**KAIRUKI UNIVERSITY**

**SCHOOL OF MEDICINE**

**DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH**

# EARLY MORTALITY AND ASSOCIATED FACTORS AMONG PRETERM NEONATES ADMITTED AT PUBLIC REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA.

By

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## CERTIFICATION

It is hereby certifying that the undersigned have read and hereby recommends for acceptance by Kairuki University, a dissertation titled***: "EARLY MORTALITY AND ASSOCIATED FACTORS AMONG PRETERM NEONATES ADMITTED AT PUBLIC REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA"*** submitted in partial fulfillment of the requirements for the degree of Master of Medicine in Paediatrics and Child Health.

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## ACKNOWLEDGEMENT AND DEDICATION

First, I thank God for his blessings during my research, which enabled me to successfully finish the project. I am deeply grateful to my research supervisors, Dr. Maulidi Fataki and Dr. Florence S. Kalabamu, for their invaluable guidance and support throughout this research. Their encouragement and expert advice have been instrumental in the success of this investigation. Thirdly, I am deeply grateful to the Temeke, Amana, and Mwananyamala Regional referral hospitals in Dar-es-Salaam. Their exceptional cooperation and provision of necessary resources have been crucial to the successful implementation of this study. I am also indebted to the participants, whose willingness to share their time and experience has made this research possible. Fourth, I am immensely grateful to my parents, husband and son for their unwavering love, understanding, prayers, and continuous support. Your presence and encouragement have played a crucial role in helping me finish my study. Finally, but not least, I would like to give special gratitude to my fellow students and all the people who contributed indirectly or directly to my research. Your insights, discussions, and contributions have enriched this research, and I am truly grateful for your support.

## DEDICATION

Personally, I would like to dedicate this project to my Parents/family who have been my constant source of love, support and inspiration through my academic journey. Thanks for being a part of my academic journey and for helping me to achieve my goals.

## ABSTRACT

**Background**: Approximately 22% of neonates in Tanzania are born prematurely which increases the possibility of early death. However, the early mortality of preterm birth and associated factors are not well understood. This study was conducted to determine the early clinical outcome and associated factors among preterm neonates born in Regional Referral Hospitals in Dar es Salaam, Tanzania. Understanding the magnitude and the associated factors can lead to improvement in quality of care with subsequent reduction of mortality among preterm neonates.

**Objectives:** The broad objective of the study was to determine the early mortality and associated factors among preterm neonates born in Regional Referral Hospitals in Dar es Salaam, Tanzania

**Methodology**: This was a descriptive longitudinal study conducted in Dar es Salaam Regional Referral Hospitals. Participants were enrolled consecutively after meeting the eligibility criteria and were followed-up for seven days post-delivery to determine early neonatal outcome. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 28.0 (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp). Chi-square test or Fisher's exact test were used to compare categorical variables while binary logistic regression was used to identify factors associated with early mortality among the preterm neonates.

**Results**: A total of 216 preterm neonates who were enrolled in the study were involved in final data analysis. Among these, 35 (16.2%) neonates died within the first seven days of life. The most common causes of deaths were respiratory distress syndrome in 21 (61.8%) neonates and sepsis in 8 (23%) neonates. Seventy-two (33.3%) neonates were admitted due to respiratory distress syndrome

and anaemia. The presence of hypoglycaemia (AOR=3.4 (1.08–10.94 and p-value =0.04); extreme and very low birth weight (AOR=5.56 (1.36–22.67 and p-value=0.02) and need for resuscitation at birth (AOR=7.4 (1.2-44.5 and p-value =0.03) were factors associated with early neonatal mortality.

**Conclusions**: The magnitude of early neonatal mortality among preterm neonates was relatively high with respiratory distress syndrome and sepsis being the leading causes of mortality. Additionally, extreme and very low birth weight; hypoglycaemia and need for resuscitation at birth were the factors associated with early neonatal mortality.

**Recommendations:** To reduce early neonatal deaths, it is important to quickly identify and treat respiratory distress syndrome and sepsis in preterm babies. Additionally, focusing on babies with extreme- and very low birth weight, low blood sugar, and those needing help to initiate spontaneous breathing at birth can improve the chances of survival.

*Key words: preterm neonate, respiratory distress syndrome, neonatal sepsis, extreme and very low birth weight*

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ANC | Ante-Natal Care |
| APH | Ante Partum Haemorrhage |
| bCPAP | Bubble continuous positive airway pressure |
| CI | Confidence Interval |
| HIV | Human Immunodeficient Virus |
| KU | Kairuki University |
| HT | Hypertension |
| IRB | Institutional of Review Board |
| IVH | Intraventricular Hemorrhage |
| MNH | Muhimbili National Hospital |
| OR | Odds Ratio |
| PI | Principal Investigator |
| SGA | Small for Gestational Age |

## DEFINITION OF TERMS

Extremely low birth weight (ELBW) - Birth weight of a newborn less than 1000 g

Very low birth weight (VLBW) - Birth weight of a newborn less than 1500 g

Low birth weight (LBW) - Birth weight of a newborn less than 2500 g

Preterm: Defined as newborns who are delivered alive before the complete 37 weeks of gestation (1).

Moderate to late preterm: Birth between 32- 37 completed weeks of gestation (1).

Very preterm: Babies born between 28 to less than 32 completed weeks of gestation (1).

Extremely preterm: Birth less than 28 completed weeks of gestation (1).

Small Vulnerable Newborns (SVNs): Includes three categories of neonates -Preterm birth, small for gestation age and low birth weight.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

Approximately 35 million neonates are born prematurely (before 37 weeks of gestation), small for gestational age, and with low birth weights (less than 2,500 grams) each year. The survival prospects of small vulnerable neonates (SVNs) are significantly lower. In 2020, SVNs accounted for almost half (55·3%) of the 2·4 million neonatal deaths. More than 60% of preterm births occur in sub-Saharan Africa and South Asia, but more than half of these births now occur in hospitals (2).

In 2019, almost 15 million neonates were born prematurely across 184 countries. In Tanzania, approximately 236,000 neonates are born prematurely every year, approximately one in every nine live births (3). Preterm birth leads to approximately 9,400 infant deaths each year (3). Preterm birth can significantly impact child's development and overall health, both during childhood and adulthood. It is the main factor contributing to neonatal deaths, accounting for 35% of deaths worldwide annually and is the second most common cause of death among children less than five years old (4). Nearly one million neonates die annually as a result of preterm birth (5). Preterm birth causes one in four neonatal deaths and birth complications in Tanzania (6). Preterm neonates are approximately seven times more likely to die within the first four weeks of life than full term neonates (4, 7). Reducing the global neonatal mortality rate involves implementing various strategies. A recent UN report shows a 48% decrease in neonatal mortality from 1990 to 2013, with 28 deaths per 1,000 live births in 2013 (8). Undernourishment has also decreased by

48%. In developing countries, most preterm births occur after 32 weeks of gestation (4).

Risk factors for early deaths in preterm neonates are multifactorial. Identified maternal

factors include low socio-economic status, young age, low level of education, micronutrients and macronutrient deficiency and history of infections during pregnancy (9, 10). Neonatal factors include low gestation age, low birth weight, poor feeding, hypothermia, hypoglycaemia, and respiratory distress (11).

Additionally, not delivering at health facilities, inadequate supply of supportive medical equipment and the quality of care are factors associated with neonatal deaths (12). However, these factors differ from one context or settings to another, warranting the need to conduct research on the prevailing factors in local context. To improve early neonatal mortality rates in the developing countries, it is crucial to widen the research scope to referral health facilities in major cities like Dar es Salaam. Additionally, analyzing death patterns and causes in preterm neonates throughout the neonatal period is essential. This study focused on determining early neonatal outcome and factors associated with early mortality (the first seven days of life) among neonates in public Regional Referral Hospitals located within Dar es Salaam, Tanzania.

### 1.2 Problem statement

Every day, 106 neonates die before they reach the first month of life, according to the World Health Organization (9). In the United Republic of Tanzania, 19 out of every 1,000 babies born alive die before their first month of life (9). Of these

deaths, 78.1% happen within the first seven days of life (9). The main reasons for newborn death are preterm birth which accounts for 24% of deaths, neonatal sepsis, birth asphyxia, haemorrhagic disease of the newborn, and congenital anomalies (10). While some documentation exists on neonatal deaths in our setting (3, 7, 9–14), there is still a lack of comprehensive data analysing the patterns of preterm neonatal deaths and early complications. This deficiency hinders the development of targeted interventions relevant to our community. Conducting such studies can significantly improve neonatal care by identifying key factors contributing to early neonatal mortality. This knowledge can help develop targeted interventions, improve clinical practices, and ultimately reduce the mortality rates of preterm neonates in Tanzania.

This study determined the early outcome and factors associated with early neonatal mortality among preterm neonates in public Regional Referral Hospitals in Dar es Salaam, Tanzania. Identifying these factors in the local context is crucial for developing effective mitigation strategies that are tailored to the specific needs and resources of our community.

### 1.3 Study objectives

#### 1.3.1 Broad objective

The broad objective is to determine the early mortality and associated factors among preterm neonates delivered in public Regional Referral Hospitals in Dar es Salaam, Tanzania.

### 1.3.2 Specific objectives

1.3.2.1 To determine early mortality of preterm neonates delivered in public Regional Referral Hospitals in Dar es Salaam.

1.3.2.2 To determine the factors associated with early neonatal mortality among preterm neonates delivered in public Regional Referral Hospitals in Dar es Salaam.

## 1.4 Rationale of the study

Preterm birth is a major health problem in Tanzania, leading to many newborn deaths. This study aimed to find out how often preterm babies die and what factors contribute to these deaths in public Regional Referral Hospitals in Dar es Salaam. By understanding these factors, there is a potential to improve healthcare practices and reduce the number of deaths among preterm neonates.

## 1.5 Research questions

1.5.1 What is the early mortality of preterm birth outcomes among preterm neonates delivered in Regional Referral Hospitals in Dar es Salaam?

