INDICATIONS, PREVALENCE, PREDICTORS OF MORTALITYAND OUTCOME OF ADMISSION TO MATERNITY INTENSIVE CARE UNIT AMONG CRITICALLY ILL WOMEN ADMITTED AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

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INDICATIONS, PREVALENCE, PREDICTORS OF MORTALITY AND OUTCOME OF ADMISSIONS TO MATERNITY INTENSIVE CARE UNIT AMONG CRITICALLY ILL WOMEN ADMITTED AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

By

Pathan M Pathan

A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master Medicine in Obstetrics and Gynaecology of

Muhimbili University of Health and Allied Sciences

October 2024

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for examination of the dissertation entitled ***Indications, Prevalence,*** **predictors of mortality** ***and Outcome of Admission to Maternity Intensive Care Unit Among Critically Ill Women Admitted at Muhimbili National Hospital, Dar Es Salaam"*** in partial fulfillment of the requirements for the degree of Master of Medicine in Obstetrics and Gynecology of Muhimbili University of Health and Allied Sciences.

_____

Dr. Belinda Balandya

(Supervisor)

Date: _____

_____

Dr. Furaha August

(Co-Supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I, **Pathan Mohamed Pathan,** declare that this **dissertation** is my original work and that has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature…… Date……

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DEDICATION

This work is dedicated to my beautiful family of Mr. and Mrs. Mohamed Ahmed Pathan, with special thanks to my wife, Farha Ally Rashid, for all her love, care, and support throughout my life and career.

ABSTRACT

Background; maternal mortality remains a significant public health challenge, particularly in low-resource settings, where it is often linked to critical maternal conditions requiring intensive care. Pregnancy-related complications such as hypertensive disorders, severe hemorrhage, sepsis, and cardiac complications can escalate rapidly, leading to life-threatening situations. Prompt access to intensive care unit (ICU) services is crucial for managing such critically ill obstetric patients, as it provides advanced monitoring and life-saving interventions.

However, delays in recognizing critical illness, seeking care, and accessing specialized ICU services contribute to poor outcomes, including high maternal mortality. In many developing countries, including Tanzania, maternal ICU admissions are rare but associated with high mortality rates, reflecting the severity of the cases admitted. Muhimbili National Hospital (MNH), a tertiary referral center, plays a pivotal role in managing critically ill pregnant and postpartum women, making it an ideal setting to study the prevalence, indications, outcomes, and predictors of mortality among maternity ICU patients. Understanding these factors is essential for developing strategies to reduce maternal deaths and improve obstetric critical care.

Study objective; to determine the prevalence of maternity ICU admission, indications, maternal outcomes, and predictors of mortality after admission to maternity ICU among critically ill obstetric patients admitted at MNH, Dar es Salaam from January 2020 to December 2022.

Methods; this was an analytical hospital-based cross-sectional study. Data was collected by retrieving medical records from the labor ward, and ICU registry and cross-checking with the hospital's electronic database, then retrieving files from medical records. Descriptive statistics was presented as frequencies, proportions, percentages, mean with standard deviation, and median with range and charts. The primary outcome variable was the outcome of the critically ill obstetric patients upon exiting from theICU. Multiple regression analysis was employed to

generate hazard ratios for relations with the participants' indications of admission to maternity ICU, demographics, and clinical characteristics.

Results: A total of 187(0.7% of all maternity admissions) women were admitted to maternity ICU, 73.3% (137/187) died, and sepsis being the leading cause of death (24.1%). The median age was 33 years and the IQR of 28-38 years. The majority (92.2%) were referral cases, more than half of them (65.8%) were postpartum, (and 51.9%) had vaginal delivery. Hypertensive Disorders of Pregnancy was the most common indication prompting ICU admission, accounting for (26.7% of all admissions). Women admitted to ICU were more likely to die if their indication for ICU admission were sepsis, respiratory complications, and cardiac complications

Conclusion: hypertensive disorders of pregnancy (HDP) were the most common reason for ICU admission, followed by respiratory and neurological complications. However, the majority of patients admitted to the maternity ICU died, with sepsis as the leading cause of death, followed by pneumonia and cardiac diseases.

The high mortality rate reflects delays in care and severe conditions at admission, emphasizing the need for timely referrals, infection control, and strengthened icu services. Improving infrastructure, staffing, and multidisciplinary care is essential to reduce maternal deaths and enhance critical care outcomes.

