DETERMINANTS OF TIMELY REFERRAL AND SAFE TRANSPORT OF NEONATES REFERRED TO AND THOSE TRANSFERRED OUT OF MAKUENI COUNTY REFERRAL HOSPITAL, KENYA

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R50/20016/2020

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (PAEDIATRIC NURSING) IN THE SCHOOL OF HEALTH SCIENCES KENYATTA UNIVERSITY

DECEMBER, 2024

DECLARATION

Student

I, Iluka Francisca Nduku, declare that this research Thesis is my original work and has not been presented in any other University for the award of a degree.

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DEDICATION

This research thesis is dedicated to the Almighty God in appreciation of His love, fidelity, and direction during the study time. Particular dedication goes to my wonderful and beloved parents Elizabeth Mumo and Josephat Iluka, husband Charles Masila, and children Henry Mwonga, Joan Mumo and Abigael Mumbe for untiring support and for believing in my dream. Special appreciation goes to my friends for unwavering support and belief in my dream.

ACKNOWLEDGEMENTS

Guidance, unwavering support, encouragement and sound advice from particular individuals and institutions made this research thesis successful. Above all, I'm very grateful to my supervisors, Dr. Sarah Bett, Mr. James M, and Dr. Talaso Barako for the inspiration, patience, expert and sound advice.

I express my sincere gratitude to my spouse Charles Masila, Henry Mwonga my son, Joan Mumo and Abigael Mumbe my daughters for their undying love, untiring support, encouragement and selfless contribution. Special gratitude goes to my dear parents Josephat Iluka and Elizabeth Mumo for their encouragement and support.

My sincere appreciations also go to my friends Dr. Muusya, Ann Kavuu, Fr. Patrick Munyao, Boniface Mutua, Lilian Mutua, Magdalene Kamanthe, Mary Makila and Family and all my friends for their tolerance, time and undying support. Acknowledgement also goes to my classmates Jason Kiruja, Roseline Apunda, Duncan Moiya, Mary Mwangi and Alice Kiplagat for the encouragement you gave me.

I also sincerely thank my siblings, Bernard Mbevi, Daniel Ngui, Patricia Mutheu, Jacinta Mukonyo, Bernadette Muthembwa, John Wambua, Stephen Kioko, Samuel Mutinda and Lucia Mwongeli for the support and encouragement you gave me. Special appreciations go to Joseph & Joyce, Richard Mwanzia, Pius Nguta, Rosemary Mbula and Patricia Mbithe for the encouragement and support.

Lastly, my special gratitude goes to Makueni County Referral Hospital fraternity for the continued support and encouragement you gave me.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
ENC	Essential Newborn Care
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
LMICs	Low- and Middle-Income countries
MCRH	Makueni County Referral Hospital
MOH	Ministry of Health
NBU	New Born Unit
NGT	Nasogastric Tube
NICU	Neonatal Intensive Care Unit
OR	(Unadjusted) Odds Ratio
SDGS	Sustainable Development Goals
SPSS	Statistical Package of the Social Sciences
UNDESA	United Nations Department of Economic and Social Affairs
UNICEF	United Nations Children's Emergency Fund
W H O	World Health Organization
WBG	World Bank Group

DEFINITION OF OPERATIONAL TERMS

Health care personnel	They are the providers of care and include doctors, nurses, clinical officers and trained paramedics.
Initiating facility	Is a facility that prepares to transfer a patient by communicating with the facility receiving the patient his or her status.
Neonate	Is a baby from 0 days to 28 days of life or within first 4 weeks after delivery.
Primary care giver	A person or an individual (mothers) who provides immediate care to a neonate who is unable to care for himself or herself.
Referral guidelines	Is a set of laid down procedures which aids in approach of a patient requiring to be referred.
Referral	The act of directing a sick neonate to a specialist or to another highly equipped hospital for further management.
Safe transport	Is based on ambulance use as a mode of transport and stabilization treatment of the neonate patient before and during transportation.
Timely Referral	A referral that is made within a short turnaround time from the time initial decision to refer a neonate patient is made to the time the neonate patient arrives to the receiving facility aimed at preventing second delay.

ABSTRACT

Internationally, 2.5 million babies lose their lives before first 28 days of life, many of the deaths occurs in the under developed countries and a third occurs on day one of life. According to the World Health Organization, many neonate deaths are preventable by simple interventions. The primary goal of the study was to establish determinants of timely referral and safe transport of neonates in Makueni County Referral Hospital. The study employed cross-sectional study design. The researcher collected data from 50 neonates through consecutive sampling. The researcher used a self-administered questionnaire, document reviews of the patients' files and structured data checklist. Patients condition on admission was obtained from the health record. The researcher analyzed the data quantitatively using the Statistical Package for Social Sciences version 26 (SPSS V26). The data obtained was summarized using frequency tables. Inferential statistics such as Chi-square tests Fishers Exact, bivariate and multivariate analysis were used to test for associations. Graphs, text, tables and pie charts were used to present the ultimate results. In total 50 admitted neonates were recruited to the study and results analyzed. According to the study findings, the researcher found out that there was no significant association between timely referral and safe transport and neonatal and maternal variables. Conversely, analysis of institutional characteristics highlights several significant factors associated with the likelihood of timely referral and safe transport during a referral. Patients who did not receive stabilization were found to be more prone to experiencing a lack of timeliness and safe transport during referral (P=0.004), patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P = 0.035). The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral (P=0.032). The availability of an ambulance emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay. The study concludes that institutional factors influenced safe transport and timely referral to include patient stabilization, vital signs monitoring, response time for referral, and the availability of an ambulance. The study recommends that ambulances should be availed timely, in adequate numbers, and be equipped with the necessary drugs and equipments so that in the event of a problem, the healthcare provider can intervene appropriately. Also, hospitals should be supplied with all the necessary equipments and drugs to aid in stabilization of patients.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Worldwide, 2.5 million babies lost their lives between 0 and 28 days of life in 2018 (World Bank Group.et.al., 2019). In many low-income and middle-income countries (LMICs), neonate survival has decreased in neonates although mortality is slow. Problems such as prematurity, birth asphyxia, and sepsis are main reasons of neonatal deaths (Walker.et.al., 2020). According to the World Health Organization, many neonate deaths are preventable and can be avoided by simple interventions. One of such interventions is proper preparedness and early identification of intrapartum complications and timely referral of the neonates which ensures reductions of neonatal deaths.

According to a study conducted in Bangladesh, early identification and timely transfer of pregnancy related emergencies and problems such as prolonged labour, pre-eclampsia, premature rapture of membranes and early separation of the placenta improved neonate's survival. This identification of the high-risk pregnancy can be made by the mothers, community-based health care workers and trained healthcare providers and in-utero transport used to save the neonate and the mother (Biswas et.al., 2018).

A study carried out in India indicated that safe transport of a sick neonate relays mostly on the use of an ambulance, well trained emergency response team, appropriate drugs, proper equipment and timely communication with receiving facility. In most cases, sick neonates are transported in public and private vehicles without any pre referral treatment hence making the transport for the neonates unsafe. Primary care givers and household members play an important role in early

recognition of warning signs in neonates and making self-referral to health care facilities. This also reveals a gap in transportation of a sick neonate (Shalini. et.al., 2017). A study conducted in India, reveals that referral and transport framework has apparently progressed with utilization of written referral notes and wide use of ambulance. However, despite the continued emphasis on maternal and neonatal health plans, bottlenecks still exist, such as lack of prior communication with referral agencies, the number of times that elapse between referrals and hospitalizations, utilization of uncommon ambulance travel and intensified transportation time. Delays while referring a neonate can worsen the neonate's condition hence increasing the mortality rates and this represents a gap in transport and timely referral. If well addressed, this can decrease the number of deaths amongst neonates (Negi et.al, 2019).

Sick neonates need quality-timely hospital care in order to survive. The care includes providing feeding support, warmth, effective phototherapy and safe oxygen therapy. Hospital care for neonates thus requires a specialized ward space, equipped with professionally trained healthcare workers. The need for timely communication with referral facilities is therefore invaluable. An estimated 2.8 million neonates die each year, many of whom lack accessibility to such specialized care (Moxon.et.al., 2015).

In Sub–Saharan Africa, timely referral and safe transport of sick neonates ensures access to timely high-quality care which is critical to improve outcomes. A study conducted in Ethiopia found that poor transportation and communications caused neonatal referrals to be delayed in all areas of study. The use of ambulances, training and sensitization of health care providers, use of referral guidelines and receiving

facility communications are all urgently needed in order to improve the outcomes of sick neonates presenting at higher level healthcare facilities (Teklu.et.al., 2020).

In South Africa, a study unveiled that transfer of seriously ill neonates is an important aspect of neonates from referring hospital because it has an influence on safety during transportation to the receiving hospital. The study highlighted that specialised dedicated neonatal units, availability of equipment such as incubators and monitors, adequate neonatal documentation, and thorough physical examination was crucial in the transfer process so as to ensure safe and efficient referral and to avoid compromising the already fragile condition of the neonate (Ashokcoomar.et.al., 2021).

Referral guidelines have been established in Kenya to ensure coordination and continuity of care at different levels of the healthcare system. The referral guidelines especially in the transfer of neonate patients require an ambulance which has functional supply of oxygen, drugs and a firm couch. The neonate should be in company of a competent health care worker. Poor adherence to these rules may result in increased in morbidity and mortality in neonate patients (Ministry of Health., 2014).

Studies carried out in Kenya indicates that newborns consist half of the admissions and two-thirds of the deaths in children zero to thirteen years in county referral hospitals (Irimu.et.al., 2020). Makueni County Referral Hospital has an average of 300 births monthly (Hospital Records, 2023). Makueni county has a 24-hour emergency operating center and ensures dispatch of ambulances within the county.

1.2 Justification of the Study

Neonates are referred to other institutions with greater experience and resources by peripheral health care facilities in Kenya because they are typically not well-equipped to handle them. For a referred neonate, neonatal mortality due to reasons such as sepsis, birth asphyxia, and prematurity can be prevented through timely referral and safe transport. Delays in identifying sick neonates, lack of transport, lack of communication with the receiving facility, lack of the appropriate equipment, the care provided before and during transport will all be aided by this study. It will make it easier to determine how they are carried, whether they are receiving the best care possible, and whether there are any gaps in the transit procedure.

Makueni County Referral Hospital, being one of the hospitals considered for neonate referrals for peripheral health care facilities, it becomes essential to conduct the study to identify the effectiveness of services offered to neonates. Neonate patients are referred to Makueni County Referral Hospital for specialized care and management. Anecdotally, according to Makueni County Referral Hospital, figures from 2020, the newborn unit at the hospital typically receives 17 referred neonates per month, making up a sizable number of newborn unit admissions. Therefore, it was crucial to carry out the study to identify whether the referral is timely and transport safe or not for those neonates at MCRH (Makueni Health Records, 2020). The design of an intervention that can help to enhance the timely referral and safe transport procedure will be guided by the study's findings.

1.3 Problem Statement

Globally, 2.5 million neonates lose their lives every year with 98% of the newborn deaths. Many neonatal deaths are attributable to preventable causes such as sepsis, birth asphyxia and prematurity births. When a decision to transfer a sick neonate is made, the receiving facility is informed to get prepared to receive the baby. Referral notes are written and transport services are organized by the initiating healthcare provider. Neonates can have better chances of survival especially in the developing countries with early identification and treatment of infections, proper preparedness and timely referral of neonates to highly specialized and equipped healthcare facilities, early launch of breastfeeding and warmth maintenance through skin-to-skin contact.

From literature review, it is evident that delays in identifying sick neonates, lack of transport, lack of communication with the receiving facility and lack of the appropriate equipment increases risks of child mortality (Teklu et. al, 2020). In many cases, insufficient number of ambulances during a referral could adversely affect the neonate. In cases where ambulance services are available, lack of emergency care on the way increases risks of death (Bose A, 2017). Lack of appropriate equipment such as oxygen cylinders, radiant heaters and incubators affects a sick neonate condition. Also, lack of knowledge to identify danger signs in neonates has led to increased morbidity and mortality rates (Negi et. al, 2019). MCRH has an average of 300 births monthly (Hospital Records, 2022). According to Kenya National Bureau of Statistics, (2022), the county has a neonatal mortality rate of 26 per 1,000 live births while countrywide is 21 per 1,000 live births. About 39% of neonates delivered in Makueni County develop complications during

delivery or before first one month of life. About 26% of the 39% of the neonates are referred to MCRH for specialized care. Delays during the referral time and transport compromise the neonate's condition and 19% of the neonates die before gaining access to specialized care (Hospital Records, 2022). Despite significant advancements in neonatal care, the timely referral and safe transport of neonates remain critical factors in neonatal outcomes. Documented evidence on safe transport and timely referral of neonate patients at MCRH is inadequate hence the need to carry out the study.

1.4 Objectives of the Study

1.4.1 Broad Objectives

To establish the determinants of timely referral and safe transport of neonates in Makueni County Referral Hospital.

1.4.2 Specific Objectives

i. To determine timeliness of referral and safe transport of neonates at Makueni County Referral Hospital.
ii. To determine neonatal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital
iii. To determine maternal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital.
iv. To identify institutional factors that affect timely referral and safe transport of neonates in Makueni County Referral Hospital.

1.5 Research Questions

v. What is the timeliness of referral and safe transport of neonates in Makueni County Referral Hospital?

vi. What are the neonatal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital?

vii. What are the maternal factors associated with timely referral and safe transport of neonates in Makueni County Referral Hospital?

viii. What are the institutional factors that affect timely referral and safe transport of neonates in Makueni County Referral Hospital?

