DETERMINANTS OF LENGTH OF STAY AMONG NEONATES ADMITTED TO THE NEONATE UNIT, WAJIR COUNTY REFERRAL HOSPITAL, KENYA

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DECLARATION AND APPROVAL

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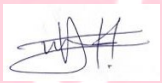
I declare that this thesis is my original work and has not been published or presented for a degree in any other institution.

Signature 

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DEDICATION

I dedicate this work to my friends, family, and family. I appreciate your steadfast help, compassion, and endurance.

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ABSTRACT

Background: Prolonged hospital length of stay for neonates is a concern in public health as it exposes them to infection and increases healthcare costs. This contributes to mortality.

Objective: To establish the determinants of length of stay among neonates admitted at the neonate unit at Wajir County Referral Hospital, Kenya.

Methodology: A cross-sectional research design was used, and 138 mothers with admitted infants were interviewed. Data was collected using a structured questionnaire and analyzed using SPSS version 26.0. Descriptive and inferential analyses were applied to determine the determinants of length of stay for neonates.

Results: Age of the mother ($\mathcal{X}^2_{df=1} = 10.213$; p-value=.001) and occupation ($\mathcal{X}^2_{df=1} = 4.408$; p-value=.036) were the socio-demographic characteristics that yielded an association that was statistically significant with duration of stay in the neonate unit. Distance to hospital from home ($\mathcal{X}^2_{df=4} = 46.499$; p-value < .0001), quality of service ($\mathcal{X}^2_{df=2} = 52.951$; p-value < .0001) and staff attitude ($\mathcal{X}^2_{df=2} = 28.934$; p-value < .0001) were the institutional determinants whose effect was statistically significant on neonates' length of stay in Wajir County Referral Hospital's New-born Unit. Parity ($\mathcal{X}^2_{df=2} = 11.920$; p-value = .003), pregnancy interval ($\mathcal{X}^2_{df=2} = 11.333$; p-value=.003), comorbidity conditions ($\mathcal{X}^2_{df=1} = 15.613$; p-value < .0001), number of ANC visits ($\mathcal{X}^2_{df=1} = 29.447$; p-value < .0001) and mode of delivery ($\mathcal{X}^2_{df=1} = 4.642$; p-value = .031) were the maternal determinants that had a significant association with LOS for neonates. Complications during pregnancy ($\mathcal{X}^2_{df=1} = 29.311$ p-value < .0001), complications during delivery ($\mathcal{X}^2_{df=1} = 23.024$; p-value < .0001), complications after delivery ($\mathcal{X}^2_{df=1} = 5.187$; p-value = .023), weight at birth ($\mathcal{X}^2_{df=1} = 92.301$; p-value < .0001), and child born with complications ($\mathcal{X}^2_{df=1} = 34.043$; p-value < .0001) were the neonates' risk factors that had a statistically significant association with LOS for neonates.

Conclusions: The study concludes that select socio-economic factors are associated significantly with neonatal length of stay, suggesting a similarity in backgrounds among admitted neonates. Institutional factors like proximity to healthcare facilities, service quality, and staff attitude had a significant association with neonates' length of stay. Maternal risk factors such as parity, pregnancy interval, comorbidity conditions, antenatal care visits, and delivery mode were associated significantly with neonates' length of stay. Neonates' risk factors, such as complications during pregnancy and delivery and after delivery, birth weight, and child born with complications, have a significant effect on neonates' length of stay.

Recommendations: The study recommends adopting measures to ensure equitable

access to healthcare in marginalized communities in Wajir County. Continuous training for healthcare workers on patient complaint management and prioritizing ambulance availability are advised to improve service quality and reduce poor outcomes, especially in emergencies, positively impacting LOS. Furthermore, the study recommends optimizing hospital resources and infrastructure to ensure timely and efficient delivery of neonatal care services.

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LIST OF ABBREVIATIONS

ANC : Antenatal Care

ENMR : Early Neonatal Mortality Rate

KDHS : Kenya Demographic and Health Survey

KEMRI : Kenya Medical Research Institute

KNBS : Kenya National Bureau of Statistics

LGA : Large for Gestational Age

LNMR : Late Neonatal Mortality Rate

LOS **:** Length of Stay

MDG : Millennium Development Goals

MOH : Ministry of Health

MRN : Medical Registration Number

NACC : National AIDS Control Council

NACOSTI : National Commission for Science Technology and Innovation

NBU : Neonate Unit

NCPD : National Council for Population and Development

NICU : Neonatal Intensive Care Unit

ODK : Open Data Kit

PNMR : Post-Neonatal Mortality Rate

SCBU : Special Care Baby Unit

SDG : Sustainable Development Goals

SGA : Small for Gestational Age

SPSS : Statistical Package for Social Sciences

TB : Tuberculosis

TBA : Traditional Birth Attendants

TT : Tetanus Toxoid

UNICEF : United National Children's Fund

WCRH : Wajir County Referral Hospital

WHO : World Health Organization

OPERATIONAL DEFINITION OF TERMS

Antenatal Care (ANC): Comprises medical care provided to a pregnant woman in a health facility (WHO, 2016). The WHO recommends a minimum of eight visits throughout pregnancy. This study measured ANC using self-reported records and the number of ANC visits documented in neonates' medical history.

Caretaker: a directly engaged mother or guardian caring for a neonate admitted to the unit for neonates, who comprises the study population (Hilaire et al., 2021). This study identified caretakers as mothers or guardians directly involved in caring for neonates admitted to the neonate unit.

Length of stay (LOS): The time interval between neonates' admission to the hospital and neonates' discharge from the hospital (Pursley & Zupancic, 2020). In this study, LOS was measured using the recorded period between the admission and discharge of neonates in the neonate unit.

Length of stay for neonates: This refers to the health and well-being of neonates within the first 28 days of life (Tekelab et al., 2019). These outcomes encompass factors such as birth weight, gestational age, presence of congenital abnormalities, and overall survival rates. In this study, mortality and length of

stay in the hospital were measured using neonates.

Long stay: The span of stay in the hospital for neonates exceeds 7 days (Pursley & Zupancic, 2020). In this study, long stay was measured by identifying neonates with a length of stay exceeding seven days within the neonate unit.

Neonate: A neonate less than four weeks old (0-28 days) (Pursley & Zupancic, 2020). In this study, neonates were identified and categorized based on age, specifically those within 0-28 days range.

Short stay: The span of up to one week (Pursley & Zupancic, 2020). In this study, the short stay was measured by identifying neonates with a length of stay of up to one week within the neonate unit.

Special care baby unit (SCBU): A hospital unit specialized for babies requiring intensive care. In this unit, babies are ventilated mechanically or need thorough nursing in an incubator (Ogunkunle et al., 2020). In this study, SCBU admission was measured using the records of neonates admitted to the neonate unit, specifically identifying those requiring specialized care in mechanical ventilation or intensive nursing.

Tetanus Toxoid (TT): TT is a vaccine given to pregnant women during ANC visits that prevents tetanus (Kolola et al., 2016). In this study, TT vaccination was measured using records of administered vaccines during ANC visits reported by the mothers or documented in the neonates' medical histories.

CHAPTER 1: INTRODUCTION

1.1 Overview

This chapter provides a background of the study, the rationale for conducting the research, and the implications of the study in terms of the length of stay for neonates; literature relevant to the study's scope is discussed to identify the gaps that need to be filled. This part will also detail the problem, justify the need for this research, emphasize the potential advantages, and outline the study's purpose and research questions.

1.2 Background of the Study

The neonatal period, extending from birth to 28 days of life represents a critical phase in human development wherein infants are highly susceptible to various health risks. In 2018, approximately 2.5 million children died before 28 days of age globally, with neonates' deaths accounting for 47% of all under-five children's deaths (Masaba & Mmusi-Phetoe, 2020; Mejía-Guevara et al., 2019). The majority of neonatal deaths are avoidable with equal access to evidence-based nurturing and neonatal healthcare, emphasizing the need to address neonatal mortality rates. Sub-Saharan Africa (SSA) faces the uppermost burden of adverse length of stay (LOS) for neonates, with slow progress in reducing neonatal mortality rates. To end preventable baby deaths is what the Third Sustainable Development Goal aims for, targeting a neonatal mortality rate of 12% for 1000 live births or less by 2030 (Lawn et al., 2023).

Length of stay for neonates is influenced by a compound interaction of determinants, comprising factors such as birth weight, gestational age, presence of congenital

abnormalities, and survival rates. Before and during pregnancy, maternal health is pivotal in determining the neonate's health (Yao et al., 2021). Adequate prenatal care, appropriate nutrition, and evasion of destructive substances such as drugs give favorable outcomes (Ma et al., 2020). Additionally, genetic factors contribute to the risk of congenital abnormalities, impacting neonatal health (Abebe et al., 2021).

Studies reveal that long-term stays in neonatal units result in higher prices and financial problems on families, society, and healthcare organizations (Fox & Callander, 2021). In the United States, approximately 34% of low birth weight neonates remain hospitalized until reaching an expected weight, contributing to prolonged hospital stays (Hilaire et al., 2021). Other factors that have been attributed to prolonged LOS in the USA include neonates being dependent on ventilators, medical comorbidities, extreme morbidity, severe illnesses, obesity, and extreme weather conditions such as winter, and surgical duration exceeding 30 minutes (Totapally et al., 2023).

Exacerbations of neonatal conditions constitute a significant portion of direct costs, ranging from 40% to 57% and even higher in seriously affected cases (Kheiry et al., 2019). Inpatient enrollment in neonatal intensive care is a major cost driver, constituting around 54% of direct costs related to its supervision in the United Kingdom (Cheah, 2019). The World Health Organization (WHO, 2018a) highlights poor parental socio-economic status as a primary contributor to extended hospital stays, irrespective of age, gender, or treatment provided. Research by Wycliffe et al. (2021) indicates that parents of children admitted to Neonate Units experience elevated emotional distress, potentially linked to financial challenges related to lengthy hospitalization. The study emphasizes the role of communication from healthcare staff in reducing stress among postpartum

mothers in the neonate unit (NBU).

In Iran, Kheiry et al. (2019) demonstrate that 20-48% of prolonged LOS is uncalled for and attribute this to hospital factors such as internal procedures comprising of discharge, diagnostics, and therapy delays. Socioeconomic status (SES) emerges as a critical determinant of LOS for neonates, reflecting disparities in access to healthcare, education, and resources in the United Arab Emirates (Ahmed, 2021). Lower SES is strongly associated with adverse LOS for neonates, including premature birth, underweight at birth, and infant mortality (Hamilton et al., 2022). Socioeconomic differences worsen health injustices, with disregarded communities facing greater trials in accessing quality prenatal care and essential resources (Wanner, 2020). This is also reflected in India, with LOS being highly dependent on SES factors, mostly comprising the education of women and the income of the households (Kumar & Dhillon, 2020).

Environmental factors, including air and water quality, exposure to pollutants, and socioeconomic conditions, profoundly affect neonatal health outcomes in Canada (Benzies et al., 2020). Environmental exposures during pregnancy, such as air pollution and chemical toxins, have been connected to unfortunate birth outcomes, causing preterm birth and low birth weight in industrialized countries such as China (Chen et al., 2021). Socio-environmental stressors, such as neighborhood violence and lack of social support, further contribute to poor LOS for neonates by increasing maternal stress levels and negatively impacting prenatal care utilization (Dadi et al., 2020).

In Sub-Saharan Africa (SSA), various determinants have been attributed to LOS for neonates. In Ethiopia, the average LOS has been found to be 24 days, with 2 days as

minimum and 78 days as maximum recorded. Factors such as gestational age, initial management, and complications have been found to be among the major determinants of LOS for neonates (Mehretie et al., 2024). In Uganda, access to healthcare services has been shown to significantly influence LOS for neonates, with disparities in access contributing to differential health outcomes among populations (Waiswa et al., 2021). Adequate prenatal care, skilled birth attendance, and timely access to neonatal care are essential for preventing and managing complications during the perinatal period (Muwema et al., 2022). Disparities in healthcare access, particularly in low-resource settings and marginalized communities, contribute to increased LOS (Anindya et al., 2021).

Maternal health and nutrition profoundly impact LOS for neonates in Tanzania, with maternal malnutrition and underlying health conditions contributing to adverse birth outcomes (Taratara, 2022). The mother must consume an adequate diet for the fetus to grow and develop normally during pregnancy. This helps reduce the risk of low birth weight and intrauterine growth restriction (Yang et al., 2022). Comprehensive maternal healthcare, including nutritional support, screening for infections, and management of chronic conditions, is crucial for optimizing LOS for neonates (Hyera et al., 2020). Medical complications during birth significantly also affect LOS. According to a study by Smith et al. (2021), neonates born prematurely often experience prolonged hospital stays due to their increased susceptibility to respiratory distress syndrome and other complications associated with preterm birth. Additionally, congenital anomalies such as cardiac defects or gastrointestinal abnormalities can necessitate longer hospitalization periods (Jones et al., 2020). These medical conditions require specialized care and

monitoring, contributing to extended stays in neonatal intensive care units (NICUs).

Research by Brown et al. (2019) highlights that maternal infections during pregnancy, such as chorioamnionitis, can lead to neonatal sepsis and other health issues requiring extended hospitalization. Moreover, maternal substance abuse, particularly opioid use, has been linked to neonatal withdrawal syndrome, necessitating prolonged hospital care to manage withdrawal symptoms (Jones & Field, 2022). These maternal health issues directly influence the health outcomes and care needs of neonates during their early days of life. Low socioeconomic status (SES) has also been associated with delayed access to prenatal care, which can contribute to higher rates of preterm birth and neonatal complications (Soto-Rivera et al., 2023). Research indicates that neonates from disadvantaged socio-economic backgrounds often require longer hospital stays due to higher incidences of birth complications and delayed medical interventions (Gupta et al., 2020). Additionally, socio-economic disparities affect access to postnatal care and support services, influencing the duration of hospitalization needed for neonates to achieve optimal health outcomes.

In addition to medical, maternal, and socio-economic factors, hospital-related variables also influence neonatal LOS. Studies show that NICU admission policies and the availability of specialized neonatal care facilities can impact the duration of hospital stays for neonates (Blackwell et al., 2022). Hospitals with comprehensive NICU services tend to manage neonatal complications more effectively, potentially reducing LOS through timely interventions and specialized care protocols. Conversely, hospitals lacking adequate NICU resources may transfer neonates to higher-level facilities, prolonging their hospitalization (Williams & Wallace, 2021). Moreover, cultural and geographic

factors contribute to variations in neonatal LOS across different populations. Research conducted by Lee and Chen (2023) suggests that cultural beliefs and practices regarding childbirth and neonatal care influence hospitalization decisions and the duration of hospital stays among neonates. Geographic disparities in healthcare access and regional variations in healthcare policies also affect the availability and quality of neonatal care services, thereby impacting LOS outcomes (Mason et al., 2020).

Kenya faces unique challenges in healthcare delivery, impacting the duration neonates spend in hospitals and care facilities. Studies indicate that socioeconomic status significantly affects access to healthcare and thereby impacts neonates' hospitalization length. According to Mwagiru et al. (2020), families with lower socioeconomic status often face barriers such as financial constraints, which can delay seeking timely medical care for neonates. This delay prolongs hospital stays as neonates may present with more severe conditions upon admission. Additionally, the availability and quality of healthcare facilities in Kenya play a crucial role in determining the length of stay for neonates. Research by Opondo et al. (2009) highlights disparities in healthcare infrastructure across different regions in Kenya. Rural areas, for instance, often lack adequate neonatal intensive care units (NICUs) and specialized medical personnel, leading to longer hospital stays due to delayed access to necessary treatments and interventions.