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LIST OF ABBREVIATIONS

ANC	:	Antenatal clinic
ASA	:	American Society of Anesthesiology
ARM	:	Artificial Rupture of Membranes
APH	:	Ante Partum Hemorrhage
CDC	:	Centre for Disease Control
CS	:	Caesarean section
DM	:	Diabetes Mellitus
HIV	:	Human immunodeficiency virus
HTN	:	Hypertension
HDU	:	High dependency unit
ICU	:	Intensive care unity
MDH	:	Millennium developmental goals
MNH	:	Muhimbili National Hospital
MUHAS	:	Muhimbili University of Health and Allied Sciences
PROM	:	Premature Rupture of Membranes
SRM	:	Spontaneous Rupture of Membranes
SSI	:	Surgical Site infection
WHO	:	World Health Organization

DEFINITION OF TERMS AND OPERATIONAL DEFINITIONS

An intensive care unit (ICU) is a unit that is well equipped with specialized trained staff INCLUDING INTENSIVISTS, and CRITICAL CARE NURSES WITH SPECIALIZED TRAINING SUCH BASIC LIFE SUPPORT(BLS), ADVANCED CARDIOVASCULAR LIFE SUPPORT (ACLS), and equipment that can provide 24-hour medical supervision and mechanical ventilation, continuous vasoactive drug support, blood transfusion, and dialysis (Soares et al., 2020).

Critically ill obstetric patients are those women who are pregnant and those within 42 days after delivery who require admission to the intensive care unit requiring close observation, mechanical ventilation, continuous inotropic infusion, blood transfusion, dialysis, or those with multiple organ failure (MOF) (Bhadade et al., 2012; Munnur et al., 2005; Vasquez et al., 2007).

Hypertensive diseases of pregnancy (HDP) encompass a group of conditions characterized by high blood pressure during pregnancy including Gestational hypertension, pre-eclampsia, eclampsia/Hemolysis Elevated Liver enzymes Low Platelets syndrome, and complications brought with this disorder.

The primary indication for maternity ICU admission refers to the main reason or condition that led to health complications that justified the need for a critically ill obstetric patient to be admitted to the maternity ICU, noted by the first health provider who assessed the patient and recommended ICU admission with discussion with intensivists who also reviewed the patient.

1.0 INTRODUCTION

1.1 Background

Maternal mortality is still a high and a threat in developing countries. It is used as an indicator of the quality and success of the implementation of strategic plans to improve obstetric services in a given country, especially in developing countries where it is significantly high. As per the last data available maternal mortality rate in Tanzania is 108 deaths per 100,000 live births, with uneven burden and variation across regions. (Crozier & Wallace, 2011; Shabani et al., 2022). The majority of the current maternal deaths can be attributed to obstetric causes that can be prevented. The presence of fully functional maternity intensive care units (ICU) and high-dependency units has significantly improved the provision of life-saving services to critically ill obstetric women (Soares et al., 2020). The critically ill obstetric patients present a group of unique requirements due to the presence of the unborn child changed mother's physiology and the presence of diseases that are present due to pregnancy such as hypertensive disorders of pregnancy (Wagaarachchi &Fernando, 2001)

Critically ill obstetric patients requiring intensive care have been observed to be different in different parts of the world. The incidence of admission of critically ill obstetric patients is generally underreported all over the world with an overall reported to be under 1% of all maternity admissions but systematic reviews revealed rated to be as high as 16% of all maternity admissions accounting for a median of 2.7 per 1000 deliveries (Anane-Fenin et al., 2021). Fewer maternity ICU admissions have been observed in higher-income countries than low low-resourced countries where more than half of global maternal mortality occurs (Bhadade et al., 2012; Bibi et al., 2008) , the greater number of admissions in low-resourced countries is further compounded by a general lack of ICU beds and most of those available are located in the large referral hospitals in the cities which limits access to patients in need of ICU beds in rural areas (Anane-Fenin et al., 2021). In developed countries, the rate has been observed to be from 0.11% to 0.89% (<2%) of all the recorded deliveries (Sriram & Robertson, 2008). In developing countries, the rate of admission to Maternity ICU for pregnant or recently delivered women ranges from 2-4 per 1000 deliveries.