1.6 Assumptions of the Study

The research study was guided by basic assumption that all the respondents were very cooperative and truthful in the provision of significant and well-founded information.

1.7 Significance of the Study

The outcome to be realized will guide in supporting better quality healthcare services that will empower the county and the national government to tackle the high level of neonatal mortality. The study findings will yield adequate information which will help the county government in policy formulation, implementation and planning context sensitive neonate services. The study will also be useful for researchers to obtain an overview of the current implementation on timely referral and safe transport of neonates. In addition, the study outcome will guide in addressing the gaps through robust approaches is crucial for improving referral and transport systems especially in resource-limited settings such as Makueni County.

The study will also enhance adequate training of peripheral staff, pre-referral stabilization equipment, and en route monitoring will ensure safe transport and timely referral of neonates hence improving their outcome and survival. Mothers, their families and the larger community will benefit from decreased neonatal deaths and increased neonate survival.

1.8 Scope of the Study

The study covered timely referral and safe transport of neonates in Makueni County Referral Hospital and it concentrated on selected primary care givers and their neonates.

1.9 Limitations of the Study

Finances needed to conduct the study was inadequate. In this case the research was constrained to a little topographical region and narrowed down to Makueni County Referral Hospital. The study time was limited to three months where a representative sample of the hospital and the study subjects was obtained. Eventually, due to the sensitive nature of the issue under investigation, there was fear of the respondents to give out information where confidentiality and anonymity was assured.

1.10 Delimitations of the Study

The study focused on timely referral and safe transport of neonates in Makueni County Referral Hospital in makueni county. It was narrowed down to the new born unit and addressed referred neonates and ignored referral of other patients such as children, adolescents and adults.

1.11 Conceptual Framework

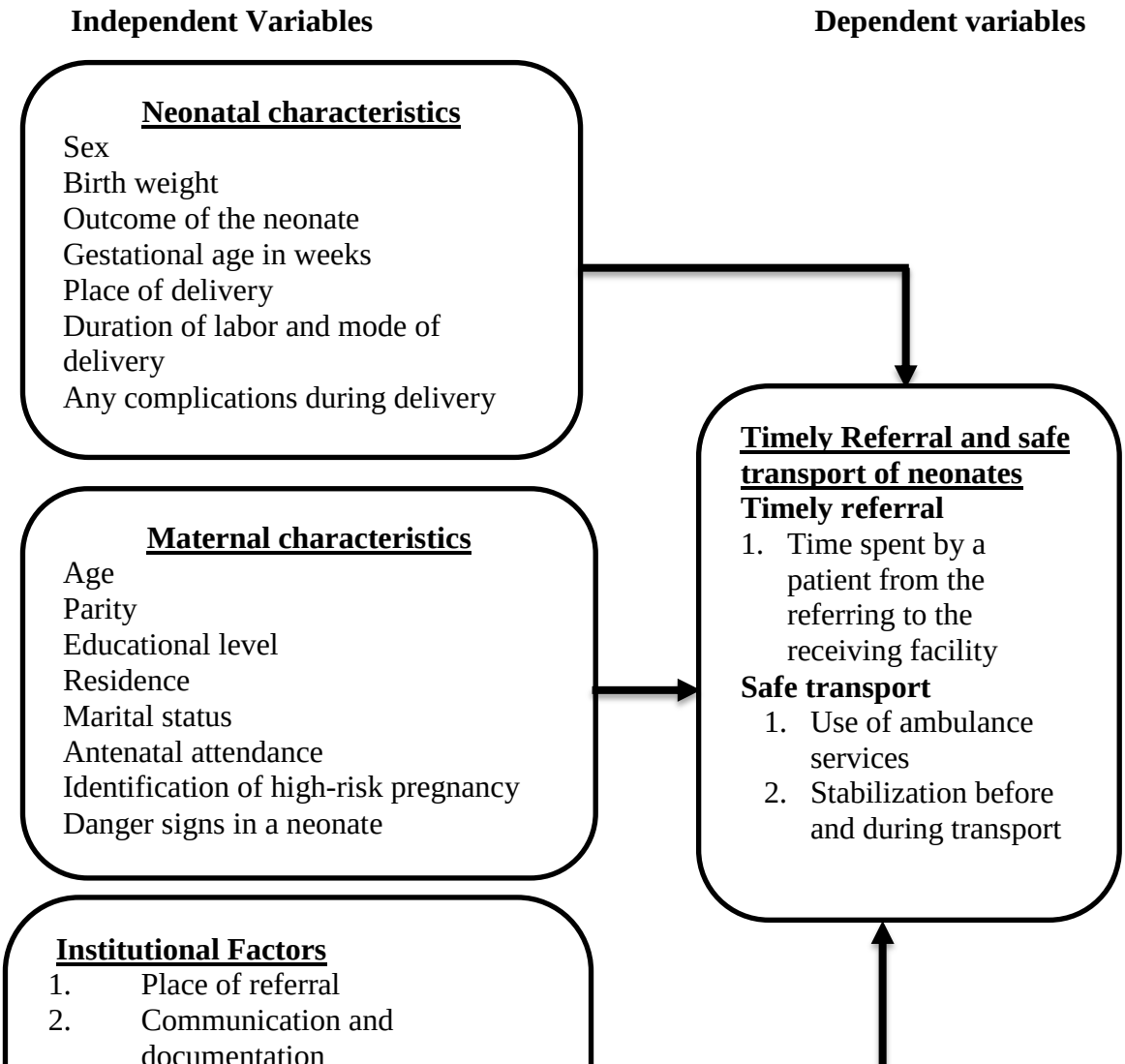

Figure 1.1: Independent and Dependent Variables Conceptual Framework

Source: Mosley-Chen (1984)

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Globally, in 2018, 2.5 million babies lost their lives in the first 28 days of life, many of the deaths occurred in underdeveloped countries, and one third occurred in day one of life (World Bank Group.et.al., 2019). A study conducted in North India revealed that infant mortality rate for referrals to hospital centers was 30.1%. India has developed the use of free ambulance services to transfer sick neonates. Proper training of health care providers and accessibility of pre-referral stabilization equipment with well-coordinated inter-hospital transfers for sick newborns are valuable interventions to improve outcomes (Singh.et.al., 2021). Increased delays while referring a neonate can worsen its condition hence increasing the mortality rates (Negi et al., 2019).

In Sub–Saharan Africa, timely and safe transport of neonates ensures access to high-quality and timely care which is critical to improve outcomes. According Tette. et.al., (2020), in West Africa, a study conducted in Ghana showed that neonates who were referred to hospitals received no treatment. Therefore, the referral system and the care accessible from home to health care facilities are critical factors of newborn sequel. A study conducted in Ethiopia reveals poor transport and communications were poor in all settings, which resulted in delay of neonatal referrals (Teklu et al., 2020).

A study conducted in Kenya by Murphy.et.al., (2018) revealed that problems with newborn resuscitation and identifying signs and symptoms of sick neonates are the worst. As result, 39% of newborns with mild illnesses receive care in settings with

very low nursing knowledge about newborn resuscitation. Referral of these neonates early would reduce the morbidity and mortality rates.

In Kenya, referral system is a mechanism that fully manages the health needs of patients with available resources beyond the place where they receive care (whether in a community unit, dispensary, health centers, sub county hospitals or higher level of specialized care). For an ideal referral system, it should ensure close association between the different levels of healthcare system both primary and secondary (MOH, 2014). This ensures that patients receive the best available care near their homes which is cost effective.

2.2 Neonatal Morbidity and Mortality

A crucial component of the third Sustainable Development Goal is lowering neonatal mortality, which is high in developing nations. Despite a global fall, the neonate mortality rate remains unacceptable at 37 per 1000 live births, and the decline is slower than that of the under-5 child mortality rate. Approximately 7000 babies worldwide pass away every day; the many of these deaths take place in the first week of life, and almost 2.6 million babies pass away in the first month. South Asia and Sub-Saharan Africa, which account for 39% of all neonate fatalities worldwide and rank in the top 10 nations with the highest neonatal mortality rate, account for almost 78% of these neonatal deaths. Building on the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs) were introduced in 2015 to address health issues pertaining to mothers, neonates, children, and adolescents (WHO, 2018).

In western countries, the neonatal transport team includes a trained neonatal nurse in combination with other disciplines such as an anaesthetist, paramedic or a

pediatrician. The choice of the neonatal transport team is dependent on the needs of the patient and competency of the staff. Transport by skilled organized personnel has been shown to decrease neonatal morbidity and mortality and therefore neonates transported by skilled health personnel had a higher survival than those who came by themselves (Jenniffer et.al., 2021).

Since 2000, the number of neonatal deaths has dropped by 44%. However, the neonate period (the first 28 days of life) accounted for nearly half (47%) of all deaths in children under five in 2022. This is one of the most vulnerable times of life and calls for higher-quality intrapartum and neonatal care. African continent, in west Africa it was responsible for only 30% of live births worldwide in 2022, but 57% (2.8 (2.5–3.3) million) of all under-5 deaths. With 27 neonatal deaths per 1000 live births, Sub-Saharan Africa had the highest neonatal mortality rate globally. Central and southern Asia came in second with 21 neonatal deaths per 1000 live births. neonatal morbidities such as congenital defects, neonatal infections, premature birth, and birth complications such as asphyxia or trauma continue to be the main causes of neonatal mortality (WHO, 2022).

In Eastern Africa, studies conducted in Kenya and Uganda indicate that stillbirth and neonatal mortality have been slowly declining, despite improvements in neonate survival in many low- and middle-income nations. The main cause of neonatal mortality is complications from prematurity (Walker et.al., 2020).

According to Kenya National Bureau of Statistics, (2022), Makueni County has a neonatal mortality rate of 26 per 1,000 live births while countrywide is 21 per 1,000 live births.

2.3 Timely Referral of Sick Neonates

According to a study conducted in western Europe in London, it indicates that neonatal mortality rates have been demonstrated to increase during humanitarian emergencies, where women and neonates are susceptible to health complications as a result in difficulties coordinating referrals (Rutherford et.al, 2023).

In Eastern Africa region, a study conducted in Ethiopia revealed that obstacles relating to the health system and clients having a detrimental effect on the neonate referral system, which is essential to the continuum of neonates' health care. Studies on neonate referral systems have been scarce because of the intricate and varied nature of neonate referral procedures. The study suggests that there is an urgent need for government investments in neonatal referral systems and standardization of referral and return referral communication in Ethiopia to decrease neonatal mortality rates (Teklu et.al.,2020).

In Kenya, the referral system is structured into four service levels: community, primary care, county referral services, and national referral services. Community Health Services encompass all health activities based in the community, organized according to the Comprehensive Community Strategy. Primary Care Facilities include all types of dispensaries, clinics, health centers, and maternity homes. County Referral Health Facilities consist of all level 4 and 5 facilities that are operated and managed by the county. All the facilities managed by the county create a county referral system, which collaborates to offer specific services, forming a virtual network. National Referral Health Facilities are those that provide specialized health care services, such as hospitals, laboratories, blood banks, and

research institutions. These establishments function with a specific degree of autonomy (MOH, 2014).

For neonate who requires referral, the referral follows a pre-established plan that can be implemented without delay at any time and should be within thirty minutes. For neonate referred within or between health facilities, there should be appropriate information exchange and feedback to relevant health care staff in the lower health facilities/or other referring facilities. Every neonate who requires referral gets pre-referral care and is transferred in the kangaroo mother care position with their mother, when possible (UNICEF, 2020).

2.4 Safe Transport of Referred Neonates

2.4.1 Presence of Functional Ambulance

According to WHO recommendations, one ambulance should serve a population of 70,000-100,000 persons. According to a study conducted in South Asia-Bangladesh, one of the most important aspects of caring for sick neonates who need to be referred to a tertiary care facility is adequate neonatal transport. One of the iatrogenic variables linked to higher neonate mortality is inadequate transportation. This study aimed to identify the factors that lead to mortality and to determine the characteristics of transport of referred newborns (Baidya et.al.,2018).

In regard to a study carried out in North India, sick neonates must be referred to higher centers due to the lack of specialized care and can greatly be enhanced by organized interhospital transport services delivered by a knowledgeable and well-equipped staff. The study illustrated the high rate of mortality during referral and transport as well as the hemodynamic deterioration of neonates. The suggested that the outcomes of the neonates referred can be improved by adequate pre-referral

stabilization, raised awareness, improved basic resuscitation skills of the peripheral health workers, and the availability of suitable equipments (Singh et.al., 2021).

In another study carried out by Rosania et.al., (2022), it highlights the need of providing critical neonates with the right care and treatment throughout transport in order to preserve hemodynamic stability and enhance vitals upon arrival at the referral center for a better result.

Worldwide, referral system has faced challenges. A study conducted in India found that transport was a challenge and has developed the use of free ambulance services to transfer sick neonates (Singh et.al, 2021). According to Negi et.al, (2019), the use of uncommon ambulance travel and increased transportation time led to delays while referring a sick neonate which can worsen the newborn's condition hence increasing the mortality rates. The modes of transport according to Negi et al, (2019), are walking, use of ambulances, cars, and buses hence indicating a gap on safe transport of neonates. In cases where ambulance was available, there were no skilled personnel to accompany the patient hence making the transport unsafe for the neonate.

A study conducted in Bangladesh stated that adequate newborn transfer is very important for the care of sick newborns that need to be referred to higher specialized levels of care. When referring a neonate, transport interferes with various aspects of its balance, such as temperature regulation, fluid and electrolyte balance, metabolic activities, cardiopulmonary status. This meddling can lead to deterioration and complications during transportation which may increase the morbidity and mortality of this fragile neonate (Baidya et.al, 2017).

In Sub-Saharan Africa, transport and infrastructure remains to be a bottleneck. A study carried out in Ethiopia indicated that lack of transport and poor communication resulted in delays of neonate patient referral (Teklu et.al, 2020). There is evidence that difficulties with referral systems, including insufficient transportation, poor communication, inadequate paperwork, and a lack of monitoring, are holding back efforts to lower newborn mortality in developing countries. To transfer newborns to a tertiary care center, a reliable referral mechanism is essential.

A study conducted in Tanzania indicated that all government-owned facilities in Tanzania offer free ambulance, which help to explain why many newborns are transported by ambulance. However, it is worth noting that regardless of the presence of ambulances, subpar functionality and equipment is seen hence causing unstable condition of the referred neonates (Kiputa et.al, 2022).

In Kenya, the greatest challenge faced by the country is neonatal transport. Lower-level healthcare facilities in rural areas need key interventions to operate in order to achieve operational conditions, but it requires multiple infrastructure support to operate. A study conducted in Kiambu County disclosed that lack of transport and poor infrastructure affected referral system (Kamau.et.al., 2017).

2.4.2 Documentation and Communication

Worldwide proper documentation guide decisions being made. A study carried out in Indonesia found out that when a referral is required, the referring health care facility should provide a written form, ensure good communication with the facility receiving the patient and the health care provider should inform the family about the neonate's condition (Nabila et.al., 2019).

In Eastern Africa, a study conducted in Ethiopia revealed that when initiating a referral, communicating with the receiving institution about the reason for the referral reduces delays in treatment, avert overcrowding, and draw on the expertise of advanced care centers. One should ensure communication with the receiving facility, however, in places of limited resources, such as scarce number of experts and increased turnover rate, as well as a lack of communication technology, may result in ineffective referral communication between the referring and the receiving health care facilities (Teklu et. al., 2020).

In Southern Africa region, a study carried out in the Republic of South Africa by Ashokcoomar et.al., (2021), it indicated that correct newborn documentation, information about clinical procedures performed before departure, and thorough inspection methods are essential before referral and should be ensured.

In Eastern African region, a study conducted in Kenya revealed that for facility-to-facility referral, the healthcare worker attending to the patient should conduct the receiving hospital earlier to confirm availability of the required advanced medical service, write the referral letter clearly and specify any preceding medical care and support offered to include attachment of all the pertinent diagnostic test results (Murphy et. al., 2018).

2.4.3 Stabilization and monitoring of Neonates

In a study conducted in India, it indicated that most referrals where from homes, public and private hospitals and many neonates were referred and transported in private and public vehicles without any pre referral care during transportation rendering a referral unsafe for the neonate (Shalini et. al., 2017). An observational study carried out in Indonesia indicated that neonates reported to health facilities in

unstable condition due to lack of stabilization before and during transportation (Ekaputri et.al., 2020).

According to Bose A, (2017), in places where trained health personnel are unavailable during transportation of a neonate, crucial lifesaving interventions such as blood glucose monitoring, maintenance of warmth and supplementation of oxygen are missed out and this may worsen the neonate's condition. The neonate's temperature should be maintained through the use of warm clothing, thermal mattresses, incubators or Kangaroo Mother Care. The ideal in transportation is the use of incubators which is used extensively in developed countries.

In Sub–Saharan Africa, a study conducted in Nigeria revealed that seven percent of the neonates were accompanied by health care workers. The neonates accompanied by health care professionals where stabilized before and during transport (Muhyeed.et.al., 2016).

In Kenya, a study conducted at Kisumu County revealed that many patients were self-referred due to location of the health care facility and accessibility of the required services (Walker et.al., 2020). Stabilization procedures such as intravenous line insertion, nasogastric tube insertion, temperature monitoring, airway protection and blood glucose monitoring during transportation were very crucial.

2.5 Management of the Referred Neonates

2.5.1 Glucose Control and Fluid Administration

Neonates face a significant risk of hypoglycemia due to several factors, including insufficient liver glycogen and muscle protein stores, a lack of body fat to fulfill

metabolic energy requirements, and the possibility that their enzyme systems for gluconeogenesis are not fully matured (Baidya et.al, 2017).

In Africa continent, neonates should begin breastfeeding as soon as possible, ideally within the first hour following birth, unless there are specific reasons preventing enteral feeding. If the neonate is unable to breastfeed, enteral feeding can also be administered through a nasogastric tube or by a cup with formula milk or expressed breast milk. Contraindications for enteral feeding include but not limited to severe respiratory distress, congenital conditions such as tracheoesophageal fistula, and intestinal obstruction. If enteral feeding is not possible, intravenous fluids should be provided during hospitalization (WHO, 2018).

Consequently, a study conducted in Kenya reveals that, in order to minimize the chances of dehydration and hypoglycemia, the collaborative management team must ensure that the neonate receives adequate fluid or milk intake during hospitalization. Hypoglycemia has been linked to increased morbidity and mortality rates in neonates (Walker et.al., 2020).

2.5.2 Vital Signs Monitoring

2.5.2.1 Airway, Breathing and Circulation

In order to guarantee airway patency, airway assessment involves positioning, suctioning, and checking for secretions. Identifying imminent respiratory failure, managing ventilator settings, performing traumatic intubation with the proper endotracheal tubes, administering artificial surfactant, and performing efficient bag-valve-mask ventilation are all skills that the neonatal management (Kumar et.al., 2020).

This means keeping an eye on breathing adequacy and respiratory rate. It will be easier to determine when a newborn needs assistance ventilation or intubation if their respiration is regularly assessed throughout hospitalization. One non-invasive technique for tracking oxygen saturation is pulse oximetry. Heart rate, capillary refill time, temperature gradient, blood pressure, and urine intake and output should all be used to track circulation while caring for the sick neonate (Ginsburg et.al.,20202).

2.5.2.2 Thermoregulation in Neonates

Maintaining temperature regulation is crucial to preventing hypothermia or hyperthermia in neonates. Neonates are more susceptible to increased insensible water losses and hypothermia because of their large body surface area and low body fat storage. Immature skin in premature neonates contributes to increased heat loss and insensible water loss. When sick and low birth weight neonates are cared for in or close to their neutral temperature environment, their survival rate increases (Dixon et al., 2021). Conduction, convention, radiation and evaporation are some of heat loss mechanisms in neonates.

Incubators are utilized to provide a controlled, enclosed heated environment to ensure neutral thermoregulation, aiding the neonate to be nursed unwrapped especially in preterm neonates. Radiant warmers also an open care cot system designed to offer thermal stability to neonates while allowing for continuous direct observation and accessibility (Dunne et.al.,2024).

2.6 Summary of Literature Review

The following gaps have been identified with literature review. These include lack of ambulance services with trained personnel for neonate referrals, lack of

knowledge to point out the danger signs in a sick neonate warranting a referral, poor transport and communication and lack of sophisticated equipment for neonate transfer and delays in turn around service delivery time just to mention a few. There is sufficient data to support the claim that neonate morbidity and mortality is decreased during transfer by a trained, organized health care workers team. Transporting a neonate who is well stabilized should be the aim of all neonatal transport teams. The researcher has not come across published studies on timely referral and safe transport of neonates in Makueni County Referral Hospital, Makueni County.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

This chapter presents Research Design, Study location, Sample Size, Sampling Method, Study Variables, Data Collection Methods, Data Collection process, Data Analysis and Ethical Considerations.

3.2 Study Design

Cross sectional study design was used for this study where the researcher was able to collect data from many respondents at that moment. This was an easier way to gather data and identify correlations that could be further investigated. Cross sectional study design answered the study questions.

3.3 Study Setting

The study was carried out in Makueni County Referral Hospital, Newborn Unit. Makueni County Referral Hospital is a level 5 facility and the only referral facility in the county and receives referrals from all other health care facilities. MCRH has an approximated neonate capacity of 54 admissions per month and has 10 nurses manning the new born unit. The staff ratio to infant ratio is 1: 12. The researcher sought responses from mothers through Mother-Infant Dyad, document reviews and data checklists. The mothers of neonates who were referred to and transferred out of Makueni County Referral Hospital at the time of study were the respondents. Administratively, Makueni County has six sub-counties which include Kaiti, Kibwezi West, Makueni, Mbooni, Kilome and Kibwezi East. The Makueni sub-county hosts the Makueni County Referral Hospital. The county has twelve sub county hospitals namely: Matiliku, Sultan Hamud, Mukuyuni, Kilungu, Makindu, Kibwezi, Mbooni, Kisau, Mtito Andei, Tawa, Mutyambua and Kambu.

3.4 Study Population and Sample

The study population comprised all newborns referred to and out of Makueni County Referral Hospital Newborn Unit at the time of study. Similarly, neonates who were transferred to other facilities from MCRH for specialised care were included in the study. The researcher targeted a population of 200 neonates.

3.5 Sampling Procedures

3.5.1 Sample Size Determination

The researcher used modified Fischer's formula as highlighted below:

Were,

N = $Z^2P(1-P) \div C^2$

N=Sample size

Z= Z value equal to 1.96

P= Prevalence estimated to be 50%

C=1- confidence level to be 0.05

Hence;

N = (1.96*1.96) *0.5(0. 5) ÷ (0.0025) =384

Therefore: $n\,f\,$ =no ; N=200 (N= the population size while $n\,f\,=$ is the finite sample size) 1+no/N $n\,f\,$ = 384 1+384/50 = 50.

Adjusting for finite population for neonates referred to Makueni County Referral Hospital new born unit based on the 2022 hospital medical records where an average of 17 referred neonates were admitted monthly and this translates to 51 neonates in three months. Consecutive sampling was done until the minimum sample size was achieved.

3.5.2 Sampling Method

The researcher used consecutive sampling to recruit all neonates referred from peripheral health facilities to Makueni County Referral Hospital. The researcher first recruited the admitted neonates and continued to recruit the study subjects as they got admitted at the hospital New Born Unit. This took place during the three months of the study.

3.5.3 Inclusion and Exclusion Criteria

Inclusion Criteria

1. Neonates referred to the Hospital, during the three months of data collection were included in the study.
2. Neonates whose mothers consented for study participation were included in the study.
3. Those mothers who had in utero transport and delivered neonates with complications were included in the study.

Exclusion Criteria

1. Neonates who were not requiring referral/ transportation were excluded from the study.
2. Neonates who had been abandoned were also excluded from the study because they were lacking primary care givers.

3.6 Study Variables

Dependent Variable was timely referral and safe transport of neonates. Independent Variables included neonate and maternal factors associated with timely referral and

safe transport of neonates and institutional factors associated with timely referral and safe transport of neonates.

3.7 Data Collection Method

3.7.1 Research Instruments

Data was collected through the use of open and closed ended questions. The researcher collected data through Mother-and-Infant Dyad. A structured data checklist and document reviews of the patients file was also used to identify the institutional factors affecting timely referral and safe transport of neonates at Makueni County Referral Hospital. The patient's condition on admission was obtained from their files. Data collected was filed safely and privacy and confidentiality were ensured.

3.7.2 Pre-Testing

Study questions and questionnaires were tested at Kitui County Referral Hospital on mothers of neonates referred to the facility. Kitui County borders Makueni County and Machakos County and there is cross referral of patients. Makueni and Kitui counties share similar economic, infrastructure and socio-cultural settings whereas Machakos county is more economically endowed with better infrastructure. Considering the above, Kitui County was the best choice for pretest. Participants did not print their names on the questionnaire instead codes were used to ensure confidentiality. The pre-test involved 20 respondents from Kitui County, which represented about 40% of the calculated sample size. After two weeks the pre-test was repeated with the same population in order to compare the responses. Adjustment of the questionnaire was based on the results of the pre-test.

3.7.3 Reliability

A research instrument's reliability was determined by how consistently it generates results after numerous trials. Results from the two tests were compared in the pre-test. Pearson's product moment correlation coefficient was determined by the researcher using the SPSS version 26 computer program. This was done to assess the degree of consistency between the two sets of test and retest replies. Gay (1992) asserts that any research tool with a correlation value between 0.70 and 1.00 is regarded as adequate reliability.

The questionnaire items' correlation coefficient was 0.86. Since a correlation coefficient of more than 0.75 was found between the two tests, the tools were regarded as reliable (Glien & Glien, 2003).

3.7.4 Validity

According to Nachmias and Nachmias (2006), the extent to which a research instrument assesses what it is proposed to measure and subsequently permits appropriate score interpretation. The suitability of the information included in the questionnaire and the checklist was evaluated in this study with the aid of expert judgment. This aided in examining the content and the degree to which the tools would gather the necessary data. The adequacy of the ideas under consideration to reflect the study's intended outcomes was examined to ensure face validity. The research instruments were validated as acceptable in representing what the study planned to measure by experts and supervisors who also determined the variables that had been employed in. The questionnaire used was in accordance with MOH guidelines on timely referral and safe transport of neonates.

3.7.5 Data Collection Process

Research approval letter was obtained from Kenyatta University Ethical Review Committee approval **PKU/2574/11700** and Kenyatta University graduate school. Permission to collect data was sought from NACOSTI. The researcher visited the County Commissioner, County Director of Education, County Secretary, the Chief Officer Health Services and MCRH for clearance before collecting data. The researcher also had a work plan which was followed. Data was collected through researcher guided questionnaire which was used to assess mother's knowledge on identification of danger signs in neonates and a checklist tool to identify institutional factors associated with timely referral and safe transport of neonates.

3.7.6 Data Management

Once questionnaires and checklists were completed, the data obtained from study participants was stored in computers, hard disks and flash disks for future references. All the information was kept under lock and key to ensure its safety.

3.7.7 Data Analysis

The study's objectives served as a guide for the analysis. Inferential statistics were used to analyze the data that was gathered. The researcher verified the consistency and completeness of the questionnaires and checklists after the data collection was finished and before processing the replies. The data was organized and categorized in accordance with the study's goals. Data from the questionnaires, document reviews and structured checklist was analyzed using the Statistical Package for Social Sciences version 26 (SPSS V26). Expert assistance from a statistician was sought. In order to test for independent association, logistic regression was employed. The study results were graphically presented in forms of frequency tables, bar graphs, and pie-charts.

3.8 Ethical Considerations

This research thesis was submitted to the administration Makueni County Referral Hospital and Kenyatta University Ethics and Research standards committee for approval. Permission to collect data was sought from NACOSTI. Permission was also sought from appropriate authorities such as office of the County Commissioner, Ministry of Education, office of the County Secretary, office of the Director Health Services and informed consent from respondents. Study benefits, its purpose and risks were explained to the participants. Those who met the inclusion criteria had a fair chance of being chosen. The gathered information was confidential. Furthermore, the research thesis was submitted through turn-it-in software to ensure no plagiarism and that the work was no other people's presentation.

CHAPTER FOUR: RESULTS

4.1 Introduction

This study aimed to achieve three main objectives: (i) identifying neonatal factors linked to timely referral and safe neonatal transport at Makueni County Referral Hospital, (ii) determining maternal factors associated with these outcomes, and (iii) pinpointing institutional factors influencing timely referral and safe transport of neonates in Makueni County Referral Hospital, (iv) to establish the extend of timely referral and safe transport of neonates in Makueni County Referral Hospital. The study employed descriptive statistics, chi-square tests, and unadjusted odds ratios to analyze the data. The findings corresponding to these objectives are described in the following sections.

4.2 Neonatal Characteristics

The response rate of the admitted neonates was 100%. Of the 50 admitted neonates 62% (n=31) were males. Majority of the neonates had a birth weight above 2500grams consisting 54% (n=27). Most of the neonates 64% (n=32) were less than 7 days during the time of study. 40% (n=20) of the neonates were born preterm. Majority of maternal gestation in weeks was term with 52% (n=27). Majority of all the deliveries occurred in hospital at 92 % (n=46) with 0nly 4% (n=2) of the deliveries occurring on the way to the health facility. Out of all the deliveries conducted, 70% (n=35) labored for less than 18 hours and 12% (n=6) labored for more than 18 hours. Majority of the neonates needed oxygen immediately after delivery with 54% (n=27) and 8% (n=4) failed to cry immediately after delivery (Table 4.1).

Table 4.1: Neonatal Characteristics for Neonates Referred to Makueni County Referral Hospital

Neonatal characteristic	Frequency (N=50)	Percentage (%)
Sex of neonate		
Male	31	62
Female	19	38
Age in days		
Less than 7 days	32	64
More than 7 days	18	36
Birth weight in grams		
Less than 1000 grams	4	8
1001-1500 grams	6	12
1501- 2500 grams	13	26
Above 2500grams	27	54
Gestational age in weeks		
Prematurity	20	40
Term	26	52
Post-datism	4	8
Place of delivery		
Home	2	4
Hospital	46	92
On the way to health facility	2	4
Duration of labor in hours		
Less than 18 hours	35	70
More than 18 hours	6	12
Caesarean section	9	18
Complication during delivery	27	54
Birth Asphyxia	4	8
Failure to cry	19	38
Others		

4.2.1 Admission diagnosis

The most common admission diagnosis was prematurity with 32% (n=16) and birth asphyxia at 26% (n=13). Other common conditions that were referred where neonatal sepsis 8%, (n=4) neonatal jaundice 10% (n=5), respiratory distress syndrome 8% (n=4), among other conditions (Figure 4.1).

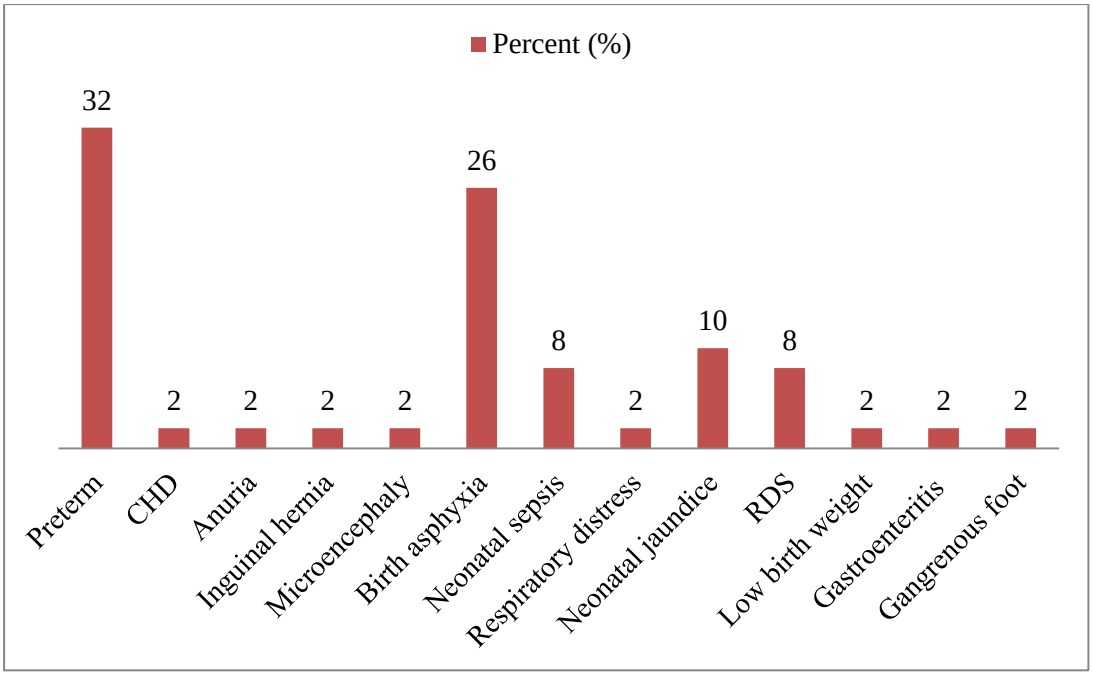

Figure 4.1: Diagnosis for Neonates Admitted at Makueni County Referral Hospital

4.2.2 Neonatal characteristics and Referral Status (Timely, safe or both)

The association between various neonatal characteristics and the referral status, categorized as either "timely and safe" or "lack of timeliness or safety or both" during the referral process. The statistical analysis used Fisher's Exact test to determine the significance of the associations, and unadjusted odds ratios (O.R.s) were computed using "No" as the reference category. Female neonates were less likely to lack timely and safe referrals than male neonates (OR = 0.800, 95% CI [0.157, 4.075], p = 1.000), although this difference was not statistically significant. Similarly, neonates under 7 days demonstrated no statistically significant difference in their likelihood of lacking timely and safe referrals compared to those over 7 days (OR = 1.558, 95% CI [0.303, 8.003], p = 0.676). However, neither age nor gender showed significant relationships with the timeliness and safety of referrals. Concerning birth weight, low-birth-weight neonates displayed a higher likelihood of lacking timely and safe referrals (OR = 2.500, 95% CI [0.433, 14.430], p = 0.423)

compared to their normal-birth-weight counterparts. Nevertheless, this difference was not statistically significant. Moreover, preterm gestational age also exhibited no significant difference in the likelihood of lacking timely and safe referrals (OR = 1.848, 95% CI [0.319, 10.693], p = 0.685) compared to term gestational age.

Furthermore, the place of delivery did not significantly influence the likelihood of lacking timely and safe referrals. Similarly, the duration of labor (in hours) did not significantly affect this outcome. Regarding complications during delivery, neonates requiring oxygen did not exhibit a significant difference in their likelihood of lacking timely and safe referrals (OR = 0.151, 95% CI [0.017, 1.369], p = 0.102) compared to those not needing oxygen.

In conclusion, this study found no significant associations between timely and safe referrals and the neonatal variables of age, gender, birth weight, gestational age, place of delivery, duration of labor, and complications requiring oxygen.

Table 4.2: Neonatal Characteristics vs Timely-Referral and Safe Transport of Neonates Admitted at Makueni County Referral Hospital

		Timely Referral and Safe Transport						P≤0.05 (Fisher's Exact	Unadjusted OR(95%). Ref cat is NO for DV)
		No		Yes		Total			
Neonatal Characteristic		N	%	N	%	n	%		
Sex of neonate	Female	15	83.30	3	16.70	18	100.00	1.000	.800(.157-4.075)
	Male	35	86.20	4	13.80	29	100.00		.Ref
	Total	50	85.10	7	14.90	47	100.00		
Age in days	<7 days	27	87.10	4	12.90	31	100.00	0.676	1.558(.303-8.003)
	> 7 days	23	81.30	3	18.80	16	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Birth Weight	Low	20	90.90	2	9.10	22	100.00	0.423	2.500(.433-14.430)
	Normal	30	80.00	5	20.00	25	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Gestation	Preterm	17	89.50	2	10.50	19	100.00		1.848(.319-10.693)
	Term	33	82.10	5	17.90	28	100.00	0.685	Ref
	Total	50	85.10	7	14.90	47	100.00		
Place of delivery	Home	13	75.00	1	25.00	4	100.00	0.488	.486(.043-5.482)
	Hospital	37	86.00	6	14.00	43	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Duration of labour (Hrs.)	>18hrs	14	80.00	1	20.00	5	100.00	1.000	.727(.069-7.684)
	<18hrs	36	84.60	6	15.40	39	100.00		Ref
	Total	50	84.10	7	15.90	44	100.00		

		Timely Referral and Safe Transport						P≤0.05 (Fisher's Exact	Unadjusted OR(95%). Ref cat is NO for DV)
		No		Yes		Total			
Neonatal Characteristic		N	%	N	%	n	%		
Complication during delivery	O2 Needed	19	76.00	6	24.00	25	100.00	0.102	.151(.017-1.369)
	02 Not needed	31	95.50	1	4.50	22	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Admission diagnosis	Others	16	84.20	3	15.80	19	100.00	1.000	.889(.175-4.515)
	Preterm/Asphyxia	34	85.70	4	14.30	28	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		
Current diagnosis	Others	16	80.00	4	20.00	20	100.00	0.423	.500(.098-2.540)
	Preterm/Asphyxia	34	88.90	3	11.10	27	100.00		Ref
	Total	50	85.10	7	14.90	47	100.00		

4.3 Maternal Characteristics

The majority of the mothers were aged between 15-24 years of age with 68% (n=32). Majority of the respondent's highest education level was secondary level comprising of 64% (n=32). Majority of respondents parity was one child with 52% (n=26). Amongst all the respondents 60% (n=30) were married. Those who visited ANC 1-4 visits were 58% (n=29) and more than 4 visits were 42% (n=19), 4% (n=2) had not attended ANC clinic. 96% (n=48) had ANC profile and 4% (n=2) having no ANC profile. Antenatal complications were reported in 20% (n=10) of the mothers and included pre-eclampsia 4% (n=2), Malaria and Dengue fever 2% (n=1), tonsillitis 2% (n=1), abdominal upset 2% (n=1), urinary tract infections 4% (n=2), anaemia in pregnancy 4% (n=2), and peptic ulcers 2% (n=1). Majority of the respondents lived in rural areas comprising of 88% (n=44) and 12% (n=6) of the respondents where self-referral. 12% (n=6) had in-utero transport (Table 4.2).

Table 4.3: Maternal Characteristics Associated with Timely Referral and Safe Transport at Makueni County Referral Hospital

Maternal characteristics	Frequency (N=50)	Percentage (%)
Maternal age (years)		
15-24 years	34	68
25-49 years	16	32
Education		
Primary	7	14
Secondary	32	64
College / university	11	22
Parity		
One child	26	52
Above one child	24	48
Marital status		
Married	30	60
Single	19	38
Windowed	1	2
ANC visits		
1-4 visits	29	58
More than 4 visits	19	38
Not attended	2	4
ANC profile		
Present	48	96
Absent	2	4
ANC complications		
No complication	40	80
Pre-eclampsia	2	4
Malaria/ Dengue fever	1	2
Tonsillitis	1	2
Abdominal upsets	1	2
UTI in pregnancy	2	4
Peptic ulcers	1	2
Anaemia in pregnancy	2	4
Residence		
Urban	6	12
Rural	44	88
Referral		
Self-referral	6	12
In utero transport	6	12
From health facility	38	76

4.4 Knowledge and Skill to Identify Danger Signs

Preterm labour was the highest risk with 38% (n=19). Bleeding with 32% (n=16), prolonged labour more than 18 hours was 18% (n=9) and premature rapture of membranes was 12% (n=6) (figure 4.2).