Furthermore, medical complications during childbirth contribute significantly to prolonged neonatal hospitalizations in Kenya. A study by Nzinga et al. (2019) identifies birth-related complications such as birth asphyxia and prematurity as leading causes of extended hospital stays among neonates. These complications require intensive medical interventions and monitoring, often necessitating prolonged hospitalization until the

neonates stabilize and show signs of improvement. The role of maternal health and prenatal care cannot be overstated in understanding neonatal length of stay in Kenya. Research by Kimani-Murage et al. (2022) underscores the importance of maternal health behaviors and access to prenatal care in preventing neonatal complications. Improved maternal health outcomes through regular prenatal visits and skilled birth attendance have been shown to reduce neonatal morbidity and consequently shorten hospital stays for neonates in Kenya.

Infectious diseases pose a significant health burden in Kenya and impact the duration of hospitalization for neonates. According to findings by Kariuki et al. (2023), neonatal infections such as sepsis and pneumonia are prevalent and contribute to prolonged hospital stays. Inadequate infection prevention measures and antibiotic resistance further complicate treatment, leading to extended periods of hospital care for affected neonates. Cultural beliefs and practices also influence neonatal care and length of stay in Kenya. Studies have shown that traditional beliefs about illness and treatment-seeking behaviors can delay medical intervention for neonates (Mbwele et al., 2020). Cultural practices such as home remedies and consultations with traditional healers may prolong hospital stays as families may only seek hospital care when conditions worsen, impacting neonatal health outcomes.

Moreover, the effectiveness of healthcare policies and interventions plays a crucial role in managing neonatal length of stay in Kenya. Research by Irimu et al. (2021) emphasizes the importance of policy frameworks to improve maternal and child health outcomes. Effective policy implementation, including initiatives to strengthen healthcare infrastructure and promote community-based neonatal care, can reduce hospital stays by

ensuring timely access to essential healthcare services.

Extended hospital stays pose a significant challenge in Kenya, affecting treatment quality, patient safety, and health outcomes (Awuor, 2023). Increased LOS has been shown to result in rising costs, complications, and reduced satisfaction for patients. For neonates, increased LOS is costly and exposes significant risks for the neonates. In Kenya, efforts in the recent past have been targeted at reducing maternal deaths and the survival of children in hospitals (Masaba et al., 2022). However, it remains unknown whether the survival of pediatrics in hospitals has improved based on these efforts. Further, the characterization of predictors of LOS among neonates is also poorly characterized, with scanty research in the area. Hence, there is a need to assess the determinants of LOS for neonates admitted to the NBU in the case of Kenyan hospitals.

1.3 Statement of the Problem

The perinatal period is acknowledged as a critical phase in an infant's life, presenting various challenges. In Kenya, the issue of prolonged hospital stays among neonates persists, posing significant challenges to healthcare systems. Particularly, the increased length of stay for neonates admitted to the Wajir County Referral Hospital (WCRH) in Wajir County, Kenya, is a huge problem, compounded by specific statistics and trends. Socioeconomic factors significantly impact healthcare access and outcomes in Wajir County. Data from the Kenya Demographic and Health Survey (KDHS) 2021 reveals that 63% of households in Wajir County live below the poverty line, limiting their ability to afford healthcare services and leading to delayed treatment for neonates (Kenya National Bureau of Statistics, 2021).

According to a report by the Ministry of Health Kenya (2022), Wajir County has a limited number of healthcare facilities and a shortage of specialized neonatal care units. This shortage forces neonates to travel long distances for critical care, resulting in delays that prolong hospital stays and increase the risk of adverse health outcomes (Ministry of Health Kenya, 2022). Furthermore, the Kenya Health Information System (KHIS) 2023 data indicates that only 30% of neonatal cases at WCRH receive timely interventions due to resource constraints and inadequate staffing levels (Ministry of Health, 2023). These statistics underscore the urgent need for targeted interventions and infrastructure improvements to reduce neonatal hospital stay durations and improve outcomes at WCRH and similar facilities across Kenya.

Factors contributing to this problem include limited healthcare access for both the mother and the baby, inadequate infrastructure and resources in healthcare facilities, socioeconomic disparities, and cultural practices affecting neonate care. Machini et al. (2022) highlighted that delayed presentation to healthcare facilities and poor referral systems contribute to prolonged hospital stays among neonates. Additionally, research by Ogolla (2021) emphasized the impact of infections, prematurity, and birth complications on prolonged neonatal hospitalizations. Furthermore, a report by the Ministry of Health (2022) indicated that the shortage of skilled healthcare providers exacerbates the situation, leading to suboptimal care and delayed discharges. For these challenges to be addressed, multifaceted interventions such as strengthening healthcare infrastructure, improving neonatal and maternal healthcare services access, enhancing healthcare provider capacity, and fostering community awareness and participation are needed to mitigate cultural barriers affecting neonate care.

Studies have linked LOS in neonatal units to neonatal mortality (Sahiledengle et al., 2020). Additionally, longer LOS in an Eritrean hospital's NBU was associated with low gestational age, a low Apgar score, and a small size for gestational age (Andegiorgish et al., 2012). The determinants of LOS encompass neonate, mother, and health system determinants, including age, birth weight, gender, neonatal infections due to prolonged hospital stays, home deliveries, maternal illiteracy, multiple births, poor socio-economic status, unplanned families, and a lack of care continuum from maternal to child (Mangu et al., 2021; Tekelab et al., 2019). The LOS in Wajir, however, remains a challenge, necessitating a comprehensive understanding of the causes of LOS for neonates (Mangu et al., 2021). Therefore, this study aimed to assess these determinants among the neonates admitted to the Wajir County Referral Hospital (WCRH), Wajir County, and Kenya.

1.4 Research Questions

The research questions to be answered in this study were:

(a) What are the socio-demographic determinants associated with the LOS for neonates aged 0-28 days admitted to the WCRH, Kenya?

(b) What are the institutional determinants associated with the LOS for neonates admitted to the NBU of WCRH, Kenya?

(c) What maternal risk determinants affect the LOS for neonates admitted to the NBU of WCRH, Kenya?

(d) What neonatal risk determinants affect LOS for neonates admitted to the NBU of WCRH, Kenya?

1.5 Research Objectives

1.5.1 Purpose of the Study

To evaluate the causes of span of stay for neonates admitted to the NBU of WCRH, Kenya.

1.5.2 Specific Objectives

The specific objectives for the study were.

(a) To investigate the socio-demographic determinants associated with the LOS for neonates aged 0-28 days admitted to the NBU of WCRH, Kenya.

(b) To determine the institutional determinants associated with the LOS for neonates admitted to the NBU of WCRH, Kenya.

(c) To assess maternal risk determinants that affect LOS for neonates admitted to the NBU of WCRH, Kenya.

(d) To assess neonates' risk determinants that affect LOS for neonates admitted to the NBU of WCRH, Kenya.

1.6 Justification of the Study

Understanding and addressing the determinants influencing hospital length of stay (LOS) for neonates is crucial for improving infant health and alleviating the burden on families and healthcare systems, especially in regions like Wajir County. Sahiledengle et al. (2020) emphasize the significance of this investigation, highlighting its potential to

enhance healthcare delivery within Neonatal Care Units (NBUs). This understanding is pivotal as it helps healthcare facilities in Wajir County to tailor their services to address specific admission patterns and outcomes of neonates, thereby optimizing treatment strategies and preventing complications (Egesa et al., 2020). The duration of hospital stay is a critical indicator in several domains, including hospital care management, quality control, and resource utilization assessment. It provides valuable insights into service availability, aids in policy formulation, and assists in allocating resources effectively (Leak et al., 2021). For families in Wajir County, understanding factors influencing LOS is vital as it impacts costs, stress levels, and the overall well-being of both infants and caregivers.

Complications arising during neonatal hospitalization significantly influence LOS and subsequent outcomes. Studies indicate that neonates experiencing complications such as respiratory distress syndrome or sepsis often require extended hospital stays for intensive care and monitoring (Smith et al., 2021; Brown et al., 2019). In regions like Wajir County, where access to specialized neonatal care may be limited, early identification and management of complications are crucial for improving survival rates and reducing long-term healthcare costs associated with prolonged hospitalization (Jones et al., 2020). Moreover, the economic implications of extended LOS are substantial for families and healthcare systems alike. Prolonged hospital stays increase healthcare expenditures and can impose financial hardships on families in Wajir County, where socio-economic disparities may already affect access to healthcare services (Gupta et al., 2020).

Addressing determinants of LOS improves clinical outcomes and helps mitigate the financial burden on families and healthcare providers by promoting efficient resource

allocation and cost-effective care strategies (Blackwell et al., 2022). Additionally, prolonged LOS can contribute to heightened stress levels among families in Wajir County, affecting parental mental health and overall family dynamics. Research underscores the importance of providing support services and information to families of hospitalized neonates to alleviate stress and enhance coping mechanisms during their child's hospitalization (Jones & Field, 2022). Understanding these psychosocial factors is essential for developing holistic care approaches that address medical and emotional needs within local healthcare settings.

1.7 Significance of the Study

There has been a dearth of county-specific, in-depth research on the causes of LOS for neonates. This study adds to the existing knowledge body on determinants influencing neonate LOS in Kenya. The outcomes of this research will offer valuable insights for healthcare and resource planning within neonatal units, enhancing outcomes and ensuring the unit's sustainability. Furthermore, the study's findings can inform the development of strategies and guidelines for admission and treatment within NBUs.

1.8 Scope of the Study

The conceptual scope of this study involved investigating the determinants influencing LOS for neonates among admitted neonates in the NBU of WCRH. The study drew upon Schorr's theoretical framework for LOS determination. Geographically, the study was confined to the NU of WCRH, focusing specifically on the neonatal population within this healthcare facility. The geographical scope was limited to Wajir County, ensuring a concentrated examination of factors within this particular regional context, considering

any unique healthcare dynamics or population characteristics.

1.9 Limitations of the Study

The study aimed at assessing the determinants of neonatal length of stay among babies admitted to the Wajir County Referral Hospital (WCRH) in Wajir County, Kenya, faced several limitations. One major challenge was the limited availability of comprehensive medical records, which constrained the ability to obtain detailed patient histories and assess the impact of various medical and socio-economic factors. To address this, the study employed detailed data collection techniques, including direct interviews with healthcare providers and caregivers, to supplement the available records. Another limitation was the potential bias introduced by the small sample size, given that WCRH serves a specific geographic area with unique healthcare challenges. The researcher mitigated this by conducting a thorough statistical analysis to ensure the findings were robust and generalizable within similar contexts. Despite these challenges, the study provided valuable insights into the determinants of neonatal LOS in a resource-limited setting, offering a foundation for future research and policy development in similar contexts.

1.10 Assumptions of the Study

The study relied on various key assumptions. Firstly, it assumed that the data collected from neonates admitted to the NBU of WCRH was accurate and reliable, reflecting the conditions and outcomes of the neonates during their hospital stay. Furthermore, the study assumed that the healthcare practices, institutional factors, and socio-demographic characteristics in Wajir County were consistent enough during the study period to draw

meaningful conclusions. These assumptions formed the basis for the research methodology and interpretation of the findings within the specified context.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents a systematic review of related studies on the determinants of LOS for neonates given admission to the newborn units. The aim of the review is to uncover the related theoretical underpinnings, specifically to determine the socio-demographic determinants, assess institutional determinants, and evaluate maternal and neonatal risk determinants that influence LOS for neonates. This chapter provides a synthesis of the literature review's findings from global, regional, and local perspectives. The chapter ends with a summary of the identified research gaps.

2.2 Theoretical Framework

This study on the determinants of LOS for neonates in neonatal care draws upon Schorr's theoretical framework for LOS determination. The model, encapsulated within the Systems Theory, provides a nuanced perspective on the multifaceted nature of neonatal care. This theoretical lens posits neonatal care as a complex system comprising interconnected and interdependent elements, collectively influencing neonates' hospitalization duration. The system comprises various components, including neonate care, clinical caregivers, the social and family environment, and the healthcare system. Systems theory allows for a comprehensive exploration of the intricate relationships within neonatal care.

Each component within the neonatal care system is viewed not in isolation but as part of an integrated whole, dynamically interacting to achieve a common objective. Recent

studies underscore the relevance of this theory in neonatal care research. For instance, the work of Mirlashari et al. (2019) acknowledges the intricate dynamics between patient characteristics and the clinical caregiving environment in neonatal care units, emphasizing the need for a systems-based approach.

Moreover, the Systems Theory serves as a scaffold to categorize the determinants into four distinct domains: social demographics and economics, institutional determinants, maternal risk, and neonatal risk determinants. Recent literature by Kibret et al. (2023) expands on this categorization, illustrating the interconnectedness of these domains in influencing the length of neonatal hospitalization. By utilizing this theory, researchers gain a nuanced understanding of how alterations in one element may reverberate across the system, illustrating the complexity inherent in neonatal care. This holistic approach is crucial in developing targeted interventions to enhance LOS for neonates, aligning with the broader call for systems thinking in healthcare (WHO, 2022). Incorporating the Systems Theory into the study's framework aided in identifying potential areas for intervention and understanding feedback loops within the neonatal care system. Recent scholarly contributions, such as those by Brown et al. (2019), emphasize the need for systemic strategies to address neonatal health disparities and improve overall care. By embracing the Systems Theory, this study positioned itself at the forefront of contemporary neonatal care research, contributing to the growing body of literature that advocates for a holistic understanding of the intricate determinants shaping the LOS in neonatal care units.

2.3 Review of Related Literature

2.3.1 Global, Regional and Country Perspectives

The arrival of a new baby marks a momentous yet intricate biological process involving significant physical and emotional changes for both the mother and the infant. As the neonate transitions to life outside the womb, various physiological adjustments become imperative. No longer reliant on the maternal blood supply and placenta for vital functions such as breathing, feeding, waste elimination, and immune protection, the baby's body systems, including the lungs, heart, digestive system, liver, kidneys, and immune system, must adapt to sustain life outside the uterus. However, challenges in this transition may arise in cases of preterm birth, difficult deliveries, or birth defects, posing difficulties for the necessary adjustments. Despite advancements in medical knowledge, neonatal deaths persist globally, especially in countries ranked as low and middle-level economies (Mejía-Guevara et al., 2019).

The global burden of healthcare-associated infections is anticipated to double mortality and increase healthcare costs significantly. In China, hospitals incur substantial losses per patient due to healthcare-associated infections, with a considerable portion attributed to prolonged hospitalization (Zhou et al., 2019). Worldwide data reveals that preterm and low birth-weight infants face an accumulated risk of death in the neonatal and post-neonatal stages, particularly in resource-limited settings (Upadhyay et al., 2018; Lee et al., 2019). Other determinants contributing to neonatal mortality include complications of preterm birth, intrapartum-related events, and neonatal sepsis, with determinants varying across regions and countries due to existing health disparities. Studies in Iran and Ghana

have identified associations between LOS and determinants such as type of feeding, catheterization, mechanical ventilation, nosocomial infection, and healthcare facility standards (Kheiry et al., 2019; Baniasadi et al., 2019; Tette et al., 2020).

