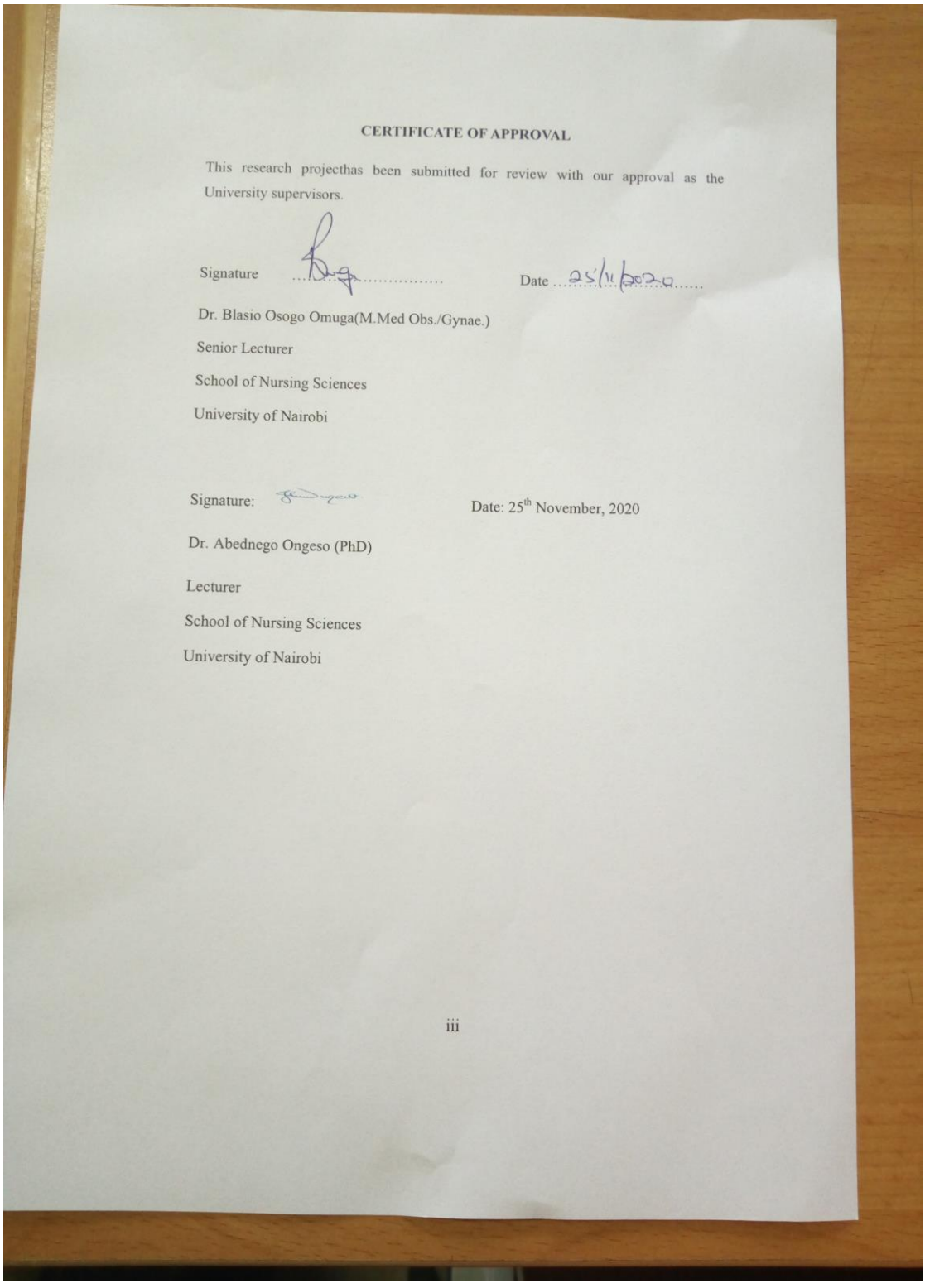
CERTIFICATE OF APPROVAL



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DEDICATION

This research study is dedicated to the paediatric nurses at Kenyatta National Hospital for their daily efforts and sacrifices in providing quality care to children admitted in the hospital I also dedicate this study to my loving husband Charles Mutai and my children for their continued love and support.

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ABBREVIATIONS

ANC	Antenatal Care Clinic
AOR	Adjusted Odds Ratio
BSI	Blood Stream Infection
CI	Confidence Interval
CoNS	Coagulase-negative Staphylococcus
CRP	C-Reactive Protein
EONS	Early-Onset Neonatal Sepsis
GBS	Group B Streptococcus
GSA	Global Sepsis Alliance
IPC	Infection Prevention and Control
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
LONS	Late-Onset Neonatal Sepsis
NICU	Neonatal Intensive Care Unit
NS	Neonatal Sepsis
OR	Odds Ratio
PROM	Premature Rupture of Membranes
SDGs	Sustainable Development Goals

SGA	Small for Gestational Age
SPSS	Statistical Package for Social Science
US	United States
UTI	Urinary Tract Infections
VLBW	Very Low Birth Weight
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Maternal age Refers to the age in years of the mothers whose neonates were admitted at KNH with neonatal sepsis

Birth order Is the neonate's rank by age among siblings in his/her family

Birth interval Refers to how soon after a prior pregnancy a woman becomes pregnant or gives birth again.

Education level Refers to the years of formal instruction received and successfully completed

Occupation Refers to what one does for livelihood

Income level Refers to one's or a household's total earnings over a defined time period

Place of residence Refers to where a person lives, in this case, whether in rural or urban area

Gestational age Refers to the age of the pregnancy from the last normal menstrual period

Birth weight is the weight of a baby at its birth

Neonates sex Refers to the gender of the neonate, whether male or female

Birth asphyxia Refers to the health condition that occurs when a baby does not receive enough oxygen before, during or just after birth.

Meconium aspiration syndrome Is respiratory distress in a newborn baby caused by the presence of meconium in the tracheobronchial airways

Antenatal care Refers to the care provided by skilled health-care professionals to pregnant women and adolescent girls in order to ensure the

	best health conditions for both mother and baby during pregnancy
Quality of care	Refers to the extent to which health care services provided to individuals and patient populations improve desired health outcomes.

ABSTRACT

Introduction: Neonatal sepsis is the most common reason for neonatal admissions in developing countries. It is also a major cause of neonatal mortality in both developed and developing countries. Although neonatal sepsis infection rates have modestly decreased across the globe as a result of ongoing health care quality improvement measures, they remain a frequent and devastating problem among hospitalized neonates. Despite multiple attempts to address this unmet need, there had been minimal empirical efforts to evaluate the perceived determinants of poor outcome of neonatal sepsis.

Objective: This study sought to establish the perceived determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Methods: This was a hospital based descriptive cross-sectional study conducted in the Paediatric Unit of Kenyatta National Hospital. A total of 175 mothers of neonates with neonatal sepsis admitted in KNH selected using consecutive sampling method were recruited into the study. A validated researcher-administered semi-structured questionnaire was used to collect the data. Descriptive statistics involved calculation of measures of central tendencies like means, modes and medians between variables while the qualitative data was analyzed through content analysis. Association between the study variables was estimated using both chi-square and odds ratio statistics at 95% confidence interval. The study results were presented in tables, graphs and charts, as appropriate.

Results: Maternal demographic factors associated with poor outcomes of neonatal sepsis included - younger or advanced maternal age ($X^2 = 4.735$, df = 2, p = 0.031); low education level ($X^2 = 6.362$, df = 1, p = 0.012) and short birth intervals of < 2 years ($X^2 = 5.108$, df = 2, p = 0.023). Maternal socioeconomic factors associated with poor outcomes of neonatal sepsis included - low household income level ($X^2 = 6.163$, df = 1, p = 0.014); large family sizes of ≥5 members ($X^2 = 4.844$, df = 1, p = 0.028) and lack of a health insurance cover ($X^2 = 5.382$, df = 1, p = 0.019). Newborn associated factors associated with poor outcomes of neonatal sepsis included - prematurity at birth ($X^2 = 5.786$, df = 1, p = 0.016); low birth weight ($X^2 = 6.470$, df = 1, p = 0.011) and low APGAR scores in the first and fifth minute ($X^2 = 7.358$, df = 1, p = 0.006). Health care system factors associated with poor outcomes of neonatal sepsis included - mothers' low ANC attendance ($X^2 = 7.270$, df = 1, p = 0.007); delay in care-seeking ($X^2 = 5.135$, df = 1, p = 0.022) and mothers' lack of health information on child caregiving ($X^2 = 6.561$, df = 1, p = 0.010).

Conclusion: Various maternal demographic, maternal socioeconomic, newborn associated and health care system factors were significant determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Recommendations: There is need for awareness creation among mothers on the value of antenatal and postnatal care services utilization and observing high standards of personal hygiene and good nutrition prior to, during and after birth.

CHAPTER ONE: INTRODUCTION AND BACKGROUND INFORMATION

1.1 Introduction

This is the introductory chapter of the study. This chapter contains background information, problem statement, study justification, study objectives, research queries and importance of the study.

1.2 Background Information

Sepsis, according to the World Health Organization (WHO), is a deadly infection that causes the dysfunction of organ due to a deregulated host response to infection (WHO, 2018). Currently there is no agreed definition for this infection since there are differing ways used to diagnose the infection. Neonatal sepsis (NS) is often said to be a clinical infection characterized by the common infection symptoms which may or may not be accompanied by bacteremia, in the first 30 days of life for a newborn. Neonatal sepsis, therefore, is the term used to give to the systematic response that occurs in response to an infection that occurs in the first 28 days of the newborns life (Wynn, 2016).

Considering the time NS occurs, the infection has been grouped as early -onset neonatal sepsis (EONS) and late-onset neonatal sepsis (LONS). This group is important as it guides medics on the antibiotic therapy to use since the two groupings have different mode of transmission and the predominant organisms vary. EONS is said to be neonatal sepsis that occurs during the first three days of the infant's life. It is often caused by the vertical transmission of bacteria from the mother to her child in the intrapartum phase. LONS occurs 72 hours or one week of the infants life. It is said to be caused by the horizontal transmission of pathogens from the environment after birth (Shah & Padbury, 2014).

In the global scene sepsis is still a known case of high mortality and mobility rates among neonates. This is despite there having been advances in healthcare quality. Globally, in 2-018 neonatal; deaths due to sepsis were estimated to be 18 deaths for every 1000 births. This estimate means that there were 7,000 neonatal deaths every

day caused by sepsis, with mortality rates estimated as ranging between 11% and 25%. The World Health Organization estimates that more than 40% of deaths occurring among infants aged below five years happen during the neonatal phase and they result to 3.1 infant deaths annually. Neonatal sepsis is estimated to cause about 1 million annual neonatal deaths worldwide (or three out of every ten neonatal deaths) and 95% of the infants who pass on are found in low and middle income nations (WHO, 2018).

The reports indicate that in Asia NS deaths are about 7.113 to 38.17 in every 1000 live births.in Africa the death rate is between 6.519 and 23.15 for every 1000 live births. In the Caribbean and South America the rates are between 3.59 and 8.910 for every 1000 infants born alive. The rates provided for the US, West Europe and Australia were between 1.5 to 3.5 for EOS and 6 for LOS for every live births. The total deaths due to sepsis for every 1000 births were reported to be 6 to 9 (Fleischmann-Struzek et al., 2018). Studies done in Africa indicate that NS accounts for 17-25% of neonatal deaths in the sub Saharan Africa region (Gebremedhin et al., 2016; Jabiri et al., 2016; Kayom et al, 2018; Adatara et al., 2019).

As provided by Global Sepsis Alliance (GSA), infections that cause sepsis cause about 2.7 million deaths among neonates in Sub-Saharan Africa and South Asia which accounts for one fifth of the global neonates deaths. The deaths caused by sepsis account for 25% of all neonatal deaths. The GSA further notes that neonatal sepsis occurs 40 times more in middle income nations compared to the high income countries. The mortality rates in these countries are also two times more than in middle- income nations compare to the high-income countries (GSA, 2019). Kenya, being one of the Sub Saharan countries, is ranked among the 39 countries with the highest estimated number of death among neonatal deaths caused by neonatal sepsis. NS is the second leading cause of neonatal deaths in Kenya accounting for about 16-20% of the total neonatal deaths (Ministry of Health, 2019).

Several organisms and risks factors exist that can cause sepsis in neonates. The commonest organisms that cause NS include *Escherichia coli*, *Group B Streptococcus* (GBS), Coagulase-negative *Staphylococcus* (CoNS), L*isteria*

monocytogenes and Haemophilus influenzae. The sources of these pathogens may be said to be in-utero infection acquired from the mother or during the post natal period from the surrounding environment or hospital (Shane, Sánchez & Stoll, 2017). Early onset NS is usually associated with infection from the mother either through transplacental, ascending from the cervix or acquired from the birth canal during delivery; while late onset NS is usually associated with pathogens acquired from the environment after delivery (Hammad & Zainab, 2018).

The risk factors for NS include prematurity, immunologic immaturity, prolonged rupture of membranes (> 18 hours), maternal pyrexia (> 38 ºC) fetal distress, overt infection such as a UTI, multiple obstetric procedures including cervical sutures, gastroenteritis/diarrhea illness, preterm delivery, maternal Group B streptococcal colonization during pregnancy, history of GBS infection in previous infant, prolonged hospitalization such as a preterm infant in a NICU, endotracheal tubes, presence of foreign bodies such as intravenous catheters, malformations such as urinary tract anomalies (for example, vesico-ureteric reflux) or neural tube defects and cross-infection by staff and parent, (Wynn, 2016).

NS manifests itself in different ways and there are no specific symptoms for the infection. Some of the common signs include respiratory distress including cyanosis and apnea, fever or hypothermia, diminished spontaneous activity, feeding difficulties, increased heart rate, apnea, bradycardia, lethargy or irritability, hypotonia, temperature instability, bulging fontanel, seizures, bleeding problems, poor perfusion, hepatomegaly, abdominal distention, diarrhea, guaiac-positive stools, altered mental status, unexplained jaundice, extreme body pain or discomfort, cold extremities, and the infant "just not looking okey" (Shane & Stoll, 2014).

WHO has provided criteria used clinically to diagnose NS among neonates. The features includes; checking if the infant has a high temperature of 37.5ºC or more of they felt hot when touched, presence of convulsion and fast breaths (> 60 breaths/minute), drawing of the chest, nasal flaring, grunts, bulging fontanel, pus from the ear, umbilical area being red which extends to the skin, feeling cold, having severe

skin pustules, doesn't wake up easily, takes more than an hour to be calmed down, fewer movement, unable to feed or attach to the breast (WHO, 2017).

According to WHO there are two ways to prevent sepsis. The first step to be followed during the prevention process is to prevent transmission of microbial and infection and preventing the infection from evolving into sepsis. When it comes to the community environment, sepsis can be prevented by adhering to hygienic ways such as proper hand washing, the safe preparation of meals, clean water and sanitation, vaccination, proper nutrition which includes exclusive breastfeeding in the first six months after birth. Prevention of the spread of the infection in hospitals include having quality infection prevention and control (IPC) systems, use of quality hygiene practices and use of precaution measures in activities such as hand washing while also having clean facilities and environment.

To prevent sepsis from evolving in both the community and hospital environment, there is need to prescribe the right antibiotic dose in case of any infection. Optimization should also be reassessed, mothers should be encouraged to promptly seek medical assistance in case they suspect any infection and they should be educated on the signs and symptoms to look out for to ensure sepsis is detected early (WHO, 2017). It is possible to reduce sepsis related mortality rates by adhering to the proper health measures in the hospitals during the per partum phase including encouraging hand washing, provision of clean water and sanitation, use of proper and clean birth practices, ensuring the facility is nit overcrowded, having strong infection control and prevention measures (Medhat, Khashana & El kalioby, 2017).

Currently, neonatal sepsis is prevented by way of culture-independent diagnostics, use of prediction scores, use of judicious antimicrobial use, and coming up with preventive ways such as vaccination of the mother. However, NS is still a serious problem and there is minimal progress that can be said to have occurred (Shah & Padbury, 2014). Despite advancing healthcare system in Kenya, available evidence shows that the incidence of NS has been on the rise at Kenyatta National Hospital. However, there has been no study done to establish the perceived determinants of poor outcome of NS in health facilities, hence the need for this study.

1.3 Problem Statement

The third Sustainable Development Goal for child health aims to reduce newborns mortality rate to 12 deaths per 1000 live births by 2030. This cannot be met without reducing neonatal mortality due to sepsis because it accounts for 25% of annual neonatal deaths in sub-Saharan Africa (Tewabe et al., 2017).

Kenyatta National Hospital is the biggest Kenyan public referral health facility and admits approximately 15 neonates per day in its pediatric unit. Neonatal sepsis accounts for about 80% of the total neonate admissions in the hospital. These admissions are attributable largely to referrals from other hospitals in different parts of the country while others are from the hospital's postnatal wards. A study done in KNH by Nasiema (2015) revealed that out of 308 neonatal admissions, 49% died of neonatal sepsis. Another study done in the same hospital by Muthwii (2016) established that severity of neonatal sepsis in the hospital was high as out of 107 neonates admitted, 37.4% had severe sepsis. Hospital records at KNH reveal that the incidence of poor outcome of NS among neonates admitted in the hospital's pediatric and new born units has been on the rise as evidenced by a 32.6% increase over the last 6 months.

Several studies have been done globally on determinants of NS including Jabiri et al. (2016) in Tanzania; Gebremedhin et al. (2016) in Ethiopia; Kumar et al. (2016) in India; Hammad and Zainab (2018) in Malaysia; Mitra et al. (2018) in Bangladesh; Al-Matary et al. (2019) in Saudi Arabia and Adatara et al. (2019) in Ghana, but in Kenya despite more effort and research being done on risk factors contributing to neonatal sepsis in Kenyatta National Hospital, there is inadequate research on what contributes to the poor outcome which has led to increasing rate of neonatal mortality. To address this research gap, this study will seek to identify the perceived determinants contributing to poor outcome of neonatal sepsis at the Peadiatric Unit of Kenyatta National Hospital.

1.4 Study Justification

The reduction of neonatal sepsis related deaths is one of the major pathways towards reduction of neonatal mortality rates in Kenya. This will greatly help Kenya achieve its Vision 2030 goal of a healthy population served by a health care system of the highest possible standards for all. In addition, the reduction of neonatal mortality rates associated with NS in Kenya is one of the major pathways towards successful achievement of Sustainable Development Goals (SDGs) target 3 whose goal is the promotion of well-being for everyone at all ages by 2030 and attainment of universal health coverage, provision of quality care services, access to quality, safe, affordable and effective medication and vaccination. Given that NS is a very leading cause of infant deaths in Kenya, combating it will see a positive change in ensuring the SDGs goals are achieved especially targets 3.1 and 3.2. Further, if the common use of antibiotics among infants is to be reduced and reliable care to be given to NS patients, there is need to reliably identify the factors contributing to poor outcome of neonatal sepsis is paramount. This study is also critical as its findings could inform hospital-based policy interventions aimed at addressing the NS associated neonatal deaths at Kenyatta National Hospital.

1.5 Research Questions

1. What are the maternal demographic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit?

2. What are the maternal socioeconomic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit?

3. What are the newborn associated factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit?

4. What are the health care system factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit?

1.6 Study Objectives

1.6.1 Broad Objective

To establish the perceived determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit

1.6.2 Specific Objectives

1. To determine the maternal demographic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit.
2. To assess the maternal socioeconomic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit.
3. To establish the newborn associated factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit.
4. To establish the health care system factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Pediatric Unit.

1.7 Significance of the Study

The research will assist health policy makers in Kenya to come up with ways and policies on how to manage neonatal sepsis in the country. Medical training institutions in Kenya will benefit by coming up with curriculum that will help the health care workers gain relevant knowledge and skills on early detection and effective treatment of neonatal sepsis in order to prevent complications. This study will be done in Kenyatta National Hospital and the results will help the hospital's management to devise policy interventions and strategies for reduction of NS related neonatal mortality in the hospital.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The current chapter carefully reviews literature on the research subject as guided by the study objectives. The chapter therefore contains literature on maternal demographic factors, maternal socioeconomic factors, newborn associated factors, health care system factors contributing to poor outcome of NS. The chapter also identifies research gaps. In addition, the chapter also outlines the theoretical, conceptual and operational frameworks.

2.2 Poor Outcome of Neonatal Sepsis

NS is a leading cause of mortality among infants and morbidity in both developing and developed nations (Shane & Stoll, 2014). Newborns said to have NS barely survive despite being admitted in health faculties. In many developing countries, there aren't adequate measures to ensure correct and effective diagnosis and treatment of newborns with NS. NS is known to present in non-specific symptoms which makes prevention and treatment difficult. Further, most of the health facilities in developing nations are characterized by few personnel and inadequate facilities which make diagnosis and treatment of NS even more difficult (Hammad & Zainab, 2018).

The use of essential systems and timely medication plus use of effective therapies can lead to enhanced diagnosis and treatment of NS. Although low and middle income countries agree that something needs to be done in regard to NS, moist of these countries are unable to implement provided policies and guidelines due to lack of resources (Alemu et al., 2019). Early identification of the factors associated with poor outcomes of NS will allow for early and effective preventive and treatment measures to be taken with an aim of reducing associated neonatal morbidity and mortality (Liang et al., 2018).

2.2 Maternal Demographic Factors Contributing to Poor Outcome of Neonatal Sepsis

A research done in rural Ghana on risk factors of NS in a birth cohort, it was established that NS outcomes were poorer in women who were at the start of their reproductive age i.e. 23 – 25 or the last phase of their reproductive age i.e. 40 – 44. The study reported that risks of death and health consequences attributed to NS were lower among women who limited their childbearing to ages above 20 years and below the age of 34 (Siakwa et al., 2014). There is a reverse association between the age of the mother during birth of the infant and deaths among infants, with teenage and older mothers having higher risks for poorer NS outcomes. Very young mothers are not fully mature biologically and their inexperience in taking proper care of the child increases mortality. Conversely, older women experience pregnancy related complications due to age (Gebremedhin et al., 2016; Kayom et al., 2018; Adatara et al., 2019; Alemu et al., 2019).

In a study done in India on risk factors associated with NS. It was observed that mortality risk became higher among infants whose mothers were extremely young and also among infants who had extremely aged mothers with a relationship of U-shaped pattern. The high risk of death among infants borne of aged mothers could be due to declined reproductive system efficacy of the mother which declines with age and also due to home economic pressures. The increased risk among children of very young mothers could be attributed to the mothers physical immaturity, lack of access to care services and lack of knowledge on how to take care of an infant (Kumar et al., 2016). Similar observations were made in Tanzania (Jabiri et al., 2016).

Maternal height has also been found to have some effects on neonatal outcomes. According to a study done by Fottrell et al. (2015) in Nepal, Bangladesh, Malawi and India, where the heights for mothers were compared, delivery outcomes on those with height of below 145 cm had increased risk of neonatal death compared to those with a height of 155 cm and above with an increased risk of 1.60 times infant mortality. According to Demisse et al. (2017) short women have prolonged labour and mostly

deliver via c-section, delaying skin to skin contact and breastfeeding within one hour are protective measures against NS and other infections for the newborn.

Maternal education level has also been pointed to as a determinant of NS outcome. In a study in urban Uganda, Kayom et al. (2018) opined that maternal education was important in reducing neonatal mortality due to sepsis because an educated mother knows the importance of hand washing and will adhere to it compared to uneducated mother who thinks it is a routine. The study further argued that an educated mother is also likely to detect early any sign of sepsis from the neonate and seek medical advice before it complicates.

Studies by Murthy et al. (2019) and Muthwii (2016) also found a positive and significant association between low maternal education and poor neonatal mortality outcomes due to neonatal sepsis. These two studies argued that low maternal education is associated with low prenatal screenings, poor neonatal outcomes, and increased complications in post-operative neonates with congenital malformations mainly due to infections which complicate the outcome of surgery.

The rapture of the membrane very early during birth exposes the infant to microorganisms that are ascending from the mothers' vagina and they enter in the amniotic sac that is protecting the newborn. If this is not well managed the infant will be infected with sepsis post-delivery (Prarthana, 2018). As noted by Wu et al. (2009), once the membrane raptures too early during the birthing process there is a higher risk that the newborn will be exposed to ascending microorganisms from the mother's birth canal and they will access the amniotic sac leading to Chorioamnionitis and fetal compromise.

A study done on the NS risk factors where a case study was done on a Ghanaian based specialist hospital, Adatara et al. (2019) provides that the study showed birth interval to be an essential determinant of the deaths of infants and small children caused by NS in Ethiopia. The outcomes indicated that births characterized by large intervals were characterized by lower risk of NS while births that had shorter intervals had an opposite effect. These outcomes are in agreement with Gebremedhin et al.

(2016) results that indicated that the risk of child death due to NS was higher among children that had lower than 2 years of birth interval (at 15 percent) and even lower among children with birth interval of higher than four years (at 4.2 percent).

Masanja et al. (2019) provides that a research done in Tanzania yielded results that indicated that there was evidence that birth order (with 6+) characterized by shorter birth preceding intervals had a high risk of child and infant deaths. Further, mothers with multiple deaths were also shown to have a high like hood of losing their infants. Mogollón (2019) looked at how birth order and mothers age impacted infant mortality and provided that high maternal age and birth order were associated with increased infant mortality rate. As noted by Muthwii (2016), infants born in the first order have a higher chance of surviving compared to newborns in the fourth and preceding orders. Mitra et al. (2018) study results contrasted with these findings as he observed that higher birth orders led to lower risk of getting NS unlike lower birth orders.

2.3 Maternal Socioeconomic Factors Contributing to Poor Outcome of Neonatal Sepsis

The research results of a study done in Uganda provided that maternal factors that significantly impacted the possibility of contracting NS included poor financial support from the child's father. The study observed that proper hand washing practices by the mother before handling the infant was a protective measure from NS. The conclusion made was that the high occurrence of NS in urban areas could be reduced by promotion of simple affordable strategies such as the encouraging of proper hand washing and empowering mothers (Kayom et al., 2018). Kumar et al. (2016) further noted that newborns whose mothers lacked parental financial support were four times likely to contract NS compared to newborns whose fathers provided financial support.

Another research done um Eastern Uganda showed that only a small number of middle and upper income earners could access health insurance. Most of the people in this part of the country went to public health facilities which had limited resources while others sought medical care from private hospitals that charged high fees. Most

of the studied mothers were housewives and did not have alternative source of money. They were dependent on their husbands for most of the basic things and financial support. Their spouses were expected to meet the transportation, medical and households bills. The research provided that lack of money and support often impacted the choice of delivery facility and also affected the mother's welfare during the antenatal, delivery and postnatal phases. This could be the reason behind high NS among children whose mothers did not have financial support from their spouses (John et al., 2015).

A study done in a community in Bangladesh looked at the risk and incidence factors of infant infections among the rural community members of Bangladesh. The results indicated that the total infections occurring in the first nine days of their life were at 14.5%. The study further noted that significant risk factors were past death of an infant in the family, delivering at home, an overcrowded home, low income status and lack of proper cord care. The study concluded that it was possible to reduce and prevent neo-natal infections if by pinpointing and following up the high risk newborns and their mothers and also encouraging the empowerment of women more so in developing countries such as Bangladesh which had high incidences of neo-natal infections (Mitra et al., 2018).

Another research based in Egypt in the south Sinai area indicated that people density in a household contributed to high child mortality rates in the studied areas. The research indicated that location that had < 1 room for two people led to a high risk on neonatal infections. As high density of individuals in every household led to overcrowding which made it easier to transmit infections from one person to another (Medhat et al., 2017). Another Ethiopia based study indicated that infants delivered at home were at a higher risk of getting neonatal infections compared to those delivered in hospitals. These findings were in agreement with other findings from a research done by Alemu et al. (2019) and Abu-Salah (2011). Another notable observation made was that infants whose cord was not cleaned and cut aseptically had a higher risk of suffering from infections. This observation supports the conclusion that a clean

cord especially in hospital settings can prevent infections caused by dirty cords practices at home (Gebremedhin et al., 2016).

Another study that was done in a hospital setting in Wolaita Sodo Town, Southern Ethiopia, indicated that 33.8% of the infants admitted in the hospital were already having NS by the time they were admitted. The factors said to impact NS included the income of household, multiple examination of the vagina, immediate and exclusive breastfeeding of the infant within one hour after birth, use of kangaroo care after an hour and the age of the infant had a significant association with NS. Household characterized with low income were observed to have high NS cases as even when they noted an infection in their newborn, they lacked the resources that could allow them access quality health care. The research recommended that the socio-economic characteristics for the mothers be improved (Mersha et al., 2019).

Yet another study done in Egypt indicated the infants borne of mothers who washed their hands first before handling them were less likely to suffer from NS. This association between maternal hand washing and low NS was also provided in an Indian study that indicated maternal hand washing led to lower cases of death at 41%. This observation led to the recommendation that health education such as the benefits of proper hand washing and the provision of clean and easily accessible water to every member of the community should be promoted (Hammad & Zainab, 2018).

Siakwa et al. (2014) in Ghana and Muthwii (2016) also did studies that revealed that parents had a role to play in determining the delivery location and other care aspects. The two studies also put more emphasis on the need for parent participation in caring for the infant and the mother during the delivery and past delivery phase. The findings also emphasized that women should be supported and encouraged especially in low income groups so that they could voter take care of their health.

2.4 Newborn Associated Factors Contributing to Poor Outcome of Neonatal Sepsis

Neonatal sex has been shown to have an influence on the outcome of neonatal mortality attributable to NS. A study by Fleischmann-Struze et al. (2018) found that

boys had high mortality rates from NS than girls with more than 60% of neonatal deaths. In a systematic review done in developing nations, being male in sex was identified as being a risk factor for neonatal mortality from NS (Liang et al., 2018). According to a study done in urban Uganda, most of the neonatal deaths occurred in males except in preterm SGA females (Kayom et al., 2018), with studies by Bunduki and Adu-Sarkodie (2019) and Tewabe et al. (2017) reporting similar findings. However, in contrast, the gender of the baby was found to be the proximal level feature that did nit significantly associate with the neonatal mortality outcomes in a study done in Ethiopia by Asmare (2011).

A leading causes of NS associated neonatal mortality is the neonate's maturity with prematurity being pointed to as a major contributor of neonates deaths (Mersha et al., 2019). Studies done by Leal et al. (2012) and Abu-Salah (2011) indicated that the risk of neonatal death from NS increased greatly in premature babies than in babies born at term. Similarly, in a study carried out in Ghana on the risk factors and causes of neonatal deaths, gestational age was identified as statistically significant variable associated with neonatal mortality with neonatal mortality in preterms found to be four times higher those in normal/full term babies (Adatara et al., 2019). Other studies that have reported prematurity as a major risk factor for neonatal mortality due to NS include those done by Alemu et al. (2019), Jabiri et al. (2016) and Wu et al. (2009).

Results observed in the US showed that a total of 36% newborns born before 28 gestation weeks had at least one occurrence of blood stream infection (BSI) during their stay at the hospital which resulted to 50% mortality (Shane et al., 2017). Sepsis was also noted to be more common in pre-terms infants in up to 1000 times and the infection was observed to be more severe when it came to causing deaths and notable neurodevelopmental handicaps in the person's life. Notably, the estimates indicate that 11% of the 135 million global births happen before the 37 weeks gestation period leading to preterm babies that are on the rise more so in the developing nations. The outcomes also indicated that preterm delivery was a factor affecting the occurrence of NS (Simonsen et al., 2014). The reason behind rise in NS among pre-term babies could be said to be lack of proper well developed defense mechanism which increases

the chance of the child suffering from NS. The outcomes indicated there is need to invest in prevention of premature births by enhancing proper care in the prenatal and delivery phases (Wu et al., 2009).

Birth weight has also been identified as a risk factor for poor NS outcomes in neonates. Masanja et al. (2019) note that the birth weight of a neonate has a relationship with the neonatal outcome with the lower the birth weight the higher the mortality. In a study done in India, Kumar et al. (2016) reported that majority of the NS related deaths occurred among neonates with a birth weight of less than 1000 grams who had a 4 times likelihood of dying from NS compared to normal weight babies. Similarly, in a study on determinants of tetanus and sepsis related neonatal deaths at household level in a peri-urban area of India, low birth weight was identified as a significant risk factor for NS related deaths among the new borns (Ghosh & Sharma, 2011).

A study by Medhat et al. (2017) on the incidence of neonatal infection in Egypt observed that VLBW preterm infants were at high risk when it came to LONS due to the immaturity in their immune system, staying in the hospital for long, use of mechanical ventilation, use of endotracheal tubes, use of catheters among other invasive procedures. In a study on the factors impacting early-onset neonatal sepsis in Children of Peruvian Military Personnel, birth weight was identified as one of the neonatal variables that had a statistically significant association with neonatal mortality due to NS. In the study, over 70% of newborns who died in the first 2 weeks after delivery were of low birth weight (Mogollón et al., 2019).

As noted by a research done in Ghana, the possibility of dying due to NS for newborns with low birth weight was more than 4 times the odds for normal weight babies (Siakwa et al., 2014). Similarly, in a study carried out in Ethiopia, the findings indicated that the risk of neonatal mortality was significantly higher in babies with a low birth weight than in those with a normal birth weight (Woldu et al., 2014). These findings were also affirmed in studies by Shane and Stoll (2014) and Muthwii (2016) which also reported existence of a strong association between low birth weight and NS related neonatal deaths.

The neonate's state of health at birth is also a contributor to NS deaths in neonate, neonatal mortality due to NS was associated with birth asphyxia, instrumental delivery and meconium aspiration syndrome. Neonatal infections, prematurity and Birth asphyxia were the leading causes of neonatal deaths representing 90% of all the total infant deaths (Murthy et al., 2019). Congenital anomalies also significantly relates to neonatal deaths from NS in a research done by Masanja et al. (2019) in Tanzania.

In a study done in India, the causes of early neonatal deaths from NS were identified as respiratory distress syndrome; birth asphyxia; congenital abnormalities and hemorrhagic diseases of newborns (Kumar et al., 2016). Similarly, in a Ghanaian study, the commonest cause of mortality was observed to be sepsis in 129 of the cases(45.4%), birth asphyxia came in second for 68 of the cases (23.9%), the third one was respiratory distress syndrome in 38 of the cases (13.3%) and last was congenital anomalies in 14 (4.9%) neonates (Siakwa et al., 2014).

Low Apgar score at the first and at the fifth minutes have also been significantly associated with neonatal mortality. This was affirmed in a study carried out in Rwanda, which also observed lower 1st and 5th minute Apgar scores as a factor that was highly associated with neonatal mortality. The odds of mortality in babies with low Apgar scores at the set timings are higher than in those whose Apgar scores are okay (Kayom et al., 2018; Hammad & Zainab, 2018).

2.5 Health Care System Factors Contributing to Poor Outcome of Neonatal Sepsis

In a study carried out in Tanzania Mwananyamala and Temeke hospitals in Dares Salaam, revealed that the risk factors associated with neonatal sepsis were resuscitation at birth and ANC attendance. Neonates that had resuscitation at birth and neonates of mothers with low ANC attendance had higher poor neonatal sepsis treatment outcomes compared to those that had not been resuscitated at birth and those whose mothers had a high ANC attendance. The study came to the conclusion

that NS among infants in Dares Salaam were mainly due to health related factors (Jabiri et al., 2016).

Another Ghanaian study that looked into the risk factors impacting occurrence of NS at Trauma and Specialist Hospital, Winneba indicated that the health care factors influencing occurrence of the infection included the attendance of antenatal and postnatal clinic by the mothers. The study pointed out that the health care system factors dud have a strong relation with the risk of NS occurrence. The study pointed out that encouraging expectant mothers to make use of antenatal care can help identify the risk factors inherent during the pre and post natal care among expectant mothers and also help devise appropriate measures that could help reduce the occurrence of NS among newborns (Adatara et al., 2019).

In another study done in Uganda, in 2013, established that lack of screening for infections during ANC, lack of proper treatment for infections, inability to breast feed the neonates, lack of health education on how to care for the neonates and inadequate supply of antibiotics and other medications were the health care system factors related to the high likelihood of having laboratory confirmed sepsis (John et al., 2015). Similarly, in a study done in Kenya, Muthwii (2016) concurred that low levels of maternal screening for infections during the ANC were a major contributor of sepsis in neonates.

Studies by Alemu et al. (2019), Gebremedhin et al. (2016) and Jabiri et al. (2016) showed that infants that were delivered at home or with the help of traditional birth attendants in unclean conditions were likely to get sepsis compared to infants delivered in hospitals where cleanliness and sterile conditions were emphasized. The cases observed indicated high occurrence of sepsis among children that were birthed by traditional birth attendants compared to infants birthed in health care facilities. Although the observation was not statistically significant, the use of traditional birth attendant had a high risk of birthing the child in unsterilized and unclean conditions which exposes the child to infections.

Lack of enough gloves, disinfectants and intravenous antibiotics made it difficult for health workers in hospitals to control the spread of NS. Lack of enough infrastructures such as enough beds meant that some mothers gave birth on the floor. Other challenges experienced by the new mothers and hospital workers included lack of enough beds which saw mothers share bed with the newborns and the lack of treatment rooms for sick newborns made it difficult to control, the infection within the facility. Hospitals also had limited laboratory reagents and equipment that made it hard to do comprehensive infection screening of expectant mothers who were coming for antenatal care at the hospital (Mogollón et al., 2019).

Mugadza et al. (2018) study looking at the attendance of antenatal care by expectant mothers provided that antenatal care was useful to the newborns and mothers as they would get screened and treated for any infections. This led to less likelihood of the mothers transmitting the infections to their children compared to mothers who didn't attend the clinics. These results were in agreement with the findings of a study done on risk-based antibiotic prophylaxis interventions by Al-Lawama et al. (2014) after screening during the antenatal period from sepsis (Liang et al., 2018).

Another Indian study pointed out that prenatal care is important in lowering health issues that occur due to poor health as during this period since the expectant women are screened and their history considered in an effort to take up preventive and treatment steps in case of infection. Expectant women who seek prenatal care have less likelihood of having neonatal morbidity and mortality (Ghosh & Sharma, 2011). Infrequent visit to antenatal clinic, inappropriate response to rupture of membrane, inappropriate response to antepartum hemorrhage and failure to return for ANC on prescribed date, are common factors contributing to deaths among newborns (Demisse *et al*., 2017). A survey done by the Ministry of Health in Kenya in 2017 revealed that only 47% of pregnant women in Kenya made the 4 minimum ANC visits. This low attendance of ANC was a contributor to increased incidences of poor outcome of neonatal sepsis (MoH, 2017).

2.6 Gaps in Literature Review

The above reviewed empirical studies point to a general consensus that a wide range of maternal demographic factors, maternal socioeconomic factors, newborn associated factors and health care system factors are contributors to poor outcome of neonatal sepsis in neonates. Most of the studies also seem to concur that the prevalence of NS varies widely particularly when comparing between developed and developing countries. However, majority of the reviewed studies highlighted factors contributed to NS while the current study's focus is on determinants of poor outcome of neonatal sepsis. It is evident that there is death of empirical research on determinants of poor outcome of neonatal sepsis in Kenya and hence the need for the current study.

Further, it is evident that, if rates of child mortality are to be lowered, there is need to address the death of infants caused by NS. More investment needs to be done in surveillance and research on the factors influencing the occurrence of NS at all the levels of the health care system. Accurate and reliable data is necessary to enact effective policies that can be effective at lowering or eliminating neonatal deaths caused by sepsis. Consequently, this research study will unveil results which may inform policy interventions for reducing neonatal mortality occasioned by NS in Kenya and particularly at Kenyatta National Hospital.

2.7 Theoretical Framework

The study theoretical framework is pegged on Mosley & Chen's analytical framework which came up in 1984. Mosley and Chen (1984), came up with the classification of the infant and child mortality determinants termed as exogenous (socioeconomic or extrinsic) which included regional, community, socioeconomic and cultural determinants. The other classification was termed as endogenous (bio-medical or intrinsic) consisting of personal injuries, illness, nutrition, environmental and maternal. Mosley and Chen (1984) came up with a child survival framework based on the socioeconomic factors assumptions that occur in a set of related intermediate factors that impact on child mobility and mortality. The factors are defined into five categories made up of 14 determinants; maternal factors are defined in terms of birth

interval, parity and age, the environmental contamination are defined as insect vectors, skin/soil/inanimate objects and air, water/ food/ fingers. The nutrient deficiency factors include micronutrients, proteins, and calories. The injury factors include intentional and accidental while the personal illness control factors are medical treatment and personal preventive measures.

Determinants in the first four classes impact on how children move from healthy to sick statues and the last class affect this rate of movement through prevention and treatment. The proximate determinant list is meant to be exhaustive indicating that the child will only change if terms of their health if one or more of the determinants change. The framework is based on the assumption that the determinants based on the socioeconomic factors impact the child mortality based on the environmental, biological and socioeconomic factors. This framework is a form of conceptual model that can be used by scientists, researchers or epidemiologists to influence the survival of an infant.

2.8 Conceptual Framework

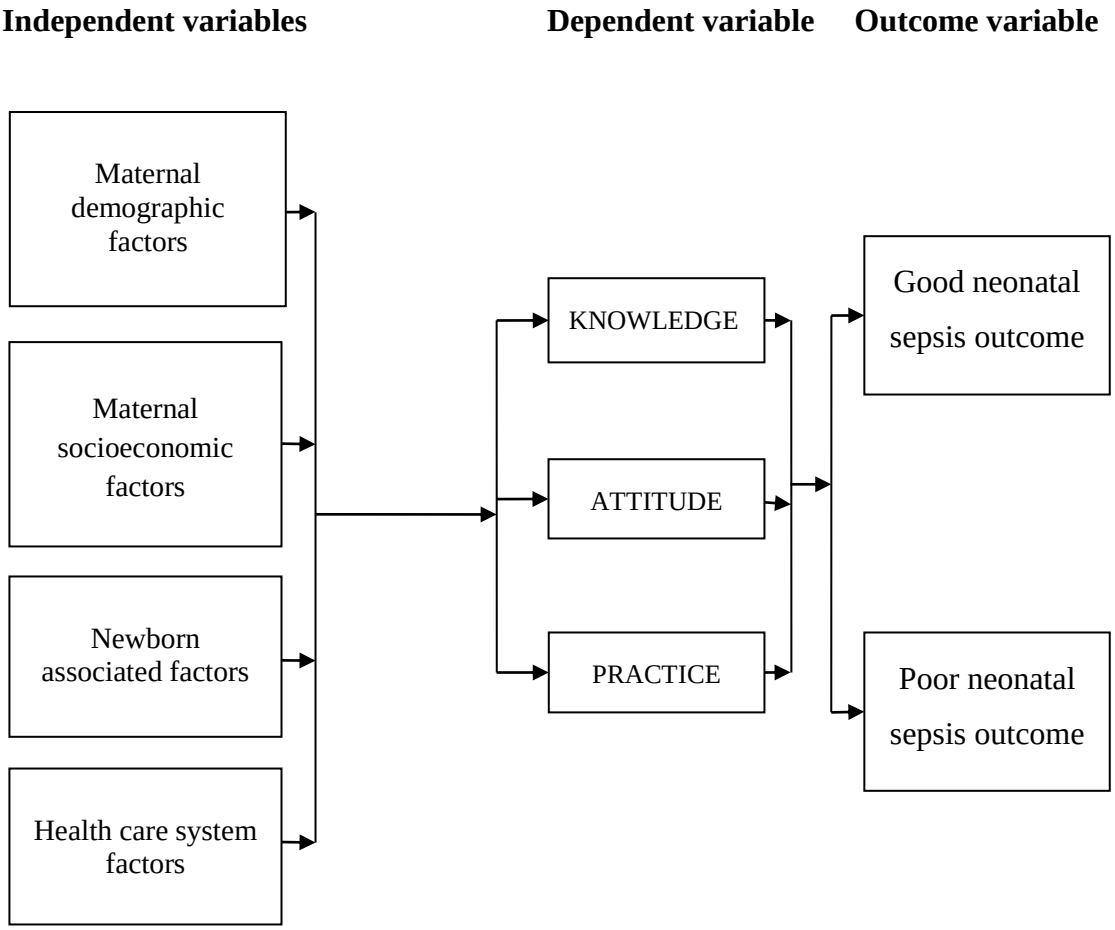

Figure 2.1 Conceptual framework - Source: (Author, 2020)

2.9 Operational Framework

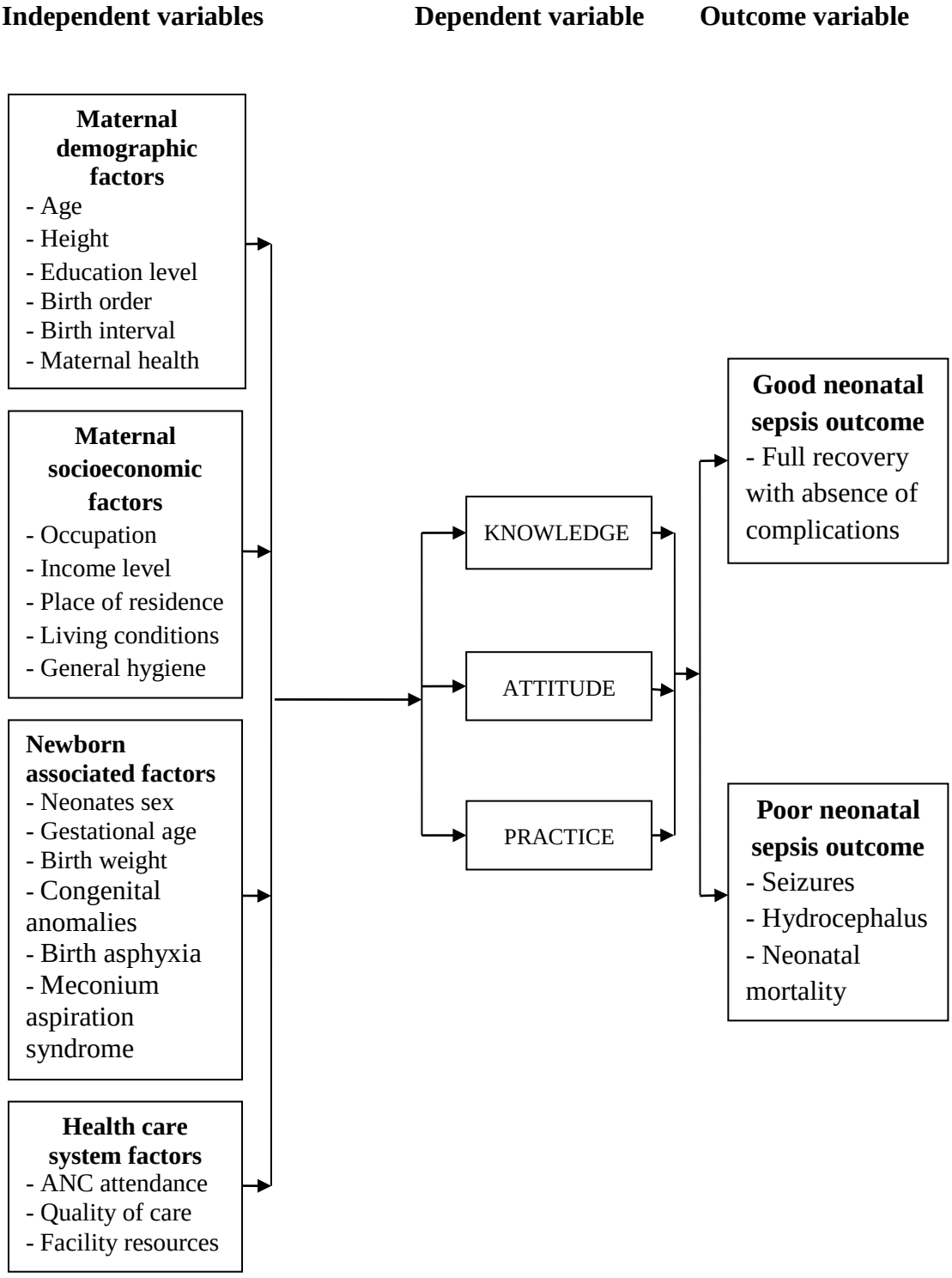

Figure 2.2 Operational framework - Source: (Author, 2020)

2.10 Definition of Key Variables

Maternal demographic factors: Are factors relating to the characteristics of the individual mothers whose children were admitted with NS at KNH.

Maternal socioeconomic factors: Are factors related to the mother's socio-economic status and context and that may be associated with occurrence of neonatal sepsis among their newborns.

Newborn associated factors: Are factors related to the individual newborns and that may predispose them to neonatal sepsis.

Health care system factors: Are factors related to nature of care and health institutions' aspects that may be associated with occurrence of neonatal sepsis among newborns.

Neonatal sepsis: this is a clinical issue that has symptoms of infection accompanied or nit accompanied by bacteremia and it occurs in the first month of the newborns life.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a framework of the methodology that was used in the study. It outlines the study design, study area, population under target, size of the sample and sampling technique, inclusion and exclusion criteria, data gathering tools and procedures, pilot testing, validity and reliability of research instrument, analysis of gathered data and ethical considerations.

3.2 Study Design

The research used quantitative approach. For the quantitative approach, a descriptive cross-sectional research design was preferred. This research design provides facts relating to study variables as they occur at the time of the research and also emerging trends related to these variables. This descriptive research was chosen since it has a high probability of providing accurate and complete descriptions of a phenomenon and also reducing the biasness during data gathering (Kothari, 2004).

3.3 Study Area

The study was conducted in the Pediatric and Newborn Units of Kenyatta National Hospital. Kenyatta National Hospital (KNH) is the largest public hospital in Kenya found about four kilometers from the Nairobi city center, off Ngong road on Hospital road. The current bed capacity of the hospital is about 2,000. The hospital offers various in and out-patient health care services in its several specialized clinics. The hospital also gives specialized health care services to referred patients and also is a facility of medical research and training in addition to being an active participant in health care policy implementation.

The KNH Pediatric Unit is located on the third floor and has a bed capacity of 320. The Unit admits pediatric patients with a wide range of illnesses from other KNH wards as well as referrals from other facilities across the country. The New Born Unit (NBU) is found in the first floor and has a bed capacity of 120. The NBU admits

newly born infants and it is where the new borns are cared for and closely monitored in the first hours after delivery. Those delivered in KNH are admitted in NBU while referrals and sick neonates from home are admitted in the pediatric wards 3a, 3b, 3c and 3d. This setting provided a good platform for studying the determinants of poor outcome of neonatal sepsis in KNH.

3.4 Study Population

The study population of this study were caregivers of neonates with neonatal sepsis admitted in the Pediatric Unit of Kenyatta National Hospital. This comprised of mothers of babies in 3a, 3b, 3c and 3d peadiatric wards and NBU. On average, 320 cases [that is, 3a – 60; 3b – 60; 3c – 60; 3d – 60 and NBU - 80] of neonates with neonatal sepsis are managed in KNH's Pediatric Unit every month. Hence, the study population of the study was 320 mothers of neonates with neonatal sepsis admitted in KNH.

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

The research was be made up of mothers of neonates admitted in KNH's pediatric wards with neonatal sepsis who voluntarily accepted to be part of the study by signing the informed consent.

3.5.2 Exclusion Criteria.

- Caregivers of neonates admitted with neonatal sepsis who are critically ill.
- Caregivers of neonates admitted with other health conditions other than neonatal sepsis e.g. birth asphyxia.
- Mothers with mental illnesses.
- Abandoned neonates with sepsis.

3.6 Sample Size Determination

The sample size was reached at using the Fisher *et al*. (1998) formula indicated below:

$n = [z^2pq/d^2]$

Where;

n = this is desired size of the sample when the population is more than 10,000.

Z = this is the standard deviation at 1.96 or 95% confidence level

p = the part of the population with traits that are desirable at 0.5.

q = (1-p) = 1 - 0.5 = 0.5

d = significance level at 0.05

Hence, $n= (1.96^2 \times 0.5 \times 0.5) / 0.05^2$

n = 384

Given that the population for the study (that is, 320) is lower than 10,000 we used the Finite Population Correction formula as noted by Fisher *et al*. (1998) indicated below;

$n_f = n / [1 + n/N]$

Where n_f = desired sample size when the total population is less than 10,000

n = estimated sample size when the total population (N) is greater or equal to 10,000

N = Total target population, which is 320.

Thus, 384 / (1 + [384/320]) = 384/1.78 = 175.

The study sample therefore comprised of 175 mothers of neonates admitted with neonatal sepsis in the Pediatric Unit of Kenyatta National Hospital.

3.7 Sampling Method

To obtain the study sample, the researcher used consecutive sampling method. Kothari (2004) postulated that consecutive sampling is a sampling method in which every subject meeting the criteria of inclusion is selected till the required sample size is achieved. The researcher also chooses to use this sampling technique due to time constraints.

3.8 Study Instruments

In this study, data gathering was done using a researcher administered semi-structured questionnaire. The tool had close- and open-ended queris. The first part of the data gathering instrument were respondents' demographic information. The other parts of the questionnaire contained queries related to the objectives of the study. As such, the questionnaire also had parts with questions on newborn associated factors, maternal demographic factors, maternal socioeconomic factors and health care system factors leading to poor outcome of neonatal sepsis among neonates admitted in KNH. The questionnaire were preferred as a data gathering tool since it was practical and can be applied in this research population and it was also affordable (Denscombe, 2014). The study also used an observation checklist to gather more information on health care system factors contributing to poor NS outcomes at KNH.

3.9 Pretesting of the Study Instruments

Pretesting of the questionnaire was done at Newborn unit Moi Teaching and Referral hospital. The pretest study utilized 18 questionnaires representing 10% of the study sample size. Mugenda and Mugenda (2009) notes that a pilot test with a 10% sample is good enough to give reliable and valid results on the data gathering instrument. Upon pretesting, the research instrument was adjusted accordingly where necessary and a final validated form of the research instrument was made.

Validity indicates the degree to which the data gathering instrument quantifies what it is expected to measure (Kothari, 2004) or the extent to which findings from the data analysis are a representative of the phenomenon under study (Denscombe, 2014). The

research instrument was availed to the supervising lecturers and peers who helped establish its content and construct validity to ensure that the items were adequately representative of the study subject .

Reliability is a measure of the degree to which the data gathering instrument provides consistent outcomes after more than one trial (Nsubuga, 2006). reliability with the help of Cronbach's Alpha Coefficient. A Cronbach's Alpha Coefficient of at least 0.70 was accepted. In case a low coefficient level is observed, changes will be made on the instrument to ensure its reliable and valid

3.10 Data Collection, Cleaning and Entry

The questionnaire were administered to the study respondents by the principal researcher. The respondents were made aware on the study purpose and they consented before being part of the research. The researcher provided guidance to the respondents in answering the questionnaires to ensure that they answer the questions properly for easier analysis. Once the respondents gave their feedback on the data gathering tool, the research reviewed the tool checking for completeness before coding the answers. The filled-in questionnaires was then stored safely under lock and key in readiness for data entry and analysis. The data collection exercise took 30 days.

The filled study questionnaires was locked under lock and key and only authorized individuals gained access to this data. This helped to prevent data loss and also prevent tampering with data confidentiality.

MS Exel and SPSS assisted in code, analyses and to verify data.

The storage of the coded data used a password to limit unauthorized access.

3.11 Data Analysis

The quantitative data obtained from the close ended questions was analyzed with the help of descriptive statistics using the Statistical Package for Social Science (SPSS, version 23).Results were presented in the form of frequencies and percentages. The

relationship between the variables were determined using Odds ratio at 5% significance level. Hence, a p-value ≤ 0.05 will be accepted as statically significant.

3.12 Data Presentation and Dissemination

Representation of the findings were in form of charts, graphs and tables.

3.13 Ethical Considerations

Authorization to do the research was obtained from the KNH/UoN Ethics and Research Committee. Permission to gather data at KNH was requested from the facility Director of Nursing Services, the Nursing Officer In-Charge of the Paediatric Unit and the New Born Unit and the targeted patients. Respondents' consented individually before their participation. Confidentiality was adhered to for all the data gotten from the study respondents. In addition, anonymity was achieved through coding of the data gathering results. There was no use of personal identification and the data given will be used for academic and research purpose. Any emerging issues was cited anonymously. Participation in the study was voluntary and the participants had freedom to stop being part of the research at any time. The participants were not induced to be part of the research by rewards or any other form of gift. There were no associated risks to the study respondents from their participation in the study. There were no costs to be incurred by the research participants. All filled questionnaires were kept safely under lock and key in readiness for data analysis and presentation.

3.14 Study Limitations

The researcher used a questionnaire as the data collection tool and therefore under- or over-reporting was likely. To counter this limitation, the researcher requested the study respondents to respond to the research tool honestly and assured them that the information was handled confidentially and only served to provide information related to this research.

The study was based on results gathered from a single hospital in the country. Thus the findings may not be generalized to all other hospitals in the country due to

differences in sizes, geographical location and institution set up. To counter this limitation, the researcher recommends that related studies be conducted in other hospitals to allow for comparing of results and generalization of the outcomes.

Some cases of missing or incomplete data in the data gathering tool were inherent. This was countered by, data cleaning before the final analysis to ensure completeness of the information availed through questionnaires.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the study results as set out in the research methodology. The results were presented on the perceived determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. The chapter begins with highlighting the response rate then it proceeds to highlight results on the nature of neonatal sepsis outcomes before outlining the results on the maternal demographic factors, the maternal socioeconomic factors, the newborn associated factors and the health care system factors contributing to poor outcome of neonatal sepsis in the Paediatric Unit of Kenyatta National Hospital in line with the study objectives.

4.1.1 Response rate

The study targeted 175 mothers of neonates admitted with neonatal sepsis in the Paediatric Unit of Kenyatta National Hospital as respondents. From the interviews, the researcher was able to obtain adequate responses from 130 of the respondents translating into a response rate of 74.3%. This response rate was considered sufficient and representative and conforms to Mugenda and Mugenda (2003) stipulation that a response rate of 50% is adequate for analysis and reporting, a rate of 60% is good while a response rate of 70% and over is excellent.

4.2 Nature of Neonatal Sepsis Outcomes

The study sought to establish whether the respondents' neonates had good or poor outcome of neonatal sepsis following treatment.

The results indicated that most (63.1%, n = 82) of the neonates had poor outcome of neonatal sepsis following treatment denoted by arising complications and death in some while 36.9% (n = 48) of the neonates had good outcome of neonatal sepsis following treatment denoted by their full recovery from the illness as depicted in Figure 4.3 below. This implied that poor outcome of neonatal sepsis was a significant challenge in KNH.

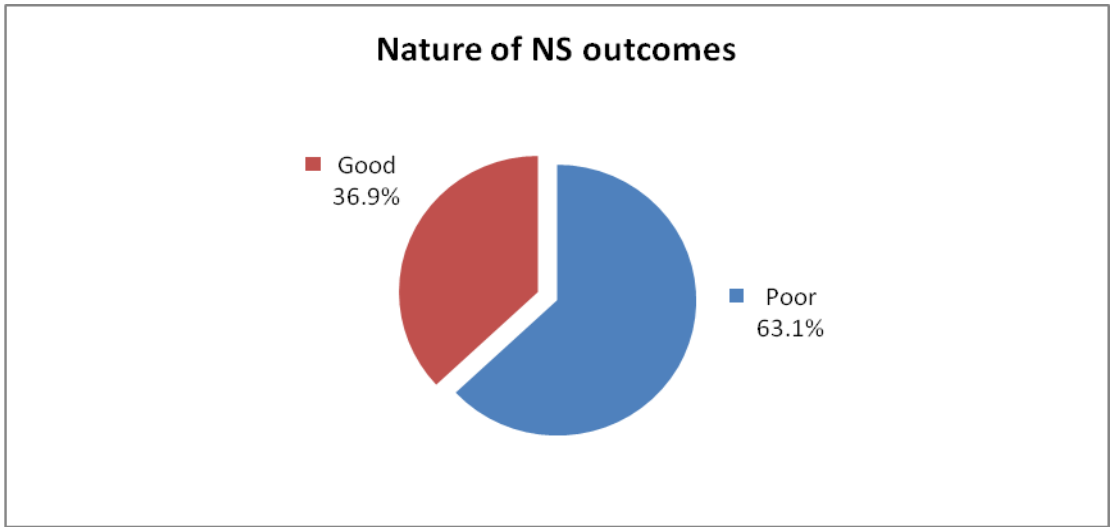

Figure 4.3 Neonatal sepsis outcomes among the reviewed neonates

4.3 Maternal Demographic Factors Contributing to Poor Outcome of Neonatal Sepsis

The first objective of the study sought to determine the maternal demographic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. The findings were as described in the subsequent subsections.

4.3.1 Maternal Age and Poor Outcome of Neonatal Sepsis

Results on maternal age indicated that most of the mothers of neonates admitted with neonatal sepsis in KNH's Paediatric Unit were aged between 25 and 34 years with 43.1% (n = 56) being aged 25 - 29 years and 26.2% (n = 34) being aged 30 - 34 years. Figure 4.4 below contains the findings.

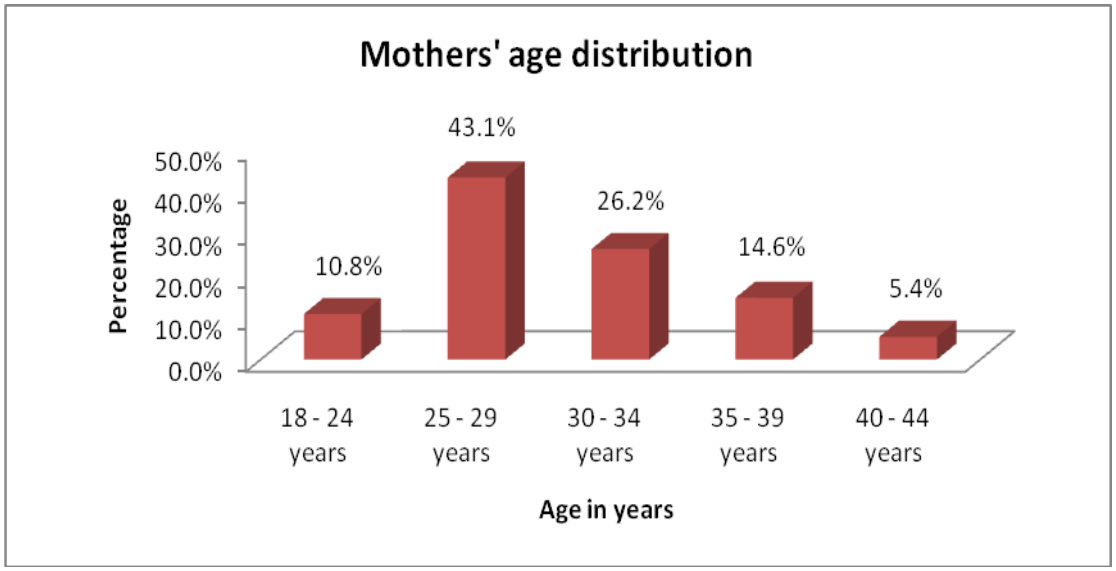

Figure 4.4 Age distribution of the mothers

Further, a statistically significant association was established between mothers' age [of below 25 years or 35 years and above] and poor outcome of neonatal sepsis (X^2 = 4.735, df = 2 and p = 0.031). In addition, the odds of poor outcome of neonatal sepsis were 1.33 times higher among mothers aged below 25 years or 35 years and above compared to those aged between 25 and 34 years. This implied that both younger and advanced maternal age did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.1 below illustrates this finding.

Table 4.1 Association of maternal age with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
	Good	**Poor**		**Chi-sq. p value**	**Odds ratio value**
Age	**[N = 48]**	**[N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
18 - 24 years	3	11	**14**		
25 - 34 years	43	47	**90**		
35 years & above	2	24	**26**	0.031	1.33 [0.642 - 2.768]

4.3.2 Maternal Height and Poor Outcome of Neonatal Sepsis

The findings indicated that most (83.8%, n = 109) of the mothers had a height of 150 cm and above while 16.2% (n = 21) had a height of below 150 cm as shown in Figure 4.5 below.

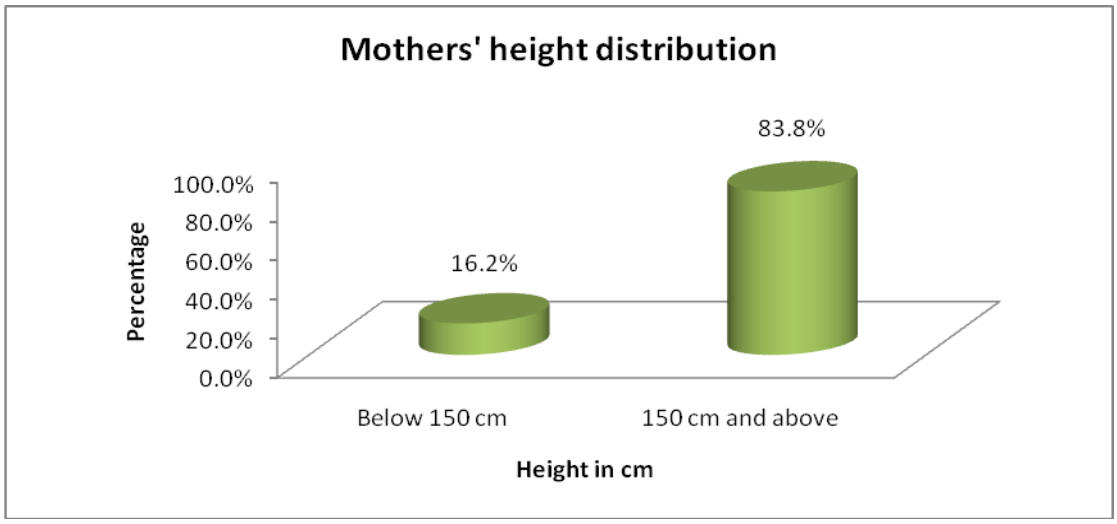

Figure 4.5 Height distribution of the mothers

Further, a statistically significant association was established between the mothers' height of below 150 cm and poor outcome of neonatal sepsis (X^2 = 4.188, df = 1 and p = 0.039) as shown in Table 4.2 below. In addition, the odds of poor outcome of neonatal sepsis were 1.45 times higher among mothers with a height of below 150 cm compared to those with a height of 150 cm and above. This implied that short stature among mothers did contribute to poor outcome of neonatal sepsis in KNH.

Table 4.2 Association of maternal height with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
	Good	**Poor**		**Chi-sq. p value**	**Odds ratio value**
Height	**[N = 48]**	**[N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
< 150 cm	4	17	**21**		1.45
≥150 cm	44	65	**109**	0.039	[0.693 - 2.881]

4.3.3 Maternal Education Level and Poor Outcome of Neonatal Sepsis

Results on the education level of the mothers whose neonates were admitted with neonatal sepsis at KNH's Pediatric Unit indicated that 47.7% (n = 62) had primary education, 26.2% (n = 34) had secondary education while 16.9% (n = 22) had no formal education. Only 9.2% (n = 12) indicated having tertiary education. This showed that most of the mothers had a low education background. This was as illustrated in Figure 4.6 below.

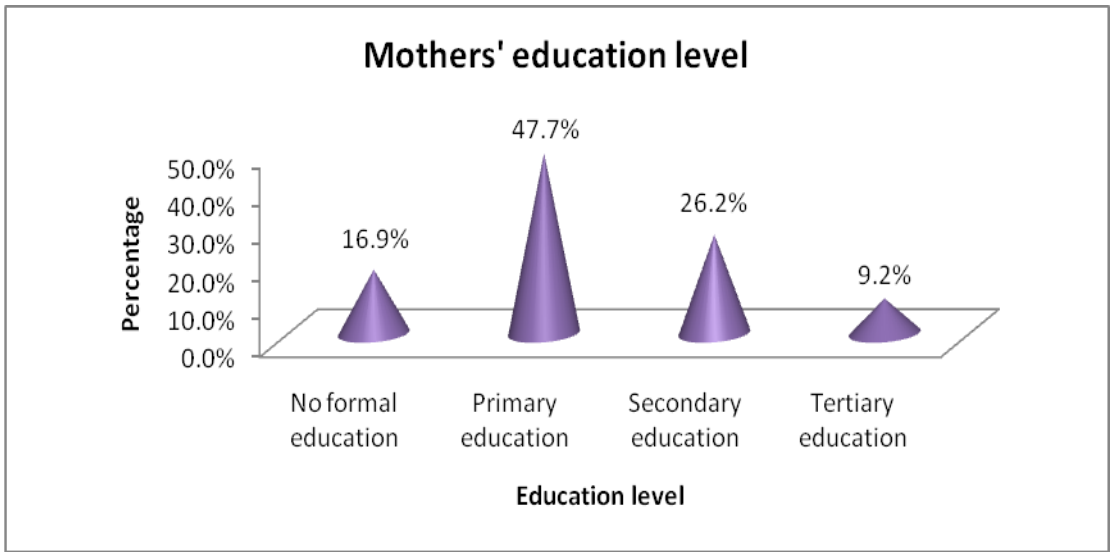

Figure 4.6 Education level of the mothers

In addition, the study established that there was a statistically significant association between the mothers' low education background and poor outcome of neonatal sepsis ($X^2 = 6.362$, df = 1 and p = 0.012). In addition, the odds of poor outcome of neonatal sepsis were 3.07 times higher among mothers with no tertiary education compared to those with tertiary education. This implied that low education levels among mothers did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as shown in Table 4.3 below.

Table 4.3 Association of maternal education level with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
	Good	Poor		Chi-sq. p value	Odds ratio value
Education level	**[N = 48]**	**[N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
Low [secondary & below]	38	80	**118**		3.07
High [tertiary]	10	2	**12**	0.012	[1.715 - 4.425]

4.3.4 Marital Status and Poor Outcome of Neonatal Sepsis

Results indicated that majority (87.7%, n = 114) of the mothers of neonates admitted with NS in KNH's Paediatric Unit were married as shown in Table 4.4 below.

Table 4.4 Marital status of the mothers

		Frequency	Percent
Marital status	Single	9	6.9
	Married	114	87.7
	Separated/Divorced	5	3.8
	Widowed	2	1.5
	Total	**130**	**100.0**

However, the study found no statistically significant association between the mothers' marital status and poor outcome of neonatal sepsis ($X^2 = 3.819$, df = 1 and p = 0.148). Further, the odd of poor outcome of neonatal sepsis was 0.62 times lower among mothers who were married compared to those not married. This implied that the mothers' marital status did not significantly contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as highlighted in Table 4.5 below.

Table 4.5 Association of marital status with poor outcome of neonatal sepsis

Marital status	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Married	42	72	**114**		0.62
Not married	6	10	**16**	0.148	[0.281 - 1.873]

4.3.5 Mothers' Religion and Poor Outcome of Neonatal Sepsis

Most (84.6%, n = 110) of the respondents were Christians. However, 10.8% (n = 14) said they were Muslims while 4.6% (n = 6) indicated not belonging to any religion as depicted in Figure 4.7 below.

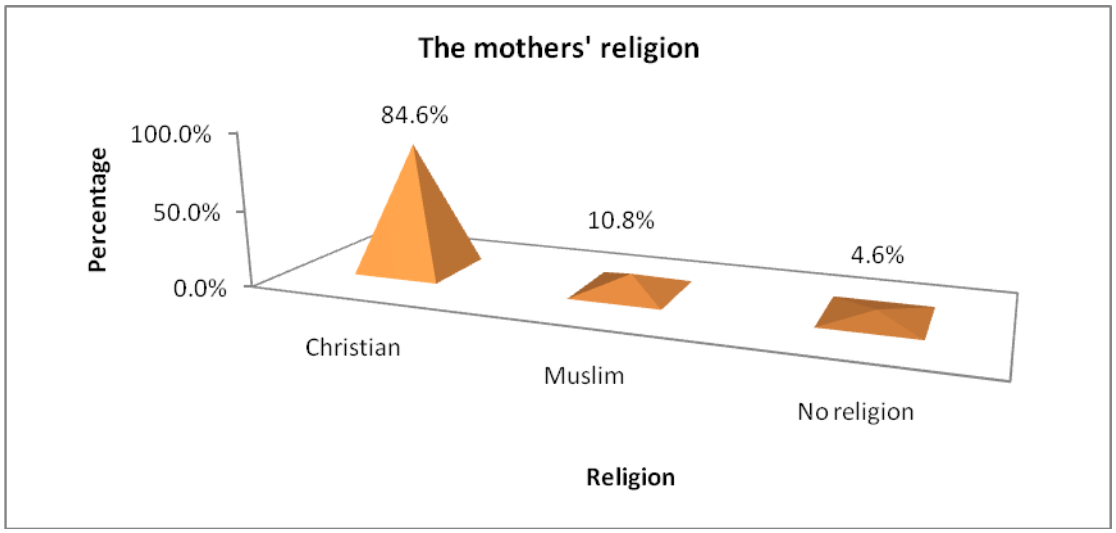

Figure 4.7 Distribution of the mothers as per their religion

However, as was the case with marital status, no statistically significant association was established between the mothers' religion and poor outcome of neonatal sepsis ($X^2 = 3.637$, df = 1 and p = 0.163) as depicted in Table 4.6 below. Further, the odds of poor outcome of neonatal sepsis were 0.38 times lower among mothers who were Christians compared to those who were non Christians. This implied that mothers'

religion did not significantly contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital.

Table 4.6 Association of mothers' religion with poor outcome of neonatal sepsis

	Neonatal sepsis outcome			Chi-sq. p value	Odds ratio value
Religion	**Good [N = 48]**	**Poor [N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
Christian	41	69	**110**		0.38
Not Christian	7	13	**20**	0.163	[0.195 - 0.569]

4.3.6 Birth Interval and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate whether the admitted neonate was their first child. Most (82.3%, n = 107) of the mothers indicated that this was not their first child. However, 17.7% (n = 23) said that this was their first child as illustrated in Table 4.7 below.

For those that indicated that this was not their first child (N = 107), they were requested to indicate the birth interval between the child and the immediate previous one. Most of the 107 indicated that the birth interval was 2 - 4 years (58.9%, n = 63) while 33.6% (n = 36) indicated that the birth interval was less than 2 years. A further 7.5% (n = 8) indicated that the birth interval was more than 4 years. This was as illustrated in Table 4.7 below.

This implied that, for most of the mothers, this was not their first child with most of them having a 2 - 4 years gap between the admitted child and the immediate preceding one.

Table 4.7 Whether this neonate was the first child to the mother and if not its associated birth interval

		Frequency	Percent
Is this your first child?	Yes	23	17.7
	No	107	82.3
	Total	**130**	**100.0**
If not, birth interval between this child and the preceding one	< 2 years	36	33.6
	2 - 4 years	63	58.9
	> 4 years	8	7.5
	Total	**107**	**100.0**

Further, a birth interval of less than 2 years was found to be significantly associated with poor outcome of neonatal sepsis ($X^2 = 5.108$, df = 2 and p = 0.023). In addition, the odds of poor outcome of neonatal sepsis were 1.56 times higher among mothers with birth intervals of less than 2 years compared to those with birth intervals of 2 years and above. This implied that shorter birth intervals did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.8 below contains the findings.

Table 4.8 Association of birth interval with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
	Good	**Poor**		**Chi-sq. p value**	**Odds ratio value**
Birth interval	**[N = 48]**	**[N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
0 [First child]	7	16	**23**		
< 2 years	4	32	**36**		1.56
2 years & above	37	34	**71**	0.023	[0.329 - 2.791]

4.3.7 Mode of Delivery and Poor Outcome of Neonatal Sepsis

Most (80%, n = 104) of the neonates under study were delivered through vaginal delivery, 15.4% (n = 20) were delivered through caesarian section while 4.6% (n = 6) were delivered through instrumental delivery as shown in Figure 4.8 below.

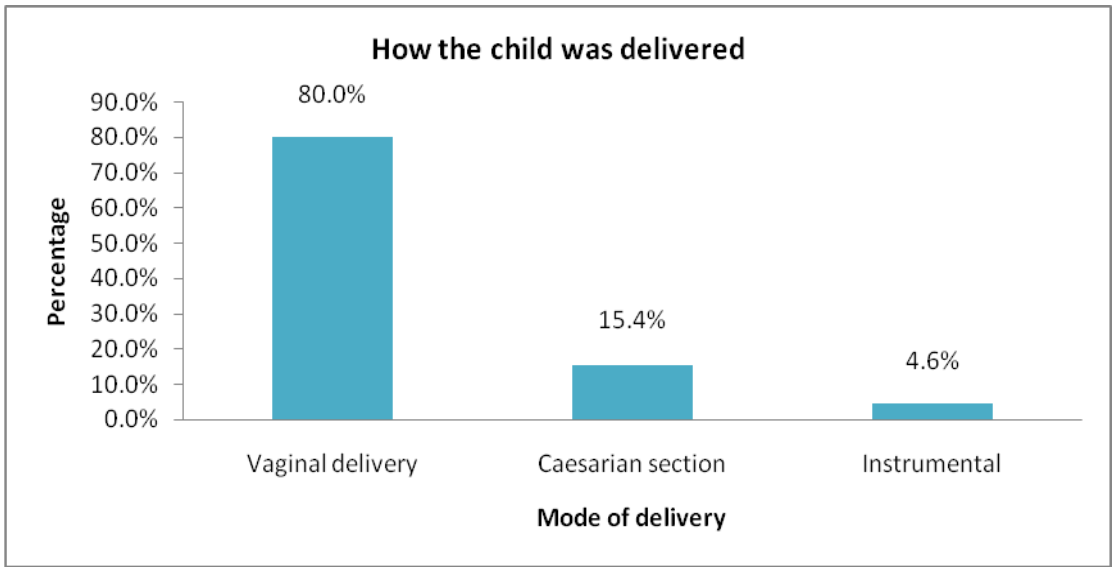

Figure 4.8 Mode of delivery for the admitted child

Further, a statistically significant association was established between vaginal mode of delivery and poor outcome of neonatal sepsis (X^2 = 4.791, df = 2 and p = 0.027). Further, the odds of poor outcome of neonatal sepsis were 1.21 times higher among mothers that delivered vaginally compared to those who delivered via CS or instrumental method. This implied that vaginal mode of delivery did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as outlined in Table 4.9 below.

Table 4.9 Association of mode of delivery with poor outcome of neonatal sepsis

Mode of delivery	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Vaginal	32	72	**104**		
CS	14	6	**20**		1.21
Instrumental	2	4	**6**	0.027	[0.509 - 1.911]

4.3.8 Obstetric Complications and Poor Outcome of Neonatal Sepsis

The study sought to find out whether the mothers had experienced any obstetric and/or medical complications during pregnancy or delivery and if so, which one. The results indicated that most (69.2%, n = 90) of the mothers did not experience any obstetric and/or medical complications during pregnancy or delivery. However, 30.8% (n = 40) said they did as depicted in Table 4.10 below.

Further, the most prevalent obstetric and/or medical complication during pregnancy or delivery experienced, among those that answered to the affirmative, was hypertension (67.5%, n = 27) as illustrated in Table 4.10 below.

Table 4.10 Whether the mothers experienced any obstetric and/or medical complications during pregnancy or delivery and their nature

		Frequency	Percent
Whether the mother experienced any obstetric/medical complications during pregnancy or delivery	Yes	40	30.8
	No	90	69.2
	Total	**130**	**100.0**
If Yes, which one? [Answered only by those who said Yes]	Anaemia	8	20.0
	Hypertension	27	67.5
	Diabetes	4	10.0
	HIV	1	2.5
	Total	**40**	**100.0**

In addition, the study established that there was a statistically significant association between having experienced obstetric complications and poor outcome of neonatal sepsis (X^2 = 5.753, df = 1 and p = 0.017). In addition, the odds of poor outcome of neonatal sepsis were 1.74 times higher among mothers that experienced obstetric/medical complications compared to those who did not experience any obstetric/medical complications, during pregnancy or delivery. This implied that obstetric and/or medical complications did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as depicted in Table 4.11 below.

Table 4.11 Association of obstetric complications with poor outcome of neonatal sepsis

Experienced an obstetric complication(s) during pregnancy or delivery?	**Neonatal sepsis outcome**		**Total**	**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
	Good [N = 48]	**Poor [N = 82]**			
Yes	3	37	**40**		1.74
No	45	45	**90**	0.017	[0.749 - 3.017]

4.3.9 Awareness of Danger Signs in Infants and Poor Outcome of Neonatal Sepsis

The study sought to find out whether the mothers were aware of danger signs in relation to a child's health status. The findings indicated that most (75.4%, n = 98) of the mothers were not aware of any danger signs in relation to a child's health status. However, 24.6% (n = 32) indicated having knowledge of danger signs in relation to a child's health status.

For the 32 mothers that indicated being aware of danger signs in relation to a child's health status, they cited lack of (or poor) breastfeeding, low body temperature, high body temperature/fever, persistent cries, difficulties in sleeping and not passing urine or stool as the danger signs that they were aware of. The findings were as shown in Table 4.12 below.

Table 4.12 Mothers awareness of danger signs in child's health and their nature

		Frequency	Percent
Are you aware of any danger signs in relation to a child's health status?	Yes	32	24.6
	No	98	75.4
	Total	**130**	**100.0**
If Yes, which one? [Answered only by those who said Yes]	Lack of (or poor) breastfeeding	13	40.6
	Low body temperature	1	3.1
	Fever	9	28.1
	Persistent cries	5	15.6
	Difficulties in sleeping	2	6.3
	Not passing urine or stool	2	6.3
	Total	**32**	**100.0**

In addition, a statistically significant association was established between mothers' lack of knowledge of danger signs in relation to a child's health status and poor outcome of neonatal sepsis ($X^2 = 10.636$, df = 1 and p = 0.001). In addition, the odds of poor outcome of neonatal sepsis were 2.75 times higher among mothers who lacked knowledge of danger signs in relation to a child's health status compared to those who had knowledge of danger signs in relation to a child's health status. This implied that mothers' lack of knowledge of danger signs in relation to a child's health status did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.13 below contains the findings.

Table 4.13 Association of Mothers' knowledge of danger signs in infants with poor outcome of neonatal sepsis

Knowledge of danger signs in infants	**Neonatal sepsis outcome**			**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
	Good [N = 48]	**Poor [N = 82]**	**Total**		
Yes	20	12	**32**		2.75
No	28	70	**98**	0.001	[0.822 - 4.678]

4.4 Maternal Socioeconomic Factors Contributing to Poor Outcome of Neonatal Sepsis

The second objective of the study sought to assess the maternal socioeconomic factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. The findings were as described in the subsequent subsections.

4.4.1 Maternal Occupation and Poor Outcome of Neonatal Sepsis

Results on maternal occupation indicated that 39.2% of the mothers were unemployed, 23.1% were casual labourers and 18.5% were housewives. Further, 12.3% were in business while 6.9% were formally employed as shown in Figure 4.9 below.

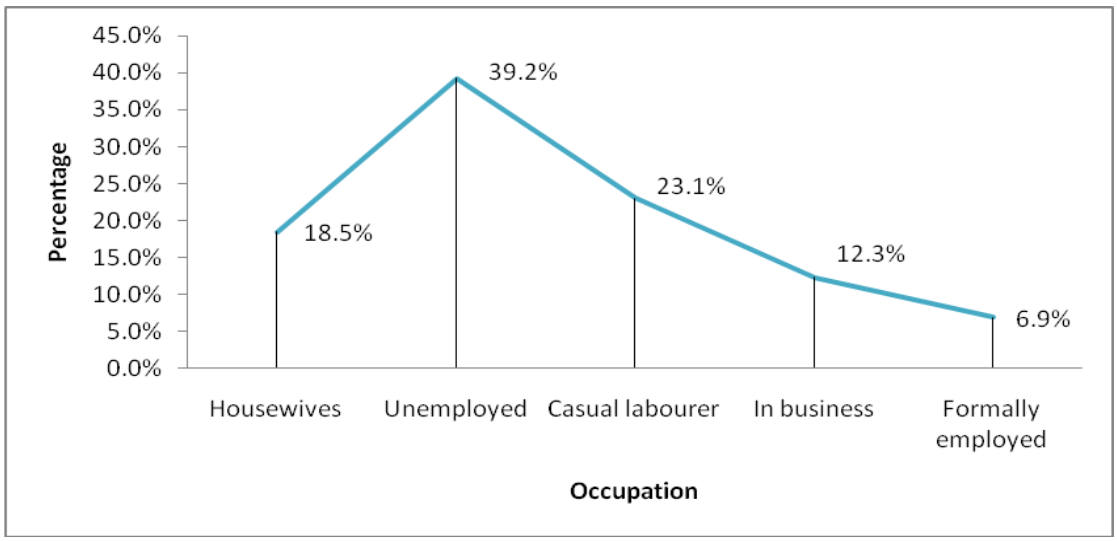

Figure 4.9 Distribution of the mothers per their occupation

Further, a statistically significant association was established between mothers with no income source and poor outcome of neonatal sepsis (X^2 = 4.178, df = 1 and p = 0.040) as shown in Table 4.14 below. In addition, the odds of poor outcome of neonatal sepsis were 1.67 times higher among mothers with no income source (housewives & unemployed) compared to those with an income source (casual labourers, in business & formally employed). This implied that mothers' lack of

income source did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital.

Table 4.14 Association of maternal occupation with poor outcome of neonatal sepsis

Do you have an income source?	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Yes	31	24	**55**		1.67
No	17	58	**75**	0.040	[0.627 - 2.713]

4.4.2 Household Income Level and Poor Outcome of Neonatal Sepsis

Most (90.8%, n = 118) of the mothers' households had a monthly income level of Kshs. 20,000 and below, denoting that most of the mothers were from low income households, corresponding with the KNBS Economic Survey 2017 categorization of low income group as those earning a monthly income of Kshs. 23,670 and below. Table 4.15 below indicates the findings.

Table 4.15 Monthly income level of the mothers' households

	Frequency	Percent
Below Kshs. 5,000	22	16.9
Kshs. 5,000 – Kshs. 10,000	71	54.6
Kshs. 10,001 - Kshs. 20,000	25	19.2
Above Kshs. 20,000	12	9.2
Total	**130**	**100.0**

The study also established that a statistically significant association existed between low household income level and poor outcome of neonatal sepsis ($X^2 = 6.163$, df = 1 and p = 0.014). In addition, the odds of poor outcome of neonatal sepsis were 2.11 times higher among mothers of low income households compared to those of

relatively higher income households. This implied that low income status among the mothers did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.16 below illustrates the findings.

Table 4.16 Association of household income level with poor outcome of neonatal sepsis

Household monthly income level	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Low (Kshs. 20,000 & below)	39	79	**118**		
High (Above Kshs. 20,000)	9	3	**12**	0.014	2.11 [0.785 - 4.142]

4.4.3 Spousal Financial Support and Poor Outcome of Neonatal Sepsis

The study sought to find out whether the mothers received any form of financial support from the child's father. Most (72.3%, n = 94) of the mothers indicated that they did not receive any form of financial support from the father of the child as depicted in Figure 4.10 below.

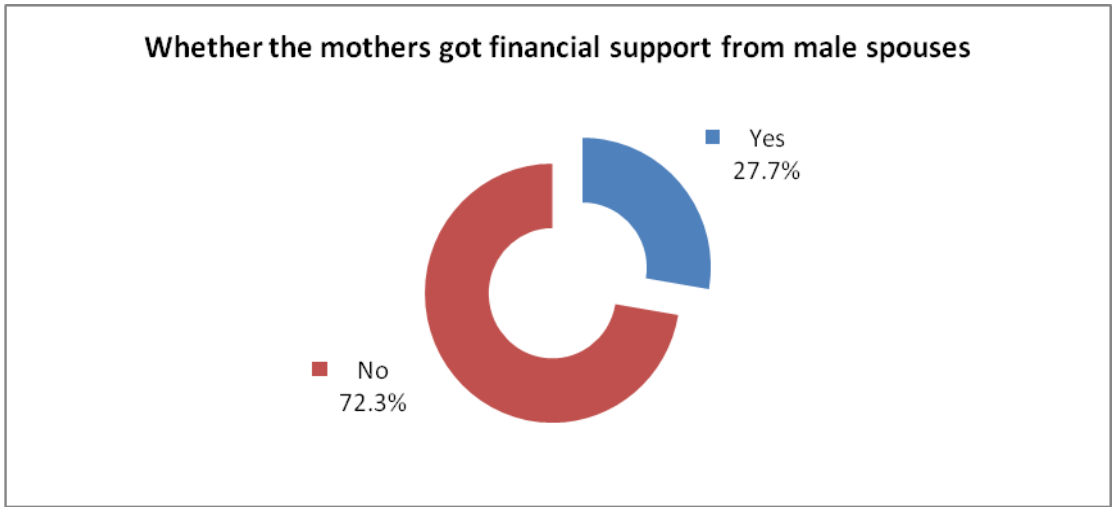

Figure 4.10 Whether the mothers got financial support from the child's father

In addition, there was a statistically significant association between mothers' lack of financial support from the child's father and poor outcome of neonatal sepsis (X^2 = 4.390, df = 1 and p = 0.035). The odds of poor outcome of neonatal sepsis were 1.82 times higher among mothers with no financial support from the child's father compared to those who received financial support from the child's father. This implied that mothers' lack of financial support from the child's father did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.17 below illustrates the findings.

Table 4.17 Association of financial support with poor outcome of neonatal sepsis

Received financial support from the child's father?	**Neonatal sepsis outcome**			**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
	Good [N = 48]	**Poor [N = 82]**	**Total**		
Yes	30	6	**36**		1.82
No	18	76	**94**	0.035	[0.761 - 2.879]

4.4.4 Place of Residence and Poor Outcome of Neonatal Sepsis

Most (64.6%, n = 84) of the mothers resided in rural areas while 35.4% (n = 46) resided in urban areas as illustrated in Figure 4.11 below.

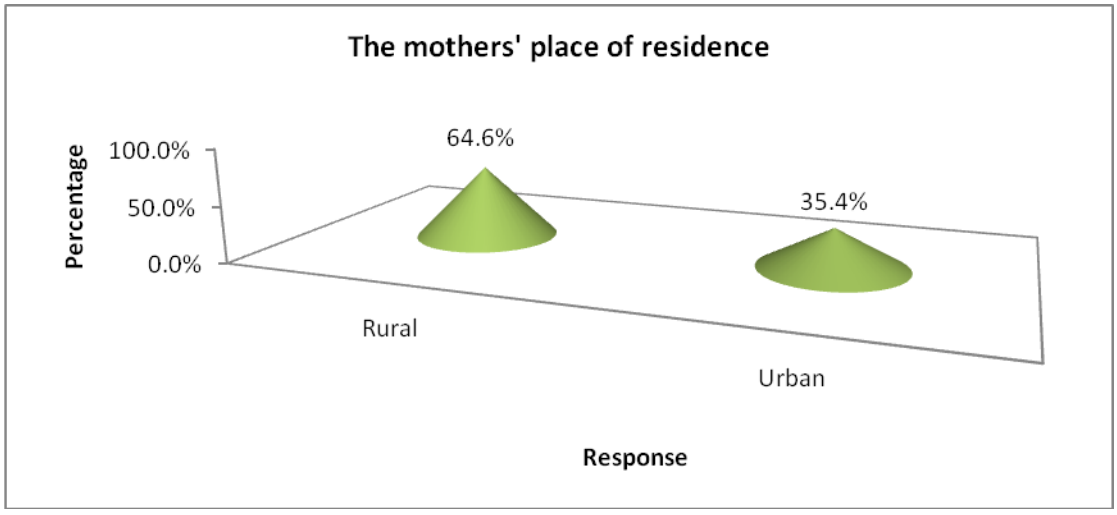

Figure 4.11 Where the mothers resided

The study did also establish that a statistically significant association existed between rural residence and poor outcome of neonatal sepsis (X^2 = 4.015, df = 1 and p = 0.043). Further, the odds of poor outcome of neonatal sepsis were 1.15 times higher among mothers who resided in rural areas compared to those who resided in urban areas. This implied that rural residence did significantly contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.18 below highlights the findings.

Table 4.18 Association of place of residence with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
Place of residence	**Good [N = 48]**	**Poor [N = 82]**	**Total**	**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
Rural	29	55	**84**		1.15
Urban	19	27	**46**	0.043	[0.576 - 2.319]

4.4.5 Family Size and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate the size of their families. Most (73.1%, n = 95) of the mothers indicated that they lived in families with 5 or more members while 26.9% (n = 35) indicated that they lived in families with less than 5 members. This was as shown in Figure 4.12 below.

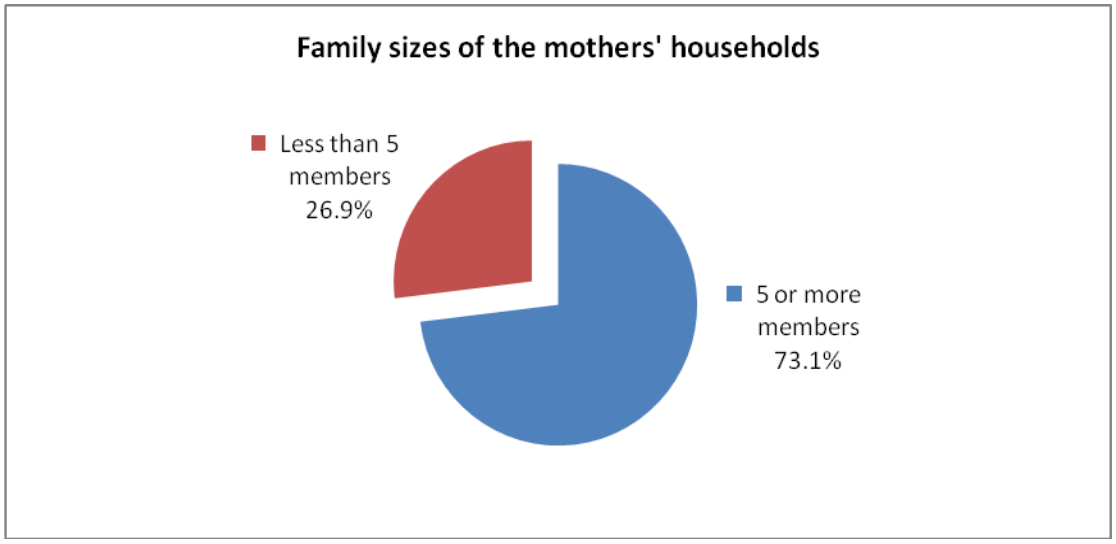

Figure 4.12 The mothers' size of families

The study also found that a statistically significant association existed between larger family sizes and poor outcome of neonatal sepsis (X^2 = 4.844, df = 1 and p = 0.028). Further, the odds of poor outcome of neonatal sepsis were 1.39 times higher among mothers who lived with 5 or more family members compared to those who lived with less than 5 family members, as depicted in Table 4.19 below. This implied that having larger family sizes did significantly contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital.

Table 4.19 Association of family size with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
	Good	Poor		Chi-sq. p value	Odds ratio value
Family size	**[N = 48]**	**[N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
< 5 members	24	11	**35**		1.39
≥ 5 members	24	71	**95**	0.028	[0.428 - 2.352]

4.4.6 Having Health Insurance Cover and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate whether their families had a health insurance cover. The results indicated that most (81.5%, n = 106) of the mothers indicated that

their families did not have a health insurance cover. However, 18.5% (n = 24) indicated that their families had a health insurance cover as illustrated in Figure 4.13 below.

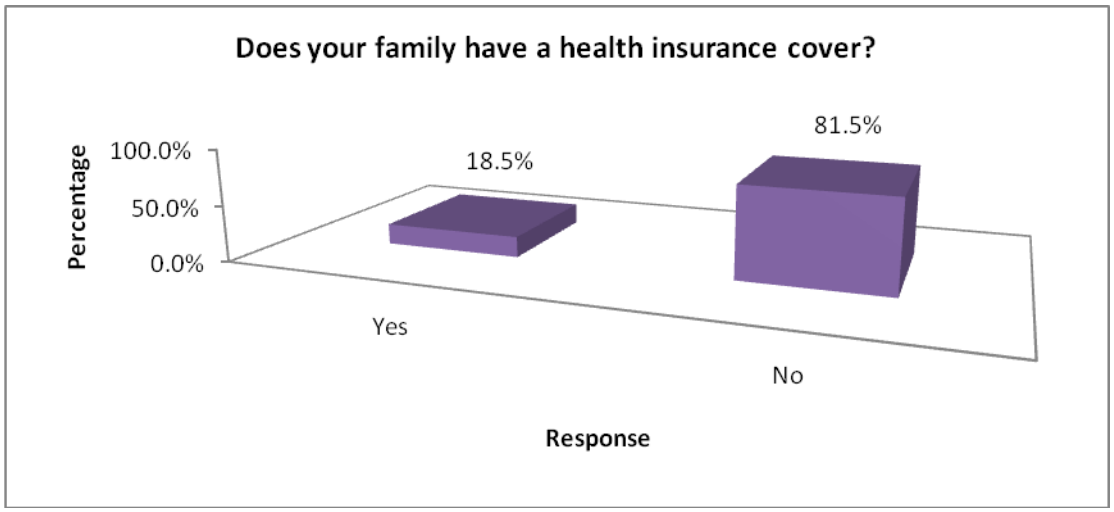

Figure 4.13 Whether the mothers' families had a health insurance cover

For those that indicated that their families had a health insurance cover (N = 24), the study requested them to indicate the kind of health insurance cover they had; while for those that indicated that they families had no health insurance cover (N = 106), they study sought to know the reasons why.

For those whose families had a health insurance cover, most (79.2%, n = 19) used NHIF, 12.5% (n = 3) used employer-based one while 8.3% (n = 2) indicated having a private form of health insurance cover.

For those that indicated that their families did not have a health insurance cover, the various reasons cited included not being able to afford, not knowing the need for health insurance covers, lack of spousal support and ignorance.

Table 4.20 below shows these findings.

Table 4.20 Health insurance cover in use or reasons for not having one

		Frequency	Percent
For those with a health insurance cover, which one?	NHIF	19	79.2
	Employer-based	3	12.5
	Private	2	8.3
	Total	**24**	**100.0**
For those without a health insurance cover, why?	Not being able to afford	78	73.6
	Not knowing the need for health insurance covers	14	13.2
	Lack of spousal support	3	2.8
	Ignorance	11	10.4
	Total	**106**	**100.0**

Further, not having a health insurance cover was found to be significantly associated with poor outcome of neonatal sepsis ($X^2 = 5.382$, df = 1 and p = 0.019). In addition, the odds of poor outcome of neonatal sepsis were 2.14 times higher among mothers whose families did not have any health insurance cover compared to those whose families had a health insurance cover. This implied that lack of a health insurance cover did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as denoted in Table 4.21 below.

Table 4.21 Association of having a health insurance cover with poor outcome of neonatal sepsis

Have a health insurance cover?	**Neonatal sepsis outcome**		**Total**	**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
	Good [N = 48]	**Poor [N = 82]**			
Yes	19	5	**24**		2.14
No	29	77	**106**	0.019	[0.731 - 3.550]

4.4.7 Hand Washing Hygiene and Poor Outcome of Neonatal Sepsis

Results on hand washing hygiene showed that only 13.8% (n = 18) of the mothers indicated that they observed proper hand washing hygiene at all times. The rest (86.2%, n = 112) indicated that they did not regularly observe proper hand washing hygiene at all times, as depicted in Figure 4.14 below.

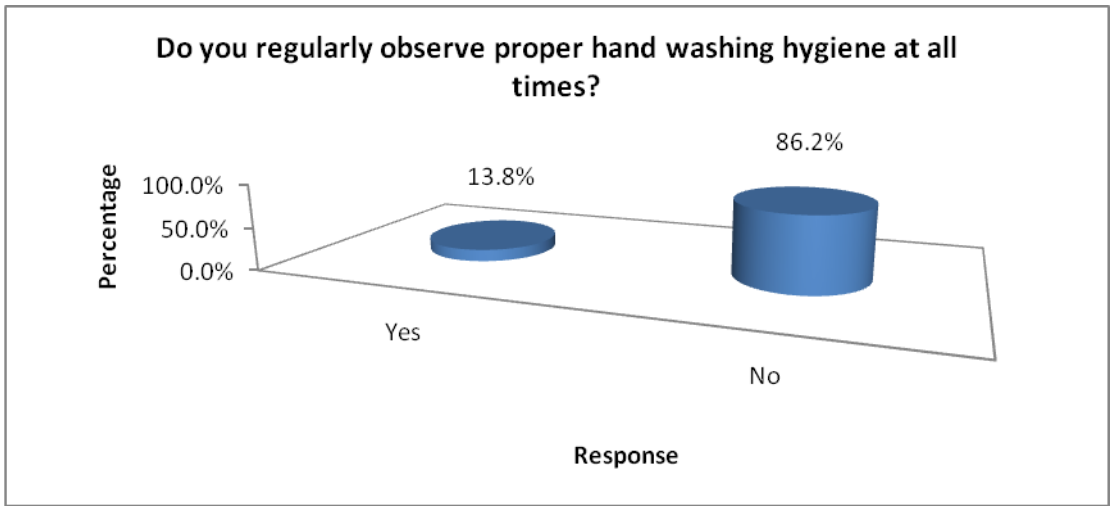

Figure 4.14 Whether the mothers regularly observed proper hand washing hygiene at all times

A statistically significant association was established between failure to regularly observe proper hand washing hygiene and poor outcome of neonatal sepsis (X^2 = 5.547, df = 1 and p = 0.021). Further, the odds of poor outcome of neonatal sepsis were 2.26 times higher among mothers who failed to regularly observe proper hand washing hygiene compared to those who regularly observed proper hand washing hygiene. This implied that the mothers' failure to regularly observe proper hand washing hygiene at all times did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as contained in Table 4.22 below.

Table 4.22 Association of observance of proper hand washing hygiene with poor outcome of neonatal sepsis

Observes proper hand washing hygiene at all times	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Yes	16	2	**18**		2.26
No	32	80	**112**	0.021	[1.125 - 3.395]

4.4.8 Awareness about Neonatal Sepsis and Poor Outcome of Neonatal Sepsis

Majority (93.1%, n = 121) of the mothers indicated that they had not heard about neonatal sepsis prior to the current hospitalization as depicted in Figure 4.15 below. This showed a low awareness level about neonatal sepsis among majority of the study participants. All of the 6.9% (n = 9) that indicated as having been aware of NS prior to this admission, cited antenatal care clinic as their source of information about NS.

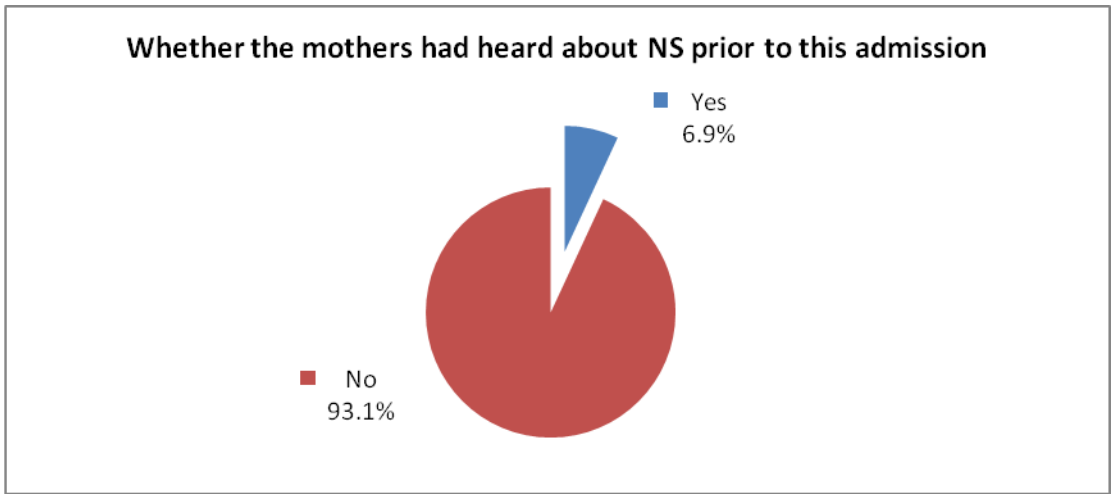

Figure 4.15 Whether the mothers had heard about NS prior to this admission

Further, the study established that there was a statistically significant association between lack of/low awareness about NS among the mothers and poor outcome of neonatal sepsis (X^2 = 4.221, df = 1 and p = 0.038). In addition, the odds of poor

outcome of neonatal sepsis were 1.59 times higher among mothers with no knowledge of NS prior to current admission compared to those who had heard about NS prior to current admission. This implied that lack of awareness about NS among caregivers did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as illustrated in Table 4.23 below.

Table 4.23 Association of awareness about neonatal sepsis with poor outcome of neonatal sepsis

Were you aware of NS prior to this admission?	Neonatal sepsis outcome			Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]	Total		
Yes	6	3	**9**		1.59
No	42	79	**121**	0.038	[0.682 - 2.498]

4.5 Newborn Associated Factors Contributing to Poor Outcome of Neonatal Sepsis

The third objective of the study sought to establish the newborn associated factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. The findings were as described in the subsequent subsections.

4.5.1 Descriptive Statistics on Newborn Associated Factors

The newborn associated factors evaluated included the child's gender, gestational age at birth, birth weight, age on admission to the hospital, whether the child cried immediately at birth or received resuscitation at birth, the child's APGAR score in the first minute and in the fifth minute, child's duration of hospitalization, whether the child was immediately breastfed after birth and whether the child had other pre-existing illnesses.

The findings on the newborn associated factors indicated that most of the infants were of male gender (63.8%, n = 83); most were born at term (67.7%, n = 88); most had

normal birth weight (as 59.2% [n = 77] weighed between 2500g and 3999g at birth); most were aged 1 - 7 days on admission to the hospital (68.5%, n = 89); most did cry immediately at birth (85.4%, n = 111); most were not resuscitated at birth (88.5%, n = 115); most were in fairly stable condition at birth (as 81.5%, n = 106 had an APGAR score of 7 - 10 in the first minute while 83.8%, n = 109 had an APGAR score of 8 - 10 in the fifth minute); most had been hospitalized for more than 7 days (70.8%, n = 92); most had been breastfed immediately after birth (60.8%, n = 79) and most had no other pre-existing illnesses other than NS (64.6%, n = 84). This was as shown in Table 4.24 below.

This showed that most of the newborns admitted with neonatal sepsis at Kenyatta National Hospital were male, born at term, had normal birth weight, were hospitalized in the first week of life, were alive at birth and in fairly stable condition at birth, were breastfed immediately after birth, had no other pre-existing illnesses other than NS and had been hospitalized for more than a week.

Table 4.24 Descriptive statistics on newborn associated factors

Newborn associated factors		**Frequency**	**Percent**
Child's gender	Male	83	63.8
	Female	47	36.2
	Total	**130**	**100.0**
Gestational age at birth	Born at term	88	67.7
	Born prematurely	42	32.3
	Total	**130**	**100.0**
Child's birth weight	< 2500g	53	40.8
	2500g - 3999g	77	59.2
	Total	**130**	**100.0**
Child's age on admission to the hospital	1 - 7 days	89	68.5
	8 - 14 days	30	23.1
	15 - 28 days	11	8.5
	Total	**130**	**100**

Whether the child cried immediately at birth	Yes	111	85.4
	No	19	14.6
	Total	**130**	**100.0**
Whether the child received resuscitation at birth	Yes	15	11.5
	No	115	88.5
	Total	**130**	**100.0**
Child's APGAR score in the first minute	7 - 10	106	81.5
	Below 7	24	18.5
	Total	**130**	**100.0**
Child's APGAR score in the fifth minute	8 - 10	109	83.8
	Below 8	21	16.2
	Total	**130**	**100.0**
Child's duration of stay in the hospital	7 days and below	38	29.2
	More than7 days	92	70.8
	Total	**130**	**100.0**
Whether the child was immediately breastfed after birth	Yes	79	60.8
	No	51	39.2
	Total	**130**	**100.0**
Whether the child had other pre-existing illnesses	Yes	46	35.4
	No	84	64.6
	Total	**130**	**100.0**

4.5.2 Association between Newborn Associated Factors and Poor Outcome of NS

Both chi-square and odds ratio statistics, at 95% confidence level, were applied to assess the association between the various newborn associated factors and poor outcome of neonatal sepsis among neonates admitted with NS at Kenyatta National Hospital. A p value of < 0.05 was considered as being statistically significant.

The newborn associated factors found to have a statistically significant association with poor outcome of neonatal sepsis in Kenyatta National Hospital, at 95% confidence level, were male gender ($X^2 = 4.742$, df = 1 and p = 0.030, OR value = 1.44 [0.120 - 2.760]); prematurity at birth ($X^2 = 5.786$, df = 1 and p = 0.016, OR value

= 4.16 [2.139 - 6.181]); low birth weight (X^2 = 6.470, df = 1 and p = 0.011, OR value = 3.51 [1.317 - 5.703]); very young age, of 1 - 7 days, at admission (X^2 = 4.887, df = 1 and p = 0.027, OR value = 2.08 [0.682 - 3.478]); not crying immediately at birth (X^2 = 5.589, df = 1 and p = 0.019, OR value = 5.77 [2.126 - 9.414]); low APGAR scores in the first and fifth minute (X^2 = 7.358, df = 1 and p = 0.006, OR value = 3.72 [1.421 - 6.019]); longer duration of hospitalization (X^2 = 4.605, df = 1 and p = 0.033, OR value = 1.69 [0.133 - 3.247]); not being breastfed immediately after birth (X^2 = 6.163, df = 1 and p = 0.014, OR value = 2.85 [0.848 - 4.852]); and having other pre-existing illnesses other than NS (X^2 = 16.763, df = 1 and p = 0.000, OR value = 2.34 [0.616 - 4.065]). This was as depicted in Table 4.25 below.

This implied that the newborn associated factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit related to the newborns' gender, gestational age at birth, birth weight, age at admission and duration of hospitalization, general state of health at birth, exclusive breastfeeding status immediately after birth and having other pre-existing illnesses prior to NS diagnosis.

Table 4.25 Association of newborn associated factors with poor outcome of NS

Newborn associated factors		Outcome of NS: Good [N = 48]	Outcome of NS: Poor [N = 82]	Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
Male gender	Yes	19	64	**83**		1.44
	No	29	18	**47**	0.030	[0.120 - 2.760]
Born	Yes	3	39	**42**		4.16
prematurely	No	45	43	**88**	0.016	[2.139 - 6.181]
Low birth	Yes	5	48	**53**		
weight	No	43	34	**77**	0.011	3.51 [1.317 - 5.703]
Age at	1 - 7 days	21	68	**89**		2.08
admission	> 7 days	27	14	**41**	0.027	[0.682 - 3.478]
Cried	Yes	46	65	**111**		5.77
immediately	No	2	17	**19**	0.019	[2.126 - 9.414]

at birth						
Low APGAR	Yes	4	20	**24**		
scores in the	No	44	62	**106**		
1st and 5th minute					0.006	3.72 [1.421 - 6.019]
Duration of	1 - 7 days	28	10	**38**		1.69
hospitalization	> 7 days	20	72	**92**	0.033	[0.133 - 3.247]
Breastfed	Yes	37	42	**79**		
immediately	No	11	40	**51**		2.85
after birth					0.014	[0.848 - 4.852]
Had other pre-	Yes	9	37	**46**		
existing	No	39	45	**84**		
illnesses prior to NS						2.34
diagnosis					0.000	[0.616 - 4.065]

4.6 Health Care System Factors Contributing to Poor Outcome of Neonatal Sepsis

The last objective of the study sought to establish the health care system factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. The findings were as described in the subsequent subsections.

4.6.1 Place of Delivery and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate where they delivered the admitted child. Results on the mothers' place of delivery indicated that most (76.9%, n = 100) delivered the child in hospital while 23.1% (n = 30) indicated that they delivered the child at home as illustrated in Figure 4.16 below.

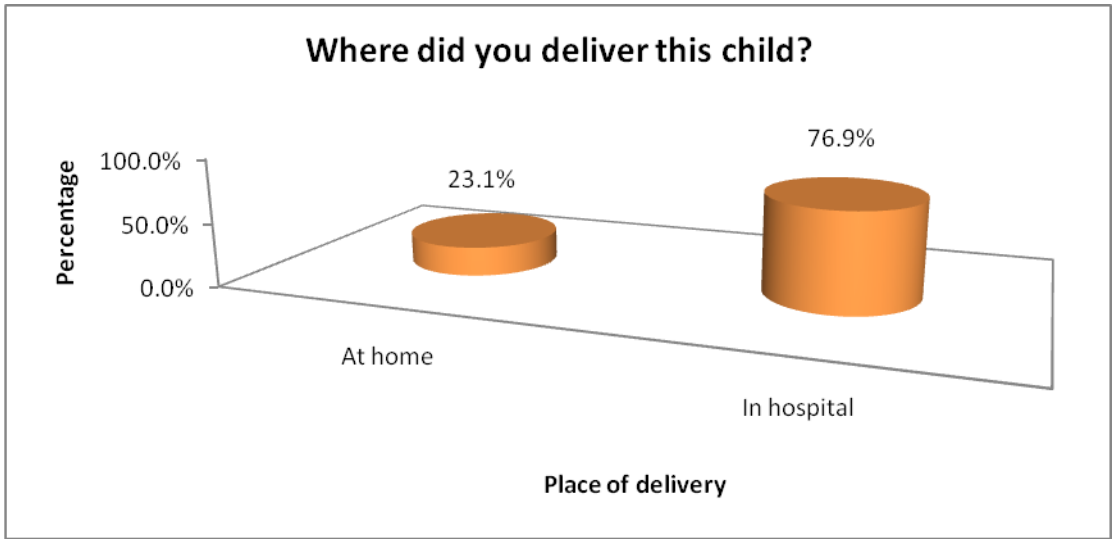

Figure 4.16 Place of delivery of the admitted child

The study also established that a statistically significant association existed between delivering at home and poor outcome of neonatal sepsis (X^2 = 4.735, df = 1 and p = 0.031). In addition, the odds of poor outcome of neonatal sepsis were 1.36 times higher among mothers who delivered at home compared to those who delivered in hospitals. This implied that home deliveries contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as denoted in Table 4.26 below.

Table 4.26 Association of place of delivery with poor outcome of neonatal sepsis

	Neonatal sepsis outcome				
Place of delivery	**Good [N = 48]**	**Poor [N = 82]**	**Total**	**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
Home	7	23	**30**		1.36
Hospital	41	59	**100**	0.031	[0.319 – 2.401]

4.6.2 ANC Visits and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate the number of ANC visits they attended. Results indicated that most (77.7%, n = 101) of the mothers had attended 1 - 2 ANC visits. Very few (10%, n = 13) had attended the recommended number of ANC visits

which is four, denoting low ANC attendance level among most of the mothers, as depicted in Figure 4.17 below.

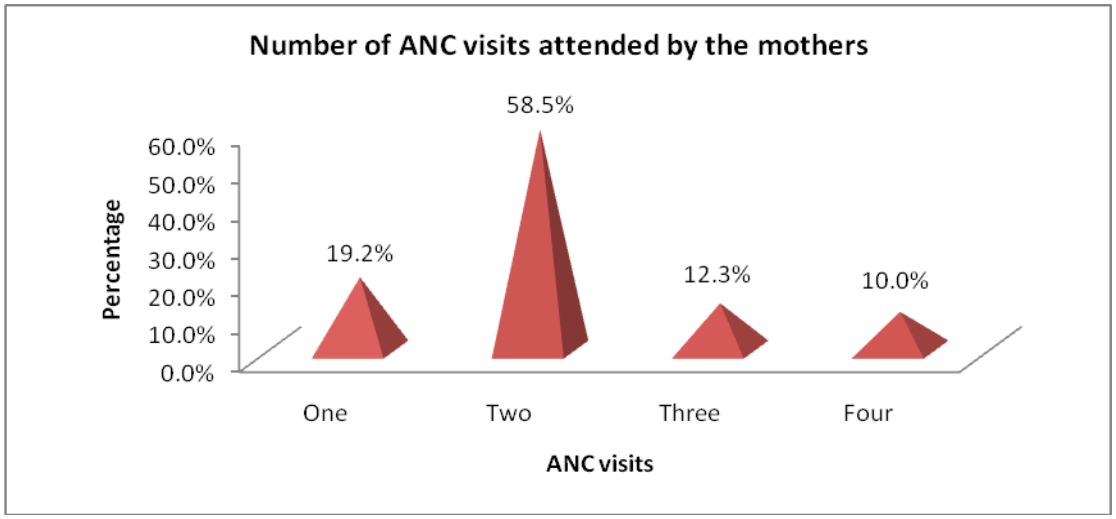

Figure 4.17 Number of ANC visits the mothers attended

The study also sought to find out whether, during the ANC visits, the mothers were screened for infections, whether the infections were treated at that facility or whether the mothers with infections were referred to another hospital for treatment.

Most (90.8%, n = 118) of the mothers were screened for infections during the ANC visits with the most common infection screened for in most of them being HIV as indicated by 94.9% (n = 112) of the 118 mothers as shown in Table 4.27 below.

For those found to have an infection (n = 18), the study sought to know if the infection(s) were treated, and all (100%, n = 18) of the mothers found to have infections, did indicate that the infections were indeed treated, with 72.2% indicating that the infections were treated in the same facility in which they were diagnosed while 27.8% indicated that they were referred to another hospital for treatment.

These findings implied that, during ANC visits, the mothers were majorly screened for HIV infection, and where need be, treatments were offered.

Table 4.27 Screening and treatment for infections

		Frequency	Percent
During the ANC visits, were you screened for infections	Yes	118	90.8
	No	12	9.2
	Total	**130**	**100.0**
If Yes, which one(s)? [Answered only by those who said Yes]	HIV	112	94.9
	Other STIs other than HIV	6	5.1
	Total	**118**	**100.0**
Were the infections treated? [Answered only by those found to have an infection(s), N = 18]	Yes	18	100.0
	No	0	0.0
	Total	**18**	**100.0**
Were you referred to another hospital for treatment?	Yes	5	27.8
	No	13	72.2
	Total	**18**	**100.0**

Further, a statistically significant association was identified between low ANC attendance and poor outcome of neonatal sepsis ($X^2 = 7.270$, df = 1 and p = 0.007). In addition, the odds of poor outcome of neonatal sepsis were 3.72 times higher among mothers who did not attend the recommended 4 ANC visits compared to those who attended the 4 recommended ANC visits. This implied that low ANC attendance among the mothers did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. Table 4.28 below illustrates the findings.

Table 4.28 Association of ANC attendance with poor outcome of neonatal sepsis

	Neonatal sepsis outcome			**Chi-sq. p value**	**Odds ratio value**
ANC visits attended	**Good [N = 48]**	**Poor [N = 82]**	**Total**	**(95% CI)**	**[at 95% CI]**
4 ANC visits	8	5	**13**		3.72
< 4 ANC visits	40	77	**117**	0.007	[1.408 - 6.032]

4.6.3 Ability to Breastfeed and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate whether they were able to breast feed the child and if not to indicate reasons as to why. The findings were that most (73.8%, n = 96) of the mothers were able to breast feed their child. However, 26.2% (n = 34) said they were not able to breast feed their child, as depicted in Table 4.29 below.

For the 34 that indicated being unable to breast feed their child, they cited poor recovery from delivery (14.7%), being unwell (35.3%), low milk production/having inadequate milk (26.5%), the child being unwell (17.6%) and not being the mother of the child (5.9%) as the reasons for the inability to breast feed the child.

Table 4.29 Whether the mothers were able to breast feed the child and if not reasons thereby

		Frequency	Percent
Are you able to breast feed the child?	Yes	96	73.8
	No	34	26.2
	Total	**130**	**100.0**
If No, why? [Answered only by those who said No]	Poor recovery from delivery	5	14.7
	I am unwell	12	35.3
	Low milk production	9	26.5
	The child is unwell	6	17.6
	I am not the mother	2	5.9
	Total	**34**	**100.0**

Further, there was a statistically significant association between inability to breast feed the child and poor outcome of neonatal sepsis ($X^2 = 5.724$, df = 1 and p = 0.018). In addition, the odds of poor outcome of neonatal sepsis were 1.31 times higher among mothers who were unable to breast feed their child compared to those who were able to breast feed their child. This implied that mothers' inability to breast feed their child contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as illustrated in Table 4.30 below.

Table 4.30 Association of ability to breastfeed with poor outcome of NS

Are you able to breast feed the child?	Neonatal sepsis outcome			Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]	Total		
Yes	42	54	**96**		1.31
No	6	28	**34**	0.018	[0.374 – 2.246]

4.6.4 Timeliness in Seeking Treatment and Poor Outcome of Neonatal Sepsis

Regarding timeliness in seeking treatment, only (9.2%, n = 12) of the mothers indicated that they promptly took the child to hospital for treatment upon the onset of the illness. The results indicate that most (53.1%, n = 69) took 1 - 3 days before taking the baby to hospital for treatment while 24.6% (n = 32) took 4 - 7 days to seek medical attention for the baby's illness as depicted in Figure 4.18 below. This implied that there were delays, among most of the mothers, in seeking medical treatment for their child.

The reasons cited for the delay to seek treatment for the child's illness included observation of the child hoping his/her condition will improve, not knowing if the child is unwell, self-medicating the child with drugs bought at local drugs stores, lacking the funds to take the child to hospital, waiting for approval/decision to take the child to hospital from the baby's father, time constraints due to livelihood commitments and lack of awareness of danger signs i relation to a child's health status.

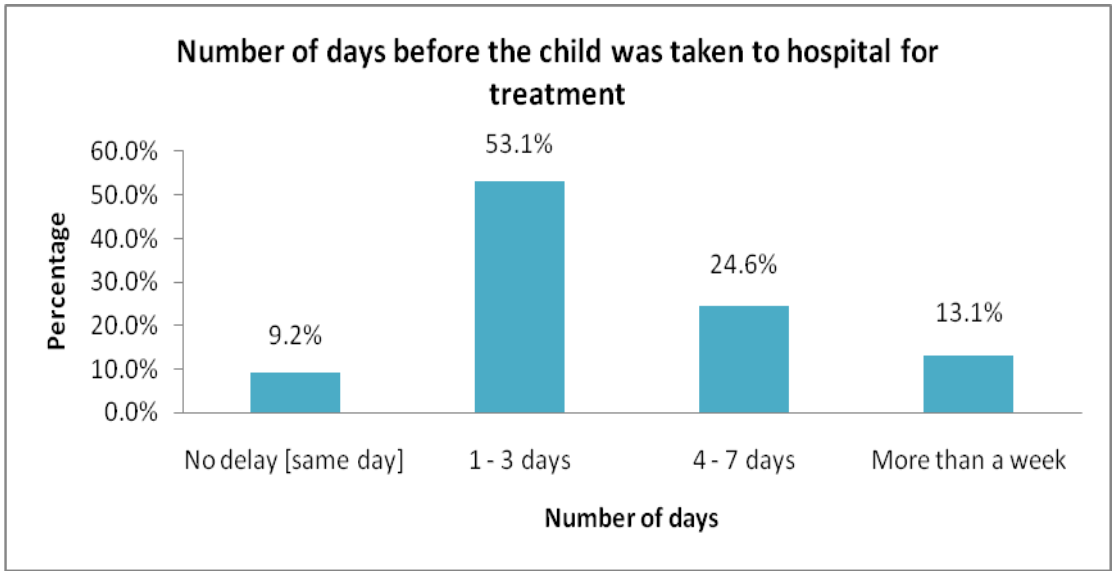

Figure 4.18 Number of days before the child was taken to hospital for treatment

In addition, a statistically significant association was found between delay in seeking treatment and poor outcome of neonatal sepsis (X^2 = 5.135, df = 1 and p = 0.022). Further, the odds of poor outcome of neonatal sepsis were 2.16 times higher among mothers who delayed to seek treatment for their child compared to those who promptly sought medical attention for their child's illness. This implied that delay in seeking hospital treatment for the child did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. The findings were as contained in Table 4.31 below.

Table 4.31 Association of timeliness in seeking treatment for the child with poor outcome of neonatal sepsis

Sought medical attention for the baby promptly?	**Neonatal sepsis outcome**			**Chi-sq. p value (95% CI)**	**Odds ratio value [at 95% CI]**
	Good [N = 48]	**Poor [N = 82]**	**Total**		
Yes	9	3	**12**		2.16
No	39	79	**118**	0.022	[0.785 – 3.535]

4.6.5 Mothers' Understanding of Issued Caregiving Instructions and Poor Outcome of Neonatal Sepsis

The study sought to establish whether the mothers understood caregiving instructions issued related to caring for the sick child.

From the findings, most (76.2%, n = 99) of the mothers did not understand caregiving instructions issued related to caring for the sick child as depicted in Figure 4.19 below.

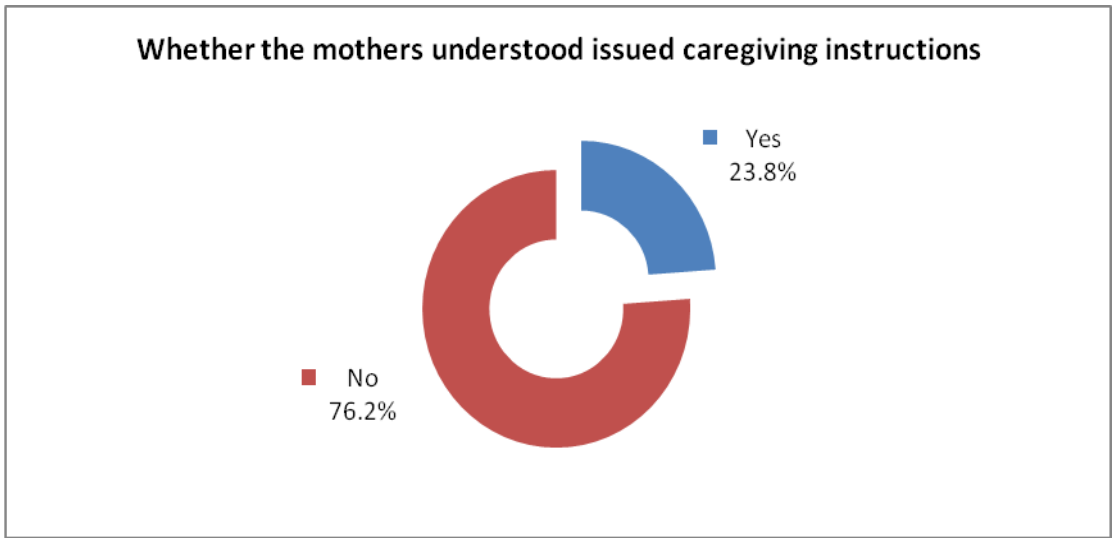

Figure 4.19 Whether the mothers understood issued caregiving instructions

The study further established that a statistically significant association existed between mothers' lack of understanding of issued caregiving instructions and poor outcome of neonatal sepsis (X^2 = 4.321, df = 1 and p = 0.037). Further, the odds of poor outcome of neonatal sepsis were 1.43 times higher among mothers who did not understand issued caregiving instructions compared to those who understood issued caregiving instructions, related to caring for the sick child. This implied that the mothers' lack of or low understanding of issued caregiving instructions (about caring for the sick child) did significantly contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as shown in Table 4.32 below.

Table 4.32 Association of mothers' understanding of issued caregiving instructions with poor outcome of neonatal sepsis

Understands issued caregiving instructions?	Neonatal sepsis outcome			Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]	Total		
Yes	26	5	**31**		1.43
No	22	77	**99**	0.037	[0.437 – 2.423]

4.6.6 Health Information and Poor Outcome of Neonatal Sepsis

The mothers were requested to indicate whether they were provided with health information about caring for the newborn.

Most (71.5%, n = 93) of the mothers indicated that they had not been provided with health information about caring for the newborn as shown in Figure 4.20 below.

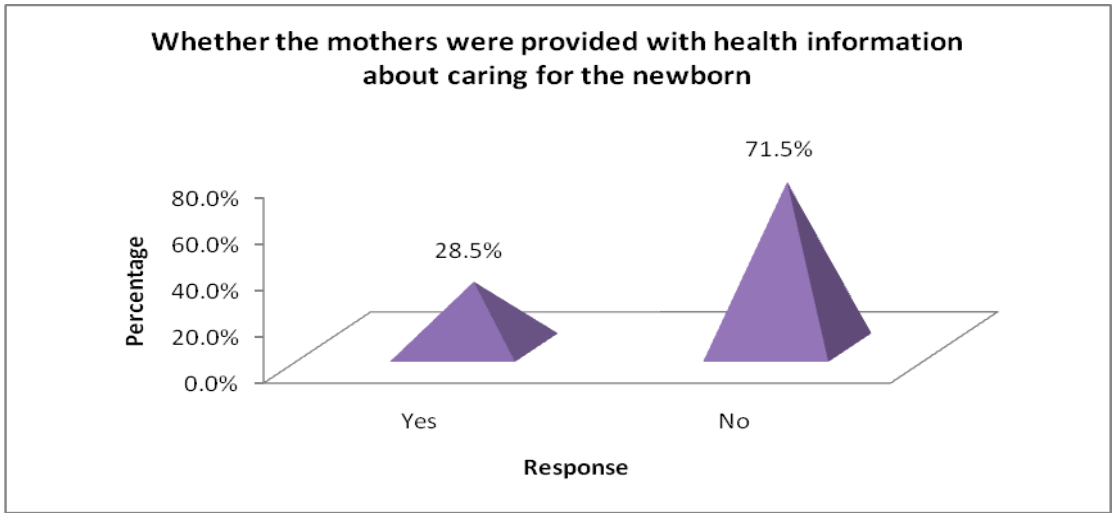

Figure 4.20 Whether the mothers were provided with health information about caring for the newborn

As to the areas/topics taught to the mothers [the 28.5%] in relation to caring for the newborn, the mothers indicated that they were provided with information touching on how to breast feed the child (27%), how to eat healthy (18.9%), how to keep the baby

warm at all times (10.8%), hygiene/cleanliness - both for the mother and the child (10.8%), signs that the child is unwell (10.8%), importance of post natal visits (8.1%), importance of child vaccination (8.1%) and how to protect the child from malaria (5.4%). This was as illustrated in Table 4.33 below.

Table 4.33 Nature of health information provided to the mothers (N = 37)

Nature of health information provided	Frequency	Percent
how to breast feed the child	10	27.0
how to eat healthy	7	18.9
how to keep the baby warm at all times	4	10.8
hygiene/cleanliness - both for the mother and the child	4	10.8
signs that the child is unwell	4	10.8
importance of post natal visits	3	8.1
importance of child vaccination	3	8.1
how to protect the child from malaria	2	5.4
Total	**37**	**100.0**

Mothers' lack of health information about caring for the newborn was found to be significantly associated with poor outcome of neonatal sepsis as denoted by a chi square p value of 0.010. In addition, the odds of poor outcome of neonatal sepsis were 2.05 times higher among mothers not provided with health information about caring for the newborn compared to those provided with health information about caring for the newborn, as depicted in Table 4.34 below. This implied that lack of health information about caring for the newborn among the mothers did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital.

Table 4.34 Association of health information with poor outcome of NS

Provided with health information about caring for the newborn?	Neonatal sepsis outcome			Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]	Total		
Yes	37	56	**93**		2.05
No	11	26	**37**	0.010	[0.582 - 3.518]

4.6.7 Quality of Care Offered and Poor Outcome of Neonatal Sepsis

Most (66.9%, n = 87) of the mothers were not satisfied with the quality of care being offered to their sick child. However, 33.1% (n = 43) said that they were satisfied with the quality of care being offered to their sick child as illustrated in Figure 4.21 below.

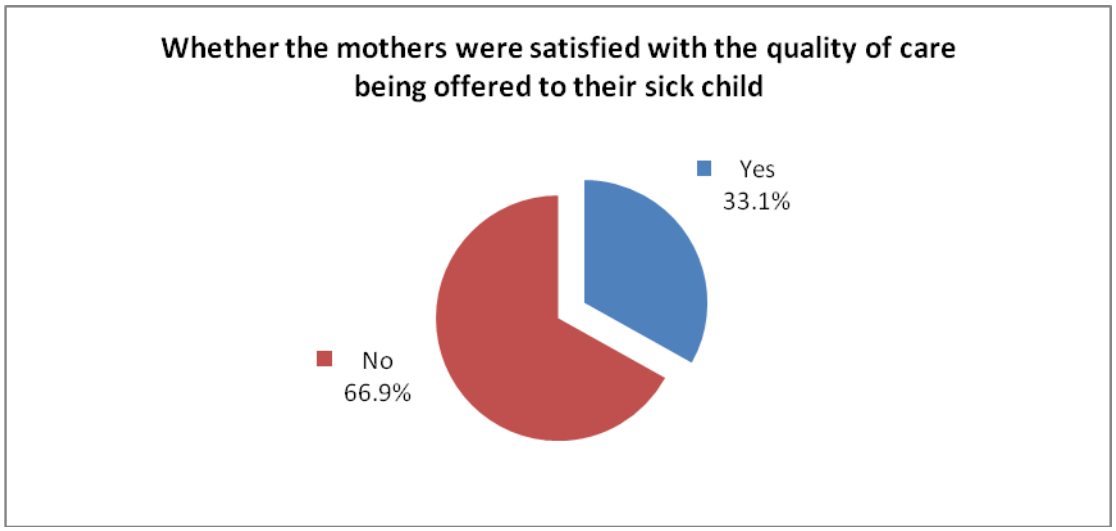

Figure 4.21 Whether the mothers were satisfied with the quality of care being offered to their sick child

Further, a statistically significant association was established between dissatisfaction with the quality of care offered and poor outcome of neonatal sepsis (X^2 = 5.724, df = 1 and p = 0.018). Further, the odds of poor outcome of neonatal sepsis were 1.69 times higher among mothers who felt dissatisfied with the quality of care offered to their sick child compared to those who expressed being satisfied with the quality of

care offered to their sick child. This implied that dissatisfaction with quality of care offered did contribute to poor outcome of neonatal sepsis in Kenyatta National Hospital. This was as shown in Table 4.35 below.

Table 4.35 Association of quality of care offered with poor outcome of neonatal sepsis

Are you satisfied with the quality of care being offered to your sick child	Neonatal sepsis outcome		Total	Chi-sq. p value (95% CI)	Odds ratio value [at 95% CI]
	Good [N = 48]	Poor [N = 82]			
Yes	30	13	**43**		1.69
No	18	69	**87**	0.018	[0.277 – 3.113]

4.6.8 Findings from the Observation Checklist

From the observation checklist, the study established that most (95%, n = 38) of the peadiatric nurses, observed, utilized hand gloves during every procedure. Similarly, most (72.5%, n = 29) of the nurses utilized hand sanitizers during every procedure. However, only (30%, n = 12) of them engaged in hand washing after every procedure. It was also observed that 66.9% (n = 87) of the neonates shared beds; lab results were not promptly processed (as only 12.3%, n = 16 were found to be processed within the expected time) and that there were also delays in review of patients after lab results were out, as observed in 83.1% (n = 108) of the cases. As such, the study noted that there were delays in processing of lab results and subsequent patient reviews and gaps in sufficiency of pediatric patients' accommodation in the hospital. The findings were as captured in Table 4.36 below.

Table 4.36 Results on health care system aspects from the observation checklist

Activities observed		Frequency	Percent
Use of hand gloves during every procedure [for pediatric nurses]	Yes	38	95.0
	No	2	5.0
	Total	**40**	**100.0**
Regular use of hand sanitizers [for pediatric nurses]	Yes	29	72.5
	No	11	27.5
	Total	**40**	**100.0**
Hand washing after every procedure [for pediatric nurses]	Yes	12	30.0
	No	28	70.0
	Total	**40**	**100.0**
Are the neonates sharing beds?	Yes	87	66.9
	No	43	33.1
	Total	**130**	**100.0**
How prompt are lab results processed?	Within expected time	16	12.3
	6 -12 hours late	44	33.9
	more than 12 hours late	70	53.8
	Total	**130**	**100.0**
Are the patients reviewed immediately the results are out?	Yes	22	16.9
	No	108	83.1
	Total	**130**	**100.0**

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents discussion of findings, conclusions and recommendations of the study in line with the study objectives. The study sought to establish the perceived determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

5.2 Discussion of Findings

5.2.1 Maternal Demographic Factors Contributing to Poor Outcome of Neonatal Sepsis

Based on this study, the maternal demographic factors established as significantly contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit were younger or advanced maternal age (of below 25 years or 35 years and above), short stature among mothers, low education levels among mothers, shorter birth intervals (that is, birth intervals of less than 2 years), vaginal mode of delivery, mothers' experiencing of obstetric/medical complications during pregnancy or delivery and mothers' lack of knowledge of danger signs in relation to a child's health status. However, no statistically significant association was established between the mothers' marital status as well as the mothers' religion and poor outcome of neonatal sepsis in the hospital. This implied that a wide range of maternal demographic factors that related to their age, height, education level, birth intervals, mode of delivery, experience of obstetric/medical complications during pregnancy or delivery and knowledge of danger signs in relation to a child's health status were significant determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Similar results were reported by Siakwa et al. (2014), Kayom et al. (2018) and Adatara et al. (2019) who pointed that that risks of mortality and health impairment attributable to NS were much lower when women avoid childbearing at the extremes

of their reproductive life span that is below age 20 and above age 34 years. Very young mothers are not fully mature biologically and their inexperience in taking proper care of the child increases mortality. Conversely, older women experience pregnancy related complications due to advanced age. Short stature was also reported to have adverse effects on neonatal outcomes in studies by Fottrell et al. (2015) and Demisse et al. (2017); while studies by Murthy et al. (2019) and Muthwii (2016) also found a positive and significant association between low maternal education and poor neonatal sepsis outcomes. They attributed this to the fact that uneducated mothers were unlikely to detect signs of sepsis in the neonate at an early stage and hence were only likely to seek medical advice when the condition complicated.

Similarly, results from Adatara et al. (2019) and Gebremedhin et al. (2016) did also show that larger birth intervals had lower risk of poor outcome from NS compared with shorter birth intervals. Studies by Prarthana (2018) and Wu et al. (2009) did also implicate obstetric/medical complications during pregnancy or delivery and mothers' lack of awareness about danger signs in infants as significant risk factors for poor outcome of neonatal sepsis incidences. Similar observations on the role of obstetric/medical complications during pregnancy or delivery and mothers' lack of knowledge of danger signs in relation to a child's health status in increasing the likelihood of poor outcome of neonatal sepsis in infants were also reported by Mitra et al. (2018) and Mogollón (2019).

5.2.2 Maternal Socioeconomic Factors Contributing to Poor Outcome of Neonatal Sepsis

Based on this study, the maternal socioeconomic factors established as significantly contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit were the mothers' lack of income source, low household income level, mothers' lack of financial support from the child's father, rural residence, having large family sizes (with 5 or more members), lack of a health insurance cover, failure to regularly observe proper hand washing hygiene at all times and the mothers' lack of awareness about neonatal sepsis. This implied that a wide range of maternal socioeconomic factors that related to their occupation (or having an income source),

household income level, financial support from the child's father, place of residence, family size, possession of a health insurance cover, observance of proper hand-washing hygiene at all times and level of awareness about neonatal sepsis were significant determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

The findings concurred with those of Kayom et al. (2018) and Kumar et al. (2016) who also observed that mothers' low socioeconomic status evidenced by such aspects as low household income level, mothers' lack of income sources and mothers' lack of financial support from the child's father were significantly associated with poor outcomes of NS. Low socioeconomic status, as evidenced by mothers' lack of income, dependence on male spouses for financial support and lack of a health insurance cover, according to John et al. (2015) and Mersha et al. (2019), may affect the mother's choice of place of delivery and her entire welfare during antenatal, delivery and postnatal, in turn increasing the odds of poor neonatal outcomes such as from the NS infection.

Significant risk factors for poor NS outcomes, according to a study by Mitra et al. (2018), included previous child death in the family; overcrowding; home delivery; unclean cord care and low household income status. The study concluded that neonatal infections and associated deaths could be reduced by identifying and following up high-risk mothers and newborns and promoting the socio-economic status of women especially in resource-poor countries where the burden of clinically ascertained neonatal infections is high. Studies by Abu-Salah (2011), Medhat et al. (2017) and Alemu et al. (2019) also identified low household income status, overcrowding at homes; home-delivery as against facility-based delivery; poor hand-washing hygiene practices, low paternal support in child care and lack of means to access affordable quality health care services as significant risk factors for poor neonatal sepsis outcomes.

5.2.3 Newborn Associated Factors Contributing to Poor Outcome of Neonatal Sepsis

Based on this study, the newborn associated factors established as significantly contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit were male gender; prematurity at birth; low birth weight; very young age, of 1 - 7 days, at admission; not crying immediately at birth; low APGAR scores in the first and fifth minute; longer duration of hospitalization; not being breastfed immediately after birth and having other pre-existing illnesses other than NS. This implied that a wide range of newborn associated factors relating to the newborns' gender, gestational age at birth, birth weight, age at admission and duration of hospitalization, general state of health at birth, exclusive breastfeeding status immediately after birth and having other pre-existing illnesses prior to NS diagnosis were significant determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Similarly, a study by Fleischmann-Struze et al. (2018) found that neonatal sex had an influence on the outcome of neonatal mortality attributable to NS with mortality rates from NS found to be higher among male neonates than female neonates. Being male was also identified as being a risk factor for neonatal mortality from NS in a study by Liang et al. (2018). Studies done by Leal et al. (2012) and Abu-Salah (2011) indicated that the risk of neonatal death from NS increased greatly in premature babies than in babies born at term. Similarly, a study by Adatara et al. (2019) in Ghana established that gestational age at birth was statistically significantly associated with neonatal mortality with NS associated neonatal mortality found to be four times higher in preterms compared to in normal/full term babies. Other studies that identified prematurity as a major risk factor for neonatal mortality due to NS included those by Alemu et al. (2019), Jabiri et al. (2016) and Wu et al. (2009).

Studies by Kumar et al. (2016) and Masanja et al. (2019) also noted that low birth weight neonates were more likely to experience NS related deaths compared to normal birth weight babies, a finding also reported by Ghosh & Sharma (2011). As argued by Kumar et al. (2016), a child's general state of health at birth is also a major

determinant of outcome from NS diagnosis and treatment. Neonates with a poor general state of health evidenced by poor Apgar scores in the first and fifth minutes, longer hospitalizations and having other pre-existing illness are more likely to register poor outcomes of NS (Siakwa et al., 2014). Low Apgar scores at the first and at the fifth minutes have also been significantly associated with neonatal mortality. As pointed out by Kayom et al. (2018) and Hammad and Zainab (2018), the odds of mortality in babies with low Apgar scores at the set timings are higher than in those whose Apgar scores are okay.

5.2.4 Health Care System Factors Contributing to Poor Outcome of Neonatal Sepsis

Based on this study, the health care system factors established as significantly contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit were delivering at home, low ANC attendance among the mothers, mothers' inability to breast feed their child, delay in seeking hospital treatment for the child, mothers' lack of or low understanding of issued caregiving instructions (about caring for the sick child), lack of health information about caring for the newborn among the mothers and dissatisfaction with the quality of care offered. This implied that a wide range of health care system factors that related to place of delivery, ANC attendance, breast feeding of the child, timeliness in seeking hospital treatment for the child, mothers' understanding of issued care giving instructions, access to health information about caring for the newborn and quality of care offered were significant determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

The findings were in agreement with those of Jabiri et al. (2016) and Alemu et al. (2019) who noted that neonates delivered outside hospitals and neonates of mothers with low ANC attendance had higher poor neonatal sepsis treatment outcomes compared to those delivered in hospitals and those whose mothers had high rates of ANC attendance. The findings also agreed with those of Mugadza et al. (2018) and Adatara et al. (2019) who reported that some of the health care system factors that predicted poor outcome of NS in neonates were mother's low attendance of antenatal

and postnatal care clinics, delays in seeking hospital treatment for the sick child and lack of health information to mothers about caring for the newborn. Encouraging maternal antenatal and postnatal care utilization is hence instrumental to development of appropriate interventions to reduce NS incidences. Studies by Muthwii (2016), Demisse et al. (2017), Liang et al. (2018) and Mogollón et al. (2019) also cited poor attendance of antenatal care clinics, low levels of maternal screening for infections during the ANC, mothers' inability to breast feed the neonates, lack of health education on how to care for the neonates, being delivered by traditional birth attendants as compared to being delivered in a health facility, congestion in hospitals and inadequate medical supplies in hospitals as significant contributors of poor outcomes of NS among affected neonates.

5.3 Conclusions

Based on the findings of the study, the researcher drew the following conclusions:

Younger or advanced maternal age, short stature among mothers, low education levels among mothers, shorter birth intervals (that is, birth intervals of less than 2 years), vaginal mode of delivery, mothers' experiencing of obstetric/medical complications during pregnancy or delivery and mothers' lack of knowledge of danger signs in relation to a child's health status were the maternal demographic factors that contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Mothers' lack of income source, low household income level, mothers' lack of financial support from the child's father, rural residence, having large family sizes (with 5 or more members), lack of a health insurance cover, failure to regularly observe proper hand washing hygiene at all times and the mothers' lack of awareness about neonatal sepsis were the maternal socioeconomic factors that contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Being of male gender; prematurity at birth; low birth weight; very young age, of 1 - 7 days, at admission; not crying immediately at birth; low APGAR scores in the first and fifth minute; longer duration of hospitalization; not being breastfed immediately

after birth and having other pre-existing illnesses other than NS were the newborn associated factors that contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

Delivering at home, low ANC attendance among the mothers, mothers' inability to breast feed their child, delay in seeking hospital treatment for the child, mothers' lack of or low understanding of issued caregiving instructions (about caring for the sick child), lack of health information about caring for the newborn among the mothers and dissatisfaction with the quality of care offered were the health care system factors that contributed to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit.

5.4 Recommendations

5.4.1 Action Recommendations

There is need for caregivers to be educated about neonatal infections including neonatal sepsis and the need for them to seek immediate treatment in a health care setting when a child falls sick.

Given maternal socioeconomic status has an effect on neonatal care outcomes, the national government with the help of county governments and development partners should invest in community empowerment programs that aim to improve the socioeconomic status of caregivers and their households. In addition, further investments in the health care system are needed to make it more affordable to all and particularly to the low income groups.

There is need for awareness creation among mothers on the value of antenatal and postnatal care services utilization and observing high standards of personal hygiene and good nutrition prior to, during and after birth.

Kenyatta National Hospital should institute necessary hospital based policies and interventions to improve the quality of care offered to pediatric neonatal sepsis patients in the facility.

5.4.2 Recommendations for Further Studies

Since the current study explored the determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit; a wider study involving other Level 5 and Level 4 hospitals in the country is hereby recommended. This will facilitate a broader comparison and generalization of the study findings.

Study Planning

Time Frame

Activity	Oct 2019	Nov 2019	Dec 2020	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	June 2020	July 2020
Development of the concept										
Proposal writing and presentation										
Submission of proposal to Ethics Board										
Pretesting the instrument										
Data collection and analysis										
Report writing and corrections										
Presentation of the project										
Project results dissemination										

Budget

Item	**Quantity**	**Unit Cost**	**Total Cost**
Assorted stationeries			Ksh. 5,400
Proposal writing			
Fair copies printing	3 copies, 100 pgs	@Ksh.(5per page x 100)3	Ksh. 1,500
Final copy printing	2 copies, 100 pgs	@ Ksh.(5 per page x100)2	Ksh. 1,000
Final copies photocopy	4 copies, 100 pgs	@Ksh.(5 per page x100)4	Ksh.2,000
Binding	6 copies	@ ksh. (1,000 per copy)6	Ksh. 6,000
Project Writing			
Data analysis statistician	1		Ksh.30,000
Fair copies printing	2 copies, 100 pgs	@ Ksh.(5 per page x100)2	Ksh. 1,000
Final copy printing	4 copies, 100 pgs	@Ksh.(5 per page x100)4	Ksh.2000
Binding	3 copies	@ ksh. (1000 per copy)3	Ksh. 3,000
Pretesting	Pilot - 1	@ Ksh. 15,000	Ksh. 15,000
Transport cost	1 person for 21 days	@ Ksh 500 x 21 days	Ksh. 20,500
Meals	@200 per day	@200 x 21 days	Ksh. 4,200
Project results dissemination			
Publication in a peer reviewed journal		@Ksh. 40,000	Ksh. 40,000
		Sub-total	**Ksh. 131,600**
Contingencies	10%		13,160
		Grand Total	**Ksh. 144,760**

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APPENDICES

Appendix 1: Participants' Information Guide

Title of Study: Perceived determinants of Poor Outcome of Neonatal Sepsis at Peadiatric Unit of Kenyatta National Hospital

Principal Investigator\and institutional affiliation: Jepkosgei Kimaiyo – Reg. No.: H56/11536/2018, University of Nairobi

Supervisors: Dr. Omuga and Dr. Ongeso, University of Nairobi

Introduction

My name is Jepkosgei Kimaiyo a student at the University of Nairobi pursuing a Master of Science Degree in Nursing (Paediatrics). I am undertaking a thesis study on 'perceived determinants of poor outcome of neonatal sepsis at Peadiatric Unit of Kenyatta National Hospital'.

Purpose of the study

The aim of the study is to establish the perceived determinants of poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. I am requesting for your participation in this study by giving me your views and opinions regarding the study subject. If you choose to participate, the researcher will ask you a series of questions that seek to gather information relating to the maternal demographic, maternal socioeconomic, newborn associated and health care system factors contributing to poor outcome of neonatal sepsis in Kenyatta National Hospital's Paediatric Unit. Our discussion will take about 15 minutes.

Confidentiality

All the information provided will be treated in utmost confidentiality. In addition, all the information given herein will only be used for research purposes. Your name or anything else that may identify you will not appear anywhere in the study as the study will use statistics.

Voluntary participation

Your participation in this study is voluntary. There will be no penalties for any decline and you can withdraw at any stage of data collection with no penalties. However, I will greatly appreciate your participation because your views are very important for the success of this study.

Benefit

This research work is for academic purposes only and if you agree to participate, the information that you will provide will be of great importance to various stakeholders in improving the quality of care for neonates diagnosed with neonatal sepsis in the country. The study aims at contributing to efforts of reducing neonatal mortality attributable to neonatal sepsis in the country. However, there will be no monetary gains or any other form of payment for participating.

Risks

There will be no any harm to you, your family or the child as a result of your participation in this study.

Contacts

For any queries regarding this study, kindly contact;

Principal researcher: Jepkosgei Kimaiyo, Cell: 0780 720 663

OR

Secretary, Ethics and Research Committee of KNH/UON, Telephone: 020-2726300 Ext 44355

[*Please ensure that you have read the following, or that the following has been read to you, and that you fully understand what is involved in participating in this study and that your role as respondent has been fully explained to you*.]

Appendix 2: Kiswahili Version of the Participants' Information Guide

Jina la utafiti: Mambo yanayochangia matokeo duni ya maambukizi ya sepsis katika eneo la matibabu ya watoto ya hospitali kuu ya Kenyatta

Mtafiti mkuu / na uhusiano wa kitaasisi: Jepkosgei Kimaiyo – Nambari ya usajili: H56/11536/2018, Chuo Kikuu cha Nairobi

Wasimamizi: Daktari Omuga na Daktari Ongeso, Chuo Kikuu cha Nairobi

Utangulizi

Jina langu ni Jepkosgei Kimaiyo mwanafunzi katika chuo kikuu cha Nairobi. Ninashiriki katika masomo ya Shahada ya Uzamili ya Uuguzi (Matibabu ya Watoto). Ninafanya utafiti kuhusu 'mambo yanayochangia matokeo duni ya maambukizi ya sepsis katika eneo la matibabu ya watoto ya hospitali kuu ya Kenyatta'.

Lengo la Utafiti

Lengo la utafiti huu ni kuchanganua mambo yanayochangia matokeo duni ya maambukizi ya sepsis katika eneo la matibabu ya watoto ya hospitali kuu ya Kenyatta. Utafiti huu utasaidia kuongeza ufahamu kuhusu mambo yanayochangia matokeo duni ya maambukizi ya sepsis miongoni mwa watoto wachanga katika hospitali kuu ya Kenyatta. Utafiti huu unahusisha akina mama wenye watoto waliolazwa katika hospitali kuu ya Kenyatta na ambao wameugua ugonjwa wa sepsis. Utatakiwa kujibu maswali yaliyoko katika dodoso la utafiti huu. Mahijiano yetu yatachukua takriban dakika kumi na tano.

Usiri

Majibu yote utakayotoa yatakuwa siri na hayataonyeshwa kwa watu wengine zaidi ya wale wanaohusika katika utafiti huu. Taarifa utakazozitoa zitatumika kwa lengo la utafiti tu na sio sababu nyingine yeyote. Jina lako au kitu chochote cha kukutambulisha hakitaonekana kwenye ripoti na badala yake tutatumia takwimu.

Kushiriki kwa hiari

Ushiriki katika utafiti huu ni wa hiari. Unaweza kusitisha mahojiano wakati wowote endapo utaona ni vyema kufanya hivyo na hakutakuwa na athari zozote na hautapoteza heshima yako. Hata hivyo, kama utashiriki utatusaidia sana katika utafiti huu kwani taarifa utakazotoa ni muhimu sana katika kufanikisha utafiti huu.

Faida

Utafiti huu ni kwasababu ya kujiendeleza kimasomo na kama utakubali kushiriki katika utafiti huu, tunategemea kwamba taarifa tutakazozipata kutoka kwako zitakuwa na maana au faida kwetu na kwa wadau wengine katika kuimarisha huduma za afya na matibabu ya maambukizi ya sepsis baina ya watoto wachanga katika hospitali kuu ya Kenyatta. Hata hivyo, hakutakuwa na malipo yoyote kutokana na kushiriki kwako katika utafiti huu.

Madhara

Hakuna madhara yoyote inayotazamiwa kwako, kwa familia yako au kwa mtoto wako juu ya kushiriki kwako katika utafiti huu.

Mawasiliano

Ukiwa na maswali yoyote kuhusu utafiti huu, tafadhali wasiliana na;

Mtafiti mkuu: Jepkosgei Kimaiyo, Nambari ya Simu: 0780 720 663

au

Mwandishi wa kamati ya ithini na utafiti ya Kenyatta na Chuo Kikuu cha Nairobi (KNH/UON), Nambari ya Simu: 020-2726300 Ext 44355

[*Tafadhali hakikisha ya kwamba umesoma maelezo yaliyopeanwa au umesomewa maelezo hayo na umeyaelewa kikamilifu. Hakikisha pia kuwa umeelezewa jukumu lako katika utafiti huu*.]

Appendix 3: Informed Consent Form

Respondent's Declaration

I have been fully informed about the nature of the study, I know the benefits, and understand that there are no risks involved. I hereby give my consent to participate in this study.

Signature of participant ……. Date …….

Researcher's Declaration

I have fully disclosed all the relevant information concerning this study to the study respondent.

Signature of researcher ……. Date ……

Appendix 4: Fomu ya Idhini

Tamko la Mshiriki

Nimefahamishwa kwa kina kuhusu utafiti huu. Naelewa faida yake na najua kuwa hakuna madhara yoyote kwa kushiriki. Hivyo basi, nakubali kushiriki katika utafiti huu.

Saini ya mshiriki …….. Tarehe ..…….

Tamko la Mtafiti

Nimemjulisha mshiriki taarifa/habari zote muhimu kuhusu utafiti huu.

Saini ya mtafiti ……..…….……. Tarehe …….

Appendix 5: Questionnaire

Section A: Maternal demographic factors

What is your age in years? ……

What is your height (in cm)? ……

What is your education level?

No formal education ( ) Primary education ( )

Secondary education ( ) Tertiary education ( )

What is your marital status?

Single ( ) Married ( ) Separated ( ) Divorced ( ) Widowed ( )

What is your religion?

Christian ( ) Muslim ( ) No religion ( )

Other (Specify) ……..….

Is this your first child?

Yes ( ) No ( )

If No, he/she is child number? ……

If No, how long did you take to have this child from the immediate previous one?

……

What was your mode of delivery of this child?

Vaginal delivery ( ) Caesarian section ( )

Instrumental ( )

Did you experience any obstetric and/or medical complications during pregnancy or delivery?

Yes ( ) No ( )

If Yes, which one (specify)? ……

Are you aware of any danger signs in relation to a child's health status?

Yes ( ) No ( )

If Yes, which ones (list)? ……

Section B: Maternal socioeconomic factors

What is your occupation? ……..……

What is your household's monthly income level? ……..……

Do you receive any form of financial support from the father of the child?

Yes ( ) No ( )

Where do you live?

Rural ( ) Urban ( )

What is your family size? ……..

Does your family have a health insurance cover?

Yes ( ) No ( )

If Yes, which one?

NHIF ( ) Employer-based ( ) Private ( )

If No, why? ……

Do you regularly observe proper hand washing hygiene at all times?

Yes ( ) No ( )

Had you ever heard about neonatal sepsis prior to this hospitalization?

Yes ( ) No ( )

If Yes, from what sources? …….

Section C: Newborn associated factors

The child's gender: Male ( ) Female ( )

Gestational age at birth: < 37 weeks ( ) 37 – 40 weeks ( )

≥ 41 weeks ( )

The child's birth weight: < 2500g ( ) 2500g - 3999g ( )

≥ 4000g ( )

The child's age on admission to the hospital ……

Did the child cry immediately at birth? Yes ( ) No ( )

Did the child receive resuscitation at birth? Yes ( ) No ( )

The child's APGAR score in the first minute: ……

The child's APGAR score in the fifth minute: ……

The child's duration of stay in the hospital: ……

Was the child immediately breastfed after birth: Yes ( ) No ( )

Did the child have any other pre-existing illnesses prior to the NS diagnosis?

Yes ( ) No ( )

If so, which ones? …… (specify)

Section F: Health care system factors

Where did you deliver this child? At home ( ) In hospital ( )

Number of ANC visits: ……

During the ANC visits, were you screened for infections? Yes ( ) No ( )

If Yes, which infections? …….

……..……..

Were they treated? Yes ( ) No ( )

Were you referred to any other hospital for treatment? Yes ( ) No ( )

Were you given Antibiotics? Yes ( ) No ( )

Are you able to breast feed the child? Yes ( ) No ( )

If No, why? …….

……..……..……..

How long did you take to bring the baby to hospital after the illness began?

……

If not immediately, why? (please explain)

……..

……..

Do you understand caregiver's instructions on caring for the sick child?

Yes ( ) No ( )

Were you given any health information on how to care for the newborn?

Yes ( ) No ( )

If Yes, on which topics?

…….....

……..……

Are you satisfied with the quality of care being offered to your sick child?

Yes ( ) No ( )

If No, why? ……

Thank you for your participation

Appendix 6: Observation Checklist

Observation checklist for health care system aspects		
	Yes	**No**
Hand washing after every procedure		
Use of hand sanitizers		
Use of hand gloves during every procedure		
Are the neonates sharing beds		
How fast/prompt are lab results processed		
Within expected time		
12 hrs. late.		
More than 12 hrs. late.		
Are the patients reviewed immediately the results are out?		
If not, how long does it take?		
Within 6 hrs		
Within 12 hrs.		
Within 24 hrs.		
More than 24 hrs		

Appendix 7: Letter to Ethical and Research Committee

Jepkosgei Kimaiyo,

Reg. No. H56/11536/2018,

School of Nursing Sciences,

College of Health Sciences,

University of Nairobi.

The Secretary,

KNH/UoN - Ethics and Research Committee,

P.O. Box 20723-00202,

Nairobi.

Dear Sir/Madam,

RE: <u>Approval To Conduct A Research Study</u>

My name is Jepkosgei Kimaiyo a student at the University of Nairobi, School of Nursing Sciences undertaking a Masters of Science Degree in Nursing (Peadiatrics). I am hereby requesting for your approval to carry out a research study on "perceived determinants of poor outcome of neonatal sepsis at Peadiatric and Newborn Units of Kenyatta National Hospital", as a requirement in partial fulfillment for the award of the said degree.

Thank you in advance.

Yours faithfully,

Jepkosgei Kimaiyo.

Appendix 8: Letter to Deputy Director of Nursing Services – KNH

Jepkosgei Kimaiyo,

Reg. No. H56/11536/2018,

School of Nursing Sciences,

College of Health Sciences,

University of Nairobi.

The Deputy Director,

Nursing Services – KNH,

Nairobi.

Dear Sir/Madam,

RE: <u>Authority To Carry Out A Research Study at KNH</u>

My name is Jepkosgei Kimaiyo a student at the University of Nairobi, School of Nursing Sciences undertaking a Masters of Science Degree in Nursing (Peadiatrics). I am undertaking a research study on "perceived determinants of poor outcome of neonatal sepsis at Peadiatric and Newborn Units of Kenyatta National Hospital", as a requirement in partial fulfillment for the award of the said degree.

I am therefore hereby requesting for your authorization to conduct data collection within the Peadiatric and Newborn Units of KNH on mothers of infants admitted with neonatal sepsis.

Yours faithfully,

Jepkosgei Kimaiyo.

Appendix 9: Approval Letter from KNH-UoN Ethics & Research Committee

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

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/236

21st July 2020

Jepkosgei Kimaiyo
Reg. No.H56/11536/2018
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Jepkosgei

RESEARCH PROPOSAL – DETERMINANTS OF POOR OUTCOME OF NEONATAL SEPSIS AT THE PAEDIATRIC UNIT OF KENYATTA NATIONAL HOSPITAL (P84/02/2020)

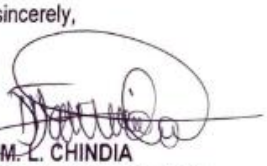
This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 21st July 2020 – 20th July 2021.

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 serious 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. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f. 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*).
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 **http://www.erc.uonbi.ac.ke**

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Director, School of Nursing Sciences, UoN
Supervisors: Dr. Blasio Osogo Omuga, School of Nursing Sciences, UON
Dr. Abednego Ongeso, School of Nursing Sciences, UoN

Appendix 10: Approval Letter from Kenyatta National Hospital

KENYATTA NATIONAL HOSPITAL
P.O. BOX 20723, 00202 Nairobi

Tel.: 2726300/2726450/2726550
Fax: 2725272
Email: knhadmin@knh.or.ke

Ref: KNH/PAEDS-HOD/48 Vol.II

Date: 14th August 2020

Jepkosgei Kimaiyo
School of Nursing Services
College of Health Sciences
University of Nairobi

Dear Jepkosgei

RE: AUTHORITY TO COLLECT DATA IN PAEDIATRICS DEPARTMENT

Following approval by the KNH/UON-Ethics & Research Committee for your Research Proposal and subsequent filing of the Study Registration Certificate, this is to inform you that authority has been granted to collect data in ***Paediatrics Department***, on your study titled ***"Determinants of poor outcome of neonatal sepsis at the Paediatric unit of Kenyatta National Hospital"***.

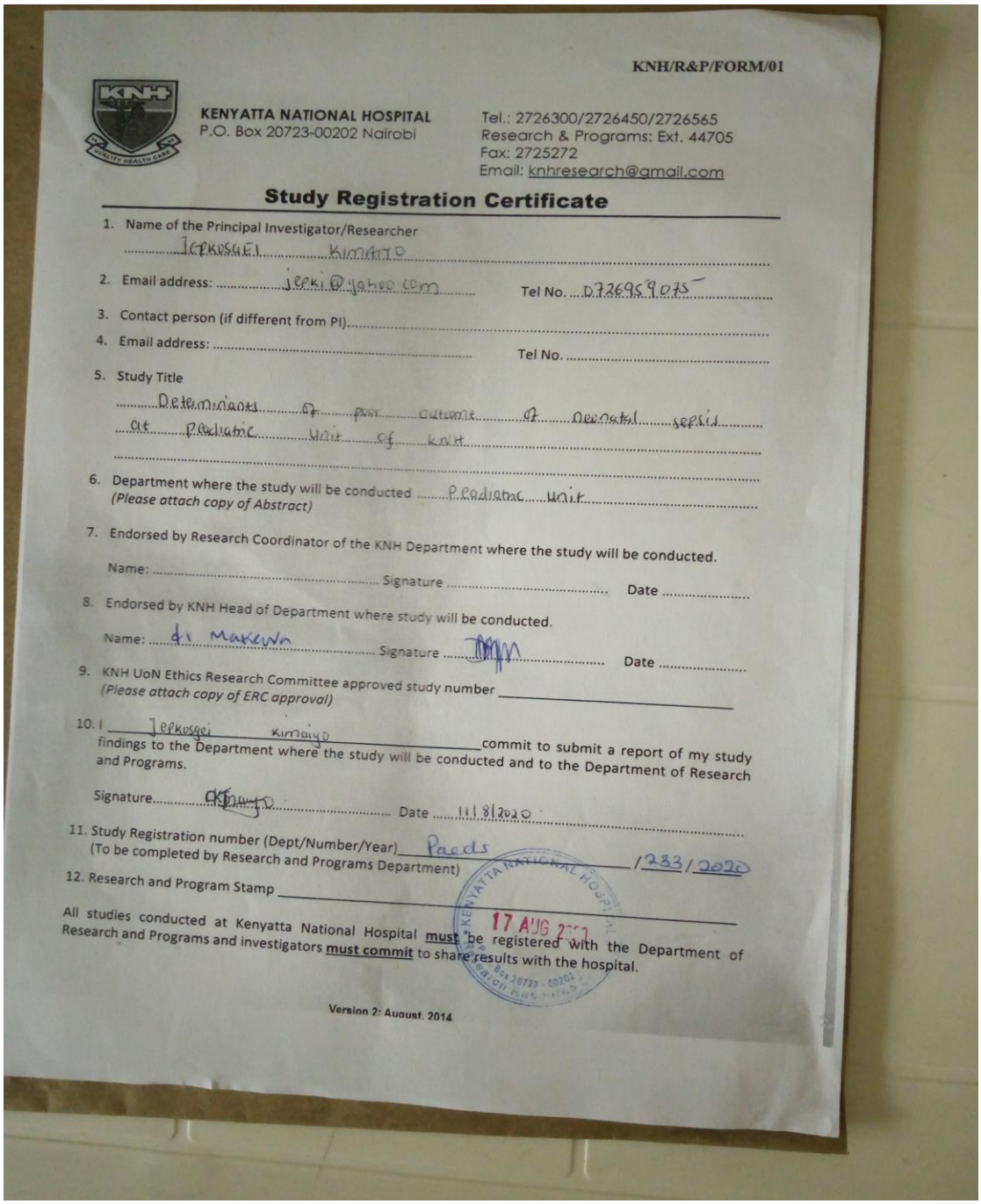
Kindly liaise with the Senior Assistant Chief Nurse, Paediatrics for facilitation.

You will also be required to submit a report of your study findings to the Department of Paediatrics after completion of your study.

Dr. Douglas Makewa
HEAD OF DEPARTMENT, PAEDIATRICS

Cc. Senior Assistant Chief Nurse, Paediatrics

Appendix 11: Study Registration Certificate



KNH/R&P/FORM/01

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
   Jepkosgei Kimaiyo
2. Email address: jepki@yahoo.com Tel No. 0726959075
3. Contact person (if different from PI)
4. Email address: Tel No.
5. Study Title
   Determinants of poor outcome of neonatal sepsis at Pediatric Unit of KNH
6. Department where the study will be conducted Pediatric unit
   (Please attach copy of Abstract)
7. Endorsed by Research Coordinator of the KNH Department where the study will be conducted.
   Name: Signature Date
8. Endorsed by KNH Head of Department where study will be conducted.
   Name: dr Makeyo Signature Date
9. KNH UoN Ethics Research Committee approved study number
   (Please attach copy of ERC approval)
10. I Jepkosgei Kimaiyo commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Research and Programs.
    Signature Date 11/8/2020
11. Study Registration number (Dept/Number/Year) Paeds /233/2020
    (To be completed by Research and Programs Department)
12. Research and Program Stamp

KENYATTA NATIONAL HOSPITAL 17 AUG 2020 P.O. Box 20723 - 00202 Nairobi

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Research and Programs and investigators **must commit** to share results with the hospital.

Version 2: August. 2014

Appendix 12: Directional Map of KNH

Appendix 13: Photo of KNH

Appendix 14: Glossary

Neonate: An infant in the first 28 days after birth.

Sepsis: Whole body inflammation caused by an overwhelming immune response to infection.

Neonatal sepsis: Sepsis in the first 28 days after birth.

Early onset sepsis: Sepsis within the first 72 hours of life.

Late onset sepsis: Sepsis presenting after 72 hours of life.

Incidence: Number of new cases of a condition.

Nosocomial infection: Infections acquired in hospitals and other healthcare facilities.

Neonatal mortality: Death of a newborn in the first 28 days after birth.

Poor outcome of neonatal sepsis: If a neonate is not improving after completing the treatment, presented with complications or died.

Good outcome of neonatal sepsis: When a neonatal improves after completing the treatment without any complication e.g. meningitis, shock, deafness or seizure.

Appendix 15: Research Project Plagiarism Report

Research Project

by Jepkosgei Kimaiyo

Submission date: 23-Nov-2020 01:10PM (UTC+0100)
Submission ID: 1454953172
File name: Research_Project_APleg_-_Carol.doc (1.05M)
Word count: 19949
Character count: 101684

Research Project

ORIGINALITY REPORT

9%	6%	3%	3%
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3	bmcpediatr.biomedcentral.com Internet Source	<1%
4	Tilahun Tewabe, Seida Mohammed, Yibeltal Tilahun, Birhanie Melaku et al. "Clinical outcome and risk factors of neonatal sepsis among neonates in Felege Hiwot referral Hospital, Bahir Dar, Amhara Regional State, North West Ethiopia 2016: a retrospective chart review", BMC Research Notes, 2017 Publication	<1%
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