Mortality rates following obstetric ICU admission of 34.8%-49% have been reported in sub-Saharan Africa compared to 5.1% in China and < 1% in New Zealand (Anane-Fenin et al., 2021).

The most common indications for admission to intensive care units are excessive hemorrhage before, during, and after labor, pregnancy-induced hypertensive disorders, and complications brought by it (Adeniran et al., 2015; Anane-Fenin et al., 2021). It has been observed that the rate of Intensive care admission is directly influencedby the presence of high-dependence units (HDU) where intermediate interventional care is provided. ICU admission is reserved for only women requiring mechanical ventilation, inotropic support, or those who have multiple organ failure requiring much closer observation and intervention (Porreco & Barkey, 2010)

The provision of high-quality and comprehensive obstetric care is an important part and parcel of delivering obstetric services in highly specialized hospitals that provide obstetric services. However, very few studies have been done in developing countries, especially in Africa where the rate of mortality rate is the highest compared to developed countries. In Tanzania, there are no studies done to assess the indications of admission to intensive care units, impact, and maternal after-intensive care provision to reduce maternal and fetal mortality rates, despite of presence of a high number of critically ill obstetric patients admitted in maternity ICU (MAICU).

This study will provide insight into a number of critically ill obstetric patients ICU admission, Indications of requiring ICU admission impact of the intensive intervention on maternal outcomes after the provision of the services in Tanzania.

1.2 Problem Statement

Efforts have been made by the World Health Organization and several stakeholders towards achieving Sustainable Development Goals (SDG) which aim at combating and reducing maternal mortality rate, several strategies have been put in place to reduce maternal mortality but the rate is still high specifically in developing countries (Adeniran et al., 2015)

Critically ill patients needing maternal intensive care admission (ICU) is significantly lower in developed countries accounting for around 2% and is significantly higher in developing countries accounting for about 10% (Vasquez et al., 2007).

Limited studies are available in developing countries generally, and Tanzania in particular, concerning the number of women requiring intensive care admission, and maternal outcomes among critically ill women that require intensive care intervention.

This study, therefore, will provide insight into the proportion of critically ill obstetric women who need intensive care admission, the indications of admission, and maternal outcomes

1.3 Rationale of the Study

ICU admission is a critical life-saving intervention for obstetric patients and serves as a key indicator of healthcare quality. While the need for intensive care services among obstetric patients is higher in developing countries than in developed ones, there is limited research on the indications for icu admission, predictors of mortality, and maternal outcomes after icu care in these settings (bibi et al., 2008; munnur et al., 2005). This knowledge gap hinders efforts to improve maternal critical care services and outcomes.this study aims to provide valuable data on the prevalence, reasons for icu admissions, mortality predictors, and patient outcomes specific to obstetric populations in developing countries. Identifying the key factors contributing to maternal mortality will help improve clinical management, guide policy decisions, and enhance the quality of obstetric care. Additionally, the study's findings will offer a foundation for future research and contribute to developing targeted interventions to reduce maternal mortality in resource-limited settings.