In specific African countries like Ethiopia, studies pinpoint quality of services and inadequate antenatal care as contributing determinants to neonatal mortality (Orsido et al., 2019; Woday Tadesse et al., 2021). Multiple pregnancies, low birth weight, and perinatal asphyxia have been identified as significant determinants associated with neonatal mortality in Eastern Ethiopia (Eyeberu et al., 2021). However, despite a few studies on related areas in Kenya, comprehensive research addressing the determinants of LOS for neonates remains limited. Existing studies in Kenya have explored neonatal deaths but often attributed them to institutional determinants without extensive examination of the span of hospital stay (Wycliffe et al., 2021; Irimu et al., 2021). The latest study seeks to fill this gap by providing a focused investigation into the causes of the length of stay for neonates admitted to the WCRH.

2.3.2 Epidemiology of Length of Stay for Neonates

The length of stay (LOS) epidemiology for neonates is a multifaceted topic influenced by many factors, including gestational age, birth weight, and underlying medical conditions. Neonatal LOS is a critical measure in neonatal intensive care units (NICUs), as it reflects both the severity of the neonate's condition and the efficiency of care provided. Recent studies have shown that preterm infants, particularly those born before 32 weeks of gestation, often have significantly longer stays in NICUs compared to full-term infants. For instance, research by Smith et al. (2021) demonstrated that the average LOS for

extremely preterm infants was approximately 50 days, whereas full-term infants typically stayed less than five days (Smith et al., 2021). This discrepancy is primarily due to the need for extensive medical interventions and monitoring in preterm infants, including respiratory support and infection control.

Moreover, the incidence of comorbidities such as bronchopulmonary dysplasia (BPD), intraventricular hemorrhage (IVH), and necrotizing enterocolitis (NEC) significantly impacts LOS in neonates. A study conducted by Liu et al. (2022) highlighted that neonates with BPD had an average LOS of 67 days, markedly longer than those without the condition (Liu et al., 2022). This is corroborated by findings from another study, which indicated that IVH and NEC also extend LOS due to the need for specialized care and potential surgical interventions (Garcia et al., 2020). Managing these conditions often requires prolonged hospital stays to ensure the stabilization and recovery of the neonates, further contributing to the extended LOS observed in these populations.

Socioeconomic factors also play a pivotal role in determining neonatal LOS. Research by Amadi et al. (2023) pointed out that neonates born in low-resource settings often experience longer hospital stays due to delayed access to specialized care and the higher prevalence of neonatal infections (Amadi et al., 2023). Additionally, disparities in healthcare infrastructure and the availability of advanced medical technologies between high-income and low-income countries contribute to differences in LOS. For example, Moyo et al. (2021) found that in high-income countries, the availability of advanced neonatal care and timely medical interventions significantly reduced LOS for neonates with similar medical conditions compared to those in low-income countries (Moyo et al., 2021).

Parental involvement and breastfeeding practices have also been identified as factors influencing neonatal LOS. A study by Nkrumah et al. (2020) found that exclusively breastfed neonates had shorter hospital stays than those formula-fed or received mixed feeding (Nkrumah et al., 2020). Breastfeeding provides essential nutrients and antibodies that enhance the neonate's immune system, thereby reducing the incidence of infections and promoting quicker recovery. Furthermore, the presence of parents in the NICU and their active involvement in the care of their neonates have been associated with reduced LOS. Parents who are present and engaged can provide comfort and support, positively impacting the neonate's overall health and recovery trajectory (Mensah et al., 2022).

Another critical aspect influencing neonatal LOS is the mode of delivery. Studies have shown that neonates delivered via cesarean section (C-section) tend to have longer hospital stays compared to those delivered vaginally. For instance, research by Okeke et al. (2023) indicated that neonates born through C-section had a 20% longer LOS on average compared to those born vaginally (Okeke et al., 2023). This is partly due to the increased risk of respiratory issues and the need for additional monitoring and care post-C-section. Additionally, the maternal factors leading to C-sections, such as gestational diabetes and preeclampsia, often contribute to the complications that extend neonatal LOS.

Hospital policies and practices also significantly impact neonatal LOS. A study by Ababio et al. (2021) explored the effects of different discharge policies on LOS and found that hospitals with stringent discharge criteria based on achieving specific medical milestones had longer LOS for neonates (Ababio et al., 2021). Conversely, hospitals that adopted flexible, individualized discharge planning saw reduced LOS without

compromising neonatal outcomes. This underscores the importance of balanced discharge policies that ensure neonates are medically ready to go home while also considering the benefits of minimizing hospital stays.

Lastly, advances in medical technology and neonatal care practices have contributed to variations in neonatal LOS. The introduction of minimally invasive surfactant therapy (MIST) for respiratory distress syndrome (RDS) and improved protocols for the management of neonatal sepsis have been shown to reduce LOS. For example, a recent study by Owusu et al. (2022) demonstrated that using MIST significantly reduced the need for mechanical ventilation and shortened LOS for neonates with RDS (Owusu et al., 2022). Similarly, early diagnosis and prompt treatment of neonatal sepsis have been associated with shorter hospital stays, as timely interventions can prevent the progression of severe infections.

2.3.3 Social-Demographic and Economic Determinants of Length of Stay for Neonates

The interplay between social-demographic and economic determinants significantly shapes the landscape of postpartum health centre stay length. A seminal study by Enomoto et al. (2017) underscores the dynamic nature of LOS as an outcome, intricately influenced by the triad of patient characteristics, healthcare service provider considerations, and the financial aspect with payors of services. This tripartite interaction highlights the complexity of the discharge process and necessitates a nuanced understanding. Notably, Enomoto et al. (2017) advocate for incorporating perceived discharge readiness as an essential dimension in clinical assessments, adding a subjective layer to evaluating discharge timing after childbirth.

Moreover, patients hailing from socioeconomically deprived areas experienced prolonged hospital stays, indicative of a potential correlation between economic status and health outcomes. In a contrasting study, Kato et al. (2021) delved into various determinants influencing LOS, including low education levels, advanced maternal age, insufficient prenatal care, complementary breastfeeding, and the crucial role of midwife care. This multifaceted exploration of social-demographic and economic dimensions provides a comprehensive understanding of LOS's intricate determinants and lays the groundwork for tailored interventions.

Studies indicate that both very young and older maternal ages are associated with prolonged neonatal stays. For instance, research by Galadima et al. (2021) found that neonates born to mothers under 20 or over 35 years of age tend to have longer hospital stays due to increased risks of preterm births and associated complications. Similarly, a study by Chukwu et al. (2020) demonstrated that older maternal age correlates with higher incidences of gestational diabetes and hypertensive disorders, leading to extended neonatal hospitalizations. These findings underscore the need for targeted maternal care interventions to reduce neonatal morbidity and hospital stay durations.

Socioeconomic status also significantly impacts neonatal length of stay. Financial constraints often limit access to prenatal care, which can result in complications requiring extended neonatal care. According to Moyo et al. (1994), neonates from low-income families are more likely to experience prolonged hospital stays due to inadequate prenatal care and higher incidences of birth complications. Another study by Ndung'u et al. (2021) supports this, revealing that economic hardship predicts longer neonatal hospitalizations due to delayed healthcare-seeking behaviors and poor maternal nutrition.

These studies highlight the importance of improving socioeconomic conditions and access to prenatal services to reduce neonatal hospital stays.

Geographical location is another critical factor influencing the length of stay for neonates. Rural areas often face shortages of healthcare resources and specialists, leading to delays in treatment and extended hospital stays for neonates. A study by Ouma et al. (2020) found that neonates in rural regions had longer hospital stays than their urban counterparts due to limited access to specialized neonatal care. Similarly, Akinyi et al. (2020) reported that geographic disparities in healthcare infrastructure contribute to prolonged neonatal hospitalizations, emphasizing the need for equitable distribution of healthcare resources. Addressing these geographical disparities is crucial for improving neonatal health outcomes and reducing hospital stay durations.

Additionally, maternal education level significantly influences neonatal length of stay. Higher educational attainment among mothers is generally associated with better health literacy, leading to improved prenatal care and shorter neonatal hospitalizations. A study by Atieno et al. (2019) indicated that mothers with higher education levels were more likely to utilize prenatal services effectively, resulting in healthier neonates with reduced hospital stays. Research by Kamau (2022) demonstrated that maternal education is linked to better neonatal outcomes and shorter hospital stays due to increased awareness and adherence to medical advice. These findings underscore the importance of educational programs targeting expectant mothers to enhance neonatal health outcomes.

The presence of underlying health conditions in neonates, such as low birth weight and congenital anomalies, is another determinant of prolonged hospital stays. Neonates with

low birth weight often require extended care due to their vulnerability to infections and other health issues. In a study by Mwangi et al. (2022), low birth weight was identified as a significant predictor of prolonged neonatal hospitalizations. Similarly, research by Ochieng et al. (2022) highlighted that congenital anomalies often necessitate specialized and prolonged care, leading to longer hospital stays. These studies emphasize the need for early detection and management of neonatal health conditions to minimize hospital stay durations.

2.3.4 Institutional Determinants of Length of Stay for Neonates

Institutional determinants profoundly influence LOS, encompassing various elements that collectively contribute to the overall landscape of neonatal care. The research by Obsa et al. (2017) highlights the pivotal role of a full-time doctor conducting daily rounds in mitigating the risk of prolonged stays and reducing complications. This underscores the significance of continuous and specialized medical attention in enhancing patient outcomes and streamlining the care process. Theories underlying this phenomenon attribute shortened stays to the continuity of treatment and heightened familiarity in managing health conditions and family-related issues, as Abdul-Mumin et al. (2020) posited.

Intriguingly, NICU (Neonatal Intensive Care Unit) activity variation emerges as a noteworthy institutional factor influencing LOS. Gupta (2019) presents evidence suggesting that treatment continuity is less consistent during weekends, marked by more caregivers (residents, fellows attending, etc.), compared to NICUs with fewer direct care workers. This contrast in care delivery during weekends can extend hospital stays, raising

questions about the importance of consistent staffing levels in neonatal care. Moreover, Welch et al. (2017) highlight the positive impact of weekly transdisciplinary meetings in coordinating and providing care continuity for neonates admitted in NICUs with medical complications. This collaborative approach improves patient outcomes, signifying the importance of streamlined communication and interdisciplinary cooperation in neonatal care settings.

2.3.5 Maternal Risk Determinants of Length of Stay for Neonates

Maternal risk determinants are pivotal in determining the trajectory of early discharge and LOS for neonates. Enomoto et al. (2017) and Abdul-Mumin et al. (2020) highlight the dynamic interplay between patients, healthcare providers, and payors in shaping discharge timings. Integrating perceived discharge readiness alongside clinical evaluations introduces a subjective dimension to the discharge process, acknowledging the multifaceted nature of patient preparedness for postpartum care. Insights from a Kenyan study by English et al. (2014) reveal that adolescent mothers (<20 years) face unique challenges, with low birth weight babies experiencing heightened morbidity and adverse outcomes. This underscores the importance of targeted interventions for this demographic to enhance neonatal health outcomes.

Additionally, the study by Picone et al. (2014) unveils gender disparities in LOS, with male infants being discharged sooner. Furthermore, patients from socioeconomically deprived areas were found to have prolonged hospital stays, indicating a potential link between economic status and healthcare outcomes. In a contrasting study, Kato et al. (2021) explored various determinants influencing LOS, encompassing low education

levels, advanced maternal age, insufficient prenatal care, complementary breastfeeding, and the crucial role of midwife care. This multifaceted exploration of social-demographic and economic dimensions provides a comprehensive understanding of LOS's intricate determinants and lays the groundwork for tailored interventions. Harron et al. (2017) utilized secondary data on births in England between 2005 and 2014. The study explored risk factors associated with LOS for neonates. The significant maternal risk factors established in the study included mode of delivery, multiple births, and maternal age.

2.3.6 Neonatal Risk Determinants of Length of Stay for Neonates

Antenatal risk determinants significantly impact the span of stay for neonates, contributing to an accumulated prevalence of neonatal sepsis. Prolonged chorioamnionitis, membrane rupture, maternal urinary tract infection, male gender, birth asphyxia, prematurity, and colonization with group B streptococcus are critical determinants of neonatal sepsis (Giannoni et al., 2018). The study by Giannoni et al. (2018) explicitly identifies the rupture of membranes before childbirth as a significant risk factor for early-onset group B streptococcal sepsis, shedding light on the need for targeted interventions in cases of premature membrane rupture.

Birth asphyxia, characterized by a severe disruption in oxygen supply to the fetus, represents a critical neonatal risk factor, affecting 2.9 to 9 neonates per 1000 births. This condition leads to a staggering 1 million deaths yearly on a worldwide scale, with a corresponding number of neonates experiencing severe neurological sequelae (Abdo et al., 2019). The WHO's inclusion of thermal care, aimed at preventing neonatal hypothermia, as a crucial component of basic measures underscores the importance of

environmental determinants in neonatal care. Results from a study in South Nepal highlight birth hypothermia as a determinant of illness and death in neonates across all birth weights and gestational ages, emphasizing the critical role of temperature regulation in neonatal well-being (Alebachew Bayih et al., 2019).

Neonatal hypoglycemia emerges as a significant metabolic problem prevalent among neonates. This condition, documented by Boardman and Hawdon (2015), poses a serious threat to neonatal health, resulting in morbidity and extreme handicap, particularly among elevated survivors. The risk determinants associated with neonatal hypoglycemia include low glycogen stores, age, prematurity, mothers with gestational diabetes, small or large gestational, hyperinsulinemia, and stress. These determinants collectively contribute to the intricate landscape of neonatal health, demanding targeted interventions to address the specific needs of at-risk neonates.

2.4 Identification of Knowledge Gap

The causes of neonate span of stay are known from various general studies. These include social, demographic, economic, institutional, maternal, and neonatal risk determinants. However, specific determinants differ among diverse communities living in Kenya. In this respect, there is very little documented information about the determinants of the span of stay for neonates in the nomadic communities living in Northeastern Kenya. Furthermore, the reviewed findings are both incompatible in some of the related causes and also present important limitation for generalization to Wajir County.

2.5 Conceptual Framework

A conceptual framework arranges the key variables, constructs, and the interactions among them. Studies have been done in the past describing possible groups of variables as determinants of patients' LOS (Driesen et al., 2018; Elmi Farah et al., 2018). Figure 1 shows the conceptual framework of the study, including the independent and dependent variables with possible indicators. The framework was iteratively developed, utilizing researchers' technical knowledge and research background, reviewed literature, and previously utilized concepts representing comparable problems.