1.5.2 What are the factors associated with early neonatal mortality among preterm neonates delivered in public Regional Referral Hospitals in Dar es Salaam?

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Early neonatal mortality among preterm neonates

The global rate of preterm neonatal mortality remains alarmingly high. In 2017, one out of every 100 live preterm neonates died due to prematurity (15). In South Korea, a study reported mortality rates of 30.0% and 16.7% during two different periods, with most deaths occurring within 24 hours of birth (16). The reasons for the rise in premature death rates vary between high- and low-income countries. In high-income countries, advancements in medical facilities for the survival of extremely preterm neonates may paradoxically increase the risk of mortality. Conversely, in low-income countries, hospital deliveries may increase the risk of neonatal death due to the lack of quality services (16–18).

In sub-Saharan Africa, the rate of preterm neonatal mortality is particularly concerning. Out of 9 million live preterm births annually, 300,000 die due to preterm complications, accounting for up to 25% of all neonatal deaths (19). Studies indicate that prematurity is associated with 28% of neonatal mortality, and preterm birth or low birth weight is linked to 52% of neonatal deaths (20). A situational analysis of neonatal care in Tanzania conducted in 2009 found that preterm birth was responsible for 27% of newborn deaths. Reducing the preterm neonatal mortality rate is crucial for achieving the Sustainable Development Goals, as it directly impacts the overall neonatal mortality rate. Preterm neonates have underdeveloped organs that cannot support life outside the womb. As the baby approaches full term, these complications worsen, primarily

affecting the brain, lungs, immune system, kidneys, skin, eyes, and gastrointestinal system. The neonates's overall health and neurodevelopmental outcomes are influenced by various factors, including the reasons for premature birth, risks to the mother and family, and the environment in which the baby is cared for both inside and outside the hospital (21, 22).

## 2.2 Factors associated with early mortality of preterm birth

### 2.2.1 Maternal-related factors for neonatal mortality among preterm neonates

Maternal age, poor nutrition, and illiteracy are linked to a high rate of preterm neonatal deaths. A study in Nepal found that mothers aged 12–15 years had twice the risk of dying compared to mothers aged 20–24 years (23). A 2014 study in Tanzania found that preterm neonates born to mothers with primary education had a higher mortality rate than those born to mothers with secondary education, with mortality rates ranging from 45.7% to 24.1% (10). These results highlight the importance of early maternal education in reducing preterm neonatal mortality rates. The method and location of delivery significantly impact the well-being of preterm neonates. Home deliveries pose a higher risk of infection and lack of resuscitation equipment, leading to poor outcomes. A study by Mbawala et al. in 2014 discovered that 53.5% of preterm neonates died due to spontaneous vaginal delivery, while 19.5% died due to a caesarean section (10).

Anaemia during pregnancy is linked to preterm delivery of small-for-gestational-age newborns and high mortality rates. Most deaths occur due to early anemia of prematurity, insufficient iron storage due to low maternal serum iron, and a short intrauterine life for iron storage. Studies in India and Jordan report high rates of

preterm births and neonatal deaths due to anemia and placental abruption (24, 25).

Pre-eclampsia, or pregnancy-induced hypertension, poses a significant risk for premature birth in infants who are small for their gestational age. This increases the likelihood of neonatal mortality due to complications related to preterm birth. Research by Cupen et al. in 2017 demonstrated that maternal hypertension and eclampsia accounted for 22.2% and 23.1% of preterm neonatal deaths, respectively (26).

When a mother contracts an infection during labour, such as from bacteria, with symptoms like fever, painful uterus, or foul-smelling vaginal discharge, the likelihood of delivering the baby prematurely increases. This can put the newborn at risk of contracting an infection from the mother's blood or the birth canal. These infections can be severe and sometimes fatal for the neonate. According to a 2013 study, mothers with risk factors like prolonged premature rupture of membranes and infections have a 2.3 times greater risk of preterm mortality for their neonates than mothers without infection (27). For women at heightened risk of delivering prematurely, it is recommended that they receive at least two injections of corticosteroids (either dexamethasone or betamethasone) prior to delivery.

This enhances the maturation of the unborn baby's lungs and prevents the onset of respiratory distress syndrome, intraventricular haemorrhage, necrotizing enterocolitis, and severe neonatal sepsis. A review conducted by Vogel et al. in 2017 highlighted the efficiency of prenatal corticosteroids in lowering the newborn

death rate resulting from these conditions, particularly within the first 48 hours (28). These findings are consistent with recommendations from the World Health Organization (29).

### 2.2.2 Neonatal-related factors in relation to mortality among preterm neonates

Preterm neonates face short-term complications due to the immaturity of organ systems and underdeveloped physiological compensatory mechanisms at birth. Preterm neonates with low birth weight are at higher risk of complications and death. According to a study done in 2017 by Cupen et al., 75% of babies with low birth weight who died had underdeveloped organs. Of these, 37.5% died before reaching 28 weeks of gestational age, 12.5% between 33-36 weeks of gestational age, and 56% were born with a birth weight of less than 1000 grams (26).

Preterm neonates have difficulty feeding because they have not developed the coordinating mechanism for sucking and swallowing until around 34 weeks of pregnancy, which increases the risk of inhaling milk into the lungs. Giving large amounts of milk may also increase the risk of inhalation. A study from 2017 found that up to 31.3% of preterm neonates died from pneumonia caused by inhaling milk into their lungs (26). Respiratory distress syndrome affects most preterm neonates born before 32 weeks of gestational age due to lung immaturity and the absence of surfactant within the alveoli (21, 22). An elevated death rate is associated with gestational age less than 28 weeks and birth weight less than 1000 grams, especially in the absence of respiratory support (30). Research from 2015 revealed that 40.4% of extremely preterm neonates died due to respiratory distress syndrome within 12 hours of delivery. However, a retrospective cohort analysis

conducted in South Africa found that antenatal corticosteroids, bubble continuous positive airway pressure, and surfactants significantly decreased the premature neonatal death rate (31).

Preterm neonates are prone to hypothermia when their body temperature falls below 36.5°C. Their large surface area and insufficient heat production make them vulnerable to rapid heat loss. Hypothermia can cause hypoglycemia and metabolic acidosis, increasing the risk of death and leading to intraventricular hemorrhage and pulmonary insufficiency (32). A study in India showed that the risk of death was highest among neonates with severe hypothermia, with a case fatality rate ranging from 39.3% to 80%. Neonates with hypoglycemia, hypoxia, and shock had an even higher risk of death. Another study found that the risk of death increased by 80% for every degree decrease in the first observed axillary temperature. Preterm neonates were found to be more susceptible to hypothermia, with the relative risk of death ranging from 2 to 30 times. The severity of hypothermia also increases the risk of death (33).

Low levels of blood sugar, or hypoglycaemia, can occur in neonates within the first two hours of life if their plasma glucose levels drop below 30 mg/dL. The levels must rise to at least 45 mg/dL and stabilize to avoid complications. Hypoglycemia is more common in premature babies because they may not have enough glycogen and fat stores, may not be eating enough, and may be too cold. If not addressed, hypoglycemia can cause both immediate and long-term complications, such as seizure disorders and poor sensory neural development. In severe cases, it can even result in death, with a mortality rate of 30-60% (34).

Necrotizing enterocolitis is a common condition that affects the intestinal wall of very preterm babies due to factors such as inadequate mesenteric blood flow, insufficient production of digestive enzymes, and abnormal x-ray images of gas. The risk of developing this syndrome is ten times higher when formula feeding is used instead of breast milk, and overfeeding preterm babies also increases the risk (21, 22, 35). A 2015 study found that 30% of premature neonates died due to NEC (25), while a 2017 retrospective study found that NEC contributed to 25% of preterm neonatal deaths (26).

In neonates weighing less than 2,000 grams, respiratory distress syndrome and hypotension often cause intraventricular hemorrhage within the first few days after birth (36). Preterm neonates are at risk of a bleeding condition called intraventricular hemorrhage, which can be fatal. A study conducted in 2017 by Schindler et al. found that IVH was the leading cause of mortality in very preterm infants, with a rate of 22 deaths per 1000 neonates. Another study conducted in 2005 by Swai et al. found that many preterm neonates with low birth weight suffered from periventricular leukomalacia (PVL) and IVH. The study reported that 32.5% of neonates with low birth weight had PVL, and 61.8% had IVH. Neonates with grade 3 and 4 IVH had high mortality rates. IVH and PVL usually occur within the first three days of life. Low hemoglobin in a neonate is associated with IVH, while maternal low hemoglobin is associated with PVL (37).

Inadequate vitamin K-dependent coagulation factors in preterm neonates can lead to haemorrhagic disease of the newborn and intraventricular hemorrhage, resulting in severe anemia. According to a study by Edo et al. in 2016, neonates with gestational ages less than 32 weeks showed a significantly higher death rate of

27.42% due to anaemia, compared to those between 33 and 37 weeks, with a mortality rate of 10.53%. This emphasizes the need for prompt diagnosis and treatment of preterm neonates to prevent serious consequences (38).

Preterm neonates face a higher risk of death due to infections, which can occur during pregnancy, at delivery, or post-delivery in the hospital. Preterm neonates who have central venous catheters for nutrition and medication and those on ventilators for respiratory support are at increased risk. A study done in India in 2015 found that 31% of preterm neonates died due to septicemia, with neonates born between 28- and 32-weeks' gestation having higher sepsis rates than those of 34-36 weeks of gestation (39).

According to 2017 research carried out in Jordan by Razeq et al congenital abnormalities in preterm neonates, whether isolated or associated with a specific syndrome, whether single or multiple, were responsible for 24.8% of deaths. The study emphasizes that these deaths could have been prevented if healthcare providers had detected these abnormalities early and intervened promptly. This highlights the need for healthcare providers to be aware and conversant on congenital abnormalities (25).

### 2.2.3 Health system-related factors for neonatal mortality among preterm neonates

Preterm births in rural areas can be devastating due to insufficient equipment and facilities. A recent study by Shah et al. showed that almost half of all premature babies died within the first 28 days of life because they did not have necessary

equipment like resuscitation equipment, warmers, incubators, bCPAP machines, suction machines, and glucometers (40). The study also found that being the first-born child, living in the poorest households, and showing symptoms of infection increased the risk of mortality. Unfortunately, this problem is not limited to rural Bangladesh. In a different study, Mbawala et al. showed that over 80% of preterm neonates with respiratory distress syndrome died due to lack of respiratory support like bCPAP machines and ventilators in NICUs (10). These findings emphasize the immediate need for more investment in healthcare facilities and infrastructure to ensure that preterm neonates receive the necessary care to survive and thrive.

The number of healthcare providers available substantially impacts the outcome of preterm neonates. Inadequate staffing levels during evening/night shifts and weekends, and decreased availability of therapeutic and diagnostic services contribute to higher mortality rates in this vulnerable group (41–45). Fatigue from night shifts may also lead to management errors. A retrospective observational study in Sweden found that preterm neonates born during the night shift had a 30% higher mortality rate and were twice as likely to die as those born during the day (46). Early neonatal mortality was higher during certain hours on weekdays and weekends. A prospective study done in Kenya showed that neonatal patient-to-nurse ratios were much higher than recommended for primary or continuing care, stable neonates requiring intervention, and high-dependency care (29, 47). A cross-sectional study done in Tanzania found that neonatal distress syndrome was more closely linked to early newborn mortality during night shifts compared to other shifts. These findings highlight the importance of adequate staffing and resources to improve outcomes for preterm neonates (14).

# CHAPTER THREE

# METHODOLOGY

## 3.1 Study area and population

The study was conducted among neonates admitted to neonatal wards, including Neonatal Care Units, Kangaroo Mother Care units, and general wards in public Regional Referral Hospitals in Dar es Salaam. Each Referral Hospital has antenatal, postnatal, labour, operating theatre, neonatal intensive care unit (NICU), and a general neonatal ward.

Specifically, the study was carried out at Amana Regional Referral Hospital Ilala Municipality, which has a bed capacity of 25 in the labour and 83 in the neonatal wards. On average, there are 30-40 deliveries daily, with approximately 90-100 preterm deliveries per month (Unpublished data).

Another study site is Mwananyamala Regional Referral Hospital in Kinondoni Municipality. The labour ward has a total bed capacity 25, and the neonatal ward has 70 beds. The hospital records 15-20 deliveries daily, with monthly preterm admissions ranging from 25 to 30 (Unpublished data).

The third study site was Temeke Regional Referral Hospital in Temeke Municipality. It has a bed capacity of 25 in the labour and 70 in the neonatal wards. Neonatal admissions range from 25 to 30 per day, and 45 to 50 preterm neonates are admitted monthly (Unpublished data). The study population was preterm neonates born in public Referral facilities in Dar es Salaam Region.

### 3.2 Study design

This study was a descriptive longitudinal follow-up of preterm neonates at public Regional Referral Hospitals in the Dar es Salaam Region, specifically Mwananyamala, Temeke, and Amana. Preterm neonates enrolled in the study were follow-up and monitored for up to seven days or until discharge if this occurred before 7 days. This timeframe was chosen to capture critical early outcome and ensure comprehensive monitoring during the initial, most vulnerable period of the neonates' lives.

These sites were intentionally selected to ensure comprehensive regional representation and because they serve as major referral centers, bridging primary healthcare and national tertiary hospitals for complex cases, including preterm births. This strategic selection enhances the study's relevance and applicability to the broader population of preterm neonates in the region.

### 3.3 Sampling method

Proportionate convenient sampling technique was used. The average monthly deliveries from each of the Regional Referral Hospital delivery books were 95, 48 and 28 from Amana, Temeke, and Mwananyamala respectively. Hence, the proportionate samples were obtained as described below.

Total number of newborns in all facilities = 171 per month, therefore, using the proportionate formula, the number of participants recruited from each of the facility was determined. This is shown in Table 1 below.

### 3.3.1Sample size estimation

The sample size from the study was calculated using Yamane formula for single proportion as shown below.

$$n = \frac{Z^2 P (1-P)}{\varepsilon^2}$$

Whereby:

n = The minimum required sample size

Z = The confidence level is shown as a percentage point on the normal distribution. If Z is 1.96 when the degree of significance is 95%.

ε = Maximum likely error/ margin of error i.e. 0.05

P = Proportion of previously reported magnitude from prospective cohort study on mortality rates of preterm neonates born in Moshi, Northern Tanzania which is 8.5%, specifically focusing on the proportion of preterm birth mortality previously reported (48).

$$n = \frac{1.96 \times 1.96 \times 0.85 (1-0.85)}{0.05 \times 0.05}$$

$$n \approx 196 \text{ study participants.}$$

To add 10% for non-response; the minimal sample size is 216 study participants.

**Table 1: Allocation of study participants to health facilities**

| SN | HEALTH FACILITY | PROPORTION | ALLOCATEDNUMBER OF PARTICIPANTS |
|---|---|---|---|
| 1 | AMANA | 95/171 x 216 | 120 |
| 2 | MWANANYAMALA | 28/171 x 216 | 35 |
| 3 | TEMEKE | 48/171 x 216 | 61 |
| | **TOTAL** | | **216** |

The study participants from each Regional Referral Hospital were recruited consecutively until the sample size was achieved.

### 3.4 Procedures for Data collection

#### 3.4.1 Data collection tools

Case report forms were used for data collection. These forms were pre-tested using 5% of the minimum sample size. The pre-test aligned the data collection form with the study objectives. The pilot study participants were obtained from Amana Regional Referral Hospital and were not included in the actual data collection for the study. The pilot enhanced the clarity of the forms and ensured all questions were aligned with the study objectives.

#### 3.4.2 Data collection methods

The Principal Investigator and five research assistants attended Neonatal Wards of the three health facilities every day from Monday to Friday from 8.00 AM to 4.00 PM in order to screen preterm neonates for eligibility criteria to participate in the study.

Thereafter, every study neonate was followed for the next seven days on a daily basis to monitor progress of the condition and to document early outcome. The PI provided supportive supervision of the research assistants on a on each day of the data collection.

The five research assistants were trained on appropriate conduct of the study using the case report forms. The Principal Investigator and research assistants introduced themselves to the mother of each eligible neonate, established rapport and gave detailed explanation of the study including the purpose of the stdy and that participation is voluntary. Each mother was asked to provide informed consent. If she agreed to participate, she was then asked to sign an informed consent form before the interview was conducted. Only after obtaining informed consent were the study participants enrolled into the study and data collection was initiated by conducting the interview guided by the CRFs.

Each CRF had a different code to avoid duplication. Then every neonate was examined thoroughly adhering to aseptic technique to record the vital signs and body weight. Besides conducting the interview, a review of medical records and patient file was done to retrieve information of the last menstrual period and confirm the information provided.

In all study sites, the research assistants assisted the PI in data collection. The minimum criteria to qualify for research assistance was either a medical officer with a degree in medicine or a registered nurse with at least a diploma in nursing and having experience of not less than 3 years in neonatal care. Therefore, two medical

officers were assigned to Temeke Regional Referral Hospital and one medical officer for Mwananyamala while two registered nurses were assigned to Amana Regional Referral Hospital.

### 3.4.3 Eligibility criteria

#### 3.4.3.1 Inclusion criteria

Preterm neonates who were admitted at public Regional Referral Hospitals in Dar es Salaam, Tanzania and whose mothers granted informed consent to participate in the study.

#### 3.4.3.2 Exclusion criteria

Preterm neonates with severe congenital abnormalities were excluded from the study as well as preterm neonates whose mothers were critically ill and were unable to communicate were also excluded.

### 3.4.4 Study variables

#### 3.4.4.1 Dependent variables

The dependent variable in this study was the early preterm neonate outcome during the first seven days of life: normal, stable, sick or dead. The checklist categorized the outcome into the following groups:

a) Alive with complications: preterm neonates who have hypoglycaemia, hypothermia, , anaemia, jaundice and respiratory distress syndrome.
b) Alive without complications
c) Dead

#### 3.4.4.2 Independent variables

**Socio-demographic characteristics of parents**:

a) Neonatal characteristics: Birth weight, gestation age, Apgar score at 1-5 minutes and neonatal complications.
b) Maternal characteristics: Age, level of education, parity, and occupation.

**Maternal clinical factors**: Hypertension, HIV status, obesity, Diabetes mellitus, anaemia during pregnancy, birth interval, and ANC adherence.

**Maternal lifestyle**: Cigarette smoking and consumption of alcohol.

### 3.4.5 Ethical considerations

Mothers were provided with a detailed explanation about the study and its purpose and assured that their acceptance or refusal to participate would not affect the care given to the child in the hospital. When the parents/guardians understood the information given, they were required to grant an informed consent to be enrolled in the study. Parents/guardians who could not write, a thumbprint was considered as proof of consent obtained with an unbiased witness that signed their testimony on the consent form. The aim of providing unique codes to each participant was to maintain confidentiality throughout the entire study period. Study procedures were only carried out after getting an informed consent from the mothers.

#### 3.4.5.1 Informed consent

Written informed consent was obtained from each mother whose preterm neonate was recruited in the study after detailed explanation of the purpose of the study and the procedures to be conducted. Also, it included the aspects of voluntary participation and the issue of confidentiality of results. An opportunity to ask

questions was provided to each mother; to ensure if the mother has understood and is willing to take part in the study. Those preterm neonates whose mothers did not grant informed to take part in the study were assured that the neonates would receive appropriate management as per standard of care without any bias.

#### 3.4.5.2 Ethical clearance

The Ethical clearance for the study was obtained from the Institutional Research and Ethics Committee of Kairuki University and permission to conduct the study was obtained from the Administration of Dar es Salaam Regional Referral Hospitals.

#### 3.4.5.3 Confidentiality

Preterm mothers were interviewed in privacy and quiet room to enhance confidentiality. All the information from the informant was secured within a pre-coded CRF using numbers in series instead of names. Study participants had the option to leave the study at any time and were assured that their withdrawal will not affect the on-going service that should be provided to the neonate at each facility.

### 3.4.6 Reliability and validity of the data collection tool

Validity refers to how accurately an idea is measured and whether the instrument covers all relevant content. Reliability means that the results should be consistent each time the test is administered or when different investigators obtain similar responses from participants. Therefore, a pre-test using the data collection tool was conducted on 10 participants by the PI and the two research assistants and a comparison was done within the responses to check for consistency of results.

Participants from the pre-test were not included in the final data analysis. The validity was consolidated by having the data collection tool evaluated by a Neonatologist to verify whether the measurement tool covered all aspects of the study objectives.

### 3.5 Data management

#### 3.5.1 Data collection in the field

The PI and the research assistants made sure all the requirements are met including all materials necessary for data collection and the letter of introduction before undertaking data collection in the health facilities.

#### 3.5.2 Data coding and cleaning

During the study period, the research assistants collected data using CRFs and sent it to the Principal Investigator daily. The Principal Investigator then checked the responses for accuracy each day. After that the data entered into the SPSS software. Data cleaning was immediately done at the end of each business day and included checking whether all questions and variables in the template for their completeness and correctness. Incorrect, corrupted, duplicated, and incomplete data was re-assessed. Since data was triple entered into the spreadsheet data, any inconsistencies in data entry were re-analyzed whenever possible.

#### 3.5.3 Data analysis

Data was analyzed using IBM SPSS (International Business Machines Corporation-Statistical Package for Social Sciences) software version 28 for windows 10, Chicago, Illinois, USA. Continuous data was summarized using medians and Inter-

Quartile Range. Categorical data was summarised using frequency and proportion by per centages. Evidence of statistical linear association was derived from assessment of significance of correlations between variables. Besides, Mann-Whitney U test or Kruskal-Wallis test was used to determine the association between dependent and independent variables in all cases of comparisons of unknown statistical distributions. A pairwise comparison post hoc analysis was used to analyses the difference between ordinally scaled characteristics with significant association with the dependent variable. An α-level of 5% was used as a limit of significance for type 1 error.

### 3.6 Dissemination of the study findings

The study is an academic requirement in partial fulfillment for the degree of Master of Medicine in Paediatrics and Child Health of Kairuki University. The findings of this study will be compiled into a Dissertation that will be submitted to the Department of Paediatrics and Child Health of Kairuki University. Copies of the Dissertation will be made available to the Departments of Paediatrics and Child Health at the Regional Referral Hospitals. At least one original research manuscript will be written and submitted to a peer-reviewed journal for possible publication. Whenever possible the PI will present the study at scientific conferences

# CHAPTER FOUR

# RESULTS

## 4.1 Enrollment log

During the study period, a total of 230 preterm neonates were screened for eligibility criteria to be included into the study. Mothers of 5 preterm neonates did not grant consent to take part in the study. Among the 225 participants that were enrolled into the study, 9 participants were excluded due to incomplete data. Hence a total of 216 preterm neonates were included in the final data analysis.

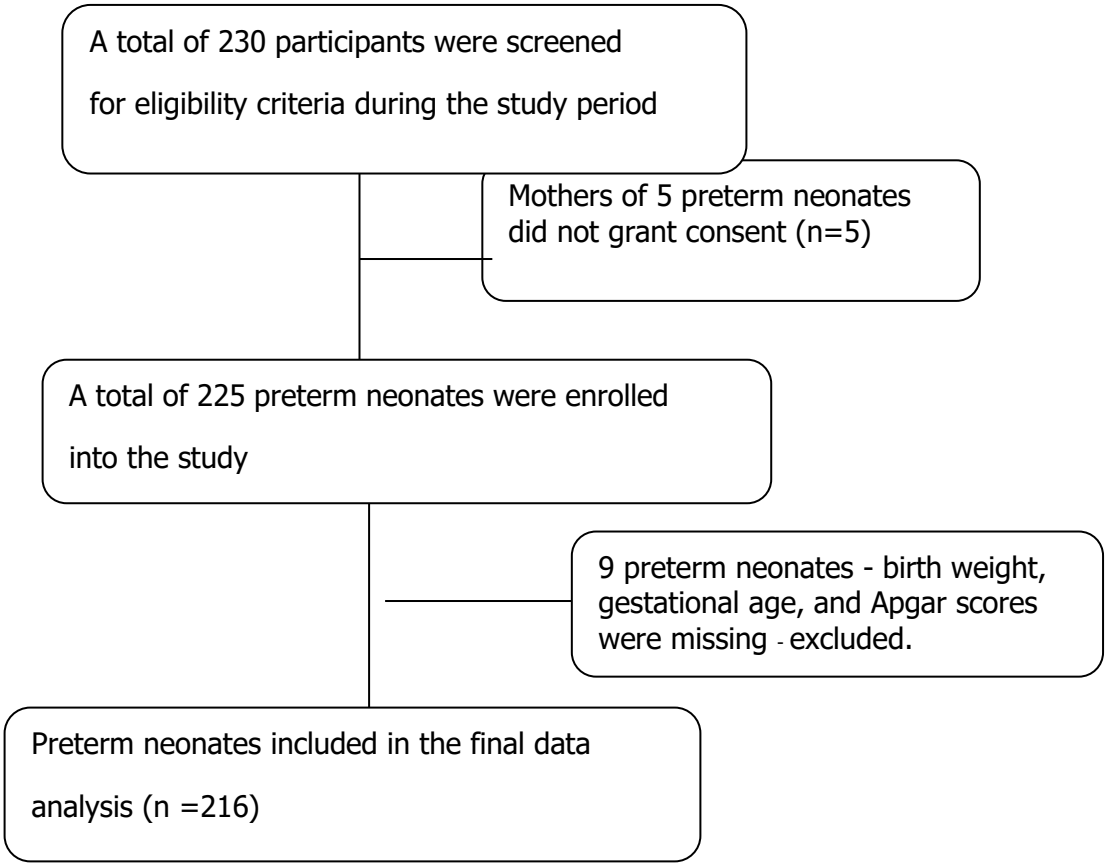


**Figure 1: Enrollment flow chart of the study participants**

### 4.2 Baseline socio-demographic and clinical characteristics of study participants

#### 4.2.1 Baseline characteristics of the mothers of study participants

Most of the research participants were from Ilala municipality 119(55.1%) whereas Temeke followed with 61 (28.2%) and Kinondoni had 36 preterm neonates (16.7%).

The mothers' average age was 27.5 years and most mothers belonged to the age group of 26-35 years. A significant percentage of the mothers were engaged in entrepreneurship and petty business. Most mothers had secondary school education.

Only a small proportion of mothers smoked cigarettes or drank alcohol during pregnancy, while a significant number suffered from anaemia, hypertension, HIV, obesity, or Diabetes mellitus. More than half of the mothers' adhered to ANC, and a quarter had received ANC steroids.

This is shown in Table 2 below.

**Table 2: Socio-demographic characteristics of mothers of study participants**

| | VARIABLES | FREQUENCY -% |
|---|---|---|
| **Health facility** | Amana RRH | 119 (55.1) |
| | Temeke RRH | 61 (28.2) |
| | Mwanayamala RRH | 36(16.7) |
| **Age group of mothers in years** | <20 | 31(14.4) |
| | 21-25 | 46(21.3) |
| | 26-30 | 75(34.7) |
| | 31-35 | 42(19.4) |
| | ≥35 | 22(10.2) |
| **Occupation** | Formal employment | 28(13.0) |
| | Entrepreneur | 127(58.8) |
| | House wife | 61(28.2) |
| **Level of education** | Primary school | 76(35.2) |
| | Secondary school | 113(52.3) |
| | College/University | 27(12.5) |
| **Parity** | One | 86(39.8) |
| | Two | 58(26.9) |
| | Three | 44(20.4) |
| | ≥ 3 | 28(13.0) |
| **Mode of delivery** | Normal | 154(71.3) |
| | CS | 62(28.7) |
| **Duration of labour in hours** | < 10 | 99(45.8) |
| | ≥10 | 117(54.2) |
| **Other characteristics** | Smoking (Yes) | 2(0.9) |
| | Alcohol (Yes) | 15(6.9) |
| | Hypertension (+) | 42(19.4) |
| | HIV status (+) | 22(10.2) |
| | Obesity (Yes) | 21(9.7) |
| | Diabetes mellitus (Yes) | 12(5.6) |
| | Anemia during pregnancy (Yes) | 78(36.1) |
| | ANC adherence (Yes) | 118(54.6) |
| | ANC steroid | 52(24.1) |

### 4.2.2 Baseline socio-demographic characteristics of study participants

The mean birth weight was 1780 grams with a ± standard deviation - 1780 ± 421 grams. The study found that a significant proportion of preterm neonates were born before 32 weeks and had low birth weights. The mean gestational age of neonates was 33.4 weeks, and most were born at or below 34 weeks. Approximately 70% of neonates required resuscitations at birth, with drying being the most common measure. Oxygen therapy and positive pressure ventilation were frequently needed, while chest compressions were less common. Hypoglycemia and neonatal sepsis were also notable concerns, with a high incidence of suspected and probable sepsis cases. This is shown in Table 3 below.

**Table 3: Socio-demographic characteristics of preterm neonates (n=216)**

| VARIABLES | | FREQUENCY (%) |
|---|---|---|
| **Gestational age at birth** | < 32 weeks | 40(18.5) |
| | ≥ 32 weeks | 176(81.5) |
| **Birth weight** | < 1780 grams | 87(40.3) |
| | ≥1780 grams | 129(59.7) |
| **Resuscitation at birth** | Yes | 151(69.9) |
| | No | 65(30.1) |
| **Resuscitation measures** | Drying | 154(71.3) |
| | Physical stimulation | 34(15.7) |
| | Suction | 28(13.0) |
| **Need for oxygen therapy** | Yes | 74(34.3) |
| | No | 142(65.7) |
| **Positive pressure ventilation** | Yes | 47(21.8) |
| | No | 169(78.2) |
| **Chest compressions** | Yes | 8(3.7) |
| | No | 207(96.3) |
| **Need for ventilations for respiratory problem** | Yes | 113(52.3) |
| | No | 103(47.7) |
| **Oxygen therapy for respiratory problem** | Yes | 11(5.1) |
| | No | 205(94.9) |
| **Hypoglycaemia** | Yes | 54(25.0) |
| | No | 162(75.0) |
| **Neonatal sepsis** | Suspected | 123(56.9) |
| | Probable | 86(39.8) |
| | Blood culture positive sepsis | 7(3.2) |

### 4.3 Primary outcome – Early outcome of preterm neonates within the first seven days of life

Out of 216 study participants 35 (16.2%) preterm neonates died within the first seven days of life. Of those who died, mean survival days were 4.1 ± 1.5 days. Figure 1 shown below illustrates the causes of death (n=35).

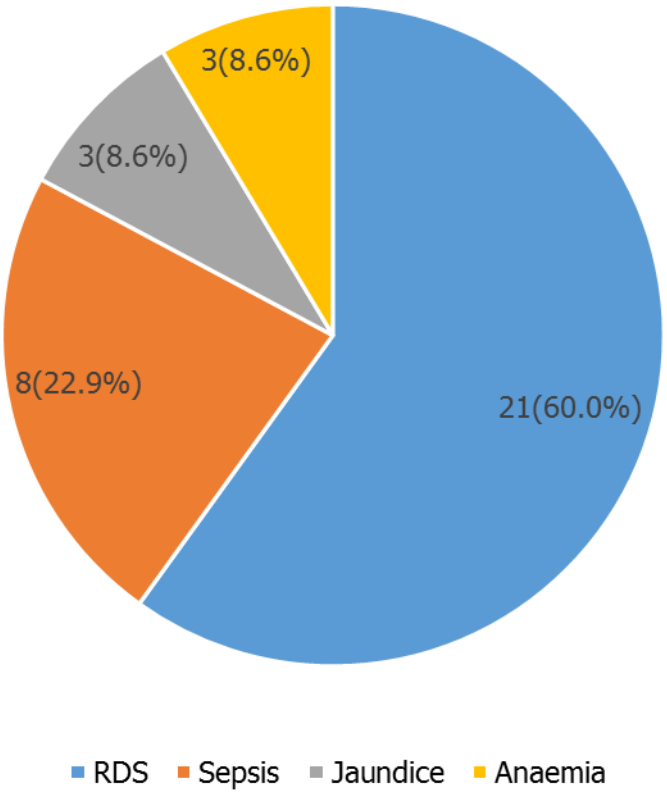


**Figure 2: Neonatal mortality and causes within the first seven days of life**

### 4.4 Complications among preterm neonates

Various complications occurred during the first seven days of life in 72 (33.3%) preterm neonates. Among those who were alive, jaundice was the most common complication among 48 neonates (80.6%). This is shown in Figure 3 below.

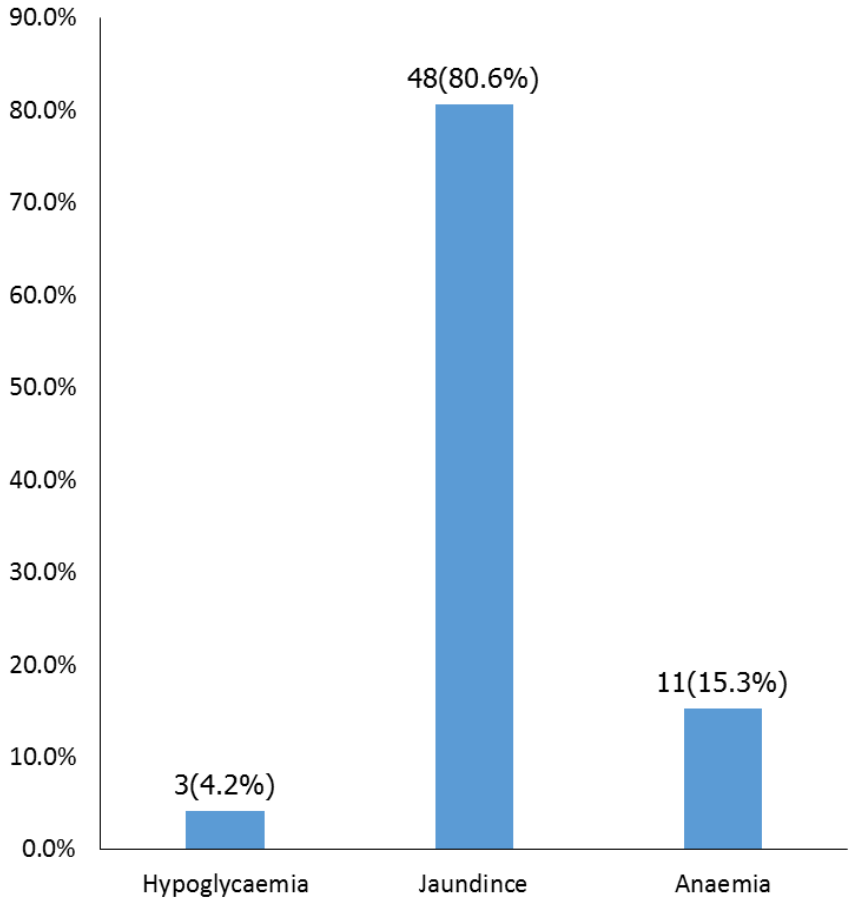


**Figure 3: Frequency distribution of complications among preterm neonates**

### 4.5 Factors associated with early neonatal mortality in preterm neonates

Neonatal deaths were higher in Temeke than in Amana and Mwananyamala. There was a greater death rate among primiparous mothers; those who did not get ANC steroids before delivery and neonates who needed resuscitation at birth. The risk of death was also higher among babies who had physical stimulation resuscitation, positive pressure ventilation, chest compression and needed oxygen therapy. Neonates with gestational age below 32 weeks and those who had hypoglycaemia also had a higher risk of death. This is shown in Table 4 and 5 below.

| Variables | | Outcome | | p-value |
|---|---|---|---|---|
| | | Dead - n (%) | Alive -n (%) | |
| **ANC Steroids** | Yes | 2(3.8) | 50(96.2) | |
| | No | 33(20.1) | 131(79.9) | 0.01 |
| **Labour pains in hours** | < 10 | 16(16.2) | 83(83.8) | |
| | ≥10 | 19(16.2) | 98(83.8) | 0.99 |
| **Mode of delivery** | Normal | 31(20.1) | 123(79.9) | |
| | Assisted delivery | 0(.0) | 1(100.0) | |
| | Caesarean section | 4(6.6) | 57(93.4) | 0.05 |
| **Gestational age in** | < 32 weeks of gestation | 16(40.0) | 24(60.0) | |
| **weeks** | ≥ 32 weeks of gestation | 19(10.8) | 157(89.2) | 0.00 |
| **Resuscitation at birth** | Yes | 33(21.9) | 118(78.1) | |
| | No | 2(3.1) | 63(96.9) | 0.001 |
| **Resuscitation** | Drying | 14(9.1) | 140(90.9) | |
| **measures at birth** | Physical stimulation | 14(41.2) | 20(58.8) | |
| | Suction | 7(25.0) | 21(75.0) | 0.001 |
| **Need for oxygen** | Yes | 14(18.9) | 60(81.1) | |
| **therapy at birth** | No | 21(14.8) | 121(85.2) | 0.43 |
| **Use of positive** | Yes | 18(38.3) | 29(61.7) | |
| **pressure ventilation** | No | 17(10.1) | 152(89.9) | 0.001 |
| **Use of chest** | Yes | 6(75.0) | 2(25.0) | |
| **compressions** | No | 29(14.0) | 178(86.0) | 0.001 |
| **Oxygen for** | Yes | 32(28.3) | 81(71.7) | |
| **Respiratory distress** | No | 3(2.9) | 100(97.1) | 0.001 |
| **Ventilation for** | Yes | 5(45.5) | 6(54.5) | |
| **Respiratory distress** | No | 30(14.6) | 175(85.4) | 0.01 |
| | No | 33(16.2) | 171(83.8) | 0.96 |

**Table 5: Results of binary analysis of preterm neonates and maternal characteristics with early outcome**

| Variables | | Outcome | | p-value |
|---|---|---|---|---|
| | | Dead -n (%) | Alive – n (%) | |
| **Hypoglycaemia** | Yes | 15(27.8) | 39(72.2) | |
| | No | 20(12.3) | 142(87.7) | 0.01 |
| **Neonatal sepsis** | Suspected | 19(15.4) | 104(84.6) | |
| | Probable | 14(16.3) | 72(83.7) | |
| | Blood culture positive | 2(28.6) | 5(71.4) | 0.66 |
| **Birth weight** | Extremely LBW | 4(33.3) | 8(66.67) | |
| | Very LBW | 20(48.8) | 21(51.2) | |
| | LBW | 11(6.9) | 149(93.1) | |
| | Normal BW | 0(0.0) | 3(100.0) | 0.001 |
| **Anaemia during pregnancy** | Yes | 17(21.8) | 61(78.2) | |
| | No | 18(13.0) | 120(87.0) | 0.09 |
| **ANC adherence** | Yes | 16(13.6) | 102(86.4) | |
| | No | 19(19.4) | 79(80.6) | 0.25 |

**Table 5: Results of binary analysis of preterm neonates and maternal characteristics with early outcome**

| Variables | | Outcome | AOR (95% CI) | p-value |
|---|---|---|---|---|
| | | Dead n (%) | | |
| **Health facility** | Ilala | 11(9.2) | | |
| | Temeke | 16(26.2) | 0.49 (0.10—2.29) | 0.36 |
| | Mwananyamala | 8(22.2) | 0.52 (0.11—2.45) | 0.41 |
| **Parity** | One | 23(26.7) | | |
| | Two | 5(8.6) | 3.65 (0.97—13.79) | 0.06 |
| | Three | 4(9.1) | 1.50 (0.28—8.02) | 0.63 |
| | ≥3 | 3(10.7) | 1.14 (0.16—8.17) | 0.90 |
| **ANC steroids** | Yes | 2(3.8) | | |
| | No | 33(20.1) | 0.13 (0.02—1.18) | 0.07 |
| **Mode of delivery** | Normal | 31(20.1) | | |
| | CS | 4(6.6) | 1.34 (0.23—7.72) | 0.74 |
| **Gestational age at birth** | < 34 | 30(22.6) | | |
| | ≥ 34 | 5(6.0) | 1.53 (0.41—5.62) | 0.53 |
| **Need for resuscitation** | Yes | 33(21.9) | | |
| | No | 2(3.1) | 0.87 (0.11—6.87) | 0.89 |
| **Resuscitation measures** | Drying | 14(9.1) | | |
| | Stimulation | 14(41.2) | 0.12 (0.03—0.57) | 0.01 |
| | Suction | 7(25.0) | 0.39 (0.09—1.81) | 0.23 |
| **Positive pressure** | Yes | 18(38.3) | | |
| **Ventilation** | No | 17(10.1) | 1.88 (0.57—6.16) | 0.30 |
| **Chest compressions** | Yes | 6(75.0) | | |
| | No | 29(14.0) | 7.31 (0.84—63.89) | 0.07 |
| **Respiratory distress** | Yes | 32(28.3) | | |
| | No | 3(2.9) | 4.65 (0.79—27.28) | 0.09 |
| **Respiratory distress – Ventilation needed** | Yes | 5(45.5) | | |
| | No | 30(14.6) | 0.60 (0.06—5.51) | 0.65 |
| **Hypoglycaemia** | Yes | 15(27.8) | 3.44 (1.08-10.94) | 0.04 |
| | No | 20(12.3) | | |
| **Birth weight(n = 213)** | LBW | 11(6.9) | | |
| | ELBW/VLBW | 24(45.3) | 5.56 (1.36—22.67) | 0.02 |

# CHAPTER FIVE

# DISCUSSION

## 5.1 Overview of discussion

The study aimed to determine the early outcome and predictive factors associated with early mortality among preterm neonates admitted at Regional Referral Hospitals in Dar es Salaam city. During a three-month study period from January to March 2024, preterm neonates enrolled into the study were followed for seven days. From the results of the study it shows that out of every six preterm neonates, one dies within the first seven days of life. Hypoglycaemia, low birth weight and need for resuscitation at birth were statistically significantly associated with death within the first seven days of life among preterm neonates.

Based on the results of the study, the mortality rate of preterm babies within the first seven days of life is 16.2%, which is a cause for concern. Nevertheless, this finding is consistent with results of a systematic review that showed a higher incidence of neonatal deaths in developing countries during the first week of life (49). However, compared to previous studies conducted in Uganda (52), the mortality rate observed in the study is higher, while those reported in studies conducted in Ethiopia and Northern Tanzania are lower (49,53). These differences could be attributed to variations in study settings and design. A study that reported lower death rates may have excluded deaths that occurred within the first 24 hours of admission during active follow-up, while those with higher death rates may have been conducted retrospectively, which included deaths that occurred at admissions.

Hypoglycaemia was significantly associated with early mortality. These findings are

comparable with other studies that reported severe cases of hypoglycaemia are associated with a higher mortality rate of 30-60% (34).

Research has shown that preterm neonates born with extremely low birth weight are at a higher risk of premature death. This may be due to their underdeveloped organs and incomplete systems, especially the respiratory system. The study revealed that approximately 70% of study participants required some form of resuscitation at birth, highlighting the severity of their condition. These findings are consistent with previous research that indicated a correlation between prematurity and respiratory immaturity, which can lead to fatal outcomes. (56, 61–63).

The majority of preterm neonates in this study required resuscitation, which predisposes to higher risk of mortality. These findings are consistent with findings of studies done in Uganda (64), Ethiopia (65) and Nigeria (66), which revealed that neonates who underwent resuscitation at birth were at greater risk of death. Furthermore, most of the study participants exhibited a low 5-minute Apgar score, a sensitive indicator of the effectiveness of resuscitation efforts. This may account for the higher incidence of neonatal mortality among those who were resuscitated at birth through physical stimulation than through the drying method.

The data in this study was collected from Regional Referral Hospitals, which are representative of the population in Dar es Salaam. These hospitals serve as primary healthcare providers for a large portion of the city's residents, ensuring a diverse and comprehensive sample. However, the follow-up duration of seven days may have been insufficient to track the progress of those with complications so as to

determine the final outcome. While the findings of this study can serve as a helpful starting point for future research in this field, it is imperative to conduct further studies with an extended follow-up period to document long-term neonatal outcomes regarding complications.

### 5.2 Strengths and limitations

The study was conducted across three Regional Referral Hospitals in Dar es Salaam, ensuring a diverse and representative sample of the population. It focused on early neonatal outcome and associated factors, providing valuable insights into the specific challenges faced by preterm neonates in this region. The longitudinal follow-up design allowed for the collection of detailed and comprehensive data on the health status and outcome of preterm infants. These strengths contribute to the robustness and relevance of the study's findings, offering a solid foundation for future research and potential improvements in neonatal care practices.

The seven day follow-up period may have been too short to capture all relevant outcomes, particularly for those with complications. Moreover, conducting the study in only three hospitals might not fully represent the variability in neonatal care across the whole country.

Additionally, reliance on hospital records and self-reported data could introduce biases. To mitigate these limitations, the study included a diverse sample from three major referral hospitals to enhance representativeness. Efforts were made to cross-check hospital records with direct observations to reduce biases. Although the follow-up period was seven it was reinforced by detailed initial assessments of neonates to capture critical early outcome. Some neonates might have died on

admission and hence were not captured by the study; this is also a limitation of the study.

### 5.3 Conclusions

The magnitude of early neonatal mortality among preterm neonates was relatively high with respiratory distress syndrome and sepsis being the leading causes of mortality. Additionally, extreme- and very low birth weight; hypoglycaemia and need for resuscitation at birth were the factors associated with early neonatal mortality.

### 5.4 Recommendations

To reduce early neonatal deaths, it is important to quickly identify and treat respiratory distress syndrome and sepsis in preterm babies. Additionally, focusing on babies with extreme- and very low birth weight, low blood sugar, and those needing help to initiate spontaneous breathing at birth can improve the chances of survival.

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# APPENDIXES

## Appendix I: Consent form - English version

**Title of the study**: Early outcome and factors associated with early mortality among preterm babies admitted at Public Regional Referral Hospitals, Dar es Salam Tanzania.

**Introduction**: My name is **Rukia Mohamed Malenda** a post-graduate student in the department of **Paediatrics and Child Health** at Kairuki University.

**Purpose of study**: This study aims to determine the preterm birth outcomes and factors related to preterm birth outcomes among women giving birth in a public regional referral hospital in Dar es Salaam, therefore physicians can make interventions appropriate to the local context thus reducing mortality rates among premature neonates and improve quality of care.

**Participant's role:** After you sign the informed consent form, you will be asked to answer questions posed by the Principal Investigator using a questionnaire. Your participation is entirely voluntary, and you can opt out of the research at any moment without facing any consequences. Before deciding, you will be given a clear understanding of the study's purpose, and the principal investigator will clarify any questions. The question that will be asked will generally base on your demographics and lifestyle.

**Risks and benefits:** I understand that answering these questions may make you nervous or bring up painful experiences. However, the Ministry of Health needs to have this information to find ways to help you and other women facing similar

challenges. Your input will be greatly appreciated.

**Cost**: The participants will not be required to pay anything.

**Compensation**: There is no payment to participants.

**Confidentiality***:* The participants' names or other Identifying details will not be recorded, either now or in the future. The lead researcher will keep every response under lock and key.

**Contacts:** In case of any question, you can contact the following:

Principal investigator: Rukia.M. Malenda Phone:0786516438

Institute research review committee (IREC) chairperson of KU: Prof. Fredrick Kaijage.

Before, during, and after the research, each participant has the right to ask any questions of the principal investigator, supervisor, and director of research and publications. I hereby ask that you sign the consent form that is enclosed.

**Declaration of consent**

I……, have been informed about the study and, having reached the age of 18years or older, willingly agree to take part in it. The lead investigator thoroughly explained the study's goal to me, and I received satisfactory answers to all of my inquiries. I've been informed of the study's advantages and hazards, and I'm free to leave at any time. It won't prevent me from receiving hospital treatment. I thus consent to being questioned and to the use of any information from my file for the purposes of this study.

Signature……Date……

Name of who is seeking the consent……..

Signature……

Date…….

**Researcher's statement**

I certify that I have fully explained the goals and methodology of the study to the participant.

Signature…… Date……

**Tel:0786516438**

In case of any other issue or question related to the study you can contact the following:

- Director of research and publication, Kairuki University P.O. BOX 65300, Dar es Salaam, Tanzania. Email: http://www.hkmu.ac.tz
- IRB chairperson: Prof. Fredrick Kaijage.
- **Supervisor Dr. Florence Salvatory Kalabamu.**
  Department of Paediatric and Child Health Kairuki University. P.O. BOX-65300, Dar es salaam, Tanzania. Emai-mukalabamu@yahoo.com

**Kiambatanisho II: Idhini ya Kushiriki**

**Kichwa cha Utafiti: -**Kiwango na sababu za matokeo ya awali miongoni mwa watoto wanaozaliwa kabla ya muda katika hospitali za rufaa za umma katika jiji la Dar es salaam, Tanzania

**Utangulizi**: Naitwa **Rukia M. Malenda** ni mwanafunzi washahada ya ubobezi wa magojwa ya watoto na kina mama katika chuo kikuu cha Kairuki.

**Dhumuni la utafiti**: Utafiti huu unalenga kubainisha uwiano wa matokeo ya uzazi kabla ya wakati na mambo yanayohusiana na matokeo ya kuzaliwa kabla ya wakati kati ya wanawake wanaojifungua katika hospitali ya rufaa ya mkoa wa Dar es Salaam.

**Jukumu la Mshiriki:**Baada ya kusaini fomu cha idhini, jukumu lako ni kujibu maswali yaliyoombwa na mtafiti katika dodoso hii. Kushiriki kwako katika utafiti huu ni baada ya kuelewa lengo la utafiti huu na ufafanuzi kutoka kwa mtafiti. Hata hivyo mshiriki ana uhuru wa kujiondoa kwenye utafiti wakati wowote bila matokeo.

**Hatari na faida**: Hakuna hatari zinazohusika wakati wa kushiriki katika utafiti. Matokeo ya utafiti huu ya naweza kusaidia katika uchaguzi wa tiba sahihi katika siku zijazo.

**Gharama**: Hakuna gharama kwa washiriki.

**Fidia**: Hakuna malipo kwa washiriki.

**Usiri**: Hakuna jina au maelezo ya kutambulika ya washiriki watachukuli wasasa au baadaye. Taarifa zote za mshiriki ni siri baina yake na mtafiti.

**Mawasiliano**: mshiriki yeyote anahaki ya kuwasiliana na mtafiti, msimamizi na mkurugenzi wa utafiti na machapisho kabla, wakati na baada ya utafiti na kuuliza maswali yoyote. Ninakuomba usaini fomu ya Idhini.

**Tamko La Idhini**

Mimi ....., umri miaka zaidi ya 18 or mzazi au mlezi, na nimeelewa juu ya utafiti huu ambapo nimekubali kwa hiari yangu kushiriki katika utafiti.

Kusudi la utafiti limeelezewa na mtafiti na maswali yote yamejibiwa kikamilifu na nimeridhika. Nimeelezwa faida na hatari za utafiti na ninauhuru wa kujiondoa kwenye utafiti wakati wowote na hautanizuia kupata matibabu katika hospitali. Nimeridhia kuhojiwa na maelezo kutoka kwenye failila yangu la Matibabu yanaweza kutumiwa pia kwa na madhumuni ya utafiti huu.

Saini.....

Tarehe.....

**Taarifa ya Mtafiti**

Mimi.....nathibitisha kwamba nimemuelezea mshiriki kusudi na asili ya Utafiti huu.

Sahihi…… Tarehe……Simu: **0786516438**

- Mkurugenzi wa Utafiti na uchapishaji, Chuo Kikuu cha Kairuki L P 65300, Dar es Salaam, Tanzania.

  Barua pepe: Email:http://www.hkmu.ac.tz

- Msimamizi:**Dr Salvatory,** Idara ya Paediatric and child health Chuo kikuu cha Kairuki S L P65300, Dar es Salaam, Tanzania.

- Baruapepe: Emai-mukalabamu@yahoo.com

**Appendix III: Data collection form (CRF)**

1. Hospital name……

Hospital location

- Ilala
- Temeke
- Kinondoni

**Maternal demographic and lifestyle information**

1. Age……..Years

2. Residence

- Ilala
- Temeke
- Kinondoni

3. Occupation

a) Employed

b)Business

c) Other……..

4. Level of education

a) Informal

b) Primary

c) secondary

d) college

5. Parity_____.

6. Smoking_____

7. Drinking alcohol_____

**Maternal clinical information**

Presence of any of the following co morbidities/health condition

- HT a) Yes b) No
- HIV a) Yes b) No
- Obesity a) Yes b) No
- Diabetes a) Yes b) No
- Anaemia a) Yes b) No
- birth interval a) Yes b) No
- ANC adherence a) Yes b) No

8. History:

Maternal data: (from the mother's file)

Antenatal Steroids……a) Yes b) No

Presence of and duration of labour pain …… hours.

**Prenatal data**

9. Birth history:

**Mode of delivery:**

- Normal delivery (b)Assisted delivery (c)Caesarean Section

**Gestation age (34-36 6/7) acc to 1st trimester**:

- Ultrasonography (b)Last Menstrual Period

Birth weight…….

10. Need for resuscitation at birth: Yes No

11. What resuscitation measure was performed?

a) Drying b) Physical stimulation c) Suction

**Initial steps:**

a) Need for $O_2$ b) Positive Pressure Ventilation c) Chest compressions

11. Respiratory morbidities:

Need for $O_2$……a) Yes b) No

Need for Surfactant……..a) Yes b) No

Need for Ventilator……..a) Yes b) No

12. Hypoglycaemia……..a) Yes b) No

13. Neonatal jaundice:

a)No treatment b)Phototherapy c)Exchange transfusion

14. Sepsis:

a) Suspected b) Probable c) Culture positive sepsis

15. What is the outcome of the baby on the 7th day?

- Alive with no complications
- Alive with complications
  - Hypoglycaemia
  - Jaundice
  - Anaemia
  - Hypothermia
- Dead (days of alive before deaths)

16. If dead, what is the cause of death?

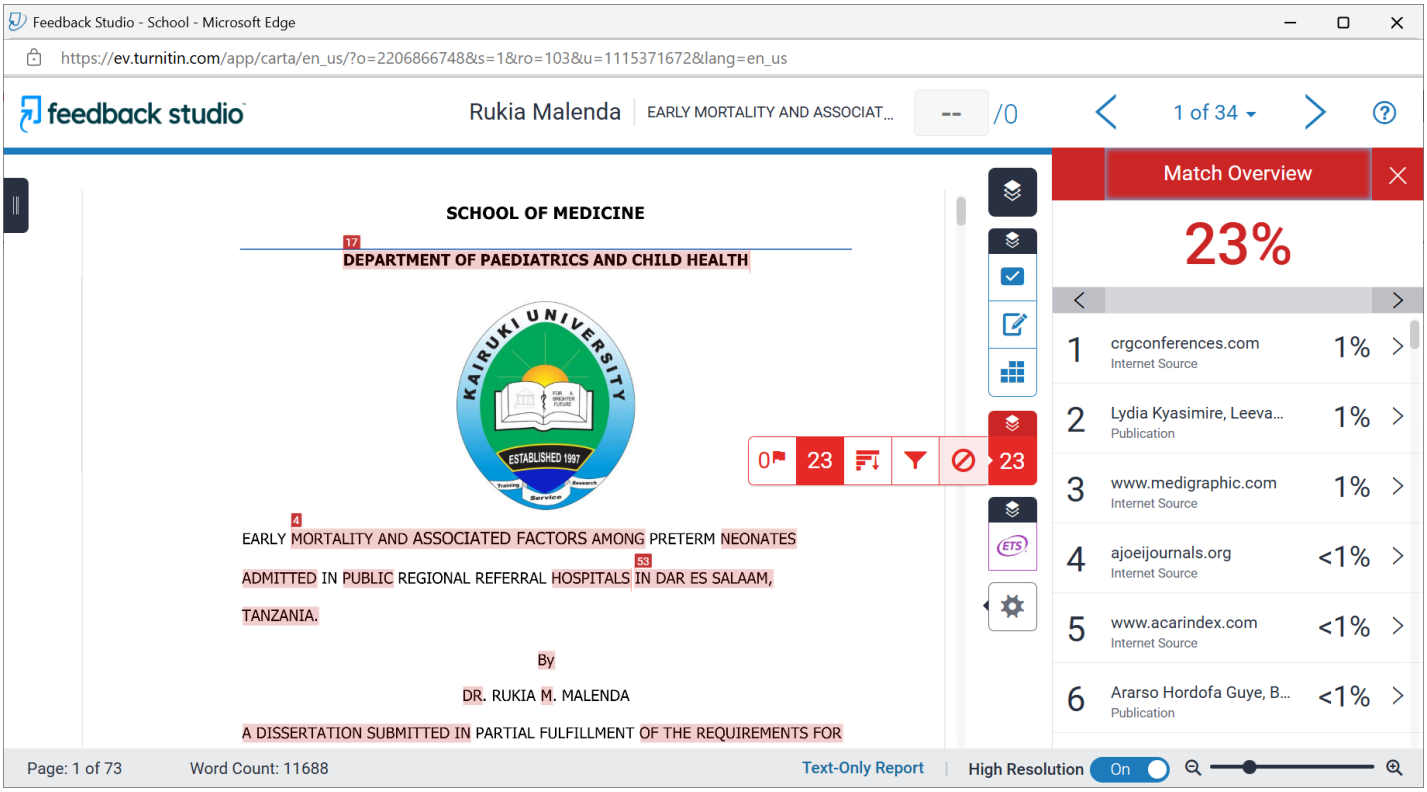
a) RDS

b) Sepsis

c) Jaundice

d) Anaemia

e) Others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DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH
EARLY MORTALITY AND ASSOCIATED FACTORS AMONG PRETERM NEONATES ADMITTED IN PUBLIC REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA.
By
DR. RUKIA M. MALENDA
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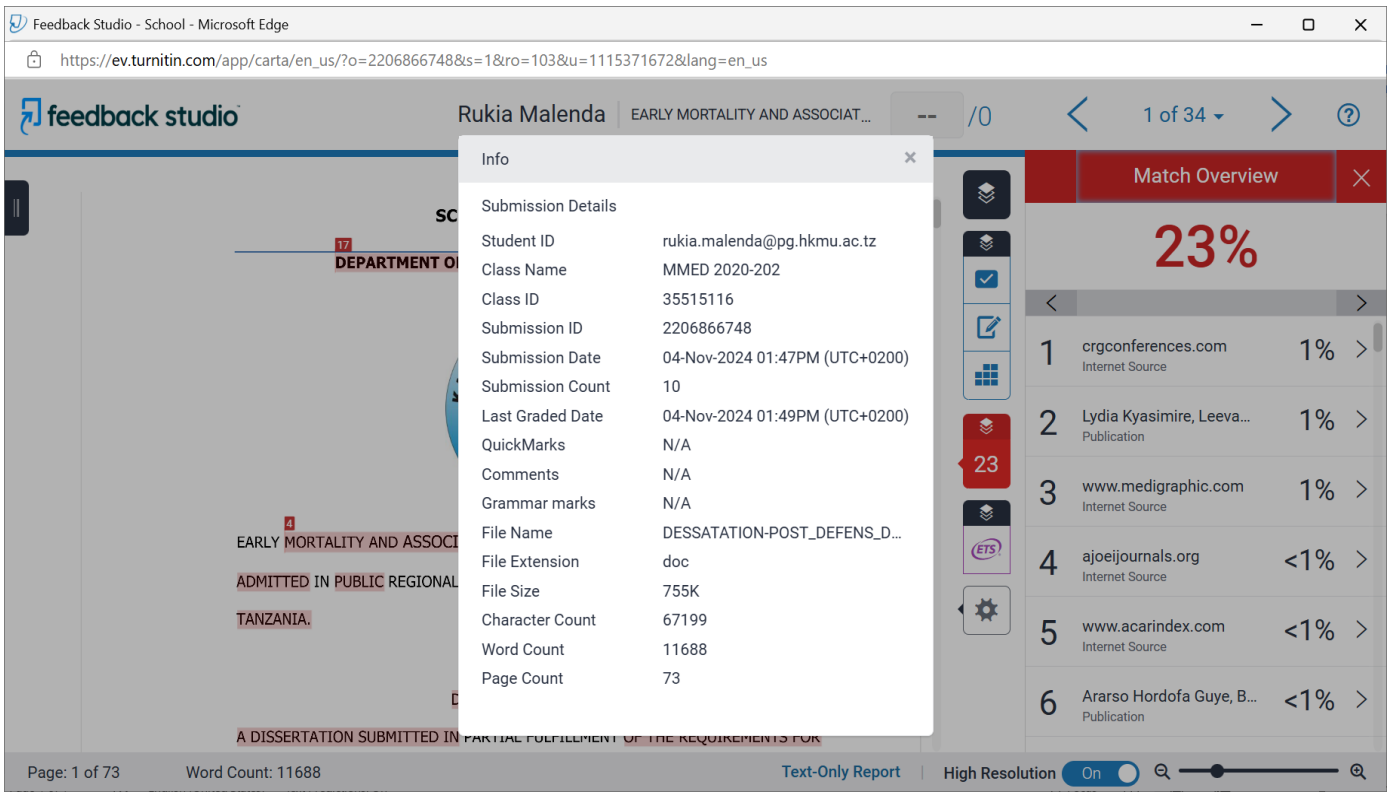
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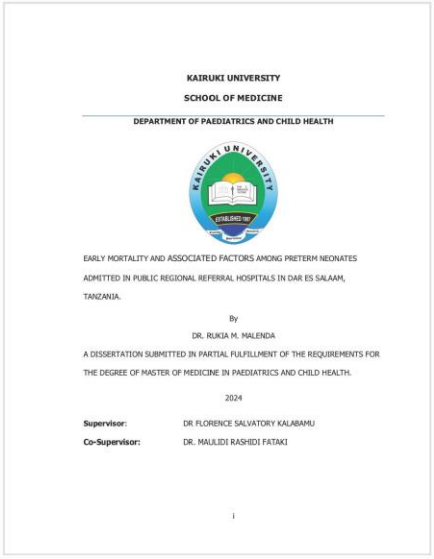

KAIRUKI UNIVERSITY

SCHOOL OF MEDICINE

DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH

EARLY MORTALITY AND ASSOCIATED FACTORS AMONG PRETERM NEONATES ADMITTED IN PUBLIC REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA.

By

DR. RUKIA M. MALENDA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN PAEDIATRICS AND CHILD HEALTH.

2024

**Supervisor:** DR FLORENCE SALVATORY KALABAMU

**Co-Supervisor:** DR. MAULIDI RASHIDI FATAKI

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# HUBERT KAIRUKI MEMORIAL UNIVERSITY (HKMU)

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**HKMU/PT/30.5/412**

**Friday, January 19, 2024**

Medical Officer,
Mwananyamala Regional Referral Hospital,
P. Box 61665,
**Dar es Salaam.**

**Dear Sir/Madam,**

**Re: LETTER OF INTRODUCTION TO DR. RUKIA M. MALENDA (MMED Part 3- PEDIATRIC AND CHILD HEALTH)**

The above named is a MMED postgraduate student specializing in Pediatric and Child Health. As part of fulfilling her MMED programme, she plans to undertake a study titled, '**Early Clinical Outcome and Associated factors among Preterm Neonates admitted in Public Regional Referral Hospitals in Dar Es Salaam, Tanzania**'. This study was reviewed and has been granted with an ethical approval **No. HKMU /IREC/406** by the HKMU Institutional Research Ethics Committee that will be valid for one year with effect from 17th January 2024.

This letter serves to introduce **DR. RUKIA M. MALENDA** who will be conducting her study at **MWANANYAMALA REGIONAL REFERRAL HOSPITAL**. Please accord her with the needed support.

Thank you for your support and cooperation in developing human resources for health in our country.

Regards,

Prof. Columba Mbekenga, PhD
**Director, Postgraduate Studies and Research Institute**

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**JAMHURI YA MUUNGANO WA TANZANIA**
**WIZARA YA AFYA.**
**HOSPITAL YA RUFAA YA MKOA YA TEMEKE**

Baruapepe:temekerh@afya.go.tz,S.L.P 45232 Dar es Salaam,Simu 0222856007

**Kumb. Na. TRRH/RSC/9/9/02/56** **Tarehe: 02/02/2024**

Dkt. Rukia M. Malenda
Muhimbili University of Health and Allied Sciences
S.L.P 65001,
**DAR ES SALAAM.**

**YAH: OMBI LA KUFANYA UTAFITI KUHUSU "EARLY CLINICAL OUTCOME AND ASSOCIATED FACTORS AMONG PRETERM NEONATES ADMITTED IN PUBLIC REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM " (RESEARCH)**

Tafadhali husika na somo tajwa hapo juu.

2. Nimepokea barua yako ya tarehe 19 Januari, 2024 kuhusu ombi lako la kufanya Utafiti (Research) katika Taasisi yetu, kuhusu **"Early clinical outcome and Associated factors among preterm Neonates admitted in Public Regional Referral Hospitals in Dar es Salaam "**

3. Ombi lako limekubaliwa, utatakiwa kulipa ada kiasi cha **Tshs. 100,000/=**. Hivyo wasiliana na mhasibu wa mapato wa Hospitali **Ndg. Lusajo Nsajigwa** kwa namba **0717 959495** ili akupatie control Number kwa ajili ya malipo ya ada hii ili uweze kuruhusiwa kufanya utafiti.

4. Asante kwa ushirikiano.

Dkt. Husna Msangi
**Kny: MKURUGENZI**
**HOSPITALI YA RUFAA YA MKOA YA TEMEKE**

Nakala: CSCO - ***Tafadhali hakikisha taarifa ya utafiti inabaki hospitalini***

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

AMANA REGIONAL REFERRAL HOSPITAL

Telegram "HEALTH", DODOMA
Phone No.: +255 026 – 2323267
Email: ps@afya.go.tz

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DAR ES SALAAM
Phone: 022—2861903

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Date: 06/02/2024

Director, Postgraduate Studies and Research Institute,
HKMU,
P.O. Box 65300,
**DAR ES SALAAM.**

**Re: PERMISSION FOR DATA COLLECTION**

Refer to your dated 19th January, 2024 which requested us to allow Dr. Rukia M. Malenda to conduct research and collect data in our institution.

We are here to acknowledge your request with the following conditions that she must submit the results of her research after completion of analysis in order the hospital to make use of the data's to solve hospital problems.

Regards.

For: MEDICAL OFFICER I/C
AMANA REGIONAL REFERRAL HOSPITAL
P.O. Box 25411
DAR ES SALAAM

*Dr. Rose Ntambuto*
**FOR: MEDICAL OFFICER INCHARGE**
**AMANA REGIONAL REFERRAL HOSPITAL**

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**E-mail:secvc@hkmu.ac.tz**
**Website:www.hkmu.ac.tz**

**Ref. No. HKMU/IREC/27.10/406**

**17th January 2024**

Dr. Rukia M. Malenda,
Hubert Kairuki Memorial University,
P.O. Box 65300,
**Dar es Salaam, Tanzania.**

**RE: ETHICAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH**

I am pleased to inform you that the research titled: **Early Clinical Outcome and Associated factors among Preterm Neonates admitted in Public Regional Referral Hospitals in Dar Es Salaam, Tanzania (Malenda R.M., 2023)** has been granted ethical approval.

This approval is in effect for one year from the above date. Any changes in the procedures should be reported to the Institutional Research Ethics Committee. Significant changes will require the submission of a revised request for ethical approval.

Permission to publish your findings should be sought from the National Institute for Medical Research (NIMR) before submission to a publisher and not concurrently.

**CHAIR PERSON**
Name: Prof. Fredrick Kaijage

Signature:

**SECRETARY**
Name: Prof. Columba Mbekenga

Signature:

Admissions:
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**Ref. No. HKMU/IREC/27.10/406**

**17th January 2024**

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Hubert Kairuki Memorial University,
P.O. Box 65300,
**Dar es Salaam, Tanzania.**

**RE: ETHICAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH**

I am pleased to inform you that the research titled**: Early Clinical Outcome and Associated factors among Preterm Neonates admitted in Public Regional Referral Hospitals in Dar Es Salaam, Tanzania (Malenda R.M., 2023)** has been granted ethical approval.

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**CHAIR PERSON**
Name: Prof. Fredrick Kaijage

Signature:

**SECRETARY**
Name: Prof. Columba Mbekenga

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