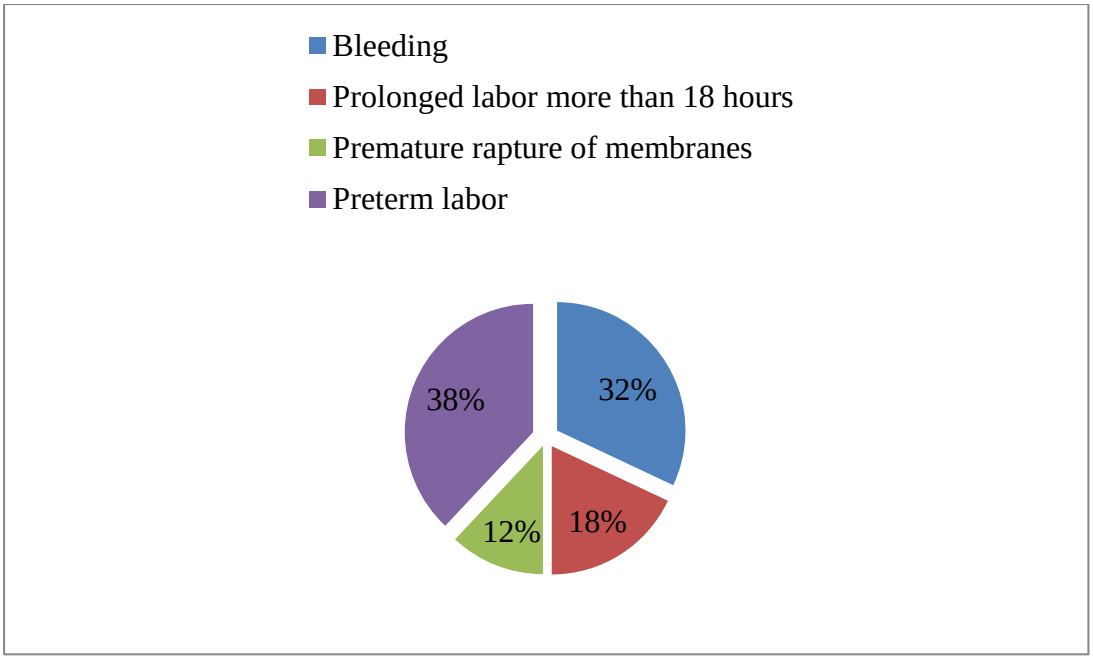

Figure 4.2: Knowledge and Skill to Identify Danger Signs Among Mothers at Makueni County Referral Hospital

4.4.1 Danger signs knowledge

Most of the respondents indicated that prematurity was the highest danger sign in neonates with 38% (n=19). Very low birth weight was second with 22% (n=11) and birth asphyxia was third with 18% (n=9) (figure 4.3).

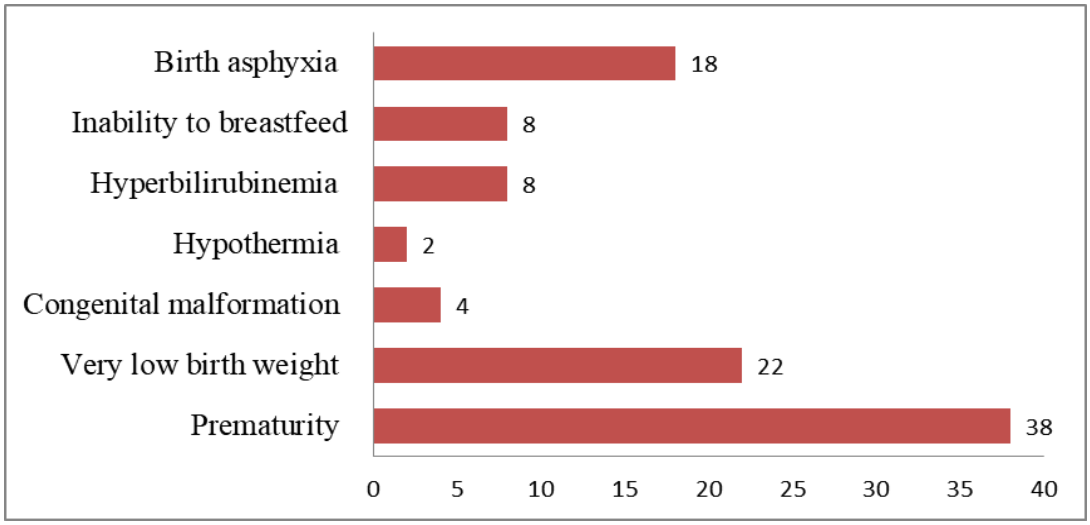

Figure 4.3: Knowledge on Danger Signs Among Mothers with Neonates Admitted at Makueni County Referral Hospital

4.4.2 Associations between Maternal Characteristics and Timely and Safe Referral Status

The association between various maternal characteristics and the referral status, which was categorized as either "timely and safe" or "lack of timeliness or safety or both" during the referral process. The statistical analysis used Fisher's Exact test to determine the significance of the associations, and unadjusted odds ratios (O.R.s) were computed using "No" as the reference category.

The analysis revealed that mothers below 24 years were comparatively less prone to experiencing a lack of timely and safe referral than those above 24 years (OR = 0.346, 95% CI = 0.038-3.181, p = 0.657). However, it's worth noting that this difference did not attain statistical significance. Among mothers aged above 24 years (the reference category), only 7.1% received timely and safe referrals, whereas the majority, 92.9%, did not.

In terms of educational background, no significant distinction emerged in the likelihood of encountering a lack of timeliness and safety referral between mothers with primary education or below and those with education above primary level (OR = 1.059, 95% CI = 0.107-10.435, p = 1.000). Additionally, parity, or the number of children, appeared not to significantly influence the lack of timeliness and safety in referrals. The comparison between mothers with one or fewer children (parity <= 1) and those with more than one child (parity > 1) yielded an OR of 1.474 (95% CI = 0.291-7.450, p = 0.701). Similarly, marital status showed no marked correlation with the probability of experiencing a lack of timeliness and safety referral. The analysis of married mothers versus those with other marital statuses indicated an OR of 0.986 (95% CI = 0.194-4.994, p = 1.000).

Moreover, the number of antenatal care (ANC) visits, regardless of being four (or fewer) or more, did not notably sway the likelihood of facing a lack of timeliness and safety referral (OR = 0.489, 95% CI = 0.085-2.825, p = 0.682). Also, the residence in rural or urban areas, and knowledge of high-risk pregnancies, did not exhibit statistically significant associations with the occurrence of lack of timeliness and safety in the referral process ($p>0.05$).

In summary, the analysis suggests that various maternal characteristics, encompassing age, educational level, parity, marital status, ANC visits, residence, and knowledge of high-risk pregnancies, did not show statistically significant relationships with the occurrence of lack of timeliness and safety in the referral process.

Table 4.4: Association Between Maternal Characteristics and Timely and Safe Referral Status of Neonates at Makueni County Referral Hospital

		Referral status: Timely Referral and Safe Transport						P≤0.05	Unadjusted
		No		Yes		Total		(Fisher's	OR (95%). Ref cat is
Maternal Characteristic		N	%	N	%	N	%	Exact)	NO for DV)
Age	<=24 years	37	81.8	6	18.2	33	100.0	0.657	.346(.038-3.181)
	>24 years.	13	92.9	1	7.1	14	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
Educational Level	<=Primary	16	85.7	1	14.3	7	100.0	1.000	1.059(.107-10.435)
	>Primary	34	85.0	6	15.0	40	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Parity	<=1 child	31	87.5	3	12.5	24	100.0	0.701	1.474(.291-7.450)
	>1 child	19	82.6	4	17.4	23	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Marital Status	Others	17	85.0	3	15.0	20	100.0	1.000	.986(.194-4.994)
	Married	33	85.2	4	14.8	27	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
ANC visits	<=4	32	81.5	5	18.5	27	100.0	0.682	.489(.085-2.825)
	>4	18	90.0	2	10.0	20	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
ANC profile	Yes	50	85.1	7	14.9	47	100.0		
	No	0	0.0	0	0.0	0	0.0		
	Total	50	85.1	7	14.9	47	100.0		
ANC complications	No	32	82.1	7	17.9	39	100.0	1.000	
	Yes	18	100.0	0	0.0	8	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Residence	Rural	35	85.4	6	14.6	41	100.0	1.000	1.167(.115-11.814)
	Urban	15	83.3	1	16.7	6	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		
Knows High risk pregnancies	No	18	88.9	1	11.1	9	100.0	1.000	1.500(.157-14.293)
	Yes	32	84.2	6	15.8	38	100.0		Ref
	Total	50	85.1	7	14.9	47	100.0		

4.5 Institutional Factors

Majority of the neonates, 74% (n=37) were transported via ambulance which respondents argued was safer and 18% (n=9) used private cars. Transport choice was influenced by several factors where transport availability was the main with 38% (n=19) and cost 26% (n=13). The patient stay was also a factor for the safety of the neonate where 76% (n=36) stayed less than 24 hours and 14% (n=7) more than 2 days. Health care professionals (nurses) escorted most of the neonates at 68% (n=34), and those escorted by relatives were 22% (n=11). Those neonates who had stabilization treatment during transport were 46% (n=23), those without stabilization treatment were 48% (n=24) and 6% (n=3) did not require pre referral stabilization. Majority of the neonates had no vital signs monitoring consisting of 88% (n=44). The response time the median was 1-2 hours yielding 62% (n=31). The neonates whom warmth was kept via warm linen were 84% (n=42). Majority of the referral's communication was made via phone call at 82% (n=41) to the receiving facility. During transport, 86% (n=43) of the neonates were not fed (Table 4.3).

Among those who provided reasons for the delay in referral, 60 % (30 individuals) specifically mentioned issues related to ambulance services, such as waiting for the arrival of an ambulance. In contrast, the remaining 40 % (20 individuals) cited various other reasons for the delay, such as waiting for the patient's condition to stabilize on the current management offered in the referring facility.

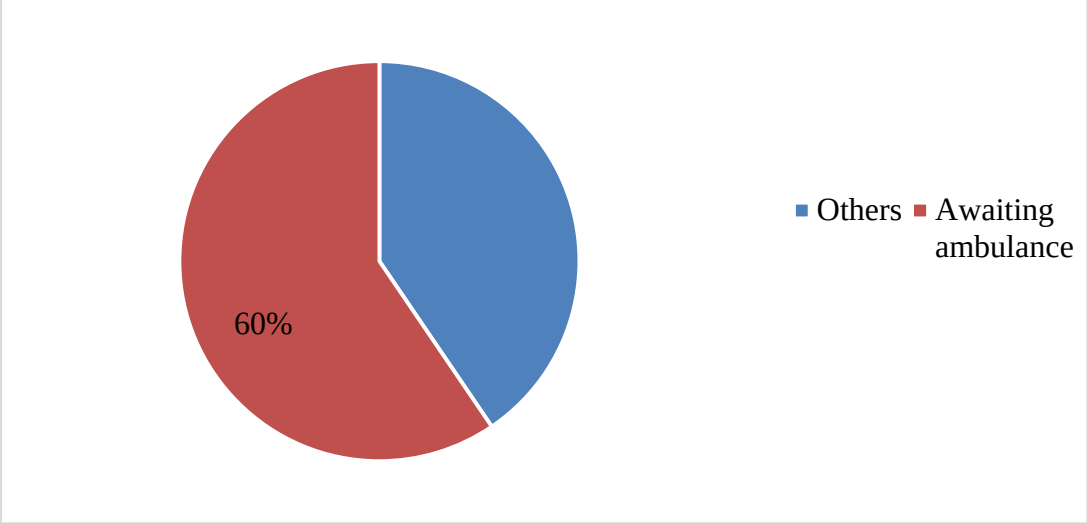

Figure 4.4: Common Reasons for a Referral Delay at Makueni County Referral Hospital

Table 4.5: Referral and Transport Characteristics at Makueni County Referral Hospital

Referral and transport characteristics	Frequency (N=50)	Percentage (%)
Mode of transport		
Ambulance	37	74
Private cars	9	18
Public vehicles	2	4
Walking	2	4
Influence of transport		
Cost	13	26
Distance to be travelled	8	16
Transport availability	19	38
Others	10	20
Patient stay		
Less than 24 hours	38	76
Between 1-2 days	5	10
More than 2 days	7	14
Escort of neonate / mother		
Health care professionals	34	68
Not health care professionals	16	32
Stabilization treatment		
Yes	23	46
No	27	54
Vital signs monitoring		
Yes	6	12
No	44	88
Response time (Hours)		
1-2 hours	31	62
3-4 hours	16	32
5-6 hours	2	4
7-8 hours	1	2
Reasons for the delay in referral	30	60
Lack of ambulance		
Other reasons e.g., on treatment	20	40
Warmth of baby		
Warm linen	42	84
Incubators/ skin to skin	8	16
Communication from referring facility		
Phone call	41	82
No communication	9	18
Feeding of the neonate during transportation		
Breastfeeding	1	2
Intravenous fluids	4	8
Cup and spoon feeding of expressed breast milk	2	4
Not fed	43	86

4.5.1 Ambulance status: Checklist

Data on ambulance characteristics revealed that 60% (n=30) of the respondents had an ambulance. Among all the ambulances present 60% (n=30) had oxygen cylinders, 10% (n=5) had radiant heaters, 2% (n=1) had incubators, 100% (n=50) had a firm coach, 14% (n=7) had monitoring equipment, and 10% (n=5) had resuscitation medicines while 8% (n=4) had resuscitation equipment (Figure 4.4).

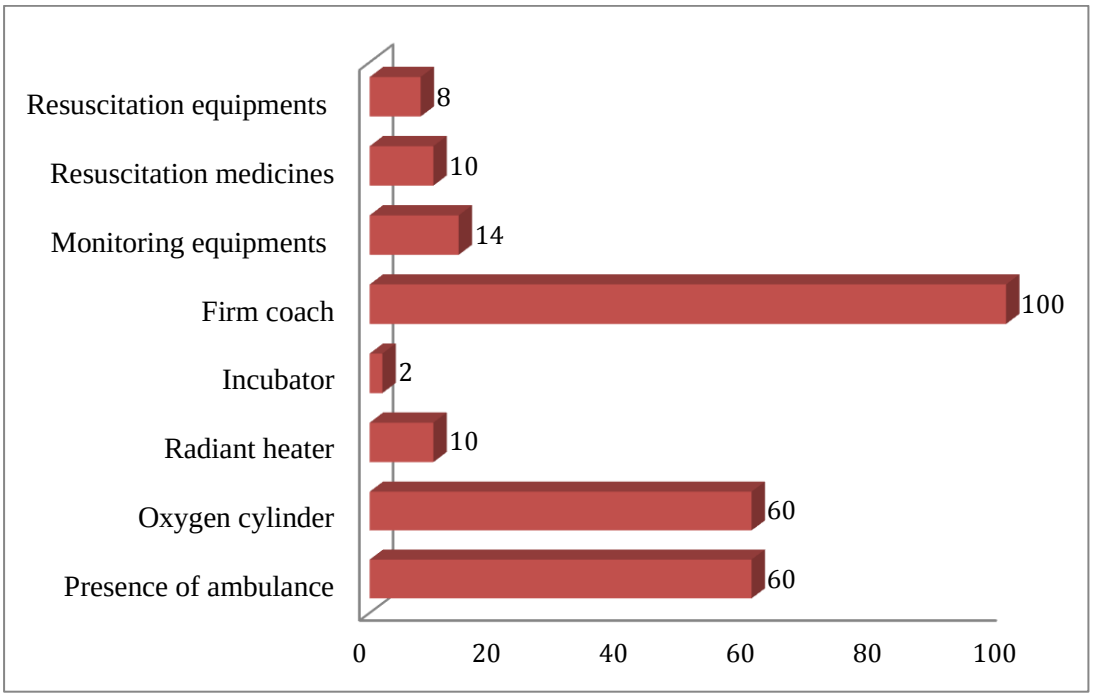

Figure 4.5: Checklists on Ambulances Transporting Neonates at Makueni County Referral Hospital

4.5.2 Referral Requirements or prerequisites

In most of the referred neonates, 92% (n=46) had referral guidelines and 84% (n=42) of all the neonates referred had written referral notes. Amongst the referred neonates 62% (n=31) required oxygen with 52% (n=27) needed nasogastric tube and was not fixed. Majority of the neonates 66% (n=33) required intravenous line with intravenous fluids administered to 52% (n=26) of the neonates. 36% (n=18) were administered with intravenous fluids appropriately. Majority of the neonates had warmth maintained by use of warm linen in 90% (n=45) of all the referred neonates.

Vital signs monitoring such as temperature, respirations, oxygen saturation and random blood sugars was done to 12% (n=6) of all the referred neonates (Table 4.4).

Table 4.6: Structured Data Checklists of Referral Requirements at Makueni County Referral Hospital

Data checklists of referral requirements	Frequency	Percentages (%)
Referral guidelines	46	92
Written notes	42	84
Oxygen requirements	31	62
Need for NGT	26	52
IV line	33	66
IV fluids	29	58
IV Administered	26	52
IV fluids administered appropriately	18	36
Warmth of neonate	45	90
Vital signs monitoring	6	12

4.5.3 Associations between Institutional Characteristics and Timely and Safe Referral Status

The relationship between different institutional or hospital characteristics and the referral status of maternal patients. The referral status was dichotomized into "timely and safe" or "lack of timeliness or safety or both" during the referral process. The statistical significance of these relationships was assessed using Fisher's Exact test. Additionally, unadjusted odds ratios (O.R.s) were computed using "No" as the reference category for the outcome variable.

Examining the mode of transport, encompassing "Others (Public/Private Car)" and "Ambulance," the findings suggest that the mode of transport does not significantly influence whether a patient experiences a lack of timeliness and safe transport during the referral process ($P>0.05$). Transport considerations, specifically "Cost" and "Transport availability," were also explored. The results demonstrate no substantial impact on the likelihood of experiencing a lack of timeliness and safe

transport during referral (P>0.05). Considering the duration of patient stay before referral, categorized as ">24hrs" or "<=24hrs," the analysis suggests that the duration of patient stay in the hospital before referral does not significantly affect the likelihood of encountering a lack of timeliness and safe transport (P>0.05).

The escort of neonate/mother, categorized as "Others" or "HCP," was also investigated. However, the data indicates no significant association with the likelihood of a lack of timeliness and safe transport during referral (P>0.05).

Interestingly, the presence or absence of "Stabilization treatment" emerges as a significant factor. Patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral (P=0.004). In the context of vital signs monitoring, the analysis suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P = 0.035) compared to their monitored counterparts (OR = 9.250, 95% CI = 1.3-62.091). Furthermore, the response time for referral, categorized as ">2hrs" or "<=2 hours," was explored. The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral (P=0.032). The "Availability of an ambulance" emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay, in comparison to 40.5% (17) who cited other reasons for the referral delay. The absence of an ambulance was found to have a substantial influence on the likelihood of experiencing a lack of timeliness and safe transport during referral (P=0.039).

Other factors, including "Warmth of baby," "Communication to referring facility," "Feeding of neonate on transit," "Oxygen cylinder," "Radiant heater," "Incubator,"

and "Monitoring equipment," were also considered. Nevertheless, the results for these factors did not reveal significant associations with the likelihood of a lack of timeliness and safe transport during referral ($P>0.05$).

In summary, the analysis of institutional or hospital characteristics highlights several significant factors associated with the likelihood of timely and safe transport during referral. These factors include stabilization treatment, vital signs monitoring, response time for referral, and the availability of an ambulance.

Table 4.7: Association Between Institutional and Timely and Safe Referral Status at Makueni County Referral Hospital

Institutional Factors		Referral status: Timely Referral and Safe Transport No N	%	Yes n	%	Total N	%	P≤0.05 (Fisher's Exact)	Unadjusted OR (95%). Ref cat is NO for DV)
Mode of Transport	Others (Public/Private Car)	10	100.0	0	0.0	10	100.0	0.318	
	Ambulance	40	81.1	7	18.9	37	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Transport Considerations	Cost	21	84.6	2	15.4	13	100.0	1.000	1.100(.156-7.740)
	Transport	29	83.3	3	16.7	18	100.0		Ref category
	Total	50	83.9	5	16.1	31	100.0		
The patient stays before the referral	>24hrs	18	80.0	2	20.0	10	100.0	0.630	.625(.102 - 3.833)
	<=24hrs	32	86.5	5	13.5	37	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Escort of neonate/mother	Others	22	92.3	1	7.7	13	100.0	0.655	2.571(.279-3.733)
	HCP	28	82.4	6	17.6	34	100.0		Ref category
	Total	50	85.1	7	14.9	47	100.0		
Stabilization treatment	No	34	100.0	0	0.0	24	100.0	**0.004**	
	Yes	16	69.6	7	30.4	23	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Vital signs monitoring	No	37	90.2	4	9.8	41	100.0	**0.035**	9.250(1.3-62.091)
	Yes	13	50.0	3	50.0	6	100.0		Ref category
	Total	50	85.1	7	14.9	47	100.0		
Response time(hrs)	>2hrs	19	100.0	0	0.0	19	100.0	**0.032**	
	<=2 hours	31	75.0	7	25.0	28	100.0		
	Total	50	85.1	7	14.9	47	100.0		
Warmth of baby	Others	16	100.0	0	0.0	6	100.0	0.571	
	Warm linen	34	82.9	7	17.1	41	100.0		
	Total	50	85.1	7	14.9	47	100.0		

Institutional Factors		Referral status: Timely Referral and Safe Transport No N	%	Yes n	%	Total N	%	P≤0.05 (Fisher's Exact)	Unadjusted OR (95%). Ref cat is NO for DV)
Communication with referring facility	No communication	16	100.0	0	0.0	6	100.0	0.571	
	Phone call	34	82.9	7	17.1	41	100.0		
	Total	50	85.1	7	14.9	47	100.0		
feeding of neonates in transit	Not Fed	14	66.7	2	33.3	6	100.0	0.214	.278(.040-1.929)
	Fed	36	87.8	5	12.2	41	100.0		Ref category
	Total	50	85.1	7	14.9	47	100.0		
is there ambulance	No	17	100.0	0	0.0	17	100.0	**0.039**	
	Yes	33	76.7	7	23.3	30	100.0		
	Total	50	85.1	7	14.9	47	100.0		
oxygen cylinder	No	16	94.1	1	5.9	17	100.0	0.396	4.000(.439-36.44)
	Yes	34	80.0	6	20.0	30	100.0		
	Total	50	85.1	7	14.9	47	100.0		
radiant heater	No	37	88.1	5	11.9	42	100.0	0.154	4.933(.65-37.124)
	Yes	13	60.0	2	40.0	5	100.0		Ref category
	Total	50	85.1	7	14.9	47	100.0		
Incubator	No	50	87.0	6	13.0	46	100.0	0.149	
	Yes	0	0.0	1	100.0	1	100.0		
	Total	50	85.1	7	14.9	47	100.0		
monitoring equipment	No	37	92.5	3	7.5	40	100.0	0.006	16.444(2.450-110.385)
	Yes	13	42.9	4	57.1	7	100.0		
	Total	50	85.1	7	14.9	47	100.0		Ref category

4.6 Neonatal outcome

In the current study, 78% (n=39) of the neonates received adequate care to include oxygen administration, vital signs monitoring, intravenous fluid therapies, nasogastric tube feeding and antibiotic therapy, 6% (n=3) were referred to level 6 facility to specialized care due to anuria and was referred for peritoneal dialysis, gangrenous foot and congenital malformation. Those referred to a level 6 facility also came as referrals from other health care facilities within Makueni County. 16% (n=8) lost their lives. (Table 4.7).

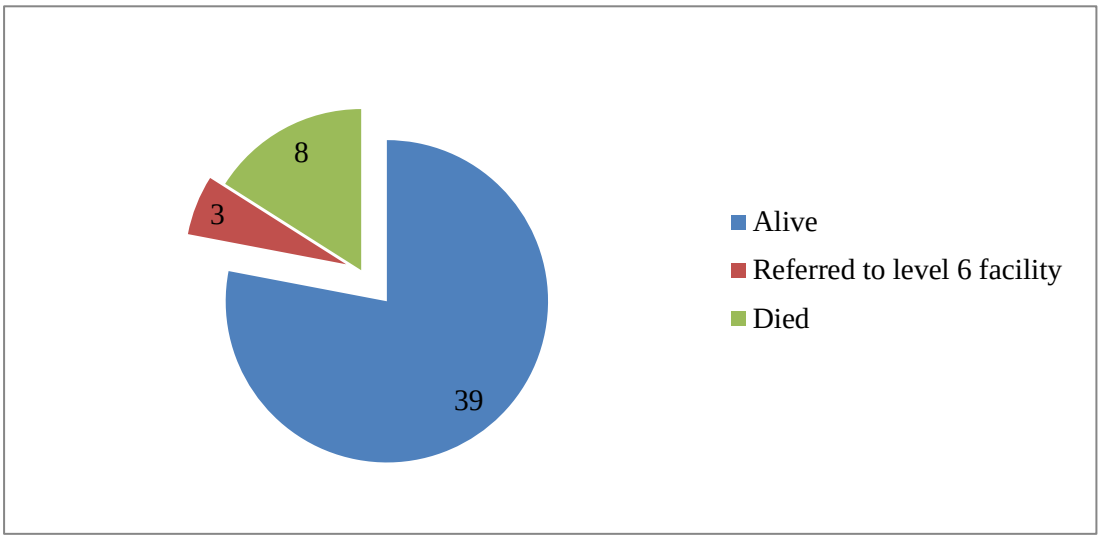

Figure 4.6: Outcomes for the Hospitalized Neonates at Makueni County Referral Hospital

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

Neonatal characteristics such as sex, birth weight, outcome, gestational age in weeks, duration of labour, mode of delivery and complications during delivery had no influence on timely and safe referrals.

In the current study, it found out that majority of the referred neonates were males. This finding is similar to a study in India by Negi et.al (2019) which indicated that majority of the referred neonates were males. This could be explained by the reasoning that male neonates are biologically and genetically weaker and more susceptible to diseases and premature death (Subedi, 2022).

Majority of the neonates had a birth weight above 2500grams. This finding concurs to a study carried out in India where most of the neonates in the study were greater than or equal to 2500grams at 57.9% (Negi et.al, 2019).

During the time of study majority of the neonates were less than 7 days old. This could be due to the fact that health care providers are able to recognize danger signs and need for a specialized care early enough. This finding is similar to a study carried out in South Africa where majority of the referred neonates were less or equal to 7 days of age at 56% (Ashokcoomar et.al, 2016) and in Ibadan in Nigeria which revealed that more neonates were referred on first day of delivery at 46.2% (Muhydeen et.al, 2016).