1.4 research questions

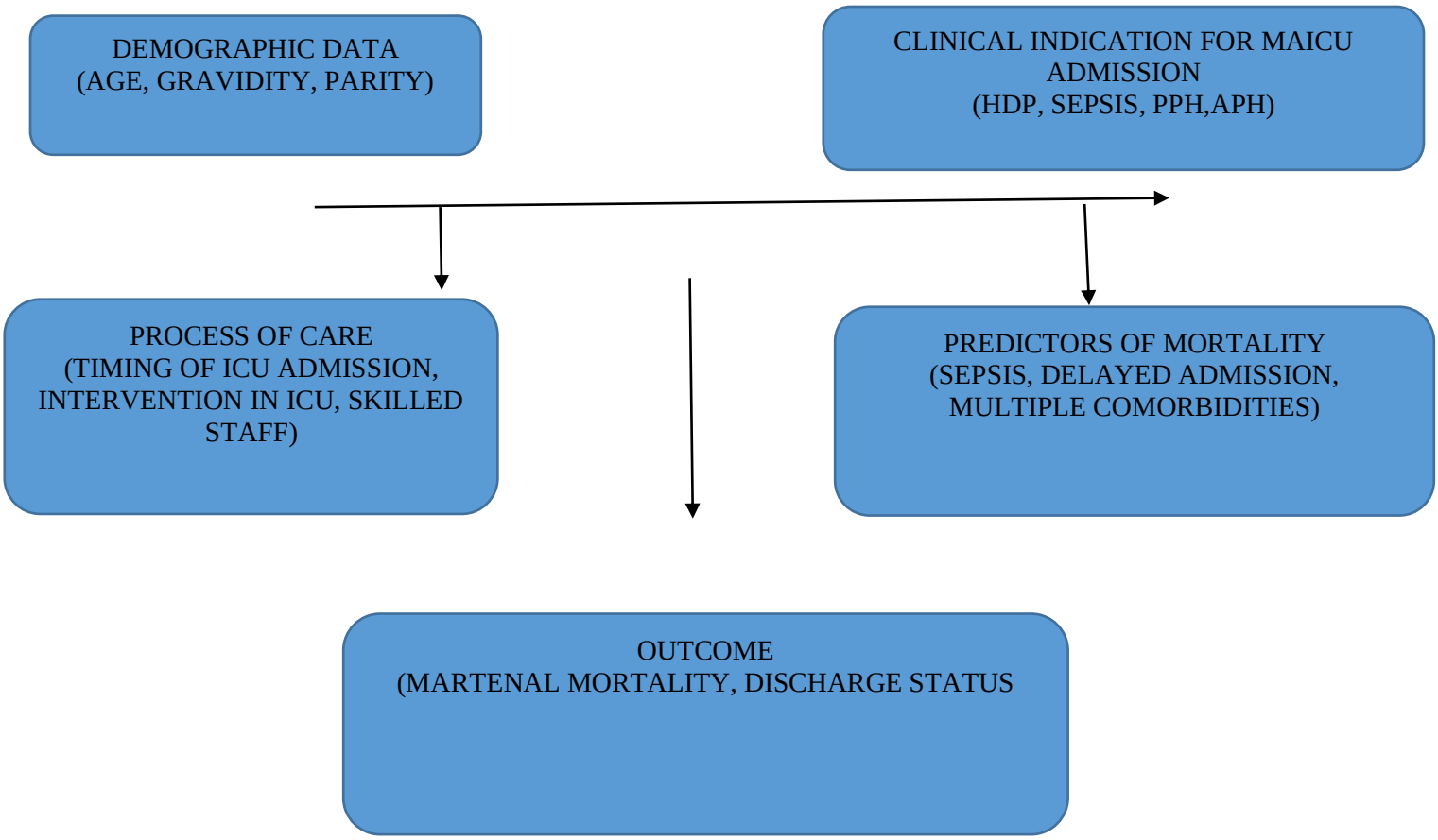
1. What was the prevalence of admissions to the maternity intensive care unit (MAICU) for critically ill obstetric patients at muhimbili national hospital (MNH), Dar es Salaam, from January 2020 to December 2022?

2. What were the main reasons for the admission of critically ill obstetric patients to the MAICU at mnh, Dar es Salaam, from January 2020 to December 2022?

3. What were the maternal outcomes of critically ill obstetric patients admitted to the MAICU at mnh, Dar es Salaam, between January 2020 and December 2022?

4. What were the key factors predicting mortality among critically ill obstetric patients admitted to the maicu at mnh, Dar es Salaam, from January 2020 to December 2022?

CONCEPTUAL FRAMEWORK



1.5 Objectives

1.5.1 Broad Objective

To determine the prevalence of admission, describe indications for admission, assess maternal outcomes, and determine predictors of mortality following admission to the MAICU for critically ill obstetric patients At Muhimbili National Hospital in Dar es Salaam during the period spanning from January 2020 to December 2022

1.5.2 Specific Objectives

1. To determine the prevalence of admission to the MAICU among critically ill obstetric patients at MNH in Dar es Salaam during the period spanning from January 2020 to December 2022

2. To describe the indications for admitting critically ill obstetric patients to the MAICU at Muhimbili National Hospital in Dar es Salaam, during the period from January 2020 to December 2022.

3. To describe the maternal outcomes following admission to the MAICU among critically ill obstetric patients at Muhimbili National Hospital in Dar es Salaam, spanning the period from January 2020 to December 2022.

4. To determine predictors of mortality following the admission of critically ill obstetric patients to the MAICU at MNH in Dar es Salaam between January 2020 and December 2022.

2.0 LITERATURE REVIEW

2.1 Indication for ICU admission among critically ill obstetric patients

The maternal mortality rate in developