CHARACTERIZATION OF NEONATAL SEPSIS AMONG PATIENTS ADMITTED IN KENYATTA NATIONAL HOSPITAL PAEDIATRIC WARDS.

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DECLARATION

I, Florence Kalunda Muthwii declare that this dissertation is my own original work and it has not been presented in a University or an academic institution of higher learning for an academic award.

Sign……...

Date……

CERTIFICATE OF APPROVAL

We certify that this dissertation has been submitted with our approval as University supervisors.

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To future mothers and newborns.

LIST OF ABBREVIATIONS

ANC- Antenatal care

APGAR-(Appearance, Pulse, Grimace, Activity, Respiration)

BSCN-Bachelor of science in nursing

CI- confidence interval

CSF-cerebral spinal fluid

df-degrees of freedom

D.I.C- disseminated intravascular coagulopathy.

E. coli-Escherichia coli

FGD- Focused Group Discussion

GBS-group b streptococcus

Hr.-hour

HSV-human simplex virus

I.e- that is

IgG-immunoglobulin G

IgM-immunoglobulin M

Kg-kilogram

K.N.H-Kenyatta national hospital

LBW-low birth weight

LOS- late onset sepsis

NICU-neonatal intensive care unit

NNS-neonatal sepsis

OR-odds ratio

PROM-premature rupture of membranes

RDS-respiratory distress syndrome

SPSS- Statistical package for social sciences

UN-United Nations

UN- undefined (in data analysis)

UON- University of Nairobi

VLBW-very low birth weight

WHO-world health organization

*significant p-value

OPERATIONAL DEFINITIONS

Characteristics -maternal, neonatal and environmental attributes that contribute to the development of neonatal sepsis.

Co-morbid - disease conditions that occur prior to or together with neonatal sepsis.

Early onset neonatal sepsis- neonatal sepsis that occurs within first seven days of life

Gross income- the amount of money earnt per month by both spouses or by those an unemployed mother depends upon for upkeep

Health care provider- trained health professional who directly interacts with the mother in service delivery during prenatal as well as postnatal period (i.e; Doctors, nurses, clinical officers)

Late onset neonatal sepsis- sepsis to neonate that occurs between >7-28days after delivery

Mild neonatal sepsis- sepsis that present with initial symptoms which implies no organ system failure e.g: hotness of body, refusal to feed.

Mother- the biological maternal parent to the neonate admitted with neonatal sepsis.

Neonate- a newborn aged 0-28days

Neonatal sepsis- is a clinical syndrome caused by invasion of the bloodstream by bacteria in the first month of life.

Nursery - a place within the health facility where clinically unstable newborn is monitored and managed after delivery.

Patient – neonate admitted with neonatal sepsis

Severity of NNS- the extent to which NNS has affected organ systems

Severe neonatal sepsis - sepsis depicting organ/system failure eg. Gangrene, bloody vomitus

Study participant- mother to neonate suffering from neonatal sepsis and admitted in paediatric ward in K.N. H

ABSTRACT

Introduction: Neonatal sepsis remains a common and serious problem. There are four million neonatal deaths annually worldwide. One out the four million neonatal deaths is due to neonatal sepsis.

Background: Neonatal sepsis is a major cause of neonatal mortality. It accounted for 44% of all deaths of under -five year old children globally in year 2012. Statistics indicate that 98% of the global one million deaths as a result of neonatal sepsis occur in Africa. Neonatal sepsis contributes to 69% of neonatal mortality in Nigeria and 28% of neonatal mortality in Kenya.

Study objective: The study sought to identify characteristics of neonates admitted for management of neonatal sepsis in Kenyatta National Hospital (K.N.H) paediatric wards.

Hypothesis: Neonatal, maternal and environmental characteristics contribute to the development of neonatal sepsis.

Methodology

The study adopted a descriptive cross-sectional design. It was carried out within paediatric wards in K.N.H-Kenya. Data was obtained from consenting mothers and healthcare workers. The researcher gathered data on maternal, neonatal and environmental characteristics associated to the development of neonatal sepsis. Study subjects were selected by systematic random sampling method in which every alternate participant was selected. A total of 107 study participants constituted the study sample. Three focused group discussions comprising nurses, doctors and clinical officers were conducted.

Data was collected by use of researcher administered semi-structured questionnaire. Qualitative data was audio-taped. Data was cleaned, entered into computer and analyzed using Statistical Package for Social Sciences (SPSS) version 20. Level of significance was at ≤ 0.05.

Study results

More than half of the neonates 62(57.9%) were males. Fifty percent of the neonates managed in nursery after delivery had fetal distress at birth. Sixty-seven (62.6%) had mild neonatal sepsis and 40(37.4%) had severe neonatal sepsis during admission. Among the sampled mothers, (44.9%) were aged between 20-25 years, (78.5%) were married while fifty-two (48.6%) had attained secondary school education. Fifty-two (47.7%) of the mothers were unemployed and most (42.1%) were earning between KShs of 10,000 – 20,000 per month. More than half 60(56.1%) of the mothers were primiparas. Majority 68(63.6%) of the deliveries took place at public/government health facility. Twenty (18.7%) of the mothers were discharged hours after delivery. Cord care practice was varied.

There was a statistical significance of more severe forms of NNS among neonates whose mothers attended 1-3 times of antenatal care [OR=2.67; P=0.044], those who developed NNS within 8 to 28 days of life [OR=3.16; P=0.024] as well as neonates who were formula-fed after delivery [OR=5.33; P=0.019].

Maternal characteristics which demonstrated a statistical significance to severe neonatal sepsis included; primary level of education (55.0%) [OR=4.89; P=0.010], primiparity [OR=3.46; P=0.003] households whose income was less than KShs 10,000 per month more severe NNS (50.0%) [OR=6.33; P=0.008].

Conclusion

Neonatal characteristics such as male gender, fetal distress at birth and being a first- born child predisposes the newborn to development of neonatal sepsis,

Maternal characteristics such as primary level of education, low economic class, being a first-time mother and unemployment predispose their newborn to development of neonatal sepsis.

Primiparity, maternal low economic status and poor antenatal clinic attendance were associated to development of a more severe form of neonatal sepsis to the newborn.

The study duration was 4 months at a cost of Kshs. 132,480.

CHAPTER ONE: INTRODUCTION

1:1 Background information

Neonatal sepsis is a systemic infection occurring in infants at ≤28 days of life and is an important cause of morbidity and mortality of newborns (Edwards; 2004). The chances of survival are slim for newborns with a serious infection, whether hospitalized or in the community due to their weak immune status. Many more newborns who survive have brain insults resulting in severe disabilities such as convulsive disorders, cerebral palsy, cognitive impairments (Himmelmann; 2007), thus adding to the burden to healthcare, social systems and home environment (Mwaniki *et al*.2010). Neonatal sepsis could be due to disease causing pathogens such as group B-streptococcus, Escherichia coli and Neisseria meningitidis (Donna *et al*.2007). Early-onset sepsis is seen in the first week of life (A.A.P.C; 2011). Simpler preventive measures based on improving health systems and new approaches can be identified through improved epidemiology and subsequent intervention trials (Seale *et al* 2007. Previous research has been to further reduce neonatal sepsis through development of maternal vaccines against prevalent pathogens such as streptococcus agalactine (Gray M; 2008).

Neonatal sepsis is a major cause of neonatal mortality. It accounted for 34% of all deaths of under -five year old children globally in year 2011 (Polin, Denson *et al*. 2012). In Nigeria, 6·5 cases of neonatal sepsis per 1000 live births were recorded in a referral hospital (Airede; 1992) In a different study, 21 cases of neonatal sepsis per 1000 live births were reported from a referral hospital in Zimbabwe (Nathoo KJ; 1990). In Kenya, neonatal sepsis was ranked seventh in the burden of disease report (I.H.M.E; 2013). Kenya was ranked sixth among the African countries with highest newborn mortality in a study on African newborns (Mongella; 2016). The study concluded that 28% (43,600 neonatal deaths) of the neonatal deaths in Kenya are due to neonatal

sepsis (Mongella;2016). This implies that a lot of Government resources are required in the management of neonatal sepsis. The Millennium development goals 4 and 5 identify maternal child health as high priorities for international development (UN; 2007). Although there was a decline in under-five year old mortality rates globally, the neonatal mortality was noted to be on the rise accounting for 44% of the under-five year old deaths in year 2012 (Ohlsson and Shah; 2013) as compared to 37% in 1990 (Ohlsson and Shah; 2013). Neonatal mortality resulting from neonatal sepsis rose from 9.7% in year 2014 to 10.7% in 2015 in Kenyatta National hospital (K.N.H; 2015). Studies have been done on the maternal risk factors of neonatal sepsis but Kenyan research has not laid emphasis on the characterization of neonatal sepsis. Neonatal sepsis results mainly from preventable causes yet the burden still remains high.

Previous research on neonatal sepsis has focused on the maternal characteristics while overlooking the interplay of key players in the occurrence of neonatal sepsis. Prevailing statistics on neonatal sepsis implies that there is a need to refocus research on neonatal sepsis in terms of the neonatal, maternal and environmental aspects inorder to generate data on the interrelationships that result in neonatal sepsis. This would offer a more profound holistic approach in dealing with the burden of neonatal sepsis.

1: 2 Problem statement

More than one-third of the estimated four million neonatal deaths around the world each year are caused by severe infections, one million of which are due to neonatal sepsis alone (WHO; 2009). This constitutes 26% of all neonatal deaths worldwide (Seale, Mwaniki *et al*. 2009). In 2012 roughly 44 percent of under-five deaths occurred during the neonatal period (I.H.M.E; 2013).

Africa, being a third world continent continues to bear most of the burden of neonatal sepsis. Over 98% of the estimated four million neonatal deaths occur in developing nations with highest rates in Africa (Cousens; 2010). Kenya is not spared either of the high incidences of neonatal mortality mainly due to neonatal sepsis. Regarding neonatal sepsis as a whole, 5·46 cases of neonatal bacteremia per 1000 live births were recorded in Kilifi, Kenya (Seale *et al*.2009). Kenyatta National Hospital (K.N.H), Kenya`s major national referral hospital attends to an average three patients with neonatal sepsis on an ordinary working day (K.N.H 2015). A total of 941 neonates were admitted in K.N.H in 2010 with neonatal sepsis against an alarming 1043 in 2014. Neonatal sepsis caused a mortality rate of 9.7% (677 neonates) in 2014 and by October 2015, it had claimed the lives of 543 neonates (10.7%) in K.N.H (K.N.H 2015) A longitudinal study done on the burden of neonatal admissions in a Rural District Hospital-Kilifi showed that close to 60% of under five year old children`s death occurred during the neonatal period (Mwaniki *et al*.2010). There is inadequate research that has been conducted to characterize neonatal sepsis inorder to come up with holistic approach of addressing the problem.

1:3 Justification

Neonatal sepsis is both a life-threatening and debilitating condition of the newborn which occurs within the first one month of life. Neonates` immune levels are not yet developed hence are vulnerable to contracting infections. Neonatal sepsis contributes to high rates of neonatal mortality as well as high burden of disease. It poses a high cost burden on healthcare resources and traumatizes families. The cost of managing the complications of neonatal sepsis poses an enormous burden and immense pain to the parents, community and the Government.

Previous research on neonatal sepsis has laid an emphasis on causative organisms in the hospital settings (mainly newborn unit) and maternal factors related to neonatal sepsis. Neonatal sepsis

has however continued to be a health challenge and the incidence remains high. This implies that science has not yet addressed the issue conclusively. This has necessitated for a change of tact by use of a broader scientific approach that in-cooperates the key players in the occurrence of neonatal sepsis.

Characterization of neonatal sepsis in this study was aimed at generating data on the key players contributing to the occurrence of neonatal sepsis. Identification of the characteristics associated with the development of neonatal sepsis will facilitate the development of strategies to curb the disease.

It was thus expected that the study would provide a holistic approach towards instituting proactive preventive strategies in dealing with the burden of neonatal sepsis; thereby reducing the morbidity and mortality of neonatal sepsis.

1:4 Study benefits

The study results would provide better understanding of the neonatal, maternal and environmental characteristics associated to the development of neonatal sepsis. This would offer a basis of structuring action oriented programs aimed at reduction of the incidence of neonatal sepsis. The information acquired would be used in policy making and guide in decision making on early detection of high risk neonates in-order to reduce chances of the development of neonatal sepsis. The data would also form a basis of development of protocol for neonatal sepsis preventive strategies in the country.

1:5 Study Hypothesis

Neonatal, maternal and environmental characteristics contribute to the development of neonatal sepsis.

1:6 Research questions

1. What are the neonatal characteristics that predispose the newborn to development of neonatal sepsis in Kenyatta National Hospital paediatric wards?
2. What are the maternal characteristics that predispose the newborn to development of neonatal sepsis in Kenyatta National Hospital paediatric wards?
3. What environmental characteristics predispose newborns to development of neonatal sepsis in Kenyatta National Hospital paediatric wards?
4. What factors are associated with severity of neonatal sepsis at diagnosis in Kenyatta National Hospital paediatric Wards?

1:7 Study objectives

1:71 Broad objective

To establish the characteristics of neonatal sepsis among neonates admitted in Kenyatta National Hospital paediatric wards.

1:72 Specific objectives

1. To assess socio-demographic characteristics among neonates admitted with sepsis in Kenyatta National Hospital paediatric wards.

2. To describe maternal characteristics of mothers whose newborns presented with neonatal sepsis in Kenyatta National Hospital paediatric wards.

3. To identify environmental characteristics (socio-economic, healthcare provider practices and cultural practices) among neonates admitted with sepsis in Kenyatta National Hospital paediatric wards.

4. To establish factors associated with severity of neonatal sepsis at diagnosis among neonates admitted in Kenyatta National Hospital paediatric Wards.

CHAPTER TWO: LITERATURE REVIEW

Neonatal sepsis or septiceamia is a clinical syndrome characterized by systemic signs of circulatory compromise (e.g., poor peripheral perfusion, pallor, hypotonia, poor responsiveness) caused by invasion of the bloodstream by bacteria in the first month of life (Edmond; 2010). Systemic and local infections (lung, cutaneous, ocular, umbilical, bone-joint and meningeal infections are common in the newborn period (Marcdante *et al*.2011).

Infections may be acquired in the uterus through the trans-placental or trans-cervical routes during or after birth. Susceptibility of the newborn to infection is related to the immaturity of both the natural and acquired immune systems at birth (Wittay; 2011). Babies suffering neonatal sepsis may present with some of the following symptoms; body temperature changes (mainly fever),breathing difficulties, diarrhea or decreased bowel movements, low blood sugar, reduced activity, reduced breastfeeding, seizures, unusually low or high heart-rate, abdominal distension, vomiting and jaundice (Pediatricians; 2012). Lack of prompt treatment and care can lead to disability or death from complications such as acute kidney injury leading to renal failure and neurological disorders such as cerebral palsy.

The World Health Organization (WHO) estimates that 1 million deaths per year (10% of all under-five mortality) are due to neonatal sepsis and that 42% of these deaths occur in the first week of life (Edmond; 2010). Africa, being a third world continent continues to bear most of the burden of neonatal sepsis. Over 98% of the estimated four million neonatal deaths occur in developing nations with highest rates in Africa (Polin *et al*.2012). Previous research revealed that neonatal sepsis was very prevalent in sub-Saharan Africa and contributed to 69% of neonatal mortality in Nigeria and other parts of Africa (Simonsen *et al*.2014)

Kenya is not spared either of the high incidences of neonatal mortality mainly due to neonatal sepsis. Regarding neonatal sepsis as a whole, 5·46 cases of neonatal bacteremia per 1000 live births were recorded in Kilifi, Kenya (Polin *et al*.2012). In Kenya, neonatal sepsis was ranked seventh in the burden of disease report (I.H.M.E; 2013). Kenya was ranked sixth among the African countries with highest newborn mortality in a study on African newborns (Mongella;2016). The study concluded that 28% (43,600 neonatal deaths) of the neonatal deaths in Kenya are due to neonatal sepsis (Mongella; 2016). Kenya`s national referral hospital (Kenyatta National Hospital-K.N.H) attends to an average three patients with neonatal sepsis on an ordinary working day (K.N.H; 2015). A total of 941 neonates were admitted in K.N.H in 2010 with neonatal sepsis against an alarming 1043 in 2014. The infection caused a mortality rate of 9.7% (677 neonates) in 2014 and by October 2015, it had claimed the lives of 543 neonates (10.7%) in K.N.H (K.N.H; 2015). In as much as work has been done on neonatal sepsis, the burden of neonatal sepsis remains progressively high. There remains a gap on information towards holistic approach in tackling the problem. This is why characterization of neonates with sepsis will focus on maternal, neonatal and environmental characteristics in the occurrence of neonatal sepsis.

2.1 Neonatal factors associated with neonatal sepsis

The neonate acquires immunity from the mother during pregnancy. Maternal humoral immunity may protect the fetus against some neonatal pathogens such as Group B streptococcus (GBS) and Herpes simplex virus (HSV). However, various deficiencies of the neonatal antimicrobial defense mechanism are more important as a contributing factor to infection than the maternal immune status (Marcdante *et al*.2011).

Maternal antibodies (IgG), cross the placenta by active transport predominantly in the latter half of the third trimester (Marcdante *et al*.2011).

Preterm infants born before 32weeks gestation are therefore born before acquiring full immunity from the mothers. Although LBW infants can generate IgM antibodies the ability of their own IgG to response to infection is reduced. This increases their vulnerability to contract infections.

Newborn infants also show a deficit in the phargocytic migration to the site of infection (to the lung) and in the bone marrow reserve pool of leukocytes thus the rate at which immune response is mounted is slower compared to older children and adults. Due to suboptimal activation of the complement, neonatal neutrophils ingest and kill bacteria less effectively than adult neutrophils do. Neutrophils from sick infants seem to have an even greater deficit in bacterial killing capacity compared with phargocytic cells from normal neonates (Marcdante *et al*.2011). This predisposes the sick infants to high chances of getting more infections and severe complications.

Infant factors associated with the development of early-onset sepsis include prematurity/low birth weight, congenital anomalies, complicated or instrument-assisted delivery, and low APGAR scores (score of ≤6 at 5 min) (Simonsen *et al*.2014). Immaturity of the premature neonatal immune system, including low immunoglobulin levels related to decreased transfer of maternal IgG across the placenta, also increases the risk of sepsis in preterm infants (Benitz; 1999). Fetal tachycardia at delivery is also a risk factor contributing to the development of neonatal sepsis (Simonsen *et al*.2014). Barrier function of the skin and mucus membranes is diminished in premature infants and is additionally compromised in ill premature infants by multiple invasive procedures, including placement of invasive fetal monitoring devices,

intravenous (i. v.) access and intubation (Polin *et al*.2012). Neonates in NICU live in a hostile environment with exposure to endotracheal tubes, central arterial and venous catheters and frequent blood draws all predisposing to bacteremia and meningitis (Gray; 2008).

Genetic factors have been implicated in the ability of bacteria to cross the blood brain barrier. This penetration has been noted for GBS, E.coli, listeria, citrobacter and streptococcus pneumonia (Marcdante *et al*.2011).

Very low birth weight, prematurity, neonates nursed in NICU all predisposes to the development of neonatal sepsis. Perinatal screening and prophylactic treatment is useful in the prevention of neonatal sepsis.

2.2 Maternal factors associated with neonatal sepsis

The neonate can contract infection from the mother in utero through the placenta, during delivery, through the birth canal or directly from contaminated blood (Wittay; 2011).

Ascending infection through the cervix may result in amnionitis, infections of umbilical cord, congenital pneumonia and sepsis. The bacteria responsible for ascending infections are common bacteria in the maternal genitourinary tract such as group B streptococci, Escherichia coli, hemophillus influenza, and klebsiela (Marcdante *et al*.2011).

Previous studies have revealed that maternal factors contributing to the development of neonatal sepsis include premature rupture of membranes (PROM), Pre-term PROM and prolonged rupture of membranes (Ohlsson and Shah; 2013). Maternal fever during pregnancy has also been found to pose a risk towards development of neonatal sepsis (Zaleznik; 2000).

Maternal risks, such as dietary intake of contaminated foods, can arise before labor and delivery, with *Listeria monocytogenes* contamination of refrigerated foods such as deli meats being the most important example. Procedures during pregnancy, such as cervical curettage and amniocentesis, which disrupt the amniotic cavity, may also increase the rates of amnionitis consequently resulting in neonatal sepsis. During labor, maternal risk factors include prolonged rupture of membranes, fever, vaginal colonization with group B streptococcus (GBS), and GBS bacteriuria (Zaleznik,2000; Kunze,2006). A history of a previous infant with GBS infection is another identified maternal risk factor in subsequent pregnancies (Zaleznik; 2000). In addition, adequacy of the maternal immune response is an important risk factor for neonatal sepsis. Maternal serum immunoglobulin (IgG) antibodies against specific capsular polysaccharides of GBS have been shown to be protective against infection with the relevant GBS strain in their infants, and an increased risk for GBS early onset sepsis has been demonstrated in infants delivered to mothers with low titers of IgG (Simonsen *et al*.2014). Chorio-amnionitis, defined by maternal fever, leukocytosis (>15,000 white blood cells [WBCs]/mm^3), maternal tachycardia, uterine tenderness and foul odor of amniotic fluid, are major risk factors for neonatal sepsis. Maternal factors associated with the development of chorioamnionitis include prolonged labor and membrane rupture, multiple digital vaginal examinations, placement of uterine monitoring devices, spontaneous onset of labor, and meconium-stained amniotic fluid (Simonsen *et al*.2014). These factors can be prevented, controlled and managed with a focus to reduction of the incidence of neonatal sepsis.

GBS has been known to cause 95% of the neonatal sepsis (Zaleznik; 2000).The effect of antibiotic use on maternal GBS colonization and risk factors of neonatal sepsis has been

evaluated (Cousens; 2010). Antibiotic use among women with PROM has been shown to reduce risk of neonatal infection (Kenyon *et al* 2010).

2:3.Environmental factors associated with neonatal sepsis

2.3:1 Hospital factors associated with neonatal sepsis

Ventilatory support and use of central venous devices are the two most common invasive-treatment modalities used in NICUs (Gray; 2008). A substantial proportion of infections associated with these devices may be preventable through general good practice, such as high hygiene standards whilst devices are *insitu*, and removal of devices as soon as they are no longer clinically required (Gray; 2008). Research has found out that administration of parenteral nutrition is a major independent risk factor for neonatal sepsis (Gray; 2008).

The role of drug treatments as contributors to the risk of late onset sepsis is also a risk factor. The drugs that have most often been implicated include drugs to prevent acid production (especially the H2-receptor antagonists such as ranitidine (Bianconi; 2007),corticosteroids (Stoll; 1999) and antibiotics (Van Der Zwet *et al*.2005). Ranitidine has been found to be associated with a sevenfold increased risk of LOS (Bianconi; 2007).

(Stoll BJ; 1999) found that a 14-day course of dexamethasone treatment was associated with an increased risk of sepsis. Prior exposure to broad-spectrum antibiotics has mainly been identified as a risk factor for sepsis in general.

Reported outbreaks of infection with specific microorganisms have been attributed to understaffing, overcrowding and movement of infants between rooms (Rhee; 2008). A study by the UK Neonatal Staffing Study Group found that the incidence of nosocomially acquired bloodstream infection was reduced in units with a dedicated infection control nurse and where

there were adequate hand-washing facilities, whereas sepsis rates were unaffected by the floor area of the unit (Van Der Zwet *et al*.2005).

2:3.2 Socio-economic factors associated with neonatal sepsis

Social characteristics and ethnic practices have a role to play in the development of neonatal sepsis. Previous studies found that ethnic and social factors associated with neonatal sepsis included; poor or late prenatal care, low socioeconomic status of the mother, poor maternal nutrition, maternal substance abuse, male sex, and African American mother (they have higher rate of GBS colonization) (Stoll *et al* 2011). In their study on early neonatal sepsis, (Simonsen *et al*. 2014) found that home delivery had the highest percentage of culture proven sepsis (52.2%). Level of education was found to be a contributing factor to development of neonatal sepsis. A study conducted in Nigeria revealed that mothers without formal education and those with only primary education had high proportions of culture proven sepsis (41.1% and 58.8% respectively) (Simonsen *et al*. 2014)

2.3.3 Healthcare provider factors associated with neonatal sepsis

The healthcare provider plays a central role in the prevention and management of neonatal sepsis. It is therefore important for the healthcare provider to take up their role by early identification of risk towards occurrence of neonatal sepsis. This will guide action towards prompt screening and treatment of the infected hence reduction of morbidity and mortality as well as complications resulting from neonatal sepsis. Prevention of sepsis especially in the preterm infants in the neonatal intensive care unit remains a major challenge. The gastrointestinal tract is an important source of potential pathogens causing hospital-acquired sepsis as the immature intestinal epithelium can permit translocation of bacteria and yeast (Nair *et al*.2011).

The intestinal tract and its micro-flora play an important role in the immunity. Altering the gut micro-flora in preterm infants confers immune-modulation thereby improving the neonate's ability to mount an immune response. This could be achieved through administration of probiotics which are live microorganisms which when administered in adequate amounts confer a health benefit on the host. The use of probiotics in premature infants is beneficial in normalizing intestinal flora, improvement in feeding intolerance, prevention of necrotizing enterocolitis and sepsis (Nair *et al*.2011). Lack of knowhow and skill of healthcare providers in the prevention of neonatal sepsis will continue contributing to the incidence of neonatal sepsis. The healthcare provider therefore ought to gather the appropriate knowledge in the preventive strategies thereby aid in the reduction of morbidity and mortality of neonatal sepsis.

Healthcare provider efforts should be geared towards prevention, prompt treatment of neonatal sepsis. The most effective strategies for prevention of neonatal sepsis include proper hand hygiene, prevention of central line-related blood stream infections, accurate diagnosis of infection, and limiting the use of unnecessary antibiotics (Polin *et al*.2012). The role of immunization to promote immunity and the need to adhere to follow-up visits should be emphasized. The healthcare provider offers a bridge between the community and the incidence of neonatal sepsis.

Summary

Literature search has revealed deficiency of information on the extent of correlation of the factors contributing to development of neonatal sepsis. A gap has also been identified on the interplay of the various variables contributing to neonatal sepsis.

2:4Theoretical framework

Theoretical framework used in this study was adopted from Betty Neumann's` systems model (1998-2008). This model views the individual as an open system consisting of subsystems. The open system has internal structures (lines of defense) which enable the individual to generate energy to defend self from intrusion from the external environment thus attaining stability. The individual is in constant interaction with a bigger system, the environment (Pearson; 2005).

The environment comprises of the input to the individual and the individual releases output to the environment. Failure of individual`s subsystems (spiritual, physical, emotional, intellectual and social) to maintain stability leads to disease. The human being is described as having concentric circles of lines of resistance (L.O.R). Lines of resistance are protection factors activated when stressors penetrate the normal line of defense (e.g; the skin, mucous membranes).The neonate faces both internal and external stressors. The internal stressors are the neonatal characteristics of neonatal sepsis while the external stressors are both the maternal and environmental characteristics. In the case of neonatal sepsis, the neonate is the individual, an open system interacting with the external environment (the air they breathe, breast milk, water they bathe in, the care-givers who handle the neonate and the community at large). The stressors invade the normal line of defense which is the usual state of wellness. Having a weak defense system, the intrusion from the environment attacks the flexible line of defense (a protective accordion invaded by stressors) resulting into entropy (process of energy depletion) thereby actualizing causing neonatal sepsis. Entropy results in disease (neonatal sepsis), disability or death as a result of lack of reconstitution, which Betty Neumann's describes as maintenance of balance towards recovery.

Betty Neumann also talked about three levels of disease prevention i.e: primary prevention (before disease occurs), secondary (when the disease is present), and tertiary level (when the complications have resulted from disease). When dealing with neonatal sepsis, we aim at primary prevention. Should the infection occur, then prompt treatment is the target. Should the unfortunate complication such as renal failure, amputation due to gangrenous foot, neurological sequelle occur, then tertiary prevention is the option applied to rehabilitate and stabilize the individual. Primary prevention is by the client and community, secondary prevention by the healthcare provider and tertiary prevention is by the collaborative effort of the client, healthcare educator, social leaders, spiritual leaders as well as the political leaders. All these levels are applied towards attaining health which Betty Neumann describes as the state of wellbeing of spiritual, physical, emotional, intellectual and social aspects of a human being.

2:5 Conceptual framework

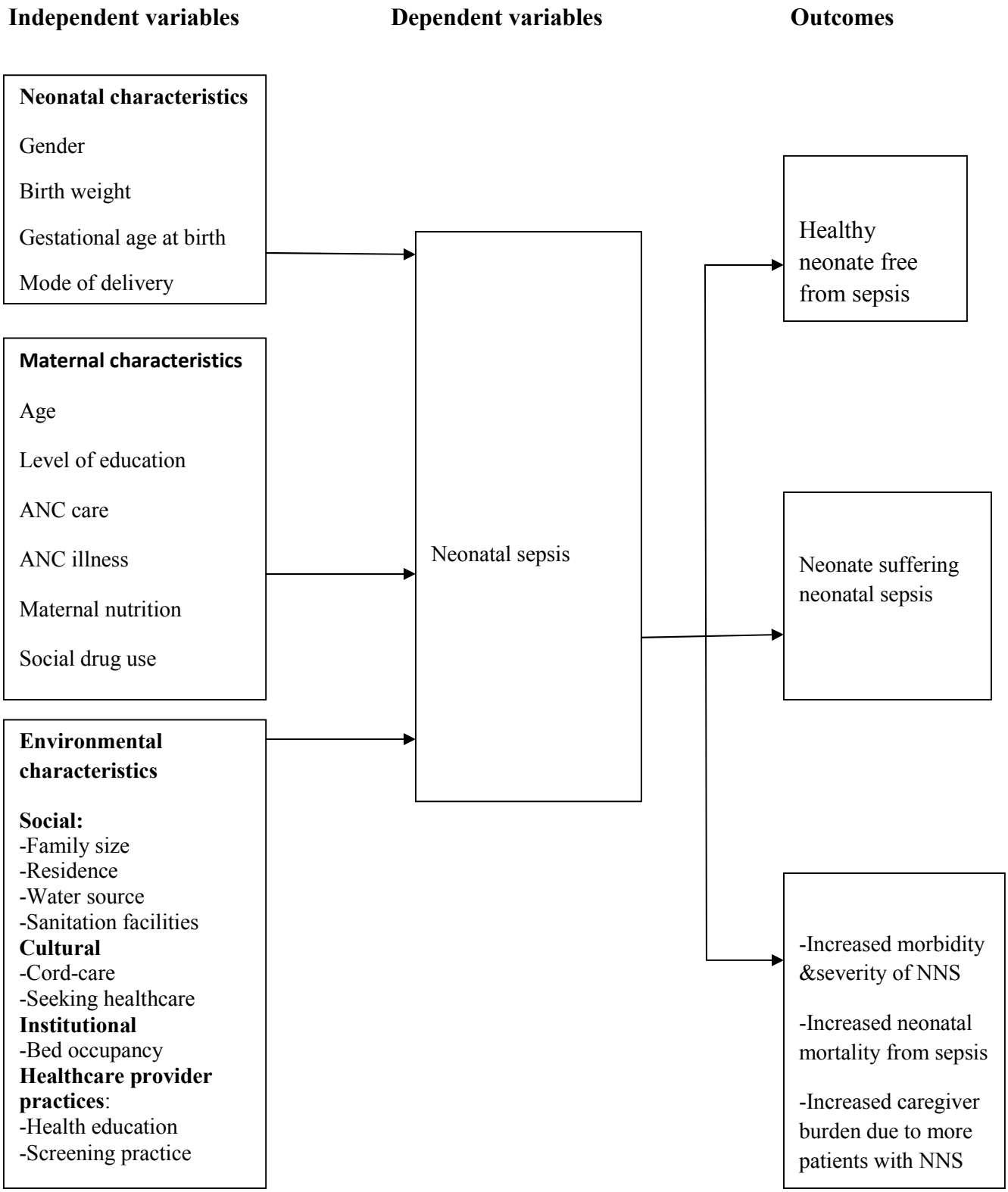


Figure 1: Conceptual framework

CHAPTER THREE: METHODOLOGY

3:1 Study design:

A descriptive cross-sectional study design was used.

3:2 Study area

The study was conducted in Kenyatta National Hospital (K.N.H) paediatric wards. This is a major national referral hospital located in Kenya's Capital city 1.5kilometers from the central business district, in upper-hill area. It is located along hospital road, off-Ngong' road. The hospital occupies about 5hactares of land. It has 50 inpatient wards and a total bed capacity of 2000. The paediatric department has eight inpatient wards where general medical patients, orthopaedic, oncology and surgical paediatric patients are admitted. The medical paediatric bed capacity was 256 and bed occupancy of not less than 150%. Patients suffering neonatal sepsis were admitted in the medical paediatric wards (mainly term newborns) through the paediatric emergency unit.

3:3 Study population

This study targeted mothers whose neonates were admitted in K.N.H paediatric wards for management of neonatal sepsis. Focused group discussions involved three groups comprised of nurses, doctors and clinicians who worked in paediatric emergency unit (entry point for sick neonates) and paediatric wards.

3:4 Inclusion criteria

Mothers whose neonates were admitted with neonatal sepsis at K.N.H. paediatric wards after giving consent to participate in the study. Consenting nurses, doctors and clinicians working in paediatric wards and emergency unit participated in the focused group discussions.

3:5 Exclusion criteria

Neonates with Co-morbid conditions which in this study referred to other disease states besides neonatal sepsis though present together with sepsis; such as congenital heart diseases, congenital physical abnormalities (such as spina bifida, Down's syndrome, omphalocele and the like) .

Neonates admitted with sepsis but under the company of someone else besides the biological mother.

3:6 Sample size calculation

The sample size was be determined using the formula by Fisher's *et al* (1998)

$$n = \frac{Z^2 p (1 - p)}{e^2}$$

Where

n= the desired samples size (if the target population is greater than 10,000)

z = is the value for corresponding confidence level (i.e. 1.96 for a 95% confidence interval)

p= is the estimated value for the proportion of the target population that have the condition of interest (p=, the most conservative estimate, there being no documented incidence of neonatal sepsis, 50% was used).

e=the level of statistical significance set which is 5% with a confidence interval of 95%

$$n = \frac{1.96^2 \times 0.5\,(1-0.5)}{0.05^2} = \frac{(1.96 \times 1.96) \times (0.5)(0.5)}{0.05^2} = \frac{3.8416 \times 0.25}{0.0025} = \frac{0.9604}{0.0025}$$

n=384.16

The sample size is 385 study participants.

Since the study population is less than 10,000 the Fisher`s formula (1998) will be used to calculate the finite study sample size as follows:

$$nf = \frac{n}{1 + (n/N)}$$

Where

nf = the desired sample size (when the population is less than 10,000)

n = the desired sample size (when population is greater than 10 000)

N = the estimate of the population size in the study area (number of neonates admitted to K.N.H paediatric wards per month suffering neonatal sepsis is about 90)

$$nf = \frac{385}{1 + (385/145)} = 385/3.65517 = 106.33 = 107 \text{ study participants}$$

Sample size was 107 study respondents.

3:7 Study instrument

The researcher used semi-structured researcher administered questionnaire (Appendix 4) to collect data from the mothers.

An interview guide (Appendix 4b) was used to guide focused group discussions.

3:8 Training of Research assistants

One research assistant who was a registered BscN nurse was trained on data collection process.

3:9 Pre-testing of the study instrument

The study instrument was pretested in K.N.H paediatric wards. Being a referral hospital, it was considered that pretesting the instrument elsewhere could have some of the participants involved both in the pretest and still constitute the study sample after referral. The participants involved in the pretesting were excluded from the study. The pretesting used 10% of the study sample size.

3:10 Sampling procedure

Systematic sampling method was used to get the study sample. Neonates meeting the inclusion criteria were randomly sampled after a written consent (Appendix 3c) had been obtained from the mothers i.e having acquired a list from the admitting centre. The first study participant was selected by simple random among mothers admitted with neonates suffering from neonatal sepsis. The mothers were allowed to pick a folded numbered paper from a basket.

The mother who picked the paper numbered 01 was the first respondent. Thereafter every alternate mother to neonate diagnosed with neonatal sepsis was included in the study sample.

Focused group discussions comprised of nurses, doctors and clinical officers working in the paediatric wards and paediatric emergency unit were conducted. FGDs were acquired from two paediatric wards selected purposively (3B & ward 3C) and the Paediatric Emergency unit. Each ward had an average of 25 nurses, 10 doctors and 5 clinicians while emergency unit had 36 nurses, 10 clinicians and 5 doctors. The groups comprised of 4 nurses, 1 doctor and 1 clinician in the wards 3B and 3C working in the specific areas. Paediatric Emergency Unit group comprised of 3 nurses, 1 doctor and 2 clinicians. Simple random method was used to get the sample for FGDs whereby folded papers labeled yes/no were picked by potential FGD participants and those who picked `yes' were included in the FGD.

3:11 Data collection procedures

3:11a Recruitment process

Eligible participants were the mothers whose neonates met the inclusion criteria. They were recruited from the paediatric wards. Once recruited, the consenting procedure followed.

Participants in three FGDs were recruited from among the healthcare workers who worked in two purposively selected paediatric wards and paediatric emergency unit. The individuals were accessed prior to the set date for the FGD. The three FGDs were conducted during the change over period once healthcare workers were done with their procedures.

3:11a Consenting procedure

The researcher introduced self to the ward in-charge and produced evidence of approval to undertake the research. Upon contact with the neonate`s mother, the researcher introduced self and issued the invitation to the study participant to participate in study. Study participants were given information that pertained to their participation (Appendix 3a) in the study in-order to make an informed consent (Appendix 3c). The FGD participants were given information on the study title, objectives and benefits. Upon acceptance to participate, they were requested to sign a consent form (Appendix 3e).

3:11c Interview procedure (data collection)

Each prospective participant was approached and explained about the study (Appendix 3a). After she consented to participate (Appendix 3c), she was taken to a room within the ward where face to face interview was conducted. The researcher asked questions as per questionnaire (Appendix 4) and then recorded responses on the respective sections of the questionnaire.

Guided focus group discussions were audio-taped.

3:12 Data management and analysis

The researcher collected data by interviewing the mothers whose neonates were admitted with neonatal sepsis. At the end of each day of data collection, questionnaires were checked for completeness. Each questionnaire was entered against its unique identifier number into a Microsoft Excel program where data cleaning was done. Missing values, extreme values and inconsistency were identified and corrected. Incomplete and wrongly answered questionnaire were omitted during the data entry process. After cleaning, the data was then exported to soft-ware for analysis using statistical package for social sciences (SPSS) version 20. Univariate

analysis was used for descriptive analysis of maternal, neonatal and environmental characteristics. Bivariate data was analyzed by ODDS ratio and chi-square to determine prevalence value for severity of neonatal sepsis against the various neonatal, maternal and environmental characteristics. Transcribed qualitative data was categorized into themes and analyzed-manually.

The data was stored in computer hard drives and back-ups in flash-discs and personal email accounts. Filled questionnaires were kept in lockable drawers whose access was limited to the researcher.

3:12a Data presentation

Analyzed data was presented in graphs, pie charts and tables.

3:13 Ethical considerations

Ethical approval to carry out the study was acquired from the Kenyatta National Hospital and University of Nairobi Ethics and Research Committee (KNH/UON-ERC) and the Kenyatta National Hospital Administration. A written informed consent (appendix 1c) was obtained from the mothers of neonates admitted in KNH paediatric wards with neonatal sepsis. Clear explanation about the study was given to the mothers prior to consent to participate in study. Questionnaires coded to ensure anonymity of study respondents. Participation was purely on voluntary basis. Mothers whose neonates were very ill were excluded from the study until their babies stabilized. Information gathered was only shared to relevant parties for implementation.

3:14 Study limitations

Kenyatta National Hospital patient population comes from Nairobi and the environs. The study sample therefore might not have been a proportionate representation of the Country`s population thus generalization may be limited to cosmopolitan setting. One point data collection (in a descriptive study may not have yielded comprehensive information).

CHAPTER FOUR: RESULTS

Section I: Descriptive/Univariate analysis

4.1. Socio-demographic characteristics of mothers

A total of 107 mothers whose babies had been admitted for management of neonatal sepsis participated in the study. The highest percentage (44.9%) of the mothers was in the age category of 20-25 years while mothers below 20 years were only 12(11.2%). Majority 64(59.8%) of the mothers were Protestant followers while Muslims were the least 3(2.8%). Most 84(78.5%) of the mothers were married (Table 4.1).

With respect to level of education, all the mothers attended some form of formal education. About half of the mothers 52(48.6%) had attained secondary school education and about one third 35(32.7%) had attained college/university education. While the remaining 20(18.7%) of the mothers attended primary school. Out of the total, 51(47.7%) of the mothers stated that they were unemployed. However, almost a quarter 27(25.2%) reported that they engaged in formal employment and 29(27.1%) were self-employed (Table 1).

Table 1 : Distribution of mothers by socio-demographic characteristics

Socio-demographic characteristics	Frequency (n=107)	Percent (%)
Age in years		
20-25	48	44.9
30-49	24	22.4
26-30	23	21.5
Below 20years	12	11.2
Religion		
Protestant	64	59.8
Catholic	34	31.8
Others (SDA)	6	5.6
Muslim	3	2.8
Mother's marital status		
Married	84	78.5
Single	20	18.7
Separated/widowed/Divorced	3	2.8
Mother's level of education		
Secondary level	52	48.6
College/University level	35	32.7
Primary level	20	18.7
Mother's occupation		
Not employed	51	47.7
Self employed	29	27.1
In formal employment	27	25.2

4.1.1 Gross income of the household per month

Forty five (42.1%) of the participants earnt between KShs of 10,000 – 20,000 per month while 40(37.7%) earnt below KShs 10,000 as gross income. (Figure 2)

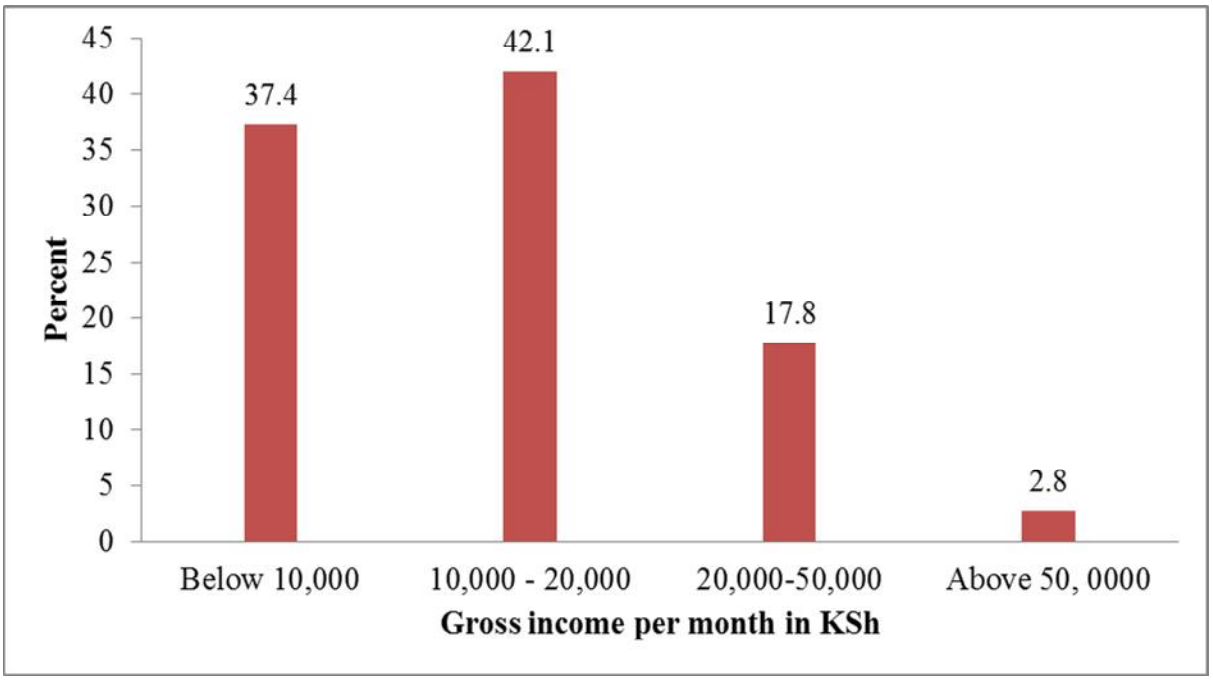


Figure 2 : Gross income of the household per month

4.2 Characteristics of the neonates

4.2.1 Socio-demographic and birth characteristics of the neonates

The majority 77(72.0%) of the neonates were between 8-28 days whereas the remaining 30(28.0%) were below 8 days (Table 2). More than half of the neonates 62(57.9%) were males. Majority of the neonates were born by spontaneous vertex delivery 82(76.6%) and most 98(91.6%) of them were born at term.

The neonates birth weight, as presented in (Table 2), showed that the highest percentage 55(51.4%) of the neonates weighed 3000 grams and above. Only 4(3.7%) neonates weighed between 1500-2000 grams at birth. Most 96(89.7%) of the neonates were breastfed after delivery while 11(10.3%) were initiated into formula feed.

Table 2 : Socio-demographic characteristics among neonates

Variables	Frequency (n=107)	Percent (%)
Baby's age		
8 - 28 days	77	72.0
0 -7 days	30	28.0
Baby's gender		
Male	62	57.9
Female	45	42.1
Gestational age		
37 weeks and above	98	91.6
33-36 weeks	9	8.4
Birth weight of the baby in grams		
3000 and above	55	51.4
2501-3000	35	32.7
2001-2500	13	12.1
1500-2000	4	3.7
Mode of delivery		
Normal vaginal delivery	82	76.6
Caesarean section	25	23.4
Type of feed that the new-born fed on after delivery		
Breast milk	96	89.7
Formula feed	11	10.3

4.2.2 Duration of time in initiating first feed after delivery

With regard to initiation of first feed after delivery, about half 57(53.3%) of the neonates were fed within one hour after delivery while 16(15.0%) fed after 4 hours (Figure 3).

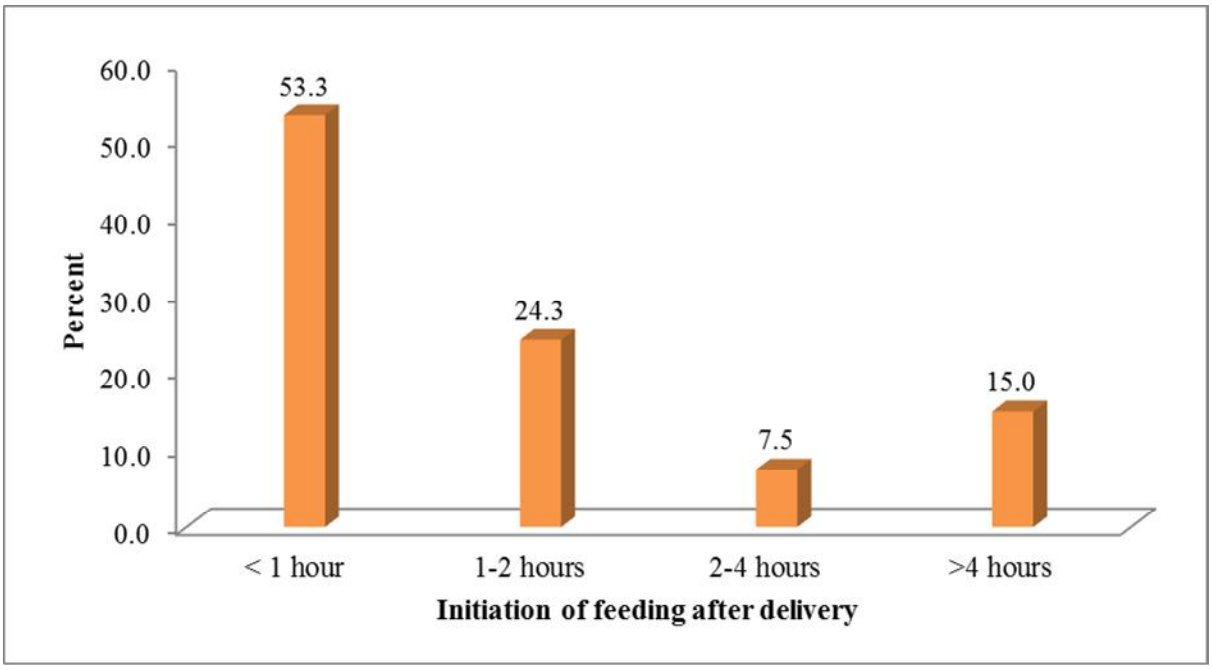


Figure 3 : Duration of initiation of first feed after delivery

4.2.3 Duration of newborn`s post- delivery stay in health facility

The neonates stayed in the health facility after delivery for an equal proportion of either one day 37(34.6%) or more than two days 37(34.6%) as depicted in Figure 4. However, 18.7% of the neonates were discharged from health facility hours after delivery.

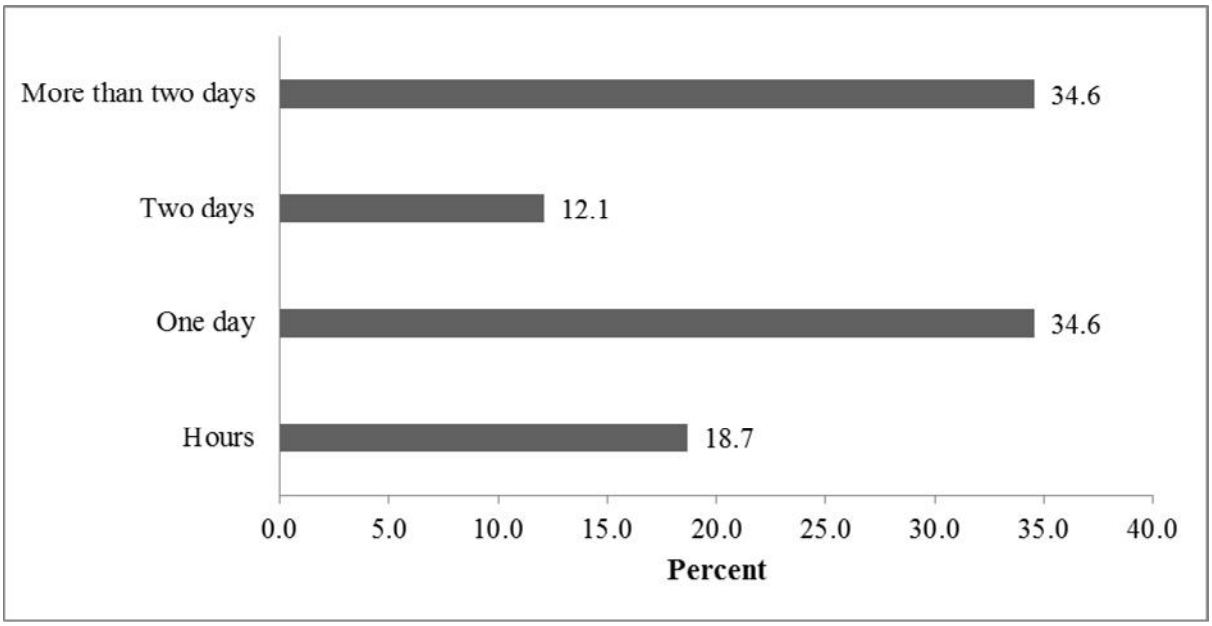


Figure 4 : Duration of newborn`s post- delivery stay in health facility

4.2.4 Health related factors among neonates

Majority 93(86.9%) of the neonates were not managed in nursery after delivery (Table 3). Twenty two (20.6%) of the babies were given medication upon delivery and the main medications given were Tetracycline eye ointment (T.E.O 15(68.2%) and Vitamin K 13(59.1%).

About three quarter 78(72.9%) of the neonates developed sepsis within the first 7 days after birth while 29(27.1%) suffered neonatal sepsis between 8-28 days after birth. The main complaint reported by mothers regarding their neonates upon hospital admission were refusal to feed 59(55.1%), hotness of the body 43(40.2%) and yellowness of the body 37(34.6%) but convulsions were reported from 7(6.5%) neonates. Majority 65(60.7%) of the neonates were brought to the hospital immediately after the onset of illness. The rest took sometime before taking their babies to hospital (Table 3). The main reason for not bringing the baby to hospital immediately following onset of illness was lack of awareness that the baby was sick 15(35.7%).

Table 3 : History of health related factors among neonates

Variables	Frequency (n=107)	Percent (%)
Whether new-born was managed in nursery after delivery		
Yes	14	13.1
No	93	86.9
Whether the baby was put on any medication upon delivery		
Yes	22	20.6
No	85	79.4
***Kind of medication if the baby was put under medication upon delivery**		
T.E.O	15	68.2
Vitamin K	13	59.1
Antibiotics	2	9.1
Onset of illness after delivery		
0-7 days	78	72.9
8-28 days	29	27.1
***Reason for hospitalization**		
Refusal to feed	59	55.1
Hotness of the body	43	40.2
Yellowness of the body	37	34.6
Convulsions	7	6.5
Others (Breathing difficulty, dehydration, lack of urine, skin eruption and others)	33	30.8
Time taken to bring the baby to hospital after illness began		
Immediately	65	60.7
1-2 days	26	24.3
More than 2 days	16	15.0
Reasons for not bringing the baby to hospital immediately after illness began		
Not aware baby was sick	15	35.7
Did not think it's serious	7	16.7
Thought baby would get well	6	14.3
Others	5	11.9
Decided to observe first	5	11.9
Lack of money and transport	4	9.5
Not applicable	65	

***Multiple response**

4.2.5 Reasons for being managed in nursery after delivery

Fetal distress 7(50.0% of n=14) was the main reason why neonates had to be managed in nursery after delivery (Figure 5)

Figure 5 : Reason for being managed in nursery after delivery

4.2.6 Classification of severity of neonatal sepsis

Symptoms including either refusal to feed, hotness of body or yellowness of body were classified as mild neonatal sepsis. However, one or more of the aforementioned symptom(s) plus at least one of the following systemic involvement and organ dysfunction symptoms including convulsion, lack of urine, skin eruptions/rashes, gangrene, bloody vomitus, abdominal distension, difficulty in breathing, bloody urine and dehydration were classified as severe neonatal sepsis during hospital admission. Figure 6 shows that 67(62.6%) neonates had mild neonatal sepsis while 40(37.4%) had severe neonatal sepsis on admission.

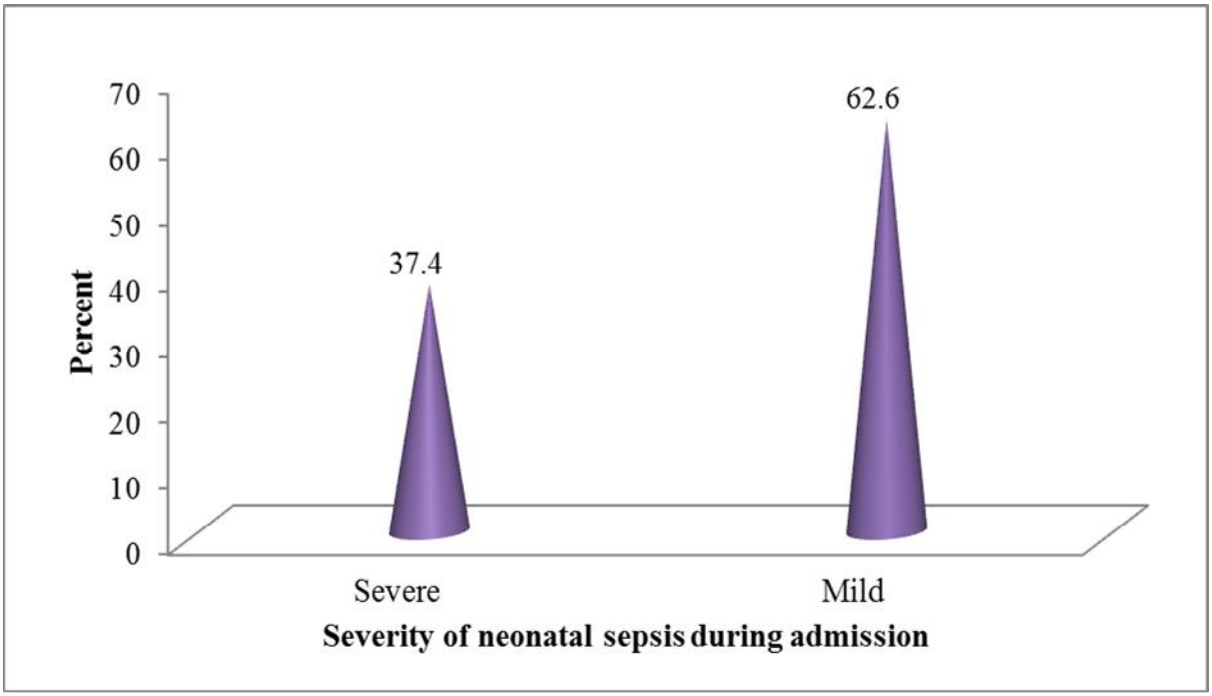


Figure 6 : Severity of neonatal sepsis on admission

4.2.7 Age of the neonate`s older sibling

More than half of the neonates were first born 60(56.1%). However, about a quarter 25(23.3%) and another 22(20.6%) neonates had older sibling aged between 2-4 years and above 4 years respectively as shown in (Figure 7).

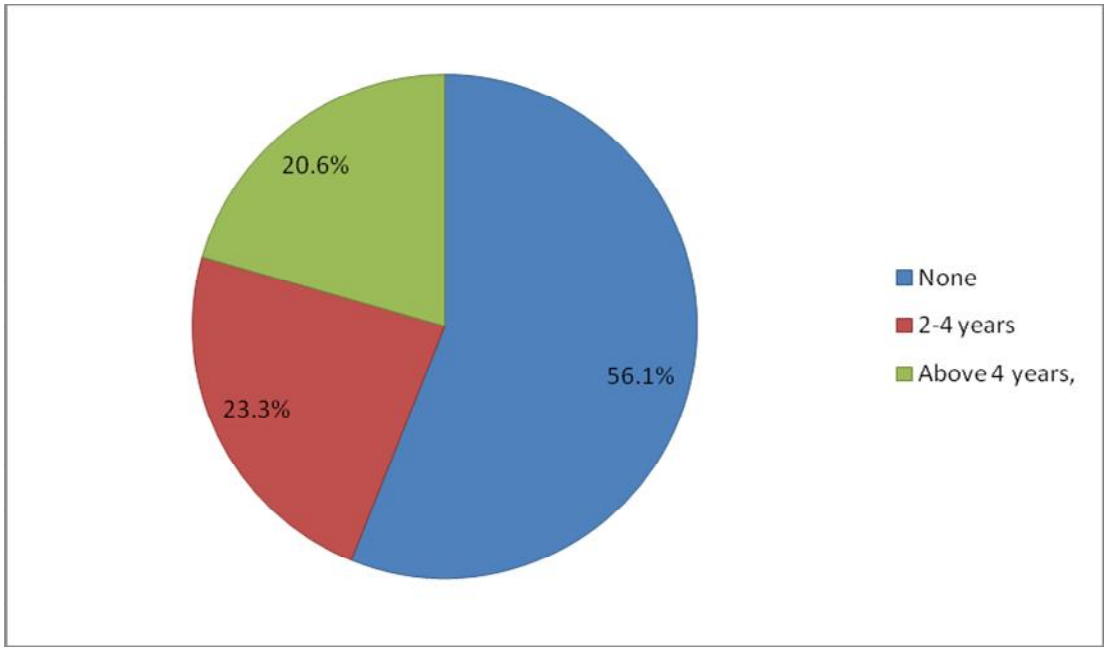


Figure 7 : Distribution of age of the neonate`s older sibling

4.3 Characteristics of the mothers

4.3.1 Distribution of health practices of mothers during pregnancy

Almost all the mothers 105(98.1%) attended antenatal care (ANC) during their pregnancy of the current baby as shown in Table 4. Most 84(80.0%) attended the minimum 4 recommended antenatal care visits. When the mothers were asked about gestation at which first ANC visit was made, majority 73(69.5%) indicated in the second 3 months. Majority 76(71.0%) indicated that they did not experience any medical illness during pregnancy while the remaining 31(29.0%) reported otherwise. All the mothers underwent HIV test during pregnancy and almost all 105(98.1%) tested negative. A large percentage 104(97.2%) of mothers did not use any drug of abuse during pregnancy. About three quarter 83(77.6%) of the mothers had been on medically prescribed drugs during pregnancy. The most commonly 69(83.1%) prescribed drug for the mothers was haematinics.

Table 4 : Distribution of mothers` health practices during pregnancy

Variables	Frequency (n=107)	Percent (%)
ANC attendance during pregnancy		
Yes	105	98.1
No	2	1.9
Frequency of ANC attendance		
4 times or more	86	80.0
1-3 times	21	20.0
Gestation at which first ANC visit was made		
Second 3months	73	69.5
Within the first 3months	27	25.7
Last 3months	7	4.8
Any medical illness during pregnancy		
Yes	31	29.0
No	76	71.0
Ever been tested for HIV		
Yes	107	100.0
Mother's status of HIV		
Negative	105	98.1
Positive	2	1.9
Drug of abuse during pregnancy		
Yes	3	2.8
No	104	97.2
Type of drugs of abuse, If used during pregnancy		
Alcohol	3	2.8
Not applicable	104	97.2
Any prescribed drugs during pregnancy		
Yes	83	77.6
No	24	22.4
***If any prescribed drugs during pregnancy, Which ones**		
Haematinics	69	83.1
Pregnacare	4	4.8
Vaginal pessaries	2	2.4
Antifungal	2	2.4
Aldomet	2	2.4
Others	7	8.4

***Multiple responses`**

4.3.2 Types of illness during pregnancy

Most of the mothers did not suffer illness during pregnancy. However for the 31 mothers who did, urinary tract infection emerged as the common illness for 16(51.6%), n=31) as demonstrated in Figure 8.

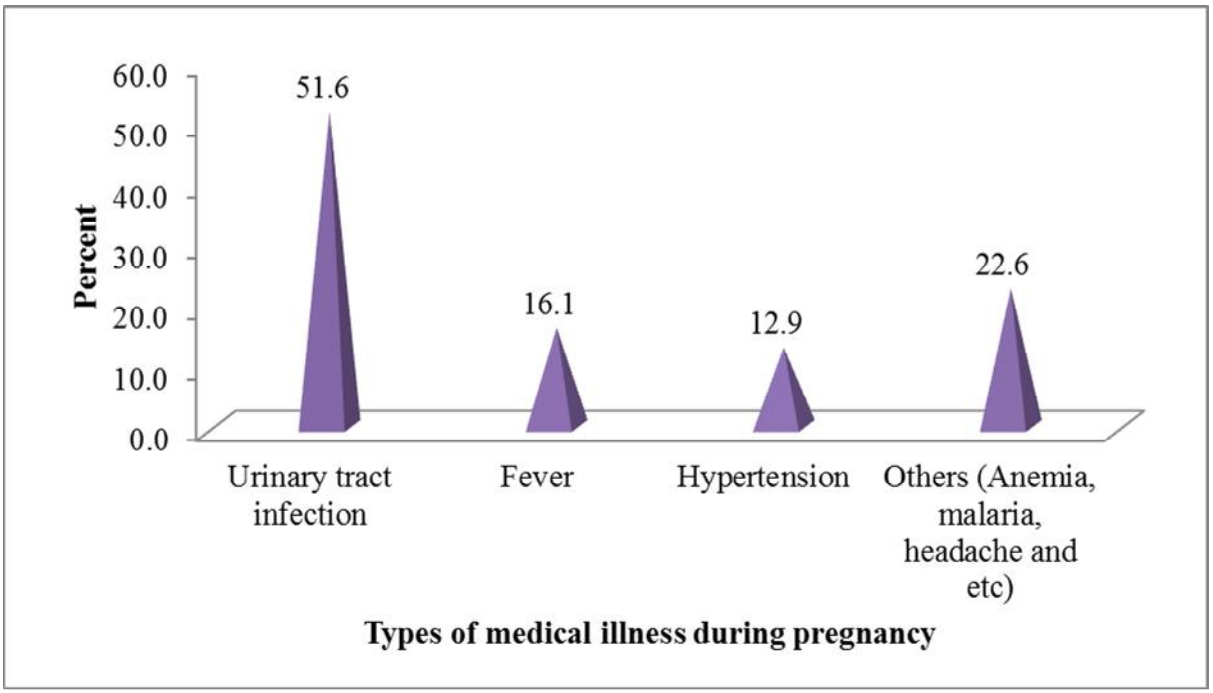


Figure 8 : Types of illness during pregnancy

4.3.3 Obstetric, pregnancy and labor characteristics

Majority 90(84.1%) of the mothers indicated that they had less than three children (Table 5). About half 55(51.4%) of the mothers were primiparas. Ninety one (85.0%) had never experienced miscarriage while the remaining 16(15.0%) reported history of miscarriage/abortion. During delivery of the current child, majority of the deliveries took place in a public/government health facility 68(63.6%). The highest percentage 39(36.4%) of the mothers indicated that the duration of labor was less than six hours while 29(27.1%) labored more than 10 hours. Majority 70(68.6%) of the mothers reported that the labor took less than 4 hours from the time membranes ruptured to delivery. Similarly, most 80(78.4%) indicated that color of the liquor was clear.

Table 5 : Obstetric, pregnancy and labor characteristics

Variables	Frequency (n=107)	Percent (%)
How many children do you have?		
Less than three	90	84.1
Three to five	17	15.9
Parity		
Primipara	60	56.1
Multiparous	47	43.6
Any history of miscarriage		
Yes	16	15.0
No	91	85.0
Place of delivery for the child		
On my way to hospital	3	2.8
In a public/government health facility	68	63.6
In private health facility	36	33.6
Duration of the labor		
Less than six hours	39	36.4
6-10 hours	34	31.8
More than 10hours	29	27.1
Elective c/s(did not labor	5	4.7
Time taken from the time membranes ruptured to delivery		
Less than 4 hours	70	68.6
4-6hours	17	16.7
More than six hours	15	14.7
Not applicable	5	
Color of the liquor		
Clear	80	74.8
Greenish	22	20.6
Not applicable	5	4.6

***Multiple response**

4.4 Environmental characteristics

4.4.1 Socio-economic characteristics of the mothers

Majority of the mothers 83(77.6%) were residing in mid-level urban settings while only 9(8.4%) resided in rural areas (Table 6). The mothers were requested to indicate the type of the house they were currently living in and 47(43.9%) were living in a single room and 22(20.6%) lived in a more than 1 bed-room house. About half 53(49.5%) of the respondents did not have any specific food preparation room. About two third 65(60.7%) used a flush toilet whereas 42(39.3%) were using a pit latrine. However, about half 57(53.3%) were sharing toilet facilities with other families. Majority 85(79.4%) of the mothers indicated that the total number of people who were living in their house was 3-5 persons.

Eighty eight (82.2%) reported to have been using tap water while 3(2.8%) were using water sold to them from water vendors as their household source of drinking water. Most of the mothers indicated that they washed their hands before feeding the baby 93(86.9%) and after nappy change 93(86.9%) but 9(8.4%) indicated that they rarely washed their hands as they cared for their babies. Regarding cleaning of the cord stump, about half 55(51.4%) used methylated spirit and cotton wool, 32(29.9%) did not clean it while the remaining 20(18.7%) used bathing water in a basin. When the mothers were asked about the actions taken when they noticed their baby was unwell, about half 57(53.3%) indicated that they sought medical help. However, a large percentage 47(43.9%) reported that they had monitored the baby`s progress for some-time.

Table 6 : Socio-economic characteristics

Variables	Frequency (n=107)	Percent (%)
Residence		
Mid-level urban setting	83	77.6
Urban slum area	15	14.0
Rural area	9	8.4
Type of the house currently living in		
Single room	47	43.9
One bed-roomed plus sitting room	38	35.5
More than 1 bed-roomed plus sitting room	22	20.6
Availability of specific food preparation room		
Yes	54	50.5
No	53	49.5
Kind of toilet		
Toilet (flushable)	65	60.7
Pit latrines	42	39.3
Sharing toilet facilities with other families		
Yes	57	53.3
No	50	46.7
Number of people who lived in the house		
Three to five	85	79.4
More than five	13	12.1
Less than three	9	8.4
Source of water		
Tap water	88	82.2
Bore-hole/well	16	15.0
Water vendors	3	2.8
***When mothers washed their hands as they cared for your baby**		
Before feeding the baby	93	86.9
After nappy change	93	86.9
Rarely do I wash hands	9	8.4
How to clean the cord of the baby		
Methylated spirit and cotton wool	55	51.4
I don`t clean it	32	29.9
Bathing water in a basin	20	18.7
Who helps you care for the baby at home		
No one	52	48.6
Relatives	45	42.1
House-help	10	9.3
Actions taken when the baby was noticed to be unwell		
Sought medical help	57	53.3
Monitored for some-time	47	43.9
Consulted friend or gave some herbal	3	2.8

***Multiple response**

4.4.2 Health-care provider, health facility preventive and promotive practices

A large percentage 100(93.5%) of the mothers were not tested for infection during pregnancy. Among the seven tested for infection, urinalysis was more commonly done 4(57.1%). As regards infection prevention, about a quarter 27(25.2%) of the mothers reported to have shared bed with another mother during their hospital stay after delivery, but the remaining indicated otherwise. Furthermore, forty nine (45.8%) reported to have had 1-2 vaginal examinations (V.E) done during labor but 26(24.3%) had V.Es done more than four times (Table 7). About two third 73(68.2%) of the mothers indicated they had received health information on prevention of infection to the new-born while 34(31.8%) reported otherwise.

Table 7 : Health facility and health-care provider preventive and promotive practices

Variables	Frequency (n=107)	Percent (%)
Whether testing for infection was done during pregnancy		
Yes	7	6.5
No	100	93.5
Type of testing for infection done during pregnancy		
Urinalysis	4	57.1
Malaria	1	14.3
Candidiasis	1	14.3
VDRL	1	14.3
Not applicable	100	
Whether shared bed with another mother during your hospital stay during delivery		
Yes	27	25.2
No	80	74.8
Frequency of vaginal examinations done during labor		
One to two	49	45.8
Three to four	26	24.3
Above four	26	24.3
None	6	5.6
Whether given any health information on prevention of infection to the new-born		
Yes	73	68.2
No	34	31.8

4.4.3 Type of health information given to the mothers on prevention of infection to the newborn

Among those who had received health information on prevention of infection to the new-born, the main type of information was on hand washing before handling the newborn 61(83.6%) while 49(67.1%) of those who reported to have received health information were taught how to keep the cord of the newborn clean. However, only 24.7% of the mothers were taught on early identification of a sick newborn (Figure 9).

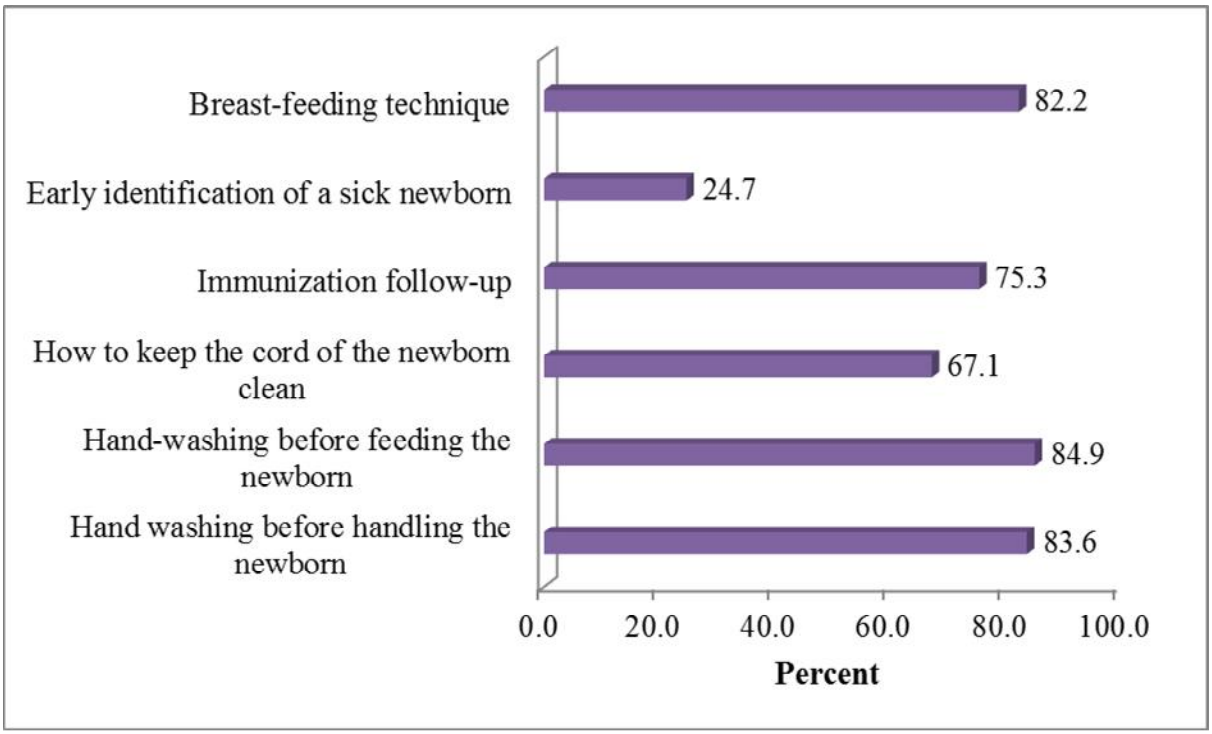


Figure 9 : Type of health information given on prevention of infection to the newborn

Section II: Bivariate analysis

4.7 Association between socio-demographic characteristics of mothers and severity of neonatal sepsis on admission

The study demonstrated a significant association between mothers' level of education and the severity of neonatal sepsis ($p = 0.021$). There were an increased proportion of neonates with severe NNS among mothers with primary level of education (55.0%) and secondary school (42.3%) as compared to those who had attained tertiary education (20.0%) (Table 8).

Households' income per month was statistically significantly associated with the severity of neonatal sepsis ($p = 0.021$). Households whose monthly earnings was less than KShs 10,000 per month higher proportions of neonates with severe NNS (50.0%) than households with income of above KShs 20,000 (13.6%).

However, the study found no significant association between severity of NNS and the other socio-demographic characteristics of the mothers (age, marital status, religion and occupation).

Table 8 : Socio-demographic characteristics of mothers and severity of NNS

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test
	n	%	n	%			p value*
Age in years							
Below 20	6	50.0%	6	50.0%	1.53	3	0.673
20-25	18	37.5%	30	62.5%			
26-30	9	39.1%	14	60.9%			
30-49	7	29.2%	17	70.8%			
Religion							
Protestant	27	42.2%	37	57.8%	2.83	3	0.418
Catholic	11	32.4%	23	67.6%			
Muslim	0	0.0%	3	100.0%			
Others (SDA)	2	33.3%	4	66.7%			
Mother's marital status							
Single	8	40.0%	12	60.0%	0.09	2	0.957
Married	31	36.9%	53	63.1%			
Separated/widowed/Divorced	1	33.3%	2	66.7%			
Mother's level of education							
Primary level	11	55.0%	9	45.0%	7.71	2	**0.021**
Secondary level	22	42.3%	30	57.7%			
College/University level	7	20.0%	28	80.0%			
Mother's occupation							
Self employed	9	31.0%	20	69.0%	1.13	2	0.666
Informal employment	10	37.0%	17	63.0%			
Not employed	21	41.2%	30	58.8%			
Gross house hold income							
Below 10,000	20	50.0%	20	50.0%	8.02	2	**0.018**
10,000 - 20,000	17	37.8%	28	62.2%			
Above 20, 0000	3	13.6%	19	86.4%			

4.8 Relationship between socio-demographic characteristics of neonates and severity of NNS on admission

Neonates aged 8 to 28 days were significantly (P=0.02) more likely to present with more severe form of NNS during admission (44.2%) compared to those neonates aged less than 8 days (20.0%) (Table 9). Similarly, the proportion of severe NNS was significantly (0.011) more among neonates who were formula fed after delivery (72.7%) as compared to those neonates who breast fed (33.3%) after delivery.

Table 9 : Socio-demographic characteristics of neonates and severity of neonatal sepsis on admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test *P value
	n	%	n	%			
Baby's age							
0 -7 days	6	20.0%	24	80.0%	5.38	1	**0.020**
8 - 28 days	34	44.2%	43	55.8%			
Baby's gender							
Male	22	35.5%	40	64.5%	0.22	1	0.634
Female	18	40.0%	27	60.0%			
Gestational age							
33-36 weeks	3	33.3%	6	66.7%	0.05	1	0.794
37 weeks and above	37	37.8%	61	62.2%			
Birth weight of the baby							
1500-2000	2	50.0%	2	50.0%	5.02	3	0.170
2001-2500	2	15.4%	11	84.6%			
2501-3000	11	31.4%	24	68.6%			
3000 and above	25	45.5%	30	54.5%			
Mode of delivery							
Normal vaginal delivery	31	37.8%	51	62.2%	0.02	1	0.870
Caesarean section	9	36.0%	16	64.0%			
Duration of feeding initiation after delivery							
< 1 hour	20	35.1%	37	64.9%	4.59	3	0.205
1-2 hours	7	26.9%	19	73.1%			
2-4 hours	5	62.5%	3	37.5%			
>4 hours	8	50.0%	8	50.0%			
Type of feed that the new-born fed on after delivery							
Breast milk	32	33.3%	64	66.7%	6.54	1	**0.011**
Formula feed	8	72.7%	3	27.3%			

4.9 Relationship between history of health related factors of neonates and severity of NNS on admission

Neonates who developed NNS within 8-28 days after birth were significantly associated with severe form of neonatal sepsis (p = 0.020). They also had a higher proportion of severe NNS (55.2%) compared to those who became sick within the first 7 days (30.8%) (Table 10).

Table 10 : Neonates` health related factors and severity of NNS on admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		$\chi 2$ value	df	$\chi 2$ test p value*
	n	%	n	%			
Whether new-born managed in nursery after delivery							
Yes	7	50.0%	7	50.0%	1.09	1.00	0.295
No	33	35.5%	60	64.5%			
How long after birth did the new-born get ill							
0-7 days	24	30.8%	54	69.2%	5.38	1.00	**0.020**
8-28 days	16	55.2%	13	44.8%			
Time taken to bring the baby to hospital after illness began							
Immediately	23	35.4%	42	64.6%	0.41	2.00	0.818
1-2 days	10	38.5%	16	61.5%			
More than 2 days	7	43.8%	9	56.2%			

4.10 Association between maternal characteristics and severity of NNS on admission

There was a significant association between the frequency of antenatal care clinic (ANC) attendance and the severity of neonatal sepsis (p =0.044) (Table 11). Increasingly more severe neonatal sepsis (57.1%) was observed among neonates whose mothers attended ANC 1-3 times compared to those whose mothers attended at least 4 times (33.3%).

Table 11 : Maternal characteristics and severity of NNS on admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test
	n	%	n	%			p value*
Frequency of ANC attendance							
1-3 times	12	57.1%	9	42.9%	4.04	1	**0.044**
4 times or more	28	33.3%	56	66.7%			
Gestation at which first ANC visit was made							
Within the first 3months	10	37.0%	17	63.0%	0.02	2	0.989
Second 3months	28	38.4%	45	61.6%			
Last 3months	2	40.0%	3	60.0%			
Any medical illness during pregnancy							
Yes	12	38.7%	19	61.3%	0.03	1	0.856
No	28	36.8%	48	63.2%			
Any medically prescribed drugs during pregnancy							
Yes	31	37.3%	52	62.7%	0.00	1	0.989
No	9	37.5%	15	62.5%			

4.11 Relationship between obstetric characteristics and severity of NNS on admission

Parity and severity of neonatal sepsis were significantly associated (p = 0.003) (Table 12). Primipara mothers tended to have neonates with more severe NNS (50.9%) than multipara mothers (23.1%). Moreover, mothers who reported to have drained greenish liquor (amniotic fluid) during labor had neonates with significantly (p = 0.006) more severe form of neonatal sepsis (63.6%) compared to those mothers who had drained clear liquor (31.2%).

Table 12 : Obstetric characteristics and severity of NNS on admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test
	n	%	n	%			p value*
Number of children							
Less than three	32	35.6%	58	64.4%	0.39	1	0.369
Three to five	8	47.1%	9	52.9%			
Any history of miscarriage							
Yes	6	37.5%	10	62.5%	0.00	1	0.992
No	34	37.4%	57	62.6%			
Parity							
Primipara	28	50.9%	27	49.1%	7.69	1	**0.003**
Multiparous	12	23.1%	40	76.9%			
Place of delivery for the child							
In a public health facility	27	39.7%	41	60.3%	0.12	1	0.72
In private health facility	13	36.1%	23	63.9%			
Duration of the labor							
Less than six hours	20	51.3%	19	48.7%	4.54	2	0.102
6-10 hours	10	29.4%	24	70.6%			
More than 10hours	9	31.0%	20	69.0%			
Time taken from the time membranes ruptured to delivery							
Less than 4 hours	27	38.6%	43	61.4%	3.01	2	0.222
4-6hours	4	23.5%	13	76.5%			
More than six hours	8	53.3%	7	46.7%			
Color of the liquor							
Clear	25	31.2%	55	68.8%	7.66	1	**0.006**
Greenish	14	63.6%	8	36.4%			
Whether the baby was put on any medication upon delivery							
Yes	6	27.3%	16	72.7%	0.73	1	0.271
No	34	40.0%	51	60.0%			
Duration of stay before being discharged from health facility after delivery							
Hours	7	35.0%	13	65.0%	0.45	3	0.929
One day	14	37.8%	23	62.2%			
Two days	4	30.8%	9	69.2%			
More than two days	15	40.5%	22	59.5%			

4.12 Association between socio-economic characteristics and severity of NNS on admission

The study found a significant association between the kind of toilet used and the severity of neonatal sepsis. Mothers who used pit latrines had more neonates with severe NNS (50.0%) (p=0.030) than mothers who were using flush toilets (29.2%) [Table 13].

Table 13 : Mothers` socio-economic characteristics and severity of NNS on admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test
	n	%	n	%			p value*
Residence							
Mid-level urban setting	32	38.6%	51	61.4%	3.25	2	0.196
Urban slum area	3	20.0%	12	80.0%			
Rural area	5	55.6%	4	44.4%			
Type of the house currently living in							
Single room	18	38.3%	29	61.7%	0.03	2	0.984
One bed-roomed plus sitting room	14	36.8%	24	63.2%			
More than 1 bed-roomed plus sitting room	8	36.4%	14	63.6%			
Availability of specific food preparation room							
Yes	23	42.6%	31	57.4%	1.26	1	0.261
No	17	32.1%	36	67.9%			
Kind of toilet							
Pit latrines	21	50.0%	21	50.0%	4.7	1	**0.030**
Toilet (flushable)	19	29.2%	46	70.8%			
Sharing toilet facilities with other families							
Yes	19	33.3%	38	66.7%	0.85	1	0.355
No	21	42.0%	29	58.0%			
Number of people living in the house							
Less than three	3	33.3%	6	66.7%	0.52	2	0.771
Three to five	31	36.5%	54	63.5%			
More than five	6	46.2%	7	53.8%			
Source of water							
Bore-hole/well	8	50.0%	8	50.0%	1.06	1	0.302
Tap water	32	36.4%	56	63.6%			
Water vendors	0	0.0%	3	100.0%			
How to clean the cord of the baby							
I don`t clean it	7	21.9%	25	78.1%	5.11	2	0.078
Bathing water in a basin	10	50.0%	10	50.0%			
Methylated spirit and cotton wool	23	41.8%	32	58.2%			

4.13 Relationship between healthcare provider practices and severity of NNS on admission

There was no significant association observed between the healthcare provider practice and severity of NNS during admission.

Table 4.14: Relationship between healthcare provider practices and severity of NNS during admission

Variables	Severe NNS, (N=40)		Mild NNS, (N=67)		χ^2 value	df	χ^2 test
	n	%	n	%			p value*
Whether shared bed with another mother during your hospital stay during delivery							
Yes	6	22.2%	21	77.8%	3.54	1	0.06
No	34	42.5%	46	57.5%			
Frequency of vaginal examinations done during labor							
One to two	18	36.7%	31	63.3%	1.39	3	0.708
Three to four	11	42.3%	15	57.7%			
Above four	10	38.5%	16	61.5%			
None	1	16.7%	5	83.3%			
Whether given any health information on prevention of infection to the newborn							
Yes	30	41.1%	43	58.9%	1.35	1	0.245
No	10	29.4%	24	70.6%			
Who helps you care for the baby at home							
No one	21	40.4%	31	59.6%	3.53	2	0.171
House-help	1	10.0%	9	90.0%			
Relatives	18	40.0%	27	60.0%			
Actions taken when you noticed the baby was unwell							
Monitor for some-time	19	40.4%	28	59.6%	1.98	2	0.371
Sought medical help	21	36.8%	36	63.2%			
Consult friend or give some herbal	0	0.0%	3	100.0%			

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

5.1.1 Introduction

This chapter entails detailed discussion of the study findings and compares them to those from prior studies. The aim of the study was to characterize neonatal sepsis among patients admitted in Kenyatta National Hospital paediatric wards. The neonatal, maternal and environmental characteristics which were analyzed in the study have been elaborated and the diverse characteristics discussed broadly. Both Univariate and bivariate results will be discussed.

5.1.2 Characteristics of the study population

5.1.2.1 Neonatal characteristics.

In this study, the age of the majority of the neonates (72.0%) was between 8-28 days at the time of interview. This could be attributed to prolonged hospital stay from early onset neonatal sepsis (EONNS) since the study found that majority of the neonates had developed EONNS. This raises a concern over the newborn care after discharge hence the need to ensure that mothers are informed of the care of the newborn. More than half of the neonates (57.9%) were males. A related study demonstrated that mortality due to neonatal sepsis was more in male neonates (Afsharpaiman *et al*. 2012). The birth weight categories for the neonates included in the study showed a high percentage (51.4%) which weighed 3000 grams and above while the rest had their birth weight at <3000grams. In as much as most of the previous studies have laid

emphasis on NNS among the preterm and low birth-weight neonates, the study findings implied that neonatal sepsis does not discriminate against gestational age and various birth-weight categories.

Most (89.7%) of the neonates were breastfed after delivery while (10.3%) were initiated into formula feed. The babies initiated into formula feed could therefore have become more vulnerable to developing neonatal sepsis since formula feed does not confer natural immunity to the newborn as the breast-milk does through transfer of immunoglobulins. The sterility during preparation of formula feed could also not be guaranteed as it is the case in breastfeeding and thus this compounded the possibility of developing neonatal sepsis.

With regard to time of first feed after delivery, about half (53.3%) of the neonates were fed within one hour after delivery. These study findings expose the practice which is contrary to the World Health Organization recommended time of initiation of feeding (within one hour) after delivery (WHO, 2016).

History of health related factors among neonates

The study found that (86.9%) of the neonates were born in stable condition and thus did not need to be managed in nursery after delivery. Though these findings implies overall labor management could have been up to standard, it doesn`t negate the fact that stable newborns can develop neonatal sepsis. It thus calls for maintenance of continuum in care through labor, delivery and post-delivery. The study elicited that majority (72.9%) of the patients suffered early onset neonatal sepsis (became ill during the first 7 days after birth). This agrees with another study conducted in Ethiopia which showed that more than three quarters (76.8%) of cases had early onset sepsis (Gebremedhin *et.al*.2015). This finding is also further supported by focused

group discussion with healthcare workers during which a participant stated, '*mostly they come three days after discharge, so you find that three-five days after discharge, they come back with neonatal sepsis.'*

The main complaint of the neonates upon hospital admission were, refusal to feed 55.1%), hotness of the body (fever) (40.2%) yellowness of the body (jaundice) (34.6%) while convulsion was (6.5%). A study on `Mortality Audit of Neonatal Sepsis', also found that the major symptoms of neonatal sepsis were lethargy and poor feeding (Enuradha *et al*. (2013).

The fact that only (24.7%) of the mothers were taught on early identification of a sick neonate; could have contributed to delay in seeking healthcare for the newborn. This supports previous research which found that under-recognition of illness and delay in care seeking by the family contributed greatly to neonatal mortality from NNS (WHO, 2009).This causes concern over the awareness and knowledge level of the mothers on alertness regarding the health condition of their newborn.

Reasons for being managed in nursery after delivery

The study found that the main reason for half of the neonates who were managed in nursery after delivery was due to fetal distress. Simonsen *et al.* (2014) similarly stated that fetal tachycardia due to fetal distress contributed to neonatal sepsis. This sends signal on the post-delivery precautions that should be taken with regard to prevention of neonatal sepsis among neonates born in distress.

Severity of neonatal sepsis

Severity of neonatal sepsis was based on the presenting symptoms whereby complaints including refusal to feed, hotness of body/ fever or yellowness of body/jaundice were classified as mild neonatal sepsis. However, one or more of the aforementioned symptom(s) plus at least one of the following severe manifestations of organ dysfunction due to neonatal sepsis such as convulsion, lack of urine, skin eruptions/rashes, gangrene of any body part, bloody vomitus, abdominal distension, difficulty in breathing, bloody urine and dehydration were classified as severe neonatal sepsis during hospital admission. The study found that (62.6%) of the neonates had mild neonatal sepsis while (37.4%) had severe neonatal sepsis during admission. Lina *et al*. (2012) demonstrated supporting findings when they found that neonatal sepsis led to poor prognosis if it presented with seizures. The study findings thus send an alarming signal to the possible poor prognosis among the (37.4%) neonates who suffered severe sepsis on admission. Such a finding not only implies the possibility of prolonged hospital stay, but also imposes more burden to the already over-stretched healthcare infrastructure and resource. Preventive and promotive efforts towards reduction of the burden of neonatal sepsis are expected to lower the disease burden caused by neonatal sepsis.

5.1.2.2 Maternal characteristics

Socio-demographic characteristics of mothers

The dominance of the young adult age category in the study depicts the challenges the young mothers were faced by as regards newborn care and this could have led to the development of neonatal sepsis. The study findings concur with Central Intelligence Agency report which concluded that the median age for getting first child was 20.3 years (2010).

Strategies to educate the young mothers on newborn care are thus vital in addressing the knowledge gap among the mothers.

Majority (59.8%) of the mothers were Protestant followers while Muslims were the least (2.8%). This significantly relates to the Kenya demographics on religious inclinations that Christian population account for 82.5% while Muslims account for 11.1% of the entire population (www.indexmundi.com/g/r.aspx?v=24).With respect to level of education, over 80% of the mothers had attained a level of education higher than primary school level. This tells that majority of the Kenyans have embraced formal education as a way of intellectual development. It also shows that education for the girl-child has been acknowledged by the majority.

The study revealed an alarming unemployment rate of (47.7%) among the mothers. This closely tends to agree with Kenya Bureau of Statistics findings which stated that unemployment rate in Kenya was 40 percent in year 2011.

This implied that unemployed mothers were economically dependent on some economic network system. The ability to seek healthcare promptly and from established facilities was thus dependent on the strength of the support system. Lack of economic independence may also have contributed to delay in seeking healthcare upon realizing that the newborn was unwell. Delay in seeking healthcare could have contributed to more severe forms of neonatal sepsis on admission. Economic empowerment of the women is therefore a key pillar towards attainment of optimum health.

Distribution of health practices of mothers during pregnancy

The study shows that most (80.0%) of the mothers attended at least the 4 times recommended antenatal care visits (WHO, 2006). When the mothers were asked about gestation at which they made their first ANC visit, majority (69.5%) indicated in the second trimester. This implies that pre-conception as well as first trimester interventions were missed among these mothers. Majority (71.0%) indicated that they did not experience any medical illness during pregnancy. All of the mothers underwent HIV test during pregnancy and almost all 105(98.1%) tested negative. The 100% HIV testing among the pregnant women indicates good progress towards sustainable development goal 3(good health and wellbeing) (UN, 2016) .The finding on HIV status however contradicts previous research that concluded that 5.6% of pregnant women were HIV positive (Ndege *et al.* (2016). Lack of acceptance of positive HIV status as well as fear of stigma due to positive status could have led to the <2% HIV positive status response. This implies that there could be a need to not only get the HIV prevalence among pregnant women, but also evaluate the challenges HIV positive pregnant women are faced with inorder to offer relevant healthcare assistance.

Types of medical illness during pregnancy

A total of 31 mothers reported to have suffered some form of medical illness during pregnancy. Urinary tract infection emerged as the common illness during pregnancy having affected (51.6%) of the women. This supports the study findings by Woldu *et al.* (2014) who found that neonates born from mothers' with urinary tract infection (UTI) had a 2.9 times higher chance of developing NNS than neonates born from mothers' with no UTI. Urinary tract infection during pregnancy could probably have been due to ascending infection easily resulting into

chorioamnionitis. Chorioamnionitis could thereafter contribute to development of neonatal sepsis in the newborn.

Obstetric, pregnancy and labor experiences

About half (51.4%) of the mothers were primiparas. These further points to the challenge newborn care poses to the first time mothers. During delivery of the current child, majority of the deliveries took place in a health facility (93.2%). This could be attributed to the fact that the Kenyatta National Hospital patient population was mainly from the urban setting. However, while the study results showed that majority of medium income earners might have had embraced the free maternity care offered in Kenyan Government health facilities, study findings in a rural setting reported contrary statistics on deliveries that occurred in health facility. Kawakatsu *et al.* (2014) reported that 48% of births in Western Kenya occurred in a health facility. It could be argued that there still are many deliveries in the rural setting which occur outside health facility. This would be in order for the mothers to avoid congestion in the hospitals. This is in particular with regard to the study finding that 25.2% of the mothers reported to have shared beds during the health facility stay for the delivery of newborn. It further implies the need to further improve quality of health facilities as well as expand the infrastructure inorder to successfully implore citizens to deliver in health facilities. Most (78.4%) of the mothers indicated that they drained clear liquor during labor while 21.6% reported to have drained greenish (meconium stained) liquor. Twenty two (20.6%) of the babies were put on medication upon delivery mainly, T.E.O (68.2%) and Vitamin K (59.1%). This exposes a deficit in the health management of babies born through meconium-stained liquor and thus a need for

healthcare practice reform since only 9.1% of the neonates were put on antibiotics. It also implies that the proposed administration of T.E.O and vitamin K to all newborns is yet to be realized (January 2016 Guidelines). Lack of administration could have led to development of ophthalmia neonatorum which could easily result in systemic bacteremia.

Duration of stay in health facility after delivery

Mothers reported various durations of stay before being discharged from health facility after delivery. Thirty seven (34.6%) mothers stayed for one day while 18.7% were discharged from the health facility hours after delivery. This duration limited the post-delivery exposure to health education as well as the initiation of lactation. With a 56.1% first time mothers, there was a high possibility that neonates would come back with neonatal sepsis due to early discharge from health facility without initiation of lactation and newborn care information. This was further exposed during the focused group discussions where a participant said '*Owing to the fact that now today there are very few families who are able to have someone to assist them, you know in Nairobi somebody ako na bwana yake tu na ukiona hao (has the husband only and if you see them), are very young people. Sincerely these young mothers, some of them are married by these people still in college or they have just started working. So now that there is that challenge for the first time mothers, I think they should be given some priority. Could be they go home not after the 48 hours may be 72hours or even referred immediately to someone who can help teach them well…am telling you these young mothers can sleep and the baby sleeps!*'

5.1.2.3 Environmental factors

Socio-economic characteristics of the mothers

With a majority of the mothers living in single rooms, an average of 3-4 persons per household, sharing toilets with other families, there were high chances of contamination and transmission of infection to the neonate whose immune system was still immature. There were thus high chances of contracting infection due to poor environmental sanitation, vector transfer of infection from the pit latrines and overcrowding. Cord care practice was varied among the mothers. This leaves a question on how universal information on cord care in the country is since 97.2% of the mothers delivered in a health facility. It also contradicts the Kenya`s Ministry of Health January 2016 paediatric protocols which states that chlorhexidine 4% should be used to clean the cord.

Age of the neonate`s older sibling

The fact that 56.1% of the neonates were first-born to their mothers may indicate deficient knowledge and experience of the mothers in the prevention of neonatal sepsis. It further reveals the predisposition being a first-time newborn has towards development of neonatal sepsis. This should help identify challenges of newborn care and offer the help needed.

Health-care provider, health facility preventive and promotive practices

Large percentage (93.5%) of the mothers were not tested for infection during pregnancy. Among those who were tested for infection, urinalysis was main test done (57.1%). Studies have shown that the leading cause (70%) of neonatal sepsis most frequently involved in early-onset

neonatal sepsis of term and preterm infants together are normal gastrointestinal tract flora (which turn pathogenic in the reproductive tract) such as Group B-Streptococcus (GBS) and *Escherichia coli* (Simonsen *et al.*2014), The study however found that such screening was not done during the Kenya antenatal profile. The need for screening was further emphasized during the focused group discussion where a participant said, *`early detection of infection, sometimes you find the infection requires early detection and treatment, we should do some laboratory investigations and treat'* .The study also exposes a contradiction to proposed antibiotic therapy to mothers with GBS during the Intrapartum period (Ohlsson & Shah, 2013). The findings also reflect a deviation from the recommended Centre for Disease Control (CDC) Intrapartum prophylaxis of GBS early onset neonatal sepsis through antibiotic therapy (Simonsen *et.al*.2014).

About a quarter (25.2%) had shared bed with another mother during their hospital stay after delivery. These points to the possibility of contracting infections while in hospital both by the mother and neonate. In their study in Ethiopia on risks of NNS, (Woldu *et al.*2014) found that a significant number of neonates born in health center had a 4.2 times higher chances of developing NNS when compared to the neonates born at home. This therefore calls for a restructuring of health systems and expansion of infrastructure to accommodate the growing population. Such actions will also raise the hospital bed density from the documented 1.4beds/1,000 population (http://www.indexmundi.com) to more acceptable levels. The deficiency of necessary infrastructure was further emphasized during the FGDs, during which one of the participants said, ``*you know the mothers are given mattresses to sleep on the floor, and these mattresses, no-one cleans them. They use them today, tomorrow…..''*As regards frequency of vaginal examinations (VEs) done during labor 26(24.3%) were done more than four VEs. This was more than the recommended four VEs through the process of labor. These

research findings agrees with previous studies which concluded that that VEs were conducted too frequently (Muliira *et al*.2013).This could have contributed to the introduction of pathogens in the reproductive tract thus resulting in neonatal sepsis in the newborn. While health education is key in preventive and promotive medicine, the study found that about two third (68.2%) of the mothers had received health information on prevention of infection to the new-born. The fact that >30% of the mothers didn`t receive health information on prevention of infection to the newborn implied that the knowledge deficit contributed to the development of neonatal sepsis in the process of care from the mother.

5.1.2.4 Severity of neonatal sepsis

Neonatal sepsis was classified into two severity categories depending on presentation on admission. Symptoms including refusal to feed, hotness of body and/or yellowness of body were classified as mild neonatal sepsis. However, one or more of the aforementioned symptom(s) plus at least one of the following systemic involvement symptoms including convulsion, lack of urine, skin eruptions/rashes as well as gangrene were classified under severe NNS. Moreover, bloody vomitus, abdominal distension, difficulty in breathing; bloody urine and dehydration were also classified as severe neonatal sepsis during hospital admission. Mild neonatal sepsis dorminated at (62.6%) while (37.4%) of the neonates had severe neonatal sepsis on admission.

Association between socio-demographic characteristics of mothers and severity of neonatal sepsis during admission

Mothers with primary level of education (55.0%) and secondary school (42.3%) had significantly (P=0.021) increased proportion of neonates with severe NNS compared to those

with tertiary level of education (20.0%). These study findings supports previous findings in a study in Nigeria which found that mothers with no formal or with only primary education had high proportions of culture proven sepsis (41.1% and 58.8% respectively) (Onyedibe K. *et al*.(2012). This implied that lower level of education could have led to inability to offer appropriate newborn care, lack of awareness that the baby was unwell and probably seek healthcare when the sepsis was severe. This could also amount to poor prognosis of the neonates who were brought to hospital in severe sepsis thereby result in high mortality of the neonates born to mothers with primary education and below.

Households whose income was less than KShs 10,000 per month had neonates with significantly more severe NNS (50.0%) [P=0.021] than households with income of above KShs 20,000 (13.6%). Low monthly income could have contributed to delay in seeking healthcare for the sick neonate thereby resulting to severe NNS on admission. Though there was however no significant association (P<0.05) between severity of NNS and the other socio-demographic characteristics of the mothers (i.e age, marital status, religion and occupation), the role of social support network cannot be ignored.

Relationship between socio-demographic characteristics of neonates and severity of NNS on admission

Bivariate analysis elicited that neonates aged 8 to 28 days were significantly more likely to have severe NNS during admission (44.2%) [P=0.02] compared to those neonates aged less than 8 days (20.0%). This could be related to the compounding effect of events during labor, delivery, after delivery and home environment since neonates aged >8days were home longer than those <8days.The proportion of severe NNS was significantly more among neonates who

were formula fed after delivery (72.7%) [P=0.01] than those who breastfed (33.3%). The study findings support previous research which confirmed that human milk feeding started within the first 72 hrs after birth was associated with an approximately threefold reduction in the risk of LOS (Ronnestad *et al*.2005)

Relationship between history of health related factors of neonates and severity of NNS on admission

The study finding on the significantly higher proportion of severe NNS [P=0.020] among neonates who developed LONNS could be attributed to the compounding effect of community-acquired LOS risks which include poor hygiene, poor cord care, bottle-feeding, and prelacteal feeds (Jeeva *et al.2008).*

Association between maternal characteristics and severity of NNS during admission

Neonates whose mothers attended 1-3 times of antenatal care had significantly increased severe neonatal sepsis (57.1%) [P=0.044] compared to those whose mothers attended antenatal clinic at least 4 times (33.3%). This may explain the benefits accrued from health education given during each attendance. This confirms the study findings on the role of antenatal care in the occurrence of late onset neonatal sepsis in a study done in Brazil which demonstrated that proportion of pregnant women who adhered to at least six (the recommended in Brazil) antenatal visits in the study (38%) was much lower than the average rate of 61% (Mizumoto *et al*.2015)

Relationship between obstetric characteristics and severity of NNS during admission

The significant association between primaparity and severity of NNS [P=0.003] cannot be over-emphasized. This reflected the impact being a first-time mother has towards prevalence of neonatal sepsis mainly due to lack of experience on newborn care.

Mothers who indicated to have drained greenish liquor (amniotic fluid) during labor had significantly more proportion of severe neonatal sepsis (63.6%) [P=0.006] compared to those mothers who indicated to have had clear liquor. This concurs with previous study which found that factors which carried a significant risk for development of neonatal sepsis were premature rupture of membrane, meconium stained amniotic fluid among others (Shah *et al*.2006). The study findings imply that neonates born through meconium stained liquor had an odds of 3.85 of developing neonatal sepsis than those born through clear liquor. This could be related to the possibility of aspiration as well as contamination of the cord stump which is an important portal of entry of pathogens.

Association between socio-economic characteristics and severity of NNS on admission

Mothers who used pit latrines tended to have neonates with significantly more severe NNS (50.0%) [P=0.030] than mothers who were using flush toilets (29.2%). This explains why late onset NNS was more to neonates >8days due to the environmental effects in the home setting. Onyedibe *et.al* (2012) confirmed this when they concluded that an improved standard of living, education and empowerment of women and increased provision of basic social amenities would go a long way in reducing the morbidity and mortality of neonatal sepsis in the environment.

Relationship between healthcare provider, health facility practices and severity of NNS on admission

The study didn`t demonstrate significant association between the healthcare provider practice and severity of NNS during admission. This however does not negate the role healthcare practice as in the prevention and control of occurrence of neonatal sepsis.

5:2 CONCLUSION

The study concludes that;

1. Neonatal characteristics such as being born through meconium-stained liquor, male gender, fetal distress at birth as well as being firstborn neonates predisposes newborns to development of neonatal sepsis.
2. Maternal characteristics such; as young age and low parity of the mother, low level of education of the mothers as well as poor socio-economic status are associated with the development of neonatal sepsis among the newborns.

3. Environmental characteristic such as living in overcrowded areas, inadequate exposure to health education post-delivery contributes to development of neonatal sepsis in newborns.

4. Severity of neonatal sepsis is higher among neonates who develop neonatal sepsis within 8-28days of birth, those born to first time mothers, those whose mothers poorly attend antenatal care clinics and to mothers with low level of education.

   Based on the study findings which found a statistical significance between the variables and development of neonatal sepsis, the study hypothesis; ` neonatal, maternal and environmental characteristics contributes to development of neonatal sepsis' is adopted.

5:3 RECOMMENDATIONS

The researcher proposes that;

1. High risk newborns should be considered for antibiotic prophylaxis against neonatal sepsis.

2. A preventive programme should be devised for mothers whose characteristics contribute to development of neonatal sepsis in newborns.

3. Environmental modifications should be proposed for mothers whose environmental conditions favor the development of neonatal sepsis in newborns.

4. Holistic approach should be implored with an aim of reducing the severity of neonatal sepsis in newborns.

5. The ministry of health should carry out routine evaluation on the adherence to laid down protocols within the healthcare sector.

3:15 REFERENCES

http://www.indexmundi.com/kenya/demographics_profile.html

http://www.tradingeconomics.com/kenya/unemployment-rate

I.H.M.E (2013). "Global Burden of Disease-kenya" Institute for Health Metrics and Evaluation".

January 2016 guidelines. pdf

Jeeva S., Agarwal R,. A Deorari ·A et al.(2008) Indian Journal of Pediatrics: Infant mortality

Available at: *www.newbornwhocc.org/2014_pdf*

Kawakatsu Y., Sugishita T., Oruenjo K et al.(2014)`` Determinants of health facility utilization for childbirth in rural western Kenya: cross-sectional study."BMC Pregnancy Childbirth **9**(14) 265

K.N.H (2015). Ranking of neonatal sepsis mortality rate among K.N.H mortality.

Kunze M., Muller C., Flecken U *et al.* (2006). " Evaluation of placental membrane swabs in the diagnosis of intrauterine infections." Geburtshilfe und Frauenheilkunde **66**: 575-578.

Lina M,Chia H. & Chiua N. (2012)`` Factors for poor prognosis of neonatal bacterial meningitis in a medical center in Northern Taiwan."Journal of Microbiology, Immunology and Infection 45(6) 442–447

Marcdante J., Jenson B. & Berman E., Ed. (2011). Nelson, Essentials of paediatrics. Philadelphia, Saunders.

Mizumoto B., Moreira B., Shantoro-Lopes G. *et al(2015)"* Quality of antenatal care as a risk factor for early onset neonatal infections in Rio de Janeiro, Brazil" The Brazilian Journal of Infectious Diseases **19**(3) 272–277

Mongella; (2016) Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa.

Available at*: www.who.int/pmnch/media/.../aonsectionIII_2.pdf*

Muliira S., Seshan V., & Ramasubramaniam S.(2013) ``Improving Vaginal Examinations Performed by Midwives." Sultan Qaboos Univ Med J **13**(3) 442-449

Mwaniki G., et al. (2010). "An increase in the burden of neonatal admissions to a rural district hospital in Kenya over 19 years." BMC Public Health **10**: 591.

Nathoo K., Mason. P & Chimbira T. (1990). " Neonatal septicaemia in Harare hospital, aetiology and risk factors—the puerperal sepsis study group." Cent Africa J Med **36**: 150-156.

Ndege S., Washington S.,Kaaria A.*et al*.(2016) "HIV Prevalence and Antenatal Care Attendance among Pregnant Women in a Large Home-Based HIV Counseling and Testing Program in Western Kenya"

Ohlsson A. and Shah v (2013). "Intrapartum antibiotics for known maternal Group B streptococcal colonization." Cochrane Database Syst Rev **1**: CD007467.

Onyedibe K., Utoh-Nedosa A., M Okolo M.et. al (2012)"Impact of Socioeconomic Factors on Neonatal Sepsis in Jos, Nigeria"

Pearson A., Vaughan B. & Fitzgerald M Ed. (2005). Nursing models for practice.

Pediatricians, p. i. d. s., neonatologists, neonatal advanced practice registered nurses (2012). " Management-early-onset-neonatal-sepsis. ."

Polin R. A., Brady S. Denson S, et al. (2012). "Strategies for prevention of health care-associated infections in the NICU." Pediatrics **129**(4): e1085-1093.

Rhee V., Khatry S., Katz J. *et al*. (2008). " Maternal and birth attendant hand washing and neonatal mortality in southern Nepal" Arch Pediatric Adolescent Med **162**: 603-608.

Rønnestad A, Abrahamsen TG, Medbø S, et al (2005) "Late-onset septicemia in a Norwegian national cohort of extremely premature infants receiving very early full human milk feeding". Pediatrics **115**:e269–76

Shah G., Budhathoki S., Das BK. et al.(2006) ``Risk factors in early neonatal sepsis". Kathmandu Univ Med J (KUMJ) **4**(2) 187-91

Seale A., Newton C., Mwaniki M. *et al*. (2009). "Maternal and early onset neonatal bacterial sepsis: burden and strategies for prevention in sub-Saharan Africa." Lancet Infect Dis **9**(7): 428-438.

Stoll B., Hansen N., Tyson J et al. (1999). ". Dexamethasone therapy increase infection in very low birth weight infants" Pediatrics **104**(5): 63.

UN (2007). Tracking the millennium development goals. d. p. monitor.

WHO (2009). " Neonatal sepsis: A major killer to be tackled in communities."

Wittay W., Sondheimer M. ,Deterding R *et al* Ed. (2011). Current diagnosis and treatment. Paediatrics.2oth edn.MCgraw hill companies.

Woldu M., Guta M., Lenjisa J., *et al* (2014) ``Assessment of the Incidence of Neonatal Sepsis, its Risk Factors, Antimicrobials Use and Clinical Outcomes in Bishoftu General Hospital, Neonatal Intensive Care Unit, Debrezeit-Ethiopia". Pediatric Therapeutics**4**:214.

www.un.org/sustainabledevelopment/sustainable-development-goals/United nations, 2016

Zaleznik D., Hillier S., Krohn M. *et al* .(2000). " Invasive disease due to group B streptococcus in pregnant women and neonates from diverse population groups." Clinical Infectious Diseases **30**: 276-281.

APPENDICES

APPENDIX 1: STUDY TIME FRAME

Duration of study: Nine months (November 2015-August 2016)

Time frame

Month / Activity	Nov 2015-January 2015	February 2016	March-mid-march 2016	April	Mid May-mid June 2016	June-July 2016	August 2016	August 2016
Research proposal writing and submission to supervisor								
Submission to E.R.C								
E.R.C recommendations acted upon								
Seeking approval From E.R.C								
Data collection, entry and data cleaning								
Data analysis								
Research report writing								
Discussion and presentation								

APPENDIX 2: STUDY BUDGET

Serial no	Item	Unit cost	Quantity	Total cost
1	**Personnel**			
	Research assistant	2000*1	20days	40,000
2	**Supplies and equipment**			
	Pens	20	10	200
	Flash-disk	1500	2	3,000
	Printing paper	500	4	2,000
	Printing charges	1000	4	4,000
3	**Consultancy**			
	Biostastician	30,000	1	30,000
	Data management	1500	20days	30,000
4	**Operating costs**			
	Binding fee	1500	4	6000
Total				115,200
Contingency	15% of total cost			17,280
Grand total	Total + contingency cost			132,480

APPENDIX 3a: PARTICIPANT/CARETAKER INFORMATION SHEET

Investigator: Florence K. Muthwii Tel.: 0723431811

School of Nursing Sciences,

University of Nairobi

P.O. Box 19676, Nairobi.

Introduction: Hello! My name is Florence, a nursing student from the University of Nairobi. I am conducting a study to establish the characteristics of neonates and their mothers that predispose the neonate to developing neonatal sepsis (preventable illness) in newborns admitted in this hospital. **The study title is: `Characterization of neonatal sepsis among patients in Kenyatta National Hospital paediatric wards,` A descriptive cross sectional study at Kenyatta national Hospital, Nairobi.** This study will be conducted at Kenyatta national hospital paediatric wards.

You are invited to participate in this study. The following information is important to help you make an informed decision.

Background and objective: The purpose of the study is to identify the maternal and neonatal factors which could lead to development of preventable illness in the newborn.

It aims at establishing the identification of those factors during pregnancy, labor and post-delivery thereby providing a guide to help identify risk factors, in the long-run reducing possibility of newborn babies getting ill.

You are therefore considered suitable participant because you are one of the mothers with a baby suffering from neonatal sepsis.

Benefits of the study:

The information you give will help us easily identify factors that contribute to the development of neonatal sepsis hence prevent the occurrence of the infection.

The information you give will be used in policy making and guide in decision making on early detection of high risk neonates in-order to reduce chances of newborns getting the illness. Minimal risk is expected in the study on the area of you giving us your information. There will be no direct monetary benefits.

What participation means

Participation is voluntary.

The study will involve interviews at the bedside where questions will be asked and you give answers to the questions. The questions will be on your time during pregnancy, labor and period following delivery. The interview is expected to take 15-20minutes.

The information you give will be kept confidential and your name will not be identifiable with the information.

You have the freedom to:

Decide whether to participate or not.

Answer the questions you are comfortable with.

Withdraw from the study at any point and your information will be confidential and destroyed.

For more information and clarification; you are free to contact;

Supervisor`s Name…Dr.Chege

School of nursing sciences (UON)

Email address……margaretchege@gmail.com

Telephone Number: 0725555114

APPENDIX 3b: FOMU YA MAELEZO KUHUSU IDHINI

Mtafiti: Florence K. Muthwii Rununu: 0723431811

Shule ya wauguzi

Chuo Kikuu cha Nairobi

Sanduku la posta 19676, Nairobi.

Utangulizi:Hujambo! Jina langu naitwa Florence, mwanafunzi katika Chuo Kikuu cha Nairobi. Ninafanya utafiti kuhusu vipengele husika vya ugonjwa katika watoto walio na umri wa hadi siku 28 ambao wamelazwa katika Hospitali Hii kuuYa Kenyatta.

Umekaribishwa kushiriki katika utafiti huu. Walakini, maelezo yafuatayo yatakusaidia kumakinika unapotoa idhini yako kushiriki katika utafiti.

Lengo la utafiti huu ni kutambua vipengee katika mama, mtoto na mazingara vinavyoweza kuchangia kuibuka kwa maradhi yanayoweza kuzuiwa katika mtoto mchanga.

Utafiti unalenga kutambua hivyo vipengee wakati wa mimba, uchungu wa kujifungua na muda punde baada ya kujifungua ndiposa kuweka mikakati ya kupunguza uwezekano wa watoto wachanga kuugua maradhi hayo.

Umehesabiwa kuwa mshirika ufaaye kwa sababu wewe ndiye mzazi wa mtoto anayeugua maradhi hayo.

Faida za utafiti

Majibu utakayopeana yatasaidia kutambua yaliyochangia kuugua kwa mtoto ndiposa tuweze kuzuia.

Matokeo ya utafiti yataweza kutumika kuelekeza maamuzi kuhusu kutambulikana kwa mapema kwa uwezekano wa ugonjwa kutokelezea na kuzuia hayo maradhi kwa mapema katika mlengo wa juu serikalini.

Kutoa habari kujihusu na mtoto ndio madhara yanayotarajiwa.

Kuhusika kushiriki.

Kushiriki ni kwa hiari yako.

Utaulizwa maswali ulipo kuhusu wakati wako wa mimba, uchungu wa kujifungua na muda baada ya kujifungua na pia hali ya mtoto wako. Kujibu maswali kutachukua muda wa dakika 15 hadi 20.

Habari utakazopeana zitalindwa zisiweze kupatikana na watu wasiohusika kwa utafiti na habari yako haitaweza kutambulishwa nawe.

Unao uhuru wa:

1. Kushiriki au kutoshiriki.

2. Kujibu maswali uko sawa kwayo.

3. Kusitisha kushiriki wakati wowote na habari yako italindwa na kuharibiwa.

Kwa habari na maelezo zaidi, una uhuru wa kuulizia,

Mwalimu wangu: Daktari M. Chege

Shule ya wauguzi

Chuo Kikuu Cha Nairobi.

Barua Pepe……Margaret.chege@gmail.com

Rununu: 0725555114

APPENDIX 3c: PARTICIPANT/PARENT INFORMED CONSENT FORM

I …(serial number)…… do agree to participate in the study on characterization of neonates with sepsis, whose purpose, benefits and risks have been explained to me.

I am informed that my participation is voluntary and no financial benefits are provided.

I have also been informed that my information will be confidentially maintained and it will not be possible to identify the information with me. I am also informed that I can withdraw from the study at whichever level I find appropriate to do so.

I therefore willingly and voluntarily agree to participate in the study on the characterization of neonates with sepsis.

Participant`s signature/thumb print……

Date ……

Time ……..

Interviewer name……..sign ……..

Date ……Time……..

APPENDIX 3d: FOMU YA KUTOA IDHINI KUSHIRIKI

Mimi (nambari ya siri)…….natoa idhini yangu kwa hiari kushiriki katika utafiti ambao nimeelezewa lengo, faida na madhara yake. Nimejulishwa kwamba kushiriki kwangu ni kwa hiari na hakuna faida zozote za kifedha nitapokea.

Nimejulishwa pia kwamba ujumbe nitakaotoa utawekwa kisiri na hautaweza kutambulishwa nami. Nafahamu naweza kusitisha kushiriki kama itafaa kwa wakati wowote.

Hivyo basi natoa idhini yangu kushiriki katika utafiti utakaozaidia kutambua vipengele husika katika kusababisha maradhi ya watoto wachanga wanapozaliwa, kwa hiari yangu.

Sahihi ya mshirika…….

Tarehe……....

Saa ……

Jina la mtafiti……Sahihi…….

Tarehe…….. Saa……..

APPENDIX 3e: HEALTHCARE WORKER FOCUS GROUP DISCUSSION CONSENT FORM

My name is Florence Muthwii. I am a student at the University of Nairobi, school of Nursing Sciences, undertaking a master's degree course in paediatric nursing. I am conducting a research study on characterization of neonatal sepsis among patients admitted in Kenyatta National Hospital paediatric wards. This study is for the award of the degree of Masters of Science in Nursing (Paediatrics). I encourage you to participate freely and contribute your views and ideas as much as possible. The information gathered will be treated as a group contribution and will be strictly confidential. The information will be highly valuable to the research and will help in holistic proactive approach in the management of neonatal sepsis. The will to participate is absolutely voluntary without any coercion or inducement. All rights will be guaranteed. In case you would like to know the results of this study or you have any complaints, please do not hesitate to contact the following:

1. Florence Muthwii on cell phone number 0723431811.

2. Dr Margaret Chege on cell phone number: 0725555114

3. Chairman KNH/UON-ERC, Box 20723 Kenyatta N. Hospital. Tel 2726300-9, Ext 44102.

We do hereby provide informed consent to take part in this study. We have been explained the nature of the study and its purpose.

Participants' signature,

1 …….. 6……

2 …….. 7……

3 …….. 8……

4 …….. 9……

5 …….. 10……..

Principle investigator/Research assistant's name …… Signature ……..

APPENDIX 4A: STUDY QUESTIONNAIRE

Questionnaire on: **Characterization of neonatal sepsis among patients admitted in Kenyatta National Hospital paediatric wards**

Serial Number…… Date of interview……..

Instructions: Thank you for your willingness to respond to my questions. This session will take 15-20minutes. You will be interviewed as the questionnaire is filled. Your responses will be recorded just the way you put them.

Thank you.

Section A: Socio-demographic data

1. 0 Demographic data (please respond to the following questions)

1.1 How old are you?

a) Below 20yrs [ ] b) 20-25years [ ] c) 26-30years [ ]

d) 30-49years [ ] e) over 49years [ ]

1.2. What is your occupation?

a) Self-employed [ ] b) In formal employment [ ] c) Not-employed [ ]

d) student [ ]

1.3. What is your highest level of education?

a) Primary level [ ] b) Secondary level [ ] c) college/university level [ ]

d) Have no formal education [ ]

1:4 what is your gross income per month?

a) <10,000 [ ] b) 10,000-20,000 [ ] c) 20,000-50,000 [ ] d) >50,000 [ ]

1.5 To which religion do you belong?

a) Protestant [ ] b) Catholic [ ] c) Muslim [ ] d) other (specify)……

1.6. What is your marital status?

a) Single [ ] b) Married [ ] c) separated [ ] d) Widowed [ ]

e) Divorced [ ]

.

Section B: Neonatal characteristics

2.0 Neonatal demographics

Kindly respond to the following questions

2.1. What gender is your neonate?

a). Male [ ] b) Female [ ]

2.2. How old is your newborn?

a) 0-7days [ ] b) 8-28days [ ] c) More than 28days

2.3. At what age in weeks was the pregnancy at birth of your newborn?

a) 25-32weeks [ ] b) 33-37weeks [ ] c)>37weeks [ ]

2.4. What was the weight at birth of your newborn (in grams)?

a) 1500-2000 [ ] b) 2001-2500 [ ] c) 2501-3000 [ ] e) >3000 [ ]

2.5. What was the mode of delivery of the newborn?

a) Normal vaginal delivery [ ] b) Caesarean section [ ]

c) Any other (specify)…….

2.6. Was the newborn managed in nursery after delivery?

a) Yes [ ] b) No [ ]

2.7 If yes in 2.6 above, why?.....

2.8. If yes in 2.7 above for how long was the newborn in nursery unit?

a)<24hours [ ] b)1-2days [ ] c)>2days [ ] d) N/A

2.9. How long did it take for the newborn to feed after delivery?

a)<1hour [ ] b) 1-2hours [ ] c)2-4hours d) >4hours

2.10. What type of feed was the newborn fed on after delivery?

a) Breast milk [ ] b) Formula feed [ ]

3.0 Neonate`s illness history

3.1. How long after birth did the newborn get ill?

a) 0-7days [ ] b) 8-28days [ ]

3.2. What was the problem of the baby when you came to hospital? (Indicate that which applies)

a) Refusal to feed [ ]

b) Hotness of the body [ ]

c) Yellowness of the body [ ]

c) Convulsions [ ]

d) Others (specify)……

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

a) Immediately [ ] b) 1-2 days [ ] c) More than 2 days [ ]

3.4:If not immediately, why? (please explain)……
…….

Section C: Maternal characteristics

4.0 Antenatal history

4.1 Did you attend any antenatal clinic while you were expecting this baby?

a) Yes [ ] b) No [ ]

4.2 If yes in 4.1 above, how many times did you visit the antenatal clinic?

a) 1-3 times [ ] b) 4times or more [ ]

4.3 At what age was the pregnancy when you first made your antenatal visit?

a) Within the first 3months [ ] b) Second 3months [ ] c) Last 3months [ ]

4.4. Did you suffer any medical illness during pregnancy?

a) Yes [ ] b) No [ ]

4.5. If yes, which one?

a) Diabetes [ ] b) Fever [ ] c) Any other, specify……..

4.8: Have you ever been tested for H.I.V?

a) Yes [ ] b) No [ ]

4.9. If yes in 4.8 above what is your HIV status?

a) Positive [ ] b) Negative [ ] c) Not tested [ ]

4.10. If no in 4.8 above, why?

……

……

4.11 Did you use any drug of abuse during pregnancy?

a) Yes [ ] b) No [ ]

4.12 If yes in 4:11 above, specify the drug(s) of abuse used……

4.13 Were you on any medically prescribed drugs during pregnancy?

a) Yes [ ] b) No [ ]

4.14 If yes in 4.13, which ones?

a) Steroids [ ] b) Ranitidine [ ] c) Antibiotics [ ] d) any other (specify)…….

5.0 Obstetric characteristics

5.1. How many children do you have?

a) Less than three [ ] b) 3-5 [ ] c) More than five [ ]

5.2. Have you ever had a miscarriage?

a) Yes [ ] b) No [ ]

5.3. If yes in 5.2 above, what caused the miscarriage?

a) My illness [ ] b) Trauma [ ] c) I don`t know [ ]

d) Any other, please specify…….....

5.4. Describe the health of your previous two children by the age of one month.

……
……....

5.5. Where was this baby born? (Choose the correct response)

a) At home [ ]

b) On my way to hospital [ ]

c) In a public/government health facility [ ]

d) In private health facility [ ]

5.6. How long did your labor take? (specify the correct response)

a) Less than six hours [ ] b) 6-10 hours [ ]

c) More than 10hours [ ] d) Elective c/s(did not labor) [ ]

5.7. How long did it take from the time membranes ruptured to delivery?

a) Less than 4 hours [ ] b) 4-6hours [ ] c) more than six hours [ ]

d) N/A [ ]

5.8. What was the color of the liquor?

a) Clear [ ] b) Greenish [ ] c) N/A [ ]

5.9 Was your baby put on any medication upon delivery?

a) Yes [ ] b) No [ ]

5.10 If yes in 5.9, which one?

a) Vitamin K [ ] b) T.E.O [ ] c) Antibiotics [ ] d) I don`t know [ ]

5.11. If you delivered in a health facility, for how long did you stay before being discharged home after delivery?

a) Hours [ ] b) One day [ ] c) Two days [ ] d) More than two days [ ]

Section D: Environmental factors

6.0 Socio-economic factors

6.1 How would you classify your residence??

a) Mid-level urban setting [ ] b) High social economic urban setting [ ]

c) Urban slum area [ ] d) Rural area [ ]

6.2 Which one of the following best describes the house you are currently living in?

a) Single room [ ] b) One bed-roomed plus sitting room [ ]

c) More than 1 bed-roomed plus sitting room [ ]

6.3 Do you have a specific food preparation room?

a) Yes [ ] b) No [ ]

6.4: What kind of toilets do you use?

a) Pit latrines b) Toilet (flushable) [ ] c) Open places [ ]

6.5: Do you share your toilet facilities with other families?

a) Yes [ ] b) No [ ]

6.6 How old is the neonate`s older sibling?

a) None [ ] b) 2-4years [ ] c) Above 4years [ ] d) Below 2 years [ ]

6.7 How many people live in your house?

a) Less than three [ ] b) 3-5 [ ] c) More than five [ ]

6.8 What is your source of water?

a) Bore-hole/well [ ] b) Water vendors [ ] c) Tap water [ ] d) Others [specify]…….

6.9 When do you wash your hands as you care for your baby?

a) Before feeding the baby [ ] b) After nappy change [ ] c) Rarely do I wash hands [ ]

6.10: what do you use to clean the cord of the baby?

a) I don`t clean it [ ] b) Bathing water in a basin [ ]

c) Methylated spirit and cotton wool [ ] d) Traditional herbs [ ]

e) Others (specify)…….

6.1 Health-care provider practices

6.1.1. Was any testing for infection done during pregnancy?

a) Yes [ ] b) No [ ]

6.1.2. If yes, which one?

Please specify……..

6.1.3. Did you share bed with another mother during your hospital stay during delivery?

a) Yes [ ] b) No [ ]

6.1.4. How many vaginal examinations did you have done during labor?

a) 1-2 [ ] b) 3-4 [ ] c) >4 [ ] d) None [ ]

6.1.5. Were you given any health information on prevention of infection to the newborn?

a) Yes [ ] b) No [ ]

6.1.6. If yes in 6.1.5 above on which topics? (indicate the ones applicable)

a) Hand washing before handling the newborn [ ]

b) Hand-washing before feeding the newborn [ ]

c) How to keep the cord of the newborn clean [ ]

d) Immunization follow-up [ ]

e) Early identification of a sick newborn [ ]

f) Breast-feeding technique [ ]

g)Any other (specify)…….

6.2 Cultural practices

6.2.1 Who helps you care for the baby at home?

a) No one [ ] b) House-help [ ] c) Relatives [ ] d) others (specify)…….

6.2.2 How often do they wash hands as they care for the baby?

a) Before feeding the baby [ ] b) After nappy change [ ]

c) Rarely do they wash hands [ ]

6.2.3 Briefly describe your experience on baby care by the care-taker

……

……

6.2.4 What did you do when you noticed the baby was unwell?

a) Monitor for some-time [ ]

b) Consult a friend [ ]

c) Gave some herbal medicine [ ]

d) Sought medical help [ ]

APPENDIX 4b: FOCUSED GROUP DISCUSSION TOOL

Neonatal sepsis is not only a national but both regional and global problem. It accounts for high morbidity and mortality of the neonates. Here comes a call to us all to discuss the following questions as regards neonatal sepsis. Thank you.

1. What neonatal characteristics play a role in the occurrence of neonatal sepsis (i.e.; what common features have we seen among the neonates who come to us with neonatal sepsis)?.....

   .....

   .....
2. What maternal characteristics do you think contribute to neonatal sepsis?.....

   .....

   .....
3. In what ways can the healthcare environment contribute to the occurrence of neonatal sepsis?.....

   .....
4. How best can the healthcare workers help reduce the burden on neonatal sepsis?.....

   .....

APPENDIX 5: REQUEST FOR APPROVAL TO CARRY OUT STUDY

Florence K. Muthwii

University of Nairobi

School of Nursing Sciences

Telephone No: 0723431811

fkaluu77@ggmail.com

The Chairperson,

Ethics and Research Committee-university of Nairobi and Kenyatta national Hospital,

Dear sir/ madam,

RE: Request for permission to carry out research study

I am a post-graduate student pursuing Master of Science in Nursing-paediatrics at The University of Nairobi. I wish to undertake a study titled `characterization of neonatal sepsis among patients admitted in Kenyatta National Hospital paediatric wards'.

I am kindly requesting for your approval to undertake the said study. I am committed to observe and adhere to the ethical principles of respect for persons, justice and beneficence.

I look forward to your favorable response.

Yours faithfully,

Florence Kalunda Muthwii.

APPENDIX 6: REQUEST FOR PERMISSION TO CARRY OUT STUDY

Florence K. Muthwii,

University of Nairobi,

School of Nursing Sciences.

Telephone No: 0723431811

Email: fkaluu77@gmail.com

May, 30th 2016

The Assistant Director-Paediatrics Department,

Kenyatta national Hospital,

Dear sir/ madam:

RE: Request for permission to carry research

I am a post-graduate student pursuing science nursing (pediatrics) in the University of Nairobi. I wish to undertake a study on `characterization of neonatal sepsis among patients admitted in Kenyatta national hospital pediatric wards'.

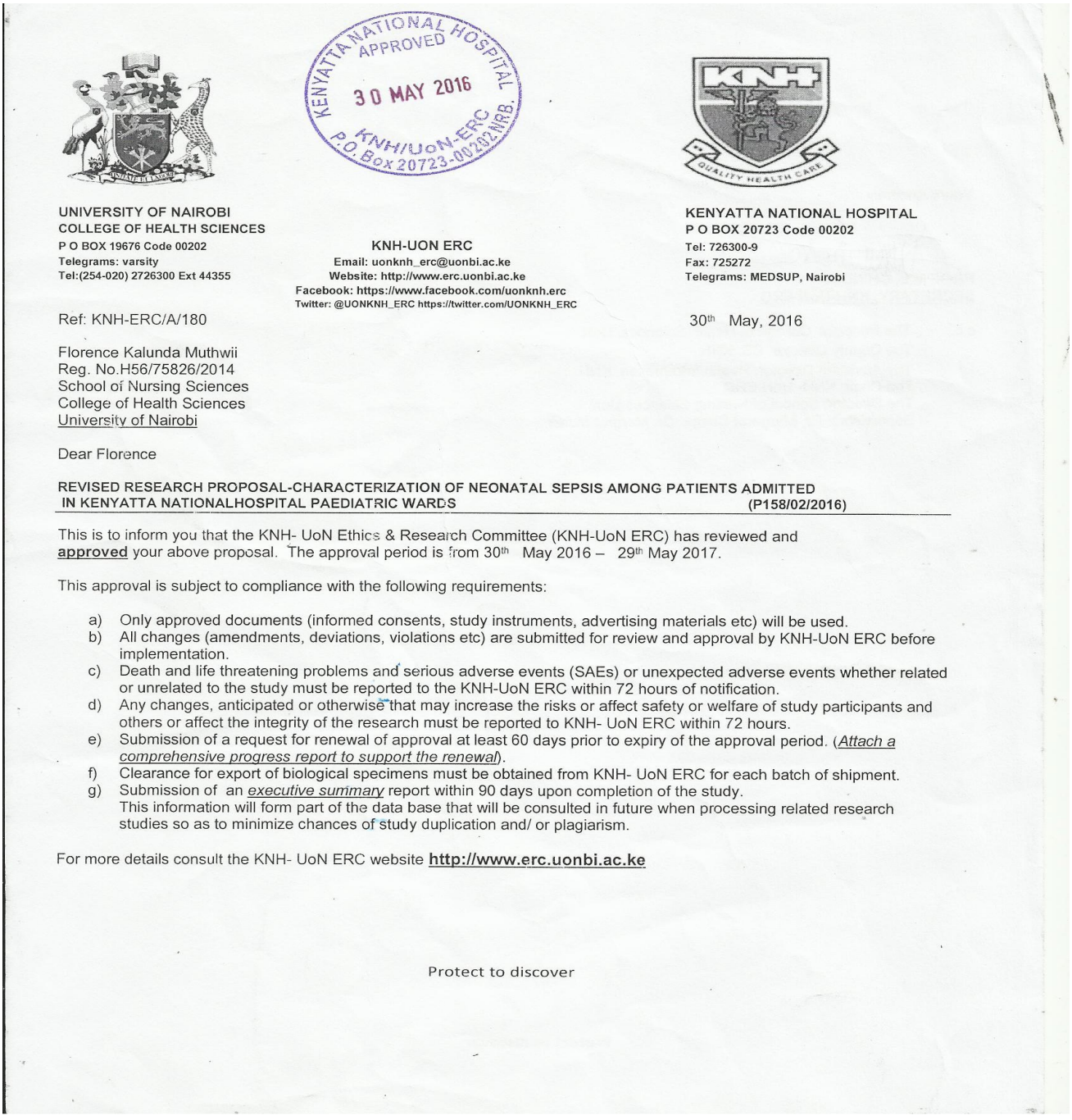
I am kindly requesting for your approval to undertake the said study in your department. Attached is a copy of the letter of approval from the University of Nairobi and Kenyatta National Hospital Ethics and Research Committee.

I look forward to a positive response.

Yours faithfully,

Florence Kalunda Muthwii.

APPENDIX 7: APPROVAL LETTER FROM UON/KNH E.R.C



KENYATTA NATIONAL HOSPITAL APPROVED 30 MAY 2016 KNH/UoN-ERC P.O. Box 20723-00202 NRB.

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/180

30th May, 2016

Florence Kalunda Muthwii
Reg. No.H56/75826/2014
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Florence

REVISED RESEARCH PROPOSAL-CHARACTERIZATION OF NEONATAL SEPSIS AMONG PATIENTS ADMITTED IN KENYATTA NATIONALHOSPITAL PAEDIATRIC WARDS (P158/02/2016)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above proposal. The approval period is from 30th May 2016 – 29th May 2017.

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) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website **http://www.erc.uonbi.ac.ke**

Protect to discover

Yours sincerely,

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

c.c. The Principal, College of Health Sciences, UoN
The Deputy Director, CS, KNH
The Assistant Director, Health Information, KNH
The Chair, KNH- UoN ERC
The Director, School of Nursing Sciences,UoN
Supervisors: Dr. Margaret Chege, Dr. Margret Muiva

APPENDIX 8: LETTER AUTHORIZING DATA COLLECTION IN K.N.H

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

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

Ref: KNH/PAEDS-AD/48 Vol.I

Date: 9th June 2016

Florence Kalunda Muthwii
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Florence

RE: PERMISSION TO COLLECT DATA IN PAEDIATRICS DEPARTMENT

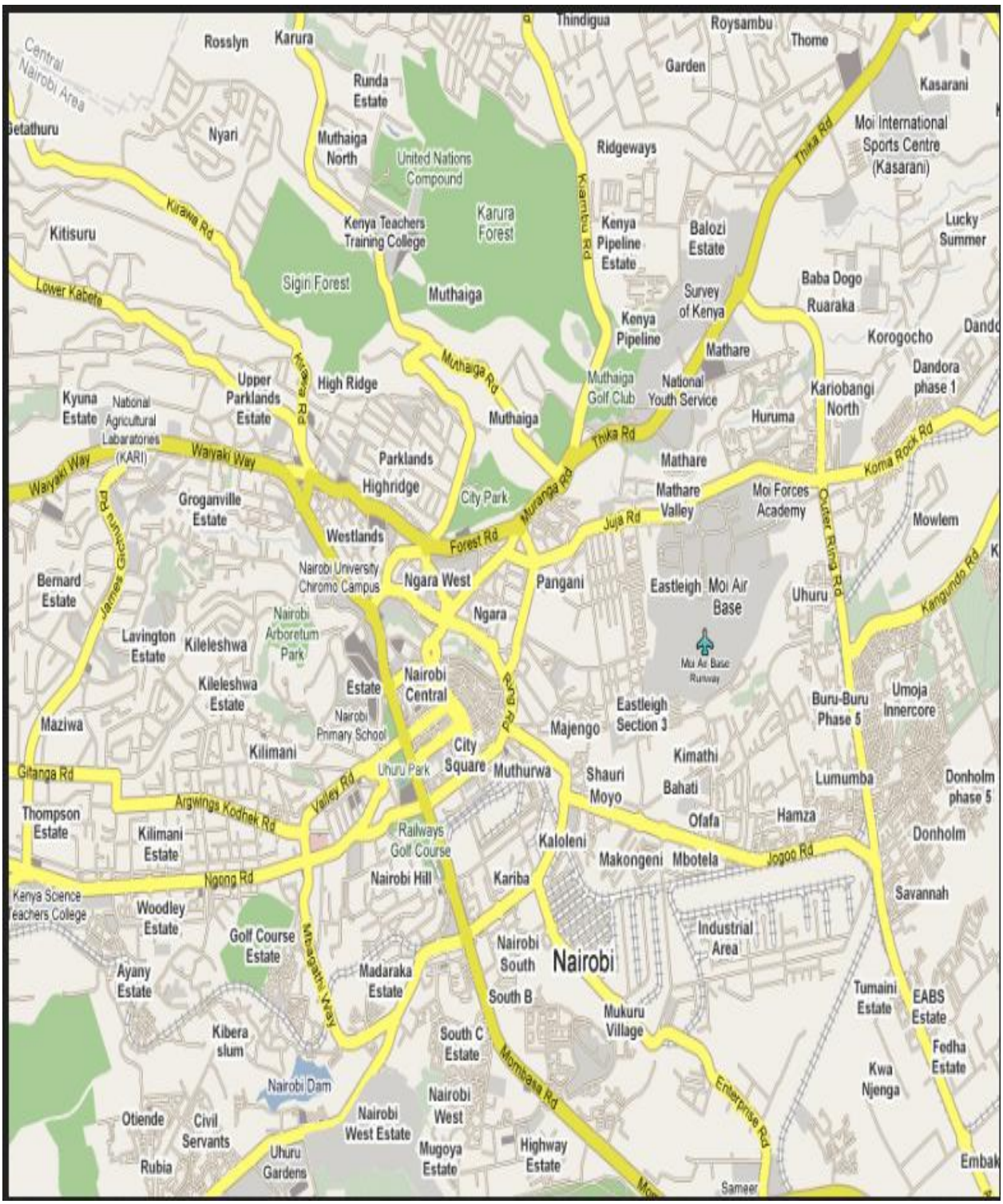
Following approval by the KNH/UON-Ethics & Research Committee for your Research Proposal, this is to inform you that authority has been granted to collect data in **Paediatrics Department** on your study titled ***"Characterization of Neonatal Sepsis among patients admitted in Kenyatta National Hospital Paediatric Wards"***.

Kindly liaise with the Senior Assistant Chief Nurse, Paediatrics for facilitation and forward to this office a report of your findings.

DR. IRENE INWANI
ASSISTANT DIRECTOR, PAEDIATRICS

Cc. SACN, Paediatrics

APPENDIX 9: MAP OF NAIROBI COUNTY



http://ictville.com/wp-content/uploads/2012/09/googlemaps-nairobi.gif

APPENDIX 10: MAP OF KENYATTA NATIONAL HOSPITAL

https://www.google.com/maps/place/Kenyatta+National+Hospital