In the current study, most neonates required oxygen at birth due to prematurity and birth asphyxia. Premature neonates born before 37 weeks gestation have not made enough surfactant which predisposes them to alveoli collapse hence developing

breathing problems. The occurrence in prematurity could be due to teenage pregnancies, limited access to quality nutrition, multiple pregnancies, lack of quality pregnancy care owing that Makueni County has increased burden of drought. This finding concurs to a study conducted in India where most of the neonates at 67.1% developed symptoms immediately after delivery hence posting a greater vulnerability in the neonates' early life (Negi et.al, 2019). In addition, similar findings were found in India and South Africa where prematurity and birth asphyxia were common (Negi et.al, 2019) and (Ashokcoomar et.al, 2016).

The neonatal characteristics had no influence on timely and safe referrals ($p > 0.05$) even though low-birth-weight neonates displayed a higher likelihood of lacking timely and safe referrals ($p > 0.05$) compared to their normal-birth-weight counterparts. This finding is in contrast to a study carried in Tanzania where low birth weight was found to be statistically significant (p-value < 0.05) (Kiputa et.al., 2022). The difference between the two studies could be due to the methodology used and the number of participants employed.

Maternal characteristics such as age, educational level, residence, marital status, and antenatal care also influenced timely referral and safe transport of neonates. Majority of the respondents resided in rural areas and delivered in hospitals which were majorly in the rural areas and the neonates had to be transported to Makueni County Referral Hospital for care, rendering a referral unsafe for the neonate. This is was due to delays in ambulance dispatch because many peripheral facilities in makueni county do not have a standby ambulance. This concurs with a study done by Shalini et al. (2017), which indicated that most referrals where from homes, public and private hospitals and many neonates were referred and transported in private and public vehicles without any pre referral care during transportation. In

addition, findings by Shalini et al. (2017), indicates that most referrals usually come from homes, public and private hospitals and many neonates are referred and transported in private and public vehicles without any pre referral care during transportation.

In the current study, majority of respondents parity was one child and were aged 24 years and below. This finding is similar to a study in Kenya which revealed that most mothers were aged between 15 to 24 years with majority having primary education and below. This led to poor decision-making during referral and affected the transportation of the referred newborn (Atieno et.al, 2019). In addition, studies by Biswas et.al, (2018) and Teklu et.al, (2020), indicates that, majority of the mothers were aged between 17 to 25 years and were primiparous.

The maternal characteristics had no influence on safe transport and timely referral of neonates ($p>0.05$) even though a retrospective study carried out by Biswas et al., 2018, found that early identification and referral of pregnancy related complications is important in reduction of both maternal and newborn deaths ($p<0.05$). This could be attributed by the methodology of the study and subjects employed.

According to the findings of this study, identification of high-risk pregnancy and danger signs on neonates associate with timely referral and safe transport of neonates. This is a good gesture where most neonates will receive prompt care but the rates are still low. Skilled healthcare providers are very instrumental in identifying the emergencies and related complications of prolonged labor, premature rapture of membranes and pre-eclampsia. This is very crucial in saving the lives of the baby and the mother. In addition, a study conducted by Bose A, 2017, indicates that timely identification and a pregnancy where there is high risk and there is more

time before the delivery, transport in utero is considered a safer way of ensuring neonates survival.

In the current study, majority of the respondents indicated that prematurity was the highest danger sign in neonates, very low birth weight was second and birth asphyxia. This finding is similar to a study in India where prematurity was common at 21.4% and birth asphyxia at 25.6% (Negi et.al, 2019). A study conducted in South Africa indicates that prematurity at 75% was also common (Ashokcoomar et.al, 2016).

In the current study, most neonates were transported via ambulance. This finding is similar to a study carried out by Shalini et.al, (2017) and Punitha et.al, (2016) which found out that many neonates who were referred to higher centres of care used ambulances as modes of transport at 70% and 75% respectively. This is also concurring to a study conducted in Tanzania which indicated that hospital organized ambulances transported 88.5% of the neonates that were referred to all government owned facilities. This is because in Tanzania, all government owned facilities offer free ambulance services (Kiputa et.al, 2022). In addition, the results are in line with research conducted in KwaZulu-Natal, South Africa, where all referrals were conveyed by ambulance (Ashokcoomar et.al, 2016). In Makueni County, this indicated that there is increased use of ambulances hence ensuring timely referral of neonates. Majority of those who used ambulance as a mode of transport in the present study was due to availability and cost. This could be as a result of health services devolution and counties are able to acquire ambulances.

In the present study in Makueni County Referral Hospital, most ambulances had a functional oxygen supply and oxygen delivery devices. However, lack of monitoring

of the neonates led to increased unstable clinical conditions of the referred neonates. This finding concurred to a study conducted in Tanzania which found out that, despite the presence of ambulances, subpar functionality and lack of equipments (Kiputa et.al, 2022).

In the present study, the presence or absence of stabilization treatment emerges as a significant factor with patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral. This could be as a result of most ambulances having not been equipped with the necessary drugs and equipments. This finding is comparable to an observational study conducted in Indonesia which revealed that neonates reported to health facilities in unstable condition due to lack of stabilization before and during transportation (Ekaputri et.al, 2020). In addition, a study conducted in Tanzania indicates that inadequate pre-transfer treatment and surveillance during transit led to a poor clinical condition upon admission (Kiputa et.al, 2022).

In this study, analysis suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation compared to their monitored counterparts though, a study carried out by Negi et.al, (2019) indicated that 11.1% of the referred neonates were escorted by health care professionals hence signifying relatively unsafe transportation. In addition, a study by Jajoo et.al (2017), found out that 40% medical personnel accompanied neonates during referral. The differences in these studies may be due to toughness of the referral systems in these different study areas.

The response time for referral, found out that time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral. Longer duration

of time during transportation of a neonate creates a gap in timely referral of a neonate and should be reduced to a minimum possible. In the current study, the mean time spent in transportation was 1-2 hours. This finding is similar to a study conducted in India where the mean time spent on transportation was 1.08 hours (Negi et.al, 2019).

In the current study, the availability of an ambulance emerged as a significant factor, with 59.5% (25) reporting waiting for an ambulance as the reason for the delay, in comparison to 40.5% (17) who cited other reasons for the referral delay. This agreed to a study carried out by Shalini et.al, (2017) and Punitha et.al, (2016) which found out that many neonates who were referred to higher centres of care used ambulances as modes of transport at 70% and 75% respectively. This is also in line with a study conducted in Tanzania which indicated that hospital organized ambulances transported 88.5% of the neonates that were referred to all government owned facilities. This is because in Tanzania, all government owned facilities offer free ambulance services (Kiputa et.al, 2022). In contrast to studies conducted in Ghana and Nigeria, the majority of neonates were transported by taxis and private automobiles at rates of 36% and 43.9%, respectively (Abdulraheem, 2016). The results are in line with research conducted in KwaZulu-Natal, South Africa, where all referrals were conveyed by ambulance (Ashokcoomar et.al, 2016). In contrast, a study done in Ibadan Nigeria found that 4% of neonates used ambulances as a mode of transport (Muhyeed, 2016). Also, similar findings were found by a study conducted in Indonesia which revealed that there is poor transportation, emergency transport is not available and private transport is very expensive (Rakhmadi et.al, 2020). In Makueni County Referral Hospital, this indicated that there is increased use of ambulances hence ensuring timely referral of neonates. Those who did not

use an ambulance as a mode of transport posted a gap in neonatal safe transport. Majority of those who used ambulance as a mode of transport in the present study was due to availability and cost respectively.

The patients who did not receive stabilization treatment were found to be more prone to experiencing a lack of timeliness and safe transport during referral (P<0.004). These findings are similar to a study conducted in Indonesia which revealed that neonates reported to health facilities in unstable condition due to lack of stabilization before and during transportation (p<0.05) (Ekaputri et.al, 2020).

In the current analysis, it suggests that patients who did not undergo vital signs monitoring were 9.25 times more prone to experiencing delays and unsafe transportation (P <0.035) which is similar to a study carried out by Negi et.al, (2019) indicated that referred neonates who had their vital signs monitored were 11.1% (p<0.005). The results suggest that patients with a response time exceeding 2 hours were more likely to face a lack of timeliness and safe transport during referral (P<0.032). This finding is similar to a study conducted in India where the mean time spent on transportation was 1.08 hours with a (p < 0.05) (Negi et.al, 2019). Availability of an ambulance emerged as a significant factor, with (p<0.05) even though a study done in Ibadan Nigeria found that neonates who used ambulances as a mode of transport had a P-value (p>0.05) (Muhyeed, 2016).

5.2 Conclusions

Based on the study findings, it can be concluded that;

i. There is lack of timeliness of referrals and safe transport of neonates in Makueni County Referral Hospital due to inadequate number of functional ambulances and trained health care providers.

ii. There is no significant association between timely referral and safe transport and neonatal variables such as age, gender, birth weight, gestational age, place of delivery, duration of labour and complications requiring oxygen.

iii. Maternal characteristics encompassing age, education level, parity, marital status, ANC visits, residence and knowledge on of high-risk pregnancies did not have statistically significant relationship with the occurrence of timely referral and safe transport of neonates.

iv. Institutional factors influenced safe transport and timely referral to include stabilization treatment, vital signs monitoring, response time for referral, and the availability of an ambulance.

5.3 Recommendations

5.3.1 Study Recommendations

From the findings of the research, the study recommended the following;

i. Functional ambulances equipped with the necessary drugs and equipments should be availed.

ii. Availability of enough and qualified heath care providers to aid in vital signs monitoring, pre-referral and en-route stabilization of neonates.

iii. Hospitals should be supplied with all the necessary equipments and drugs which aid in stabilization of neonate patients such as pulse oximeters, oxygen cylinders, incubators, ambubags, glucometers, cardiac monitors, oxygen flow meters among others.

5.3.2 Recommendations for Further Research

The following areas have been suggested for further research:

i. For comparison and generalization, a similar study may be conducted in other county referral hospitals.

ii. Similar study may be undertaken but using different subjects for greater and different understanding.

iii. A study may be carried out on other interventions for preventing neonatal deaths other than timely referral and safe transport of neonates.

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APPENDICES

Appendix I: Informed Consent

Iluka F. Nduku

P.O Box 95- 90300

Makueni

0726428462

SUBJECT: INFORMED CONSENT

Dear respondent,

My name is Iluka Francisca Nduku MSc Nursing (Pediatric) student at Kenyatta University. I am conducting a study titled: Determinants of Timely Referral and Safe Transport of Neonates Referred to and Those Transferred out of Makueni County Referral Hospital, Kenya. The study findings will be used to improve safety during transport and timely referral of neonates.

Procedures to be followed

Participation in the study will require one to answer questions about you and the neonate through interviewer guided questionnaire. I will record the information you provide in a questionnaire.

Voluntarism

Participation in the study is voluntary and you are free to ask questions related to the study at any time. You have the right to refuse participation in this study. You will not be penalized nor victimized for not joining the study and your decision will not be used against you.

You may refuse to answer questions and you may stop an interview at any time. You may also stop being in the study at any time without any consequences now or in future.

Discomforts and risks

The study will be anonymous with no risks associated with it. No procedures that can lead to injury or discomfort will be performed. The neonate will continue receiving treatment as per the diagnosis made and will be treated as per pediatric protocol and the Ministry of Health guidelines.

Benefits

If you chose to participate in this study, you will help us learn how to ensure there is timely referral and safe transportation of neonates. There is no direct benefit to the participants but the study will inform policy makers to improve on the weaknesses of timely referral and safe transport of neonates in Kenya. There is no reward for anyone who chooses to participate in the study. The neonates care will continue with care as planned. There will be no intimidation to the mother as well. There will be minimal interference of the hospital programme to ensure the ongoing treatment will not be interfered with.

Reward

There are no rewards or any payment to you if you choose to participate.

Confidentiality

Your name will not be recorded on the questionnaire and questionnaires will be kept in a safe place at the university. All information collected from you will be kept confidential in a locked cabinet and will only be shared with the study team.

Contact Information

If you have any questions, you may contact the following; Iluka F. Nduku- 0726428462, supervisor Dr. Sarah- 0722610684, Dr. Talaso- 0722790680, School of Nursing, Kenyatta University.

However, if you have any questions about your rights as a participant: you may contact Kenyatta university Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke.

Participant's Statement

The above statement regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept confidential and I can leave the study at any time without any penalty or harm. Having known that this study is voluntary, I do hereby give consent to participate in it.

Name of Participant……. Date: ……..

Signature or Thumbprint……

Investigator's statement

I, the undersigned, have explained to the volunteer in a language she understands the procedure to be followed in the study and the risks and the benefits involved.

Name of interviewer…:…… Date…….

Interviewer signature……..

Appendix II: Questionnaire

Mother-and-Infant Dyad

Section 1: Demographic data of a Neonate

Indicate appropriately

a. Sex of the neonate. Male [ ] Female [ ]

b. Age in days. Less than 7 days [ ] More than 7 days[ ]

c. Birth weight in grams……..

d. Gestational age in weeks at birth……..

e. Place of delivery. Home [ ] Hospital [ ] on the way to health facility [ ]

f. Duration of labour in hours. Less than 18 hours [ ] More than 18 hours [ ] Caesarean section [ ]

g. Any complications during delivery

1. Birth Asphyxia [ ]

2. Failure to cry [ ]

3. Others specify……

h. Admission diagnosis……

i. Current diagnosis……

Maternal Characteristics

a. Age……..years

b. Educational level. None [ ] Primary [ ] Secondary [ ] College / University [ ]

c. Parity. One child [ ] Above one child [ ]

d. Marital status. Married [ ] Divorced [ ] Single [ ] Windowed [ ] Separated [ ]

e. Attendance of Focused Antenatal care. Yes [ ] No [ ]

f. Total number of ANC visits ……

g. Presence of ANC profile. Yes [ ] No [ ]

h. Any ANC complications during pregnancy. Yes [ ] No [ ]

If yes specify……

i. Residence

1. Urban [ ]
2. Rural [ ]

j. Sub county hospital referring.