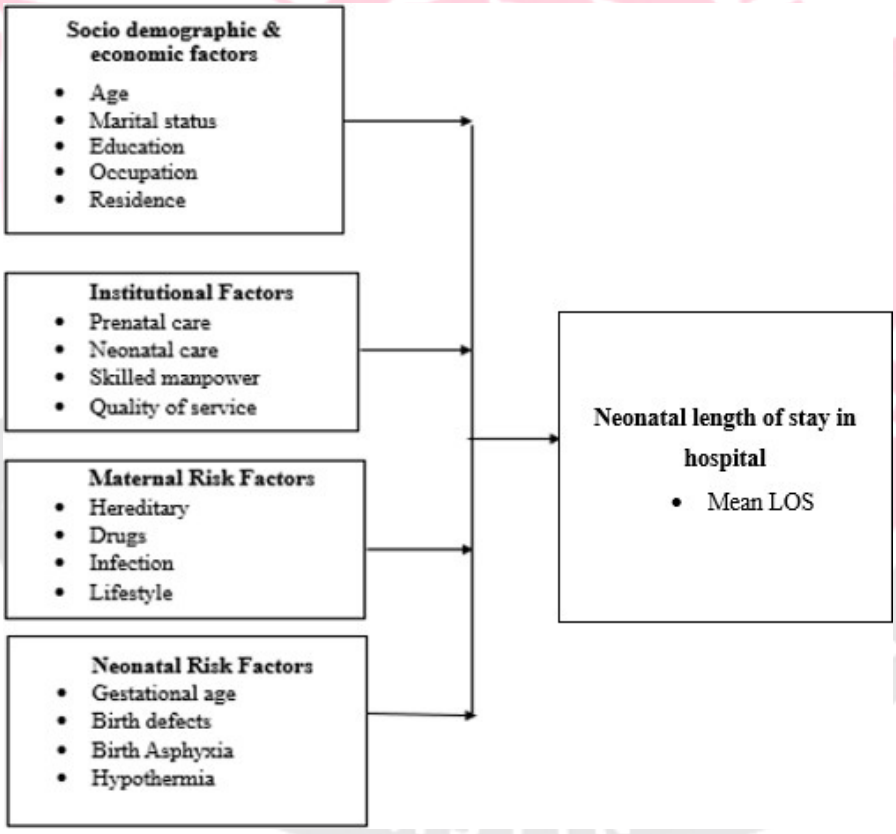

Figure 1: Conceptual Framework

Source Author, (2024)

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This section describes the processes, techniques, and materials used in the analysis. It also identifies the research design, study location, population, target population, sample size, sampling technique, data collection, and data analysis. Lastly, the legal and ethical issues considered are highlighted.

3.2 Research Design

This cross-sectional hospital-based research design was conducted to assess the determinants of LOS among neonates admitted to the NBU of Wajir Referral Hospital (WCRH), Kenya. Utilizing a cross-sectional hospital-based research design allowed for an in-depth exploration of neonatal care aspects within the confines of WCRH. By focusing on the neonatal population within the NBU, the research sought to uncover unique contextual determinants that may impact the LOS for neonate rates, thereby offering valuable insights for both clinical practices and healthcare policies tailored to the Wajir region. The cross-sectional hospital-based research design facilitated a holistic examination of the neonatal care environment, considering diverse social, institutional, maternal, and neonatal risk determinants, thus contributing to the broader knowledge base in neonatal healthcare.

3.3 Location of Study

Wajir County, positioned in the northeastern region of Kenya, was the study's location. The specific site was the WCRH, previously known as the Wajir District

Hospital. Positioned in Wagberi ward within the Wajir East Constituency, this level 5 Ministry of Health facility serves as a key medical institution. The hospital comprises 6 inpatient wards with 83 total bed capacity and on average 8, 341 turnover of inpatients (Wajir Hospital Statistics, 2015). The annual outpatient workload, catering to adults and children, averages around 6,700. The neonatal unit, designed for 28 beds, has an average occupancy rate of 71%. Staffing includes 15 nurse-midwives and two medical officers, but notably, there is no full-time Pediatrician on-site. In the year 2020, the neonatal unit admitted 351 neonates, and there were 49 recorded neonatal deaths.

3.4 Target and Study Population

3.4.1 Target Population

The study focused on the entire population of neonates and their mothers admitted to the Neonatal Care Unit (NBU) at Wajir County Referral Hospital (WCRH). The research investigated factors affecting neonatal care and outcomes within this setting. By including all neonates and mothers admitted during this timeframe, the study ensured a representative sample that could provide valuable insights into the healthcare practices and experiences of neonates and their caregivers at WCRH's NBU. This approach aimed to capture a broad spectrum of cases and circumstances, facilitating a nuanced understanding of the challenges and opportunities in neonatal healthcare delivery in Wajir County.

3.4.2 Study Population

The study population encompassed all neonates and their mothers who were admitted to the Neonatal Care Unit (NBU) of Wajir County Referral Hospital (WCRH). This inclusive approach aimed to comprehensively represent neonatal cases and maternal caregiving experiences within the hospital's specialized unit. By including every neonate and mother admitted to the NBU during the study period, the research sought to explore various medical conditions, treatment outcomes, and socio-demographic factors impacting neonatal health in Wajir County. This approach ensured that the study findings could broadly apply to the population served by WCRH's NBU, offering insights into healthcare practices, challenges, and opportunities for improving neonatal care services in the region.

3.4.3 Study Period

The study spanned a duration of three months, specifically conducted from September to November 2023. This timeframe was chosen to provide a comprehensive and detailed examination of neonatal care practices and outcomes within the Neonatal Care Unit (NBU) of Wajir County Referral Hospital (WCRH). Researchers conducted the study over this period to capture a wide spectrum of cases and scenarios that could influence neonatal health and maternal caregiving experiences. This temporal scope allowed for the systematic observation and analysis of medical interventions, treatment protocols, and socio-demographic factors affecting neonates and their mothers admitted to WCRH’s NBU. The three-month duration ensured sufficient time to gather robust data and insights into the complexities of neonatal healthcare delivery in the context of Wajir County,

facilitating informed recommendations for enhancing healthcare practices and policies.

3.5 Inclusion Criteria

The study included:

a) All neonates of age 0-28 days admitted to the NBU

b) All mothers of the neonates admitted to the facility.

c) Medical records of NBU admitted neonates.

3.6 Exclusion Criteria

The study excluded:

a) Neonates with incomplete medical records, which were 10 in total.

b) Illegible medical records where there were none.

c) Neonate was admitted to the facility and had been referred to the hospital.

3.7 Sample Size Determination and Sampling Procedures

3.7.1 Sample Size Determination

The Fisher's formula (Fisher, 1998) for estimating the sample size was computed as follows:

$$n = \frac{Z^2_{\alpha/2}\ p(1-p)}{d^2} \qquad (1.1)$$

Where;

$Z_{\alpha/2}$ = Standard Score corresponding to the (1- $\alpha/2$) confidence level (1.96 obtained from Z tables)

P = the estimated prevalence of neonates of age 0-28 days admitted to the NBU (10% according KDHS, 2022 statistics)

d = the allowable precision (5%)

Computation: using Z = 1.96, p = 10%, d = 0.05

$$n = \frac{1.96^2 x\ 0.10(1-0.1)}{0.05^2} = \frac{3.8416 \times 0.1 \times 0.9}{0.0025}$$

$$= (3.8416X0.1X0.9)/0.05X0.05 = 138.24$$

3.7.2 Sampling Procedures

In this study, which was conducted over three months, systematic sampling was used to select participants. All mothers with neonates admitted to WCRH's Neonatal Care Unit (NBU) who provided consent and neonates aged 0 to 28 days were eligible. One hundred thirty-eight neonates and their mothers admitted to the NBU during this period were systematically sampled from a list generated at regular intervals. This sampling method ensured the representation of the entire sample frame, allowing the study to capture a diverse range of cases and experiences within the designated timeframe. This systematic approach facilitated a more comprehensive understanding of the factors under study, maximizing the potential for meaningful insights into the care and outcomes of

neonates and their mothers within the NBU setting.

3.8 Data Collection Instruments

The study employed a structured questionnaire as its primary tool for data collection from mothers of neonates admitted to the Neonatal Care Unit (NBU) of Wajir County Referral Hospital (WCRH). The questionnaire was designed with four distinct sections to gather comprehensive information systematically. Section 1 focused on socio-demographic and economic determinants, aiming to capture variables such as maternal age, education level, income status, and household characteristics that could influence neonatal health outcomes. Section 2 centered on institutional determinants, exploring factors related to the hospital environment and healthcare services accessed by the mothers and neonates.

Section 3 of the questionnaire addressed maternal risk determinants, encompassing maternal health history, prenatal care practices, and any existing medical conditions that might impact neonatal health. This section aimed to provide insights into the maternal factors contributing to the length of stay and treatment outcomes in the NBU setting. Section 4 focused on neonatal risk determinants, capturing data on the neonates' health status, birth weight, gestational age, and any diagnosed medical conditions affecting their hospitalization.

To ensure rigorous data collection, the structured questionnaire was administered by trained research assistants under the supervision of the principal investigator. Concurrently, a data collection sheet was utilized to extract secondary data from hospital records, specifically documenting clinical characteristics such as admission dates and discharge for each mother-neonate pair. This secondary data, compiled in a checklist

format detailed in Appendix IV of the study, facilitated the systematic comparison and contrast with the primary data obtained through the questionnaire. This methodological approach aimed to validate findings, enhance data completeness, and provide a robust basis for analyzing the factors influencing neonatal hospital stay durations at WCRH's NBU.

3.9 Pilot Study

Piloting was done in neighbouring Garissa County at the Garissa Referral Hospital. The pilot study involved one tenth of the study's anticipated sample size, as recommended in Mugenda and Mugenda (2019). Therefore, 14 respondents were selected for piloting. Piloting was necessary to pre-test the study's questionnaire and assess its validity and reliability.

3.9 Validity and Reliability of Research Instruments

3.9.1 Validity of Research Instruments

Validity measures the extent to which the research instrument performs its intended purpose accurately (Orodho, 2009). Validity was ensured through validation by supervisors from the School of Public Health, AMREF International University, who were research experts.

3.9.2 Reliability of the Research Instruments

Reliability indicates the research instrument's degree of producing consistent results after repeated trials (Zohrabi, 2019). Cronbach Alpha reliability coefficient was employed in

determining the research instrument's reliability. For the questionnaires to be considered reliable, a reliability coefficient ≥ 0.7 was deemed appropriate.

Table 1: Cronbach Alpha Reliability Coefficient

Variable Category	Cronbach's Alpha	N of Items
Socio-Demographic Determinants	.708	5
Institutional Determinants	.798	5
Maternal Risk Determinants	.863	10
Neonatal Risk Determinants	.750	10

Source: Pilot Data (2024)

3.10 Data Collection Procedures

The researcher obtained approval to collect data from the Ethics and Scientific Review Committee of AMREF Health Africa. After approval, questionnaires were administered through face-to-face interviews. This was achieved by the researcher aided by two (2) trained research assistants. The research assistants recruited had a degree in health sciences and were trained in data collection procedures in relation to the study in a realistic NBU setting. The principal investigator managed data collection, ensuring detailed recording and preservation. Confidentiality was maintained, and COVID-19 protocols were observed during data collection. This involved adhering to guidelines such as wearing masks, maintaining appropriate social distancing, and using hand sanitizers to

ensure the safety of both the participants and the research team. The research assistants and the principal investigator were equipped with personal protective equipment (PPE) and trained on properly using these items. Additionally, efforts were made to conduct the data collection processes in well-ventilated areas or outdoors where possible. These measures protected health and safety and helped build trust with participants, assuring them that their well-being was a top priority during the research process. Electronic data entry utilized ODK, with subsequent transfer to a Microsoft Excel Sheet. Rigorous data cleaning and quality measures were implemented. The process of gathering data took three (3) months.

3.11 Data Analysis and Presentation

The study obtained quantitative data, cleaned, coded, and entered into the Statistical Package for Social Scientists, SPSS, version 26.0 for analysis. Analysis was done through descriptive statistics such as frequencies and percentages and inferential statistics that utilized the Chi-Square test. The findings presentation used tables and figures such as bar graphs and pie charts. For the Chi-Square test, a significance level of 0.05 was considered the threshold for the significance of the variables. The unit of analysis was Neonatal.

3.12 Ethical Considerations

Before embarking on the study, the researcher obtained ethical clearance from the Ethics and Scientific Review Committee of AMREF Africa. Further, the researcher assured the respondents that any information regarding their identity and lives would be kept confidential. The respondents were assured that their personal information would not be shared with third parties and would only be utilized to achieve the objectives of the study.

The anonymity of the respondents was assured and guaranteed by not sharing in any way any information regarding the respondents. Privacy was also assured by informing the respondents not to indicate any form of identification in the questionnaires. The nature and objectives of the research were explained to the respondents. Procedures followed in data collection were outlined to the respondents since it was their right. Afterward, informed consent was obtained from the participants so that they could partake in the study. Only those who consented were given the questionnaires to fill out. The respondents were versed that participation in the study was voluntary, and no payment or compensation was provided. This was informed through writing.

The research involved a matter sensitive to hospitalization and the health of neonates. At times, it involved respondents who had undergone trauma by having extremely sick neonates. The respondents were, therefore, debriefed to ensure that they provided sufficient information for the nature of the study. This helped prevent the respondents from experiencing adverse effects in relation to issues such as psychological effects. The researcher ensured that only appropriate information was provided to the respondents in relation to the study. Misconception situations were appropriately corrected during the debriefing process. The data collected was filed for ease and convenient access. Data printouts were correctly filed after analysis, and any form of soft copy was stored in a secured flash disk. The data collected was only accessible to the researcher alone. Collected data was destroyed six months after the analysis and preparation of the research report.

The respondents' safety was maintained, and COVID-19 protocols were observed during data collection. Respondents were provided with masks, maintained appropriate social

distancing, and used hand sanitizers to ensure the safety of both the participants and the research team. The research assistants and the principal investigator were equipped with personal protective equipment (PPE) and trained on properly using these items.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the study findings, organized according to the study's objectives. The first part presents the socio-demographic characteristics, followed by the maternal and neonatal clinical characteristics, while the second part presents the results of the study objectives.

4.2 Return Rate

In total, 138 questionnaires were issued through the face-to-face interviews. Out of these, 122 were considered adequately filled for analysis and drawing inferences for the study. This represented a return rate of 88.4%, which, as outlined in Fincham (2008), was acceptable since it exceeded 60%.

4.3 Descriptive Statistics

4.3.1 Socio-Demographic Characteristics of the Mothers

The mean age of the study participants was 23.7 (± 4.7) years, where the youngest mother was 15.0 years and the eldest was 37.0 years. The results also show almost half (percent = 49.2%, frequency = 60) of participants were aged between 20 to 24 years, more than half (59.0%) resided in rural areas, the majority (75.4%) had no formal education, most (87.7%) were unemployed, more than half (51.6%) lived within more than 5 km from the health facility. The study participants were predominantly young mothers, with a mean age of 23.7 years. Almost half were aged between 20 and 24 years, resided in rural areas,

had no formal education, and were unemployed. These characteristics suggest a population with potential limited access to healthcare resources and education, possibly influencing maternal and neonatal health outcomes. The results are as shown on Table 2.

Table 2: Distribution of Mothers by Socio-Demographic Characteristics

	Frequency *(n=122)*	**Percent**
Age in years		
15 – 19	20	16.4
20 – 24	60	49.2
25 – 29	25	20.5
30 – 34	11	9.0
35 – 39	6	4.9
Mean = 23.7 years; standard deviation = 4.65 years; minimum = 15 years, maximum = 37 years; mode = 24 years		
Residence		
Rural	50	41.0
Urban	72	59.0
Education		
No Formal Education	92	75.4
Formal Education	30	24.6
Occupation		
Unemployed	107	87.7
Self-employed	15	12.3

Source: Research Data (2023)

4.3.2 Institutional Characteristics

The study also assessed the institutional determinants of LOS of neonates. The majority of participants, 76.2% (93), indicated that the distance of the hospital from their homes

was 4 Km and above. On the mode of transport used, 91.8% (112) indicated using a taxi. The results further indicate that 73.8% (90) of the respondents indicated that the quality of service was good and very good. Regarding staff attitude, 82.8% (101) indicated the staff have a friendly and very friendly attitude (Table 3).

Table 3: Distribution of Participants by Institutional Characteristics

		Frequency	Percent (%)
Distance to hospital from home	<1km	10	8.2%
	2-3Km	19	15.6%
	4-5Km	30	24.6%
	5-6Km	36	29.5%
	>7Km	27	22.1%
Mode of transport to hospital	Taxi	112	91.8%
	Other	10	8.2%
Quality of service	Neutral	32	26.2%
	Good	60	49.2%
	Very good	30	24.6%
Staff attitude	Very friendly	39	32.0%
	Friendly	62	50.8%
	Neutral	21	17.2%

Source: Research Data (2023)

Respondents also indicated they chose the health facility. Based on Table 3, 86.9% (106) indicated choosing the health facility due to the availability of personnel, while 27.0% (33) indicated due to the availability of drugs (Table 4).

Table 4: Reason for the Choice of Facility

Reason for choosing this facility		Frequency	Percent (%)
Availability of drugs	Yes	33	27.0%
	No	89	73.0%
Availability of healthcare personnel	Yes	106	86.9%
	No	16	13.1%
Availability of specialized equipment	Yes	6	4.9%
	No	116	95.1%
I had no other alternative	Yes	2	1.6%
	No	120	98.4%

Source: Research Data (2023)

4.3.3 Maternal Characteristics of the Mothers

This was obtained from the hospital records using the secondary data collection sheet. The results of the maternal characteristics show that almost half (45.9%) of them were multi-para, more than half (62.3%) have had previous deliveries done at a health facility, a few (14.8%) have ever had a delivery at home, almost half (47.5%) have had a pregnancy interval of about nine months from last birth. On a number of ANC visits, almost half (48.4%) had 4 or more of the recommended minimum number of visits, and the majority (79.5%) had a vaginal delivery. Most of the mothers were thus multiparous, with over 62% having previous deliveries at a health facility. About half had the recommended minimum number of ANC visits, and the majority had vaginal deliveries. These findings may indicate a level of experience among the mothers in managing pregnancies, but the adequacy of antenatal care remains a consideration. The results are as shown on Table 5.

Table 5: Distribution of Mothers by their Maternal Characteristics

	Frequency *(n=122)*	Percent
Parity		
Primi para	45	36.9
Multi para	56	45.9
Grand multi para	21	17.2
Previous deliveries at health facility		
Yes	76	62.3
No	46	37.7
Previous deliveries at home		
Yes	18	14.8
No	104	85.2
Pregnancy interval		
<2 years	72	59.0
≥2 years	5	4.1
NA (Primi)	45	36.9
Comorbidity		
Hypertension	1	0.8
Kidney disease	1	0.8
Anaemia	5	4.1
None	115	94.3
Diagnosis during pregnancy		
Pregnancy induced hypertension	2	1.6
Kidney disease	1	0.8
None	119	97.5
Number of ANC visits		
≥4	59	48.4
<4	63	51.6
Multiple gestation		
Yes	2	1.6
No	120	98.4
Medical diagnosis of maternal risk determinants		
Antepartum hemorrhage	1	0.8
PROM	4	3.3
Pre-term delivery	9	7.4
None	108	88.5

Obstetric complications		
Incompetent cervix	1	0.8
Pregnancy induced hypertension	4	3.3
NA	1	0.8
None	116	95.1
Mode of delivery		
SVD	97	79.5
CS	25	20.5

Source: Research Data (2023)

4.3.4 Neonatal Characteristics

Through the questionnaires, the characteristics of the neonates were obtained. There were more male (60.7%) neonates than female (39.3%). A few of the neonates had complications during pregnancy (12.3%), during delivery (13.1%), and after delivery (13.9%). Only a few of the neonates were born at term (32.0%), and a majority had normal birth weight (74.6%). Most of them were born with complications (73.8%), and almost half developed complications after birth (47.5%). The average age of the neonates was 4.3 (± 4.3) days. The neonatal population thus had a higher proportion of males, and a significant number experienced complications during pregnancy, delivery, and post-delivery. A majority were born with complications and almost half developed complications after birth. The prevalence of preterm births and low birth weight is noteworthy, suggesting potential challenges in neonatal health. The results are shown in Table 6.

Table 6: Distribution of Neonates by Different Characteristics

	Frequency *(n=122)*	**Percent**
Gender		
Male	74	60.7
Female	48	39.3
Complications during pregnancy		
Yes	15	12.3
No	107	87.7
Complications during delivery		
Yes	16	13.1
No	106	86.9
Complications after delivery		
Yes	17	13.9
No	105	86.1
Gestation at birth (weeks)		
Extremely preterm (<28)	4	3.3
Very preterm (28-32)	32	26.2
Moderate to late preterm (33-37)	47	38.5
Normal term (38-41)	39	32.0
Birth weight (kg)		
Very low (1.0-1.4)	6	4.9
Low (1.5-2.4)	25	20.5
Normal (2.5-4.5)	91	74.6
Born with any complications		
Yes	90	73.8
No	32	26.2
Develop complications after birth		
Yes	58	47.5
No	64	52.5
	Mean ± SD	
Age of neonate (days)	4.3 ± 4.3	

Source: Research Data (2023)

4.3.5 Reason for First Admission

The neonates were admitted for one or more reasons, of which the top three reasons were birth asphyxia (47.5%), followed by low birth weight (11.5%), and pre-term (10.7%). The leading reasons for neonatal admission were birth asphyxia, low birth weight, and pre-term birth. These findings highlight critical areas of concern in neonatal health, possibly reflecting challenges in prenatal care, delivery, and immediate postnatal care as shown in Table 7.

Table 7: Diagnosis at admission

Reason	**Frequency**	**Percent of Neonates,** *(n/122)*
Birth asphyxia	58	47.5
Neonatal sepsis	10	8.2
Fever	4	3.3
Jaundice	2	1.6
Low birth weight	11	8.7
Meconium aspiration	12	9.8
Birth injury	1	0.8
Severe hydration	2	1.6
Spina bifida	1	0.8
Pneumonia aspiration	2	1.6
Pre-term	13	10.7
Respiratory syndrome	4	3.3
Severe pneumonia	2	1.6

Source: Research Data (2023)

4.3.6 Recorded Diagnosis of Neonate

The questionnaire also recorded the reason for the first admission of the neonate. The topmost recorded diagnosis of the neonate was perinatal asphyxia (56.6%). Perinatal

asphyxia was thus the most frequently recorded diagnosis, indicating that a significant proportion of neonates experienced oxygen deprivation during childbirth. Other common diagnoses included meconium aspiration and neonatal sepsis, pointing towards the complexity of health issues faced by the neonatal population, as shown in Table 8.

Table 8: Neonates complications at birth

Recorded diagnosis of neonate	Frequency	Percent
Meconium aspiration	9	7.4
Perinatal asphyxia	69	56.6
Neonatal sepsis	11	9.0
Respiratory distress syndrome	4	3.3
Pneumonia	3	2.5
Jaundice	4	3.3
Low birth weight	7	5.7
Pre-term baby	9	7.4
None	6	4.9

Source: Research Data (2023)

4.3.7 Length of Stay of the Neonates

Using the questionnaire, the LOS of the neonates was recorded. The mean LOS of the neonates was 5.5 (± 2.9) days, with the median number of days being 5.0 days, and the minimum was 1.0 days, with the maximum being 14.0 days. Based on the mean length, it can be suggested that neonates have a substantial duration of hospitalization. This could indicate the severity of health issues and the need for comprehensive medical care during their stay, as shown in Figure 2. Regionally, neonates in rural areas often experience shorter stays due to limited healthcare resources, whereas urban centers like Nairobi typically report slightly longer stays due to better access to specialized care (Kamau et

al., 2021). Globally, the expected LOS for neonates varies significantly depending on the healthcare system and the neonates' health conditions. In developed countries, the LOS tends to be shorter, often averaging around 3-4 days due to efficient healthcare systems and better post-discharge care (Smith et al., 2023). However, in many developing countries, the LOS can be longer due to higher rates of neonatal complications and varying levels of healthcare infrastructure (Mwangi & Kariuki, 2022). Thus, the LOS of 5.5 days in your study appears to be within a reasonable range when contextualized both locally within Kenya and against broader global standards.

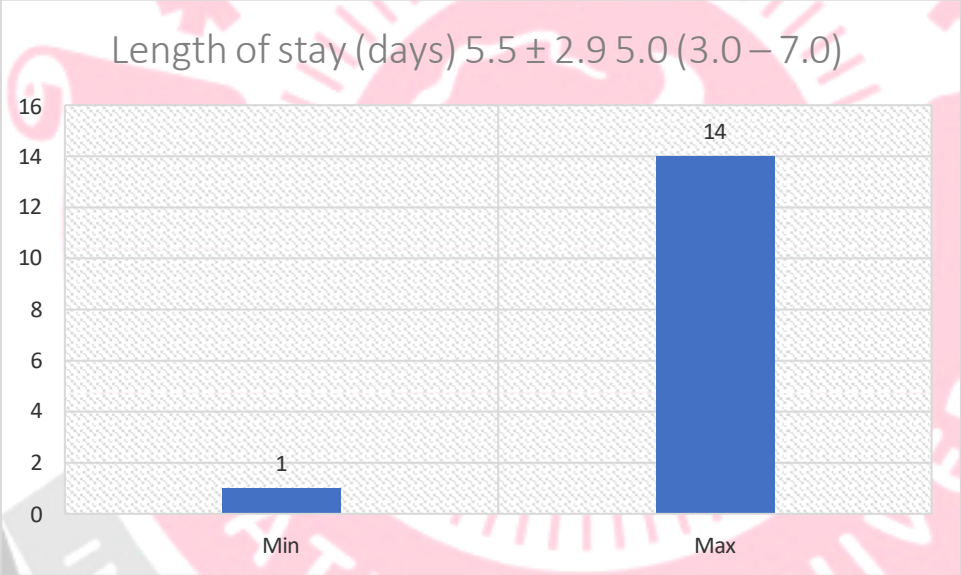

Figure 2: Length of Stay of the Neonates

Source: Research Data (2023)

4.3.8 Neonatal Care Outcomes at WCRH

The majority of the neonates were alive (87.7%), while a few of them died (12.3%). The majority of neonates were discharged alive, but a noteworthy 12.3% died during the

admission period. The fact that most neonates were alive, accounting for 88.0% of the total, indicates the overall health and survival rates among the neonates in the study. This suggests that a significant proportion of neonates had favorable outcomes during their hospitalization at the NBU. The 12.3% mortality rate among neonates during the admission period can be attributed to several causative factors. Firstly, prematurity and associated complications such as respiratory distress syndrome and infections are leading causes of neonatal mortality, particularly in low-resource settings where access to advanced neonatal care is limited (Ochieng et al., 2023). Secondly, perinatal asphyxia, resulting from inadequate oxygen supply during labor and delivery, remains a significant contributor to neonatal deaths in many Kenyan hospitals (Mutiso & Mwangi, 2022). Additionally, congenital anomalies, often detected late due to limited prenatal screening, can lead to poor outcomes (Kariuki et al., 2021). Infections, including sepsis, pneumonia, and meningitis, are prevalent in neonatal units and can be exacerbated by overcrowding and inadequate infection control practices (Njoroge et al., 2022). Finally, socioeconomic factors such as maternal malnutrition, lack of access to antenatal care, and delays in seeking medical help also play a crucial role in the high neonatal mortality rates observed (Mwangi & Kimani, 2023). This underscores the gravity of the health challenges faced by the neonatal population despite medical intervention, as shown in Figure 3.

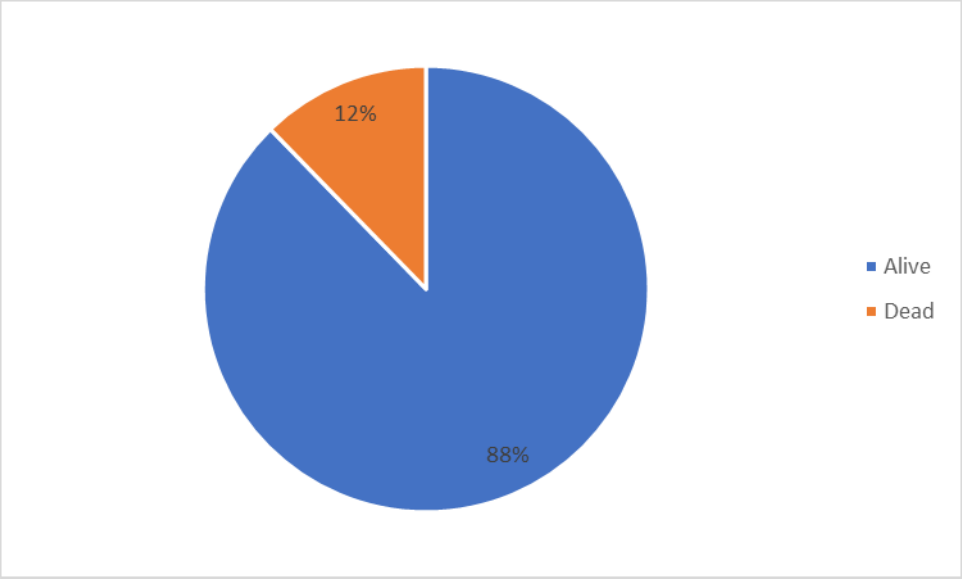

Figure 3: Neonatal Outcome

Source: Research Data (2023)

4.4 Inferential Statistics

4.4.1 Socio-Demographic Determinants of Length of Stay

To establish the relationship between various social-demographic determinants and LOS, a Chi-Square analysis was run between each indicator of social-demographic determinants and LOS for neonates admitted to the NBU of WCRH. The findings are summarized in Table 9.

Table 9: Chi-Square Results for the Association between Socio-Demographic Characteristics and Length of Stay

		What was the duration of stay in the NBU?		Chi-Square (P-Value)
		Long	Short	
Age	<=23	6	58	$\chi^2_{df=1}$ = 10.213; p-value=.001
	>23	19	39	
Residence	Rural	11	39	$\chi^2_{df=1}$ = .118; p-value=.731
	Urban	14	58	
Education Level	No formal Education	22	70	$\chi^2_{df=1}$ = 2.688; p-value=.101
	Formal Education	3	27	
Occupation	Unemployed	25	82	$\chi^2_{df=1}$ = 4.408; p-value=.036
	Self-Employed	0	15	

Source: Research Data (2023)

Among the socio-demographic determinants examined, age of the mother ($\chi^2_{df=1}$ = 10.213 ; p-value=.001) and occupation ($\chi^2_{df=1}$= 4.408 ; p-value=.036) yielded an association that was statistically significant LOS in the NBU. This suggests that age and occupation are crucial in influencing LOS within the studied population.

The interpretation of the results underscores the importance of considering socio-demographic factors in healthcare outcomes, particularly in neonatal care. The findings imply that the mother's age substantially impacts the LOS for neonates in the NBU. This insight can inform healthcare providers and policymakers in tailoring interventions and support services to improve neonatal outcomes, such as targeted maternal and child health programs focusing on specific age groups.

However, it is noteworthy that other socio-demographic determinants examined residence ($\mathcal{X}^2_{df=1} = .118$; p-value=.731) and education ($\mathcal{X}^2_{df=1} = 2.688$; p-value=.101) of the mothers did not exhibit statistically significant associations with duration of stay. This does not necessarily imply that these factors are irrelevant but rather suggests that within the context of this study and population, age and occupation emerge as the most salient determinants.

4.4.2 Institutional Determinants of Length of Stay

To establish the link between various institutional determinants and LOS, a Chi-Square analysis was run between each indicator of institutional determinants and LOS for neonates admitted to the NBU of WCRH. The findings are summarized in Table 10.

Table 10: Chi-Square Results for Association between Institutional Determinants and Length of Stay

		What was the duration of stay in the NBU?		Chi-Square (P-Value)
		Long	Short	
Distance to hospital from home	<1km	7	3	$\mathcal{X}^2_{df=4} = 46.499$; p-value < .0001
	2-3Km	11	8	
	4-5Km	6	24	
	5-6Km	1	35	
	>7Km	0	27	
Mode of transport to hospital	Taxi	24	88	$\mathcal{X}^2_{df=1} = .856$; p-value=.355
	Other	1	9	
Quality of service	Neutral	0	32	$\mathcal{X}^2_{df=2} = 52.951$; p-value < .0001
	Good	5	55	
	Very good	20	10	
Staff attitude	Very friendly	19	20	$\mathcal{X}^2_{df=2} = 28.934$; p-value < .0001
	Friendly	6	56	
	Neutral	0	21	

Source: Research Data (2023)

The study found that distance to hospital from home ($\mathcal{X}^2_{df=4} = 46.499$; p-value < .0001), quality of service ($\mathcal{X}^2_{df=2} = 52.951$; p-value < .0001) and staff attitude ($\mathcal{X}^2_{df=2} = 28.934$; p-value < .0001) had a statistically significant effect on LOS for neonates admitted to the NBU of WCRH. This shows that these determinants explain LOS for neonates since p < .05.

4.4.3 Maternal Risk Determinants of Length of Stay

To establish the relationship between various maternal risk determinants, a Chi-Square analysis was run between each indicator of maternal risk determinants and LOS for neonates admitted to the NBU of WCRH. The findings are summarized in Table 11.

Table 11: Maternal risk determinants and Length of Stay

		What was the duration of stay in the NBU?		Chi-Square (P-Value)
		Long	Short	
Parity	Primapara (<=1)	2	43	$\chi^2_{df=2} = 11.920$; p-value = .003
	Multi para (2-4)	18	38	
	Grand multi para (>=5)	5	16	
Pregnancy interval	<2 years	13	59	$\chi^2_{df=2} = 11.333$; p-value=.003
	=> 2 years	4	1	
	NA	8	37	
Comorbidity conditions	Yes	6	2	$\chi^2_{df=1} = 15.613$; p-value < .0001
	No	19	95	
Number of ANC visits	>=4	0	59	$\chi^2_{df=1} = 29.447$; p-value < .0001
	<4	25	38	
Mode of delivery	SVD	16	81	$\chi^2_{df=1} = 4.642$; p-value = .031
	CS	9	16	

Source: Research Data (2023)

The results in Table 11 show that parity ($\chi^2_{df=2} = 11.920$; p-value = .003), pregnancy

interval ($\mathcal{X}^2_{df=2} = 11.333$; p-value=.003), comorbidity conditions ($\mathcal{X}^2_{df=1} = 15.613$; p-value < .0001), number of ANC visits ($\mathcal{X}^2_{df=1} = 29.447$; p-value < .0001) and mode of delivery ($\mathcal{X}^2_{df=1} = 4.642$; p-value = .031) had a significant association with LOS for neonates. These findings underscore the importance of considering maternal health factors in understanding and predicting outcomes in neonatal care. For instance, a shorter pregnancy interval (the time between pregnancies) increases the risk of longer hospital stays.

4.4.4 Neonates' Risk Determinants of Length of Stay

A chi-square analysis was run to establish the relationship between various neonates' risk determinants and LOS. The findings are summarized in Table 12.

Table 12: Neonates' Risk Determinants and Length of Stay

		What was the duration of stay in the NBU?		Chi-Square (P-Value)
		Long	Short	
Gender of the neonate	Male	14	60	$\chi^2_{df=1}$ = .286; p-value = .593
	Female	11	37	
Complications during pregnancy	Yes	11	4	$\chi^2_{df=1}$ = 29.311 p-value < .0001
	No	14	93	
Complications during delivery	Yes	11	5	$\chi^2_{df=1}$ = 23.024; p-value < .0001
	No	14	92	
Complications after delivery	Yes	7	10	$\chi^2_{df=1}$ = 5.187; p-value = .023
	No	18	87	
Weight at birth (in Kg)	NBW	0	91	$\chi^2_{df=1}$ = 92.301; p-value < .0001
	LBW	25	6	
Child born with complications	Yes	7	83	$\chi^2_{df=1}$ = 34.043; p-value < .0001
	No	18	14	
Develop complications after birth	Yes	11	47	$\chi^2_{df=1}$ = .158; p-value =.691
	No	14	50	

Source: Research Data (2023)

The provided Chi-square analysis aims to elucidate the relationship between various neonatal risk determinants and LOS in the NBU of WCRH. The results demonstrate that

complications during pregnancy ($\mathcal{X}^2{}_{df=1} = 29.311$ p-value < .0001), complications during delivery ($\mathcal{X}^2_{df=1} = 23.024$; p-value < .0001), complications after delivery ($\mathcal{X}^2_{df=1} = 5.187$; p-value = .023), weight at birth ($\mathcal{X}^2_{df=1} = 92.301$; p-value < .0001), and child born with complications ($\mathcal{X}^2_{df=1} = 34.043$; p-value < .0001) had a statistically significant association with LOS for neonates.

Complications during pregnancy, delivery, and after delivery emerge as particularly influential factors, with high Chi-square values and low p-values ($p < 0.001$). This suggests that complications at various stages significantly affect the length of hospitalization for neonates. Similarly, gestation at delivery and birth weight exhibit strong associations with LOS, underscoring the critical role of these factors in neonatal health. Furthermore, complications at birth and after birth also show significant associations with the duration of stay in the NBU. These findings highlight the multifaceted nature of neonatal health and the importance of considering various risk determinants in assessing and predicting outcomes in neonatal care.

However, not all neonatal risk determinants demonstrate significant associations with neonatal outcomes. For instance, the gender of the neonate ($\mathcal{X}^2_{df=1} = .286$; p-value = .593) and after-birth complications ($\mathcal{X}^2_{df=1} = .158$; p-value =.691) show no significant association with the duration of stay in the NBU. This suggests that within the context of this study and population, these factors may not be as influential in determining neonatal health outcomes. The Chi-square analysis underscores the complex interplay of neonatal risk determinants in shaping outcomes in neonatal care. By identifying significant associations between various factors such as complications during pregnancy, delivery,

and after delivery, gestation at delivery, birth weight, presence of complications at birth, and type of medical diagnosis, the findings provide valuable insights for healthcare practitioners and policymakers striving to improve neonatal health outcomes in settings like WCRH.

CHAPTER 5: DISCUSSIONS

5.1 Introduction

This chapter presents the discussion on the summary of the findings. This section discusses and compares the findings of the study and compares them with other findings on the published works on the subject.

5.2 Discussion of Findings

5.2.1 Discussion on Socio-Demographic Determinants of Length of Stay for Neonates

The chi-square analysis, however, revealed that among these determinants, only the age and occupation of the mother demonstrated a statistically significant effect on LOS for neonates. This implies that maternal age plays a crucial role in influencing the duration of neonatal hospitalization. The finding aligns with the broader understanding that maternal age can impact LOS for neonates, possibly through its association with maternal health, experience, and access to resources. The study revealed a significant association between occupation and LOS. Occupation has been found to play a role in the socio-economic status of the households. The World Health Organization (WHO, 2018a) highlights the role of poor parental socio-economic status as a significant contributor to extended hospital stays. This agrees with the specific findings of this study but underscores the complex interplay of determinants influencing LOS for neonates. It emphasizes the importance of considering the broader socio-economic context, beyond the variables examined in this study, to comprehend the dynamics affecting the length of neonatal hospitalization.

The research of Wycliffe et al. (2021) suggests a relationship between longer hospital stays and increased financial strain due to hospital costs, as well as heightened emotional distress. The findings partially agree with other research studies, such as those conducted by Andegiorgish et al. (2020), Baniasadi et al. (2019), Kato et al. (2021), and Tekelab et al. (2019), have reported associations with determinants like poor socio-economic status. However, research by Baniasadi et al. (2019) and Kato et al. (2021) found residence and maternal education to significantly influence LOS, thus contradicting the findings of the current study. These divergent findings underscore the heterogeneity in neonatal populations and healthcare contexts. Moreover, discrepancies with other studies highlight the importance of acknowledging the variability in healthcare settings, populations, and methodologies when interpreting findings across different research endeavors.

5.2.2 Discussion on Institutional Determinants of Length of Stay for Neonates

The institutional determinants examined in this study, including distance from the health facility, quality of service, and staff attitude, demonstrated a significant association with LOS for neonates. The chi-square analysis underscored these institutional determinants' impact on neonates' LOS, with the mode of transport to the facility being the only exception. This suggests that the geographical proximity to the health facility, perceived service quality, and staff attitudes collectively influence the duration of hospitalization. In the multivariate analysis, after adjusting for other determinants, only quality of service and staff attitude remained statistically significantly associated with the LOS. This finding echoes the results of Orsido et al. (2019), who conducted a study in Southern Ethiopia and identified quality of service as a crucial institutional factor influencing LOS for neonates. The importance of quality and skilled care in reducing the LOS at neonatal

units is emphasized by Obsa et al. (2017), aligning with the current study's findings. This suggests that providing high-quality care by healthcare professionals can potentially streamline the hospitalization process for neonates.

Moreover, Baniasadi et al. (2019) highlighted the impact of specialist doctors on reducing the average LOS in hospitals. This resonates with the current study's emphasis on staff attitude as a significant factor influencing LOS for neonates. The literature also suggests that Information and Communication Technology (ICT), such as telemedicine and tele-counseling, can facilitate the role of healthcare professionals in enhancing the quality of care and subsequently influencing the duration of hospitalization (Baniasadi et al., 2019). Comparatively, these findings align with a growing body of evidence emphasizing the pivotal role of institutional determinants in LOS for neonates. However, the specific focus on quality of service and staff attitude as independent contributors to the LOS adds nuance to the existing literature. It highlights the need for healthcare facilities to prioritize not only the availability of specialized medical personnel but also the quality of healthcare and the attitudes of the healthcare staff.

5.2.3 Discussion on Maternal Risk Determinants of Length of Stay for Neonates

Examining maternal risk determinants in this study revealed that the number of antenatal care (ANC) visits and the delivery mode were independently linked with the LOS. The chi-square analysis further highlighted the significant impact of all maternal risk determinants on LOS for neonates. The multivariate analysis confirmed that ANC visits remained statistically significantly associated with the LOS. These findings suggest that maternal determinants, encompassing parity, pregnancy interval, comorbidity, number of

ANC visits, obstetric complications, and mode of delivery, collectively contribute to determining the duration of hospitalization. The emphasis on the number of ANC visits aligns with the results of previous studies. For instance, Orsido et al. (2019) identified poor or no ANC as a contributing factor to neonatal LOS in a study conducted in Southern Ethiopia. The current study's consistent finding underscores the crucial role of adequate antenatal care in promoting positive LOS for neonates.

Comparisons with other findings highlight the consistency of results regarding the importance of ANC visits in influencing LOS for neonates. The divergence in the association with the mode of delivery underlines the contextual nuances that influence these relationships. It is essential to recognize that healthcare practices, socio-economic determinants, and regional variations can impact the generalizability of findings across different studies. The focus on ANC visits as a significant determinant aligns with existing literature, emphasizing the universal importance of antenatal care in improving neonatal health. As maternal and neonatal care strategies continue to evolve, understanding the multifaceted nature of these risk determinants is crucial for implementing targeted interventions and optimizing LOS for neonates.

5.2.4 Discussion on Neonates Risk Determinants of Length of Stay for Neonates

The investigation into neonates' risk determinants in this study showed that complications during delivery, complications after delivery, gestation at delivery, and birth weight were independently associated with neonates' LOS. The chi-square analysis reinforced these findings, highlighting the statistically significant impact of various neonatal risk determinants on both outcomes. The implication of low birth weight on the LOS suggests

that infants with lower birth weights tend to remain hospitalized until they attain a weight considered appropriate for their gestational age. This aligns with previous research by Hilaire et al. (2021), which underscores the significance of weight-related considerations in neonatal care. Studies conducted in the African region, including those by Abdul-Mumin et al. (2020) and Andegiorgish et al. (2020), have consistently reported lower survival rates for extremely and very low birth weight neonates than studies in more developed regions.

The association between increasing gestational age and decreased LOS is consistent with findings from Andegiorgish et al. (2020). The current study's observation that short-term babies had significantly shorter stays compared to preterm babies is in line with Alebachew Bayih et al.'s (2019) report of longer stays in an Eritrean Hospital's neonatal unit with decreasing gestational age. Global analyses, such as those by Upadhyay et al. (2018), also support the idea that preterm and low birth weight infants face elevated LOS during neonatal and post-neonatal periods.

While this study did not find an association between birth asphyxia and neonates' LOS, it is noteworthy that other investigations, including those by Elmi Farah et al. (2018) and Eyeberu et al. (2021), have reported significant associations. The lack of consensus across studies underscores the complex and multifactorial nature of LOS for neonates, where various risk determinants interact in diverse ways. The findings regarding neonatal risk determinants emphasize the intricate relationship between complications during and after delivery, birth weight, and gestational age with LOS for neonates. The emphasis on birth weight as a significant predictor aligns with global trends, while the varying associations reported in other studies highlight the importance of considering regional

and contextual differences.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusion, recommendations, and suggestions for further research. The conclusions and recommendations are based on the study. Finally, the chapter provides suggestions for future research.

6.1 Conclusion

The study's conclusions highlight significant associations between various determinants and LOS for neonates. Regarding socio-demographic and economic determinants, the study concludes that age and occupation were independently associated with LOS. The lack of association with other socio-demographic factors could stem from a homogeneity in socio-economic backgrounds among the women, suggesting little variability in their characteristics. Alternatively, it might underscore the need for more measures or additional variables to effectively capture the socio-economic influences on the duration of hospitalization.

On institutional determinants, the study finds that the distance from the health facility, quality of service, and staff attitude were associated with LOS for neonates. The scarcity and unavailability of specialized care, crucial for neonates in the newborn unit, may contribute to these associations. The quality of care, particularly the continuity of treatment facilitated by skilled healthcare personnel, emerges as a key determinant. These findings emphasize the critical role that accessible, specialized care and a positive healthcare environment play in influencing LOS for neonates, calling for targeted

interventions to address these institutional determinants.

Concerning maternal risk determinants, the study identifies the number of ANC visits and mode of delivery as determinants associated with LOS for neonates. The association with the number of ANC visits may be attributed to a potential lack of education among women, leading to limited knowledge about health matters during pregnancy. In the case of the mode of delivery, the expectation of a longer stay for cesarean sections aligns with the surgical nature of the procedure. These conclusions underscore the importance of educational programs focusing on antenatal care and the potential need for additional support for women undergoing cesarean sections to manage their hospitalization effectively.

Lastly, on neonates' risk determinants, the study reveals associations between complications during and after delivery, gestation at delivery, and LOS for neonates. As suggested by the findings, the lack of ANC visits might contribute to increased risks leading to complications during and after delivery. This highlights the critical role of early and regular antenatal care in mitigating risks and improving LOS for neonates. The conclusions draw attention to the need for targeted interventions addressing neonatal risk determinants, particularly emphasizing the importance of adequate ANC.

6.2 Recommendations from the Study

The study recommends implementing comprehensive maternal education programs within hospitals to enhance maternal health literacy and promote proactive healthcare-seeking behaviors. Educating mothers about prenatal care, neonatal health signs, and early intervention measures can significantly reduce the incidence of preventable

complications that prolong hospital stays. By empowering mothers with knowledge and skills to identify and address potential health issues early on, hospitals can foster a proactive healthcare environment that enhances neonatal outcomes and shortens hospitalization durations. Furthermore, the study recommends optimizing hospital resources and infrastructure to ensure timely and efficient delivery of neonatal care services. Hospitals should prioritize investment in neonatal intensive care units (NICUs), medical equipment, and staffing levels to meet the needs of neonates requiring specialized care. By enhancing capacity and capability within NICUs, hospitals can minimize delays in treatment, streamline medical interventions, and ultimately reduce the length of stay for neonates.

Additionally, establishing protocols for rapid response and multidisciplinary team collaboration can further expedite decision-making processes and enhance the overall efficiency of neonatal care delivery. In addition, the study recommends implementing standardized clinical protocols and guidelines for neonatal care management across hospital departments. By adopting evidence-based practices and standardized care pathways, hospitals can improve treatment consistency, reduce medical decision-making variability, and enhance neonates' clinical outcomes. Standardized protocols can also facilitate more effective communication and coordination among healthcare providers, ensuring comprehensive care delivery and timely interventions that mitigate risks and complications associated with prolonged hospital stays.

The study recommends fostering a supportive, inclusive care environment that prioritizes principles of family-centered care. Hospitals should encourage parental involvement in neonatal care decision-making and provide adequate support services such as counseling,

breastfeeding support, and discharge planning. Engaging families as care partners promotes bonding and emotional well-being and empowers parents to participate in their child's recovery process actively. By integrating family-centered care approaches into clinical practice, hospitals can enhance patient satisfaction, improve care continuity post-discharge, and potentially reduce readmission rates, contributing to shorter hospital stays for neonates.

The study recommends that facility management and county health departments provide workshops and continuous training for healthcare workers to improve patient care and reduce LOS for neonates. Training programs should focus on enhancing the management of patient complaints, improving service quality, and fostering a positive staff attitude. Well-trained healthcare workers are better equipped to handle neonatal emergencies and provide high-quality care, which can significantly reduce LOS. Continuous education ensures that healthcare providers are up-to-date with the latest medical practices and technologies, enhancing their ability to deliver effective treatments. This training can also address the specific needs of neonates and their mothers, ensuring that both receive comprehensive and compassionate care. Moreover, workshops can create a supportive environment where healthcare workers can share experiences and best practices, improving patient outcomes. By investing in the professional development of healthcare workers, the county can ensure a more efficient and patient-centered healthcare system. Ultimately, continuous training can lead to better healthcare services, improved neonatal outcomes, and reduced hospital stays.

The study recommends ensuring the availability of ambulances in healthcare facilities to provide timely emergency transportation and reduce LOS for neonates at WCRH.

Reliable ambulance services are critical for transporting neonates and mothers in emergencies, ensuring they receive prompt medical attention. Delays in transportation can lead to worsening health conditions, prolonging hospital stays, and increasing the risk of adverse outcomes. By prioritizing ambulance availability, healthcare facilities can significantly improve emergency response times, reducing the time it takes for patients to receive necessary care. This measure is particularly important in rural and remote areas where access to healthcare facilities may be limited. Timely emergency transportation can prevent complications from delayed medical interventions, reducing neonates' LOS. Additionally, having a well-equipped ambulance service enhances the overall emergency preparedness of healthcare facilities. Investing in ambulance services improves neonatal health outcomes and strengthens the county's healthcare infrastructure. Therefore, ensuring the availability of ambulances is crucial in reducing LOS for neonates at WCRH.

The study recommends mandatory counseling and education for pregnant mothers to promote antenatal care (ANC) attendance and reduce LOS for neonates. Counseling should emphasize the importance of regular ANC visits, which have been shown to reduce neonatal mortality and morbidity significantly. Pregnant women should be encouraged to attend at least four ANC visits to ensure comprehensive monitoring and care throughout their pregnancy. Education programs should cover potential risks during pregnancy, complications during delivery, and strategies for optimal maternal and neonatal health. By educating mothers on the importance of ANC, healthcare providers can identify and manage risk factors early, reducing the likelihood of complications that extend LOS for neonates. Mandatory counseling can also address misconceptions and

cultural barriers that may prevent women from seeking prenatal care. This proactive approach ensures pregnant women receive the necessary support and information to make informed health decisions. Educating and counseling expectant mothers can lead to healthier pregnancies, better neonatal outcomes, and shorter hospital stays.

The study recommends implementing community health education programs to raise awareness about maternal and neonatal health and reduce LOS for neonates at WCRH. These programs should focus on the importance of early healthcare-seeking behavior, proper prenatal nutrition, and the benefits of regular ANC visits. Community health workers can be vital in disseminating information and promoting positive health behaviors among pregnant women and new mothers. By engaging the community, healthcare providers can address socio-demographic determinants that impact health outcomes, such as education and awareness. Regular health education sessions can help mothers understand potential risks during pregnancy and childbirth and provide guidance on preventive measures and optimal infant care. This approach ensures that mothers are well informed and prepared for potential complications, reducing the risk of extended LOS for neonates. Additionally, community-based programs can foster a supportive environment where mothers can share experiences and receive peer support. Ultimately, community health education can lead to improved maternal and neonatal health, reducing the length of hospital stays and enhancing overall healthcare outcomes.

6.3 Suggestions for Further Research

Based on the study findings, the study suggests that the interplay of these determinants in different regions and cultural contexts would provide valuable insights. Conducting

comparative studies across diverse communities can unveil determinants that might not have been evident in the current study. Analyzing the impact of community-specific socio-economic dynamics on healthcare utilization and LOS for neonates could guide targeted interventions tailored to the unique needs of distinct populations.

Second, it is crucial to investigate the intricacies of healthcare delivery systems and institutional determinants. Further research could focus on assessing the implementation of healthcare policies, availability of resources, and variations in healthcare practices among different facilities. Investigating the specific elements of service quality that influence neonates' LOS and exploring how healthcare institutions can optimize staff attitudes and patient care would enhance the overall quality of neonatal care.

Lastly, additional studies could explore maternal mental health and its implications on LOS for neonates. Understanding the prevalence and impact of maternal stress, anxiety, and depression during pregnancy and postpartum could provide a more comprehensive picture of the determinants influencing neonatal health. Research in this area could inform the development of interventions to support maternal mental well-being, consequently positively affecting LOS for neonates. Furthermore, exploring innovative strategies for community-based mental health support and integrating mental health considerations into routine maternal care practices could be areas of fruitful investigation.

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APPENDICES

Appendix I: Informed Consent Form

TITLE OF THE STUDY: Determinants associated with LOS among neonates admitted to the NBU of WCRH.

PRINCIPAL_ INVESTIGATOR

Name: Dr. Sheikh Daud Abdi

Department: Public Health

Address: P.O. Box 1511 Nairobi

Phone: 0722241655

Email: drdaudis@gmail.com

PURPOSE OF STUDY

The main purpose of this study is to assess the determinants associated with LOS among neonates admitted to the NBU of WCRH.

STUDY PROCEDURES

If you agree to participate in this study, we will take you through a structured questionnaire regarding your social, demographic and economic status. We will also ask you questions regarding your LOS at this hospital and also your neonate baby. The interview is expected to take 10 minutes of your time.

RISKS

There are no direct or indirect risks to you or your family as a result of your participation in this study. However, if as a result of participation leads to experiencing of discomforts, you are allowed to not respond to any or all items and you may voluntary terminate participation any time.

BENEFITS

There may be no immediate direct benefits to you from participating in this study. However, the_ information you provide will help the government and other stakeholders in the health sector to formulate policies and strategies to effectively deliver quality healthcare services to the communities living in this region.

REIMBURSEMENTS

There will be no reimbursements as the interview will be conducted at the health facility.

CONFIDENTIALITY

To help us maintain confidentiality, you should not enter your name or identification in any position of this data collection form. Any data collected regarding you will not be published in any form of findings or presented to third parties.

COMPENSATION

There will be no compensation as the interview will be conducted at the health facility.

CONTACT INFORMATION

Provided on the introductory page is the contact detail of the principal investigator. Any questions about the study or experiences of adverse effects due to participation in the study may be channeled there. Questions regarding your rights as a respondent or in case there may arise problems which you may be uncomfortable discussing with the principal investigator, kindly contact the AMREF Institutional Review Board.

VOLUNTARY PARTICIPATION

Your partaking in this study is considered voluntary. Agreeing to take part in the study will lead to you being asked to sign the consent form. However, you can withdraw at any time from the study with no reasons being given without affecting any relationship that you may have with the researcher. Any concerns or questions related to the study may be forwarded to the researcher at Phone Number 0722241655 or email: drdaudis@gmail.com

The AMREF Scientific and Ethics Review Committee has reviewed and approved this research. It is a national body that reviews scientific research protocols and scientists' conducts so as to protect all parties' rights. Any questions regarding you as a research participant may be channeled to the contact:

The Chair, AMREF Scientific and Ethics Review Committee (ESRC)

P.O._ Box_ 30125_ –_ 00100,_ Nairobi,_ Kenya

Email: esrc.kenya@amref.org Tel: +254 (0)20 699 4000 Fax: +254 (0)20 699 2531

CONSENT

Having read and understood the information provided and having had the chance to ask

questions, I understand that participation in the study is voluntary and that I can freely withdraw at any time from the study without any reason being given and with no cost being incurred. I understand that this consent form copy will be availed. I agree taking part in the study voluntarily.

Participant's signature_ _____Date_ _____

Investigator's signature_ _____ Date_

_____

Appendix II: Foomka Oggolaanshaha La Wargeliyay

1. **CINWAANKA DARAASADDA:** Qiimaynta arrimaha la xidhiidha mudada joogitaanka iyo dhimashada dhallaanka ee dhallaanka la seexiyay xarunta dallaanka ee isbitalka weyn ee ismaamulka Wajeer

2. **BAARAHA UGU WEYN**

   Magaca: Dr Sheikh Daud Abdi

   Waaxda: Caafimaadka Dadweynaha

   Cinwaanka: P.O. Box 10051-00100 Nairobi

   Telefanka: 0722241655

   Email ka: drdaudis@gmail.com

3. **UJEEDADA DARAASADDA**

Ujeedada daraasaddan ayaa ah in la qiimeeyo arrimaha la xidhiidha mudada joogitaanka iyo dhimashada dhallaanka la soo seexiyo Xarunta Dhallaanka iyo Waadhka Carruurta ee Cisbitaalka Weyn ee Degmada Wajeer.

4. **QABKA DARAASADDA**

Haddii aad ogolaato inaad ka qaybgasho daraasaddan, waxaanu kugula socon doonaa xog0ururinta habaysan ee ku saabsan heerkaaga bulshada, degaanka iyo dhaqaale. Waxaan sidoo kale ku weydiin doonaa su'aalo ku saabsan muddada aad joogtid isbitaalkan iyo sidoo kale dhallaanka. Wareysiga waxaa la filayaa inuu qaato muuda 30 daqiiqo ah.

5. **Khatarta**

Ma jiraan khatar toos ah ama mid aan toos ahayn oo adiga ama qoyskaaga ka oo gaari karto sababa la xiriio ka qaybgalkaaga daraasaddan. Si kastaba ha noqotee, haddii aad la kulanto wax dhib ah oo ka dhashay su'aalaha la weydiiyay, waxaad diidi kartaa inaad ka jawaabto qeyb ama dhammaan su'aalaha waxaadna joojin kartaa ka qeybgalkaaga wakhti kasta

haddii aad sidaasi doorato.

6. FAA'IIDOOYINKA

Waxa laga yaabaa inaanay jirin faa'iidooyin toos ah oo degdeg ah oo aad ka heleysid ka qaybqaadashada daraasaddan. Si kastaba ha ahaatee, macluumaadka aad bixiso waxay ka caawin doontaa dawladda iyo daneeyayaasha kale ee waaxda caafimaadka si ay u dejiyaan siyaasado iyo xeelado si wax ku ool ah u gaarsiiyo adeeg caafimaad oo tayo leh bulshooyinka ku nool gobolkan.

7. LACAG CELIN

Ma jiri doonto wax lacag celin ah maadaama wareysiga lagu qaban doono xarunta caafimaadka.

8. Sirta

Si loo ilaaliyo sirta, magacaaga laguma qori doono meel kasta oo ka mid ah foomka xog ururinta mana lagu xiriirini doono daabacaad ama bandhig kasta oo isticmaalaya macluumaadka iyo xogta lagaa ururiyay adiga ama natiijooyinka cilmi-baarista ee daraasaddan.

9. Magdhow

Ma jiri doonto wax magdhow ah maadaama waraysiga lagu qaadayo xarunta caafimaadka.

10. MACLUUMAADKA SOO XIRIIRKA

Macluumaadka xiriirka waxaa lagu bixiye bogga koowaad. Haddii aad wax su'aalo ah ka qabtid wakhti kasta oo ku saabsan daraasaddan, ama aad la kulanto saameyn liddi ku ah natiijada ka qaybqaadashada daraasaddan, waxaad la xidhiidhi kartaa baaraha ugu weyn. Haddii aad qabto su'aalo ku saabsan xuquuqdaada ka qaybgale cilmi-baadhis ahaan, ama haddii ay jiraan dhibaatooyin aadan rabin inaad kala hadashid baaraha ugu weyn, fadlan la xidhiidh Hay'adda AMREF Internationa, Guddiga Dib-u-eegista.

11. KA QAYB QAADASHADA IKHTIYAARIGA AH

Ka qayb qaadashadaada daraasaddan waa ikhtiyaari. Haddii aad ogolaato inaad ka qayb qaadato daraasaddan, waxaa lagu weydiin doonaa inaad saxiixdo foomka oggolaanshaha. Si kastaba ha ahaatee, wali waxaad xor u tahay inaad ka laabato wakhti kasta adoon bixin sabab. Ka noqoshada daraasaddan wax saameyn ah kuma yeelan doonto xiriirka aad la leedahay cilmi-baadhaha.

Haddii aad leedahay wax su'aal ah ama walaac ku saabsan daraasadda, waxaad xor u tahay inaad la xiriirto baaraha ugu weyn daraasaddan 0722241655 ama email ka: drdaudis@gmail.com

Cilmi-baaristan waxaa dib u eegis ku sameeyay oo na ansixiyay Guddiga Dib-u-eegista Sayniska iyo Anshaxa ee AMREF - waa hay'ad qaran oo dib u eegis ku sameeya borotokoolka cilmi-baarista sayniska iyo hab-dhaqanka saynisyahannada si loo ilaaliyo dhammaan xuquuqda dhinacyada ka la duwan. Haddii aad qabto wax su'aalo ah oo ku saabsan xuquuqdaada ka qaybgalaha cilmi-baarista, waxaad la xiriiri kartaa:

Guddoomiyaha, Guddiga Dib-u-eegista Sayniska iyo Anshaxa AMREF (ESRC)

Sanduuqa Boostada 30125 – 00100, Nairobi, Kenya

Email ka: esrc.kenya@amref.org Tel: +254 (0)20 699 4000 Fakis: +254 (0) 20 699 2531

12. OGOLAANSHAHA

Waan akhriyay oo waan fahmay macluumaadka la bixiyay waxaanan fursad u helay inaan su'aalo ka weydiiyo. Waxaan fahamsanahay in ka-qaybgalkaygu uu yahay mid ikhtiyaari ah oo aan xor u ahay inaan ka noqdo wakhti kasta, anigoon sabab sheegin oo aan wax kharash ah bixinin. Waxaan fahamsanahay in la ii siin doono koobiga foomkan oggolaanshaha. Waxaan si ikhtiyaari ah u aqbalay inaan ka qayb qaato daraasaddan.

Saxeexa ka qaybqaataha _____ Taariikhda _____

Saxeexa baaraha _____ Taariikhda _____

Appendix III: Questionnaire for Mothers

DETERMINANTS LENGTH OF STAY AMONG NEONATES ADMITTED TO THE NBU OF WCRH

County	Wajir	**Constituency**	Wajir East
Ward	Township	**Date**	dd-mm-yyyy

1 Socio, demographic and economic determinants (To be completed fully)	
1.1 Residence	1. Rural ☐ 2. Urban ☐
1.2 Age of mother	Age (years) _____
1.3 Religion	1. Christian ☐ 2. Islam ☐ 3. Other ☐
1.4 Highest level of education	1. No formal Education ☐ 2. Primary ☐ 3. Secondary ☐ 4. College ☐ 5. University ☐
1.5 Marital Status	1. Single ☐

	2. Married ☐ 3. Divorced ☐ 4. Widowed ☐
1.6 Occupation Status	1. Unemployed ☐ 2. Self-employed ☐ 3. Employed ☐
1.7 Main source of income	1. Employment (Salaried) ☐ 2. Business ☐ 3. Sale of livestock ☐ 4. Donations ☐ 5. Remittances ☐
2 Institutional Determinants	
2.1 What is the distance from your home to this Hospital?	1. less than 1km ☐ 2. 2-3Km ☐ 3. 4-5 Km ☐ 4. 5 – 6 Km ☐ 5. More than 7 Km ☐
2.2 What mode of transport did you use to this hospital?	1. Walk ☐ 2. Taxi ☐ 3. Tuktuk ☐ 4. Bodaboda ☐
2.3 Why did you choose to come to this health facility?	Select all that apply.

	1. Availability of drugs ☐ 2. Availability of healthcare personnel ☐ 3. Availability of specialized equipment ☐ 4. I had no other alternative ☐
2.4 Quality of service	1. Very Poor ☐ 2. Poor ☐ 3. Neutral ☐ 4. Good ☐ 5. Very Good ☐
2.5 Staff attitude	1. Very friendly ☐ 2. Friendly ☐ 3. Neutral ☐ 4. Hostile ☐ 5. Very Hostile ☐
3 Maternal Risk Determinants	
3.1 Birth order of new born	1. First ☐ 2. Second ☐ 3. Third ☐ 4. Fourth ☐ 5. Enter the birth order ☐
3.2 Birth interval	1. Less than 6 months ☐ 2. 9 months ☐ 3. One year ☐

	4. Two years ☐ 5. Three years ☐ 6. More than 4 years ☐
3.3 Lifestyle – Do you engage in any of the following?	1. Smoking ☐ 2. Drinking of alcohol ☐ 3. Chewing Miraa ☐
3.4 Do you suffer from any of the following diseases?	1. Hypertension ☐ 2. Diabetes ☐ 3. Heart ☐ 4. Kidney ☐
3.5 During your pregnancy, were you diagnosed with any of the following diseases?	1. Pregnancy induced Hypertension ☐ 2. Diabetes ☐ 3. Heart ☐ 4. Kidney ☐
3.6 Did you attend all the Antenatal clinics throughout your pregnancy?	1. Yes ☐ 2. Sometimes ☐ 3. Not at all ☐
3.7 If no, why?	1. Hospital is far ☐ 2. Not important ☐ 3. Busy schedule ☐ 4. I had no problem ☐ 5. I don't Know about ANC ☐

3.8 Did you have multiple gestation	1. Yes ☐ 2. No ☐
3.9 If yes, how many	------
3.10 Record medical diagnosis of maternal risk determinants	1. Placental disorder/abruption ☐ 2. Antepartum hemorrhage ☐ 3. IUGR ☐ 4. PROM ☐ 5. Pre-term delivery ☐
3.11 Obstetric complications	1. Incompetent cervix 2. Pregnancy-induced hypertension 3. Maternal infection/Choriamnionitis
3.12 Mode of delivery	1. SVD 2. CS
4 Neonates Risk Determinants	
4.1 Date of birth (DOB)	------
4.2 Gender of the neonate	1. Male ☐ 2. Female ☐
4.3 Any complications during pregnancy?	1. Yes ☐ 2. No ☐
4.4 Any complications after delivery?	1. Yes ☐ 2. No ☐
4.5 Gestation period for child when born (in weeks)	… .....Weeks

4.6 Weight at birth (in Kg)	… .....Kgs
4.7 Was the child born with any complications?	1. Yes ☐ 2. No ☐
4.8 Did the child develop complications after birth?	1. Yes ☐ 2. No ☐
4.9 What was the reason for first admission?	……..
4.10 Size of child at birth	1. Small ☐ 2. Average ☐ 3. Large ☐
4.11 Record the medical diagnosis of the neonate	1. Congenital anomalies ☐ 2. Meconium aspiration ☐ 3. Perinatal asphyxia ☐ 4. Neonatal sepsis ☐ 5. Respiratory distress syndrome ☐ 6. Pulmonary hemorrhage ☐ 7. Persistent pulmonary hypertension ☐ 8. Pneumonia ☐

Appendix IV: Secondary Data Checklist

Clinical Characteristics of the Mothers

1. Parity

Primi [ ]

Multi [ ]

Grand multi [ ]

2. Previous delivery location

At health facility [ ]

Not at health facility [ ]

If not at heath facility, indicate where…….

3. Pregnancy interval

<2 years [ ]

≥ 2 years [ ]

NA (Primi) [ ]

4. Comorbidity

Hypertension [ ]

Kidney disease [ ]

None [ ]

5. Diagnosis during pregnancy

Pregnancy induced hypertension [ ]

Kidney disease [ ]

None [ ]

6. Number of ANC visits

≥ 4 [ ]

< 4 [ ]

7. Multiple gestation

Yes [ ]

No [ ]

8. Medical diagnosis of maternal risk determinants

Antepartum hemorrhage [ ]

PROM [ ]

Pre-term delivery [ ]

None [ ]

9. Obstetric complications

Incompetent cervix [ ]

Pregnancy induced hypertensions [ ]

NA [ ]

None [ ]

10. Mode of delivery

SVD [ ]

CS [ ]

Appendix V: Ethical and Scientific Review Committee Letter

amref health africa

Amref Health Africa In Kenya

REF: **AMREF** — ESRC P1076f2021 November 16, 2021

Sheikh Daud
Amref International University
P.O. Box 27691 — 00506
Nairobi, Kenya
Tell: 0722241655
Email: drdaudis@gmail.com

Dear Dr Daud,

RESEARCH PROTOCOL: DETERMINANTS OF LENGTH OF STAY AND MORTALITV AMONG NEONATES ADMITTED TO THE NEW BORN UNIT, WAJIR COUNTY **REFERRAL HOSPITAL, KENYA.**

Thank you for submitting your protocol to the Amref Ethics and Scientific Review Comminee (ESRC).

This is to inform you that the ESRC has reviewed and approved your protocol. Your application approval number is ESRC P1076-2021. The approval period is from November 16, 2021 to l'Jovember IS, 2022, and is subject to compliance with the following requirements:

a) Only approved documents (including informed consents, study instruments, advertising materials, material transfer agreements etc.) will be used.
b) All changes including (amendments, deviations, violations eto.) are submitted for review and approval by Ammr rsoc barer implementation.
c) Death and life-threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the Amref ESRC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect **safety** or welfare of study **participants** and others or affect the integrity of the research must be reported to Amref ESRC within 72 hours.
e) Clearance for export of biological specimen must be **obtained** from the relevant government authorities for each batch of shipmenVexport.
f) Submission of a **request** for renewal **of approval at least** 60 days prior to **expiry** of the **approval** period. Attach a comprehensive progress report to support the renewal.
g} In case of late renewal, the Amref ESRC shall not be held responsible for any severe adverse events (SAEs) that may occur as a **result** of research activities that were carried out after the expiry of approval.
h) Submission of an executive summary rtport within 90 days upon **completion** of the study to the Amref ESRC.
i) All government regulations for prevention and control of the spread of COVID-19 including social distancing, provision of personal protective equipment for participants and research assistants should be adhered to during data collection. All research assistants should be monitored for COVID 19 symptoms and referred for testing in case they present with symptoms.

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. eo ke and also obtain other clearances needed.

Please do not hesitate to contact the ESRC Secretariat (esrc.kenya@.amref.org) for any clarification or query.

Yours sincerely,

AMREF - ESRC
NOV 2021
P.O. Box 30125-00100, NAIROBI

Prof. Mohamed Karama
Chair, Amref ESRC
CC: Samuel Muhula, Monitoring & Evaluation and Research Manager, Amref Health Africa in Kenya.

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Appendix VI: Approval Letter from Wajir County Referral Hospital

COUNTY GOVERNMENT OF WAJIR

DEPARTMENT OF MEDICAL SERVICES, PUBLIC HEALTH AND SANITATION

When replying, please
Quote our Ref & Date

P O Box 2 – 70200
WAJIR

Ref:WCRH/ADM/HR/VOL5(14)21 **7th April 2023**

Dr.Sheikh Daud
Amref lntemational University
P.O. Box 27691 - 00506
Nairobi, Kenya
Tell:0722241655
Email: drdaudis@gmail.com

Dear Dr Daud,

RESEARCH PROTOCOL: DETERMINANTS OF LENGTH OF STAY AND MORTALITY AMONG NEONATES ADMITTED TO THE NEW BORN UNJT, WAJIR COUNTY REFERRAL HOSPITAL, KENYA.

Thank you for submitting your protocol to the county government of Wajir
.
This is to inform you that the committee has reviewed and approved your protocol and is subject to compliance with the following requirements:

- All government regulations for prevention and control of the spread of COVID-19 including social distancing, provision of personal protective equipment for participants and research assistants should be adhered to during data collection. All research assistants should be monitored for COVID 19 symptoms and referred for testing in case they present with symptoms.
- You will be required to present the report of your research to the county director of health.

Roble Hassan

For CEO

Wajir county referral hospital

Appendix VII: Study Site (Wajir County Referral Hospital)

Appendix VIII: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE TECHNOLOGY & INNOVATION

Ref No. 332437

Date of Issue: 02/July/2024

RESEARCH LICENSE

This is to Certify that Dr. Daud Abdi Sheikh of Amref International University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Wajir on the topic: DETERMINANTS OF LENGTH OF STAY AND MORTALITY AMONG NEONATES ADMITTED TO THE NEW BORN UNIT, WAJIR COUNTY REFERRAL HOSPITAL, KENYA for the period ending: 02/July/2025.

License No: NACOSTI/P/24/36835

332437

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE TECHNOLOGY & INNOVATION

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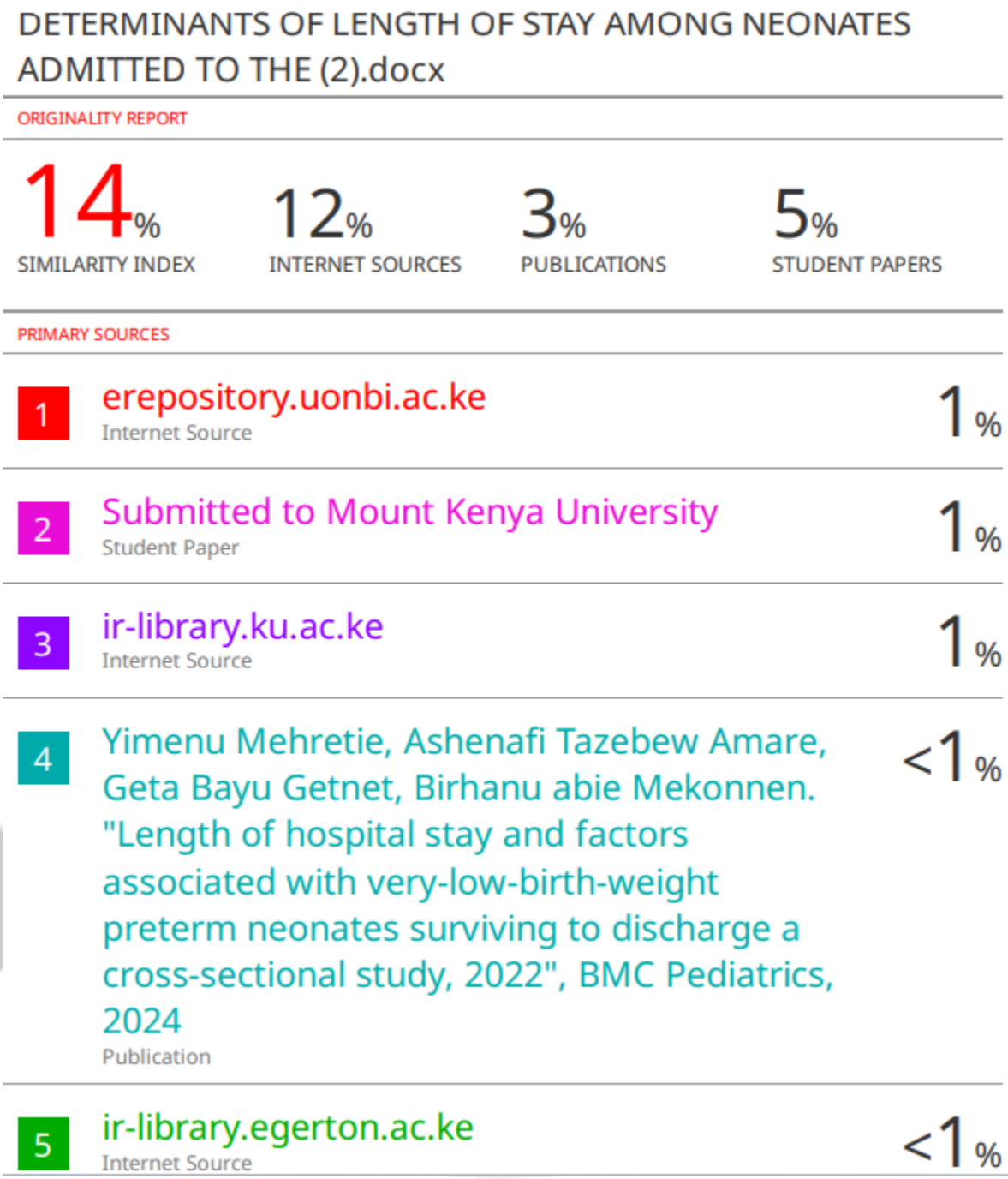
Appendix IX: Similarity Index Report



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5	ir-library.egerton.ac.ke Internet Source	<1%

Appendix X: Evidence of Publication

Sheikh, D. A., Lakati, A., & Ongeso, A. (2022). Determinants of length of stay and mortality among neonates admitted to the newborn unit, Wajir County Referral Hospital, Kenya. *African Journal of Emerging Issues*, *4*(10), 46 - 63. Retrieved from https://ajoeijournals.org/sys/index.php/ajoei/article/view/336