Matiliku [ ] Mbooni [ ]

Kisau [ ] Sultan Hamud [ ]

Mtito Andei [ ] Tawa [ ]

Mutyambua [ ] Kambu [ ]

Mukuyuni [ ] Kibwezi [ ]

Makindu [ ] Kilungu [ ]

k. Self-referral……

l. Others Specify……

Section 2: Knowledge on Danger Signs Identification among Mothers

Tick appropriately

a. Which one do you consider as a high risk pregnancy?

1. Bleeding [ ]
2. Premature rupture of membranes [ ]
3. Prolonged labor more than 18 hours [ ]
4. Preterm labor [ ]
5. Any other, specify……

b. Which one do you consider as danger signs in a neonate requiring a referral?

1. Prematurity [ ]
2. Very low birth weight [ ]

3. Congenital malformations [ ]
4. Hypothermia [ ]
5. Hyperbilirubinemia [ ]
6. Inability to breastfeed [ ]
7. Birth asphyxia [ ]
8. Any other specify ……...

Section 3: Referral and Transport Characteristics

a. Were you informed of the reason for referral?

1. Yes [ ]
2. No [ ]

b. If yes, Reason for referral……. (Check file).

c. Which mode of transport was used during the referral of the neonate?

1. Ambulance [ ]
2. Private cars/taxi [ ]
3. Public vehicles (buses) [ ]
4. Walking [ ]
5. Motorcycles [ ]
6. Any others (Specify)……...

d. What influenced the choice of transport mode?

1. Cost [ ]
2. Distance to be travelled [ ]
3. Transport mode availability [ ]
4. Any other (Specify) ……

e. How long did the patient stay in the referring facility or at home?

1. Less than 24 hours [ ]
2. Between 1-2 days [ ]
3. More than two days [ ]

f. Who escorted the neonate during the referral?

1. Parents [ ]
2. Relatives [ ]
3. Friends [ ]
4. Health care professionals [ ] (Specify)….....
5. Any other (Specify)……

g. Was there stabilization treatment before and during transport?(Check file)

1. Yes [ ]
2. No [ ]

h. Was the neonate's temperature, pulse rate, respiration rate and blood sugars monitored during transport?

1. Yes [ ]
2. No [ ]

i. How long did you take to reach the receiving facility? (Hours)……

j. How was warmth of the baby ensured during the transport to the receiving facility?

1. Warm linen [ ]
2. Skin to skin contact [ ]
3. Incubators [ ]
4. None of the above [ ]
5. Others, Specify……...

k. How did the referring facility communicate with the receiving facility?.....

l. How was feeding of the sick neonate carried out during the transportation?

1. Breastfeeding [ ]
2. Intravenous fluids [ ]
3. Nasogastric tube feeding [ ]
4. Cup and spoon feeding of expressed breast milk [ ]
5. Not fed [ ]

Section 5: Ambulance Checklist

	Yes	**No**
Does the hospital have an ambulance?		
Is the ambulance in good working condition? Presence of oxygen cylinder Presence of radiant heater Presence of an incubator Presence of a firm coach		
Is there monitoring equipment such as thermometer,		

pulse oximeter, glucometer?		
Presence of resuscitation medicines		
Presence of resuscitation equipments such as ambubags, suctioning apparatus?		

Section 6: Document Review Checklist

	Yes	**No**
Are there referral guidelines in the facility?		
Were there written notes during the referral of the neonate? If yes, was the referral letter complete?		
Did the neonate require oxygen? If yes, was oxygen administered?		
Was there a need for nasogastric tube? If yes was nasogastric tube inserted?		
Did the neonate have an intravenous line? Was there indication for intravenous fluids?		
Was intravenous fluids administered to the neonate? Was intravenous fluids administered appropriately?		
Was the neonate kept warm?		
Were there vital signs monitoring during referral? Temperature Oxygen saturations Respirations Random blood sugars		

Date and time when the infant was referred (initial decision) …….

Date and time when the infant was referred (actual referral) ……

Date and time when the infant was referred (reached the referring hospital) ……

Date and time when the infant referred had an actual treatment commenced (receiving care) ……

Reason for any delay……

Outcome of the neonate……. [] Alive [ ] Referred to level 6 facility [ ] Died

Appendix III: Research Approval and Authorization Letters

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: R50/20016/2020 DATE: 2nd June, 2022

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI.

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. FRANCISCA NDUKU ILUKA

I write to introduce Ms. Francisca Nduku Iluka who is a Postgraduate Student of this University. She is registered for M.Sc. degree programme in the **Department of Medical Surgical and Pre-Clinical Science.**

Ms. Iluka intends to conduct research for a M.Sc. thesis Proposal entitled, **"Determinants of Timely Referral and Safe Transport of Neonates Referred to and those Transferred out of Makueni County Referral Hospital, Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

KENYATTA UNIVERSITY OFFICE OF DEAN 03 JUN 2022 GRADUATE SCHOOL P.O. Box 43844-00100, NAIROBI

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

KENYATTA UNIVERSITY
CENTRE FOR RESEARCH ETHICS AND SAFETY

Fax: 8711242/8711575 **P. O. Box 43844,**
Email: chairman.kuerc@ku.ac.ke
Nairobi, 00100

Tel: 8710901/12

Website: www.ku.ac.ke
Our Ref: **KU/ERC/APPROVAL/VOL.1** Date: 22nd /08/2022

Francisca Nduku
P.O BOX 43844-00100
Nairobi.

Dear Ms. Nduku,

APPLICATION NUMBER: PKU/2574/I1700- DETERMINANTS OF TIMELY REFERRAL AND SAFE TRANSPORT OF NEONATES REFERRED TO AND THOSE TRANSFERRED OUT OF MAKUENI COUNTY REFERRAL HOSPITAL, KENYA

This is to inform you that ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** has reviewed and approved your above research proposal. Your application approval number is **PKU/2574/I1700.** The approval period is **22nd /08/2022 to 22nd/08/2023**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE***
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.

vi. 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.

vii. Submission of an executive summary report within 90 days upon completion of the study to ***KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE***

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

To serve you better, researchers are kindly requested to access and complete a customer feedback form and sent it back online as you continue with research and upon completion of data collection found on the following website link; ;(https://docs.google.com/forms/d/1ytWefDwvyz5h1oz_VIn0xbxg3uGdlDzMXFWNDsMrRPQ/edit?usp=sharing

Yours sincerely

Prof. Judith Kimiywe

Director: Centre for Research Ethics and Safety

REPUBLIC OF KENYA

MINISTRY OF EDUCATION

STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

Email:cdemakueni@gmail.com
When replying please quote

County Director of Education Office
P.O. Box 41-90300
MAKUENI

Ref: No. MKN/C/ED/5/33/VOL.II/128 **7th September, 2022**

Francisca Nduku Iluka
KENYATTA UNIVERSITY

RE: RESEARCH AUTHORIZATION

This office is in receipt of a letter from the Director General, National Commission for Science, Technology and Innovation (NACOSTI) authorizing you to carry out research on **"Determinants of timely referral and safe transport of Neonates Referred to and those transferred out of Makueni County Referral Hospital, Kenya"** for the period ending **4th September, 2023.**

Following this authorization, you are allowed to proceed with your research in the County as requested.

COUNTY DIRECTOR OF EDUCATION
DATE 7/09/2022
P.O. BOX 41-90300
MAKUENI

Robinson K. Kiarii
For County Director of Education
MAKUENI

REPUBLIC OF KENYA **GOVERNMENT OF MAKUENI COUNTY**

OFFICE OF DIRECTOR HEALTH SERVICES
P.O. BOX 89-90300 MAKUENI
Email:countyhealthmkn@gmail.com contact@makueni.go.ke
Website: www.makueni.go.ke

REF: GMC/DOH/CDH/GEN.III (132) 8th September, 2022

Fransisca Nduku Iluka
Kenyatta University
P.O. Box 43844 - 00100
Nairobi-Kenya

MEDICAL SUPERINTENDENT
MAKUENI COUNTY REFERRAL HOSPITAL
0 8 SEP 2022
P.O. Box 95, MAKUENI - 90300
TEL: 044 - 33175/33195

Dear Madam,

RE: AUTHORIZATION TO CARRY OUT A STUDY

Reference is made to the letter dated 7th September, 2022 and **NACOSTI/P/22/19942** dated 4th September, 2022 regarding the above matter.

You are hereby authorized to do research on "***Determinants of timely referral and safe transport of neonates referred to and those transferred out of Makueni County Referral Hospital, Kenya.***"

You are directed to:-

1. Report to the Medical Superintendent prior to the initiation of the fieldwork component to further facilitation.
2. Collaborate and liaise with Unit Head Clinical Services for dissemination of study findings.
3. Submit the final study report to the undersigned office.

Yours

COUNTY DIRECTOR OF HEALTH
MAKUENI COUNTY
0 0 SEP 2022
P.O. Box 89 - 90300, MAKUENI.
Email: countyhealthmkn@gmail.com

Dr. Kiio S. Ndolo
Director Medical Services
Makueni County

Copy to:

- Ag. ECM – Health Services
- Ag. CO – Health Services
- Director(s) – Health Services
- Med Supt –MCRH
- Research Focal Person – Health Services
- Unit Head Clinical Services

IREPUBLIC OF KENYA **GOVERNMENT OF MAKUENI COUNTY**

OFFICE OF THE COUNTY SECRETARY
P.O. Box 78-90300 - MAKUENI ***Tel No.: 020-2034944***
Email: *county.secretary@makueni.go.ke, contact@makueni.go.ke*
web: *www.makueni.go.ke*

Ref: Ref: ADM/12/VII/(138) Date: 7th September, 2022

Francisca Nduku Iluka,
P.O. Box 95-90300,
MAKUENI.

Subject: RESEARCH AUTHORIZATION

We acknowledge receipt of research licence No. NACOSTI/P/22/19942 dated 4th September, 2022 from Director General National Commission for Science Technology and Innovation licensing you to carry out a research on `Determinants of timely referral and safe transport of neonates referred to and those transferred out of Makueni County Referral hospital`, Kenya for the period ending 4th September, 2023.

The purpose of this communication is to inform you that you have been authorized to carry out the research in Makueni County Government as per your request.

Rael M. Muthoka
Ag. County Secretary
HEAD OF THE COUNTY PUBLIC SERVICE &
SECRETARY TO THE COUNTY EXECUTIVE COMMITTEE

c.c.

(i) Ag. CECM – Health Services
(ii) Ag. Chief Officer – Health Services

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

Telegram:
Telephone: 0101-362-089
Fax:
Email: *cc.makueni@interior.go.ke*

COUNTY COMMISSIONER
MAKUENI COUNTY
P.O. Box 1-90300
MAKUENI

Ref: MKN/CC/ADM.6/1 VOL.V/20

7th September, 2022

Francisca Nduku Iluka
KENYATTA UNIVERSITY

RE: RESEARCH AUTHORIZATION

Reference is made to Director General National Commission for Science Technology and Innovation Research License **Ref. No. NACOSTI/P/22/19942** dated **4th September, 2022** on the above subject.

You are hereby authorized to undertake research on **"Determinants of timely referral and safe transport of neonates referred to and those transferred out of Makueni County Referral hospital, Kenya** "for the period ending 4th September, 2023.

By a copy of this letter the Deputy County Commissioners are requested to give you the necessary assistance.

COUNTY COMMISSIONER MAKUENI COUNTY 07 SEP 2022 P.O. BOX 1-90300, MAKUENI

J. N. KIOK
FOR: COUNTY COMMISSIONER
MAKUENI

c.c.
County Director of Education
MAKUENI

Deputy County Commissioner
MAKUENI SUB-COUNTY

FRANCISCA NDUKU ILUKA
P.O BOX 95-90300
MAKUENI.
25TH JULY, 2022.

TO,
THE MEDICAL SUPERINTENDENT,
KITUI COUNTY REFERRAL HOSPITAL,
P.O BOX 22-90200,
KITUI.

Dear Sir/Madam,

Re: **Application for an Opportunity to Carry out Pilot Study**

I am writing to express my interest to the above mentioned.

I am currently a student at Kenyatta University Main Campus in my second year of Master of Science Nursing (Paediatric Nursing), Registration number: R50/20016/2020, with **Timely Referral and Safe Transport of a Neonates Referred to and those Transferred out of Makueni County Referral Hospital,** as my focus in research.

I look forward for your response.

Thank you for your time and consideration.

Yours,

Francisca Nduku Iluka

Appendix IV: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **299654**

Date of Issue: **04/September/2022**

RESEARCH LICENSE

This is to Certify that Ms.. Francisca Nduku Iluka of Kenyatta University, has been licensed to conduct research in Makueni on the topic: DETERMINANTS OF TIMELY REFERRAL AND SAFE TRANSPORT OF NEONATES REFERRED TO AND THOSE TRANSFERRED OUT OF MAKUENI COUNTY REFERRAL HOSPITAL, KENYA for the period ending : 04/September/2023.

License No: **NACOSTI/P/22/19942**

299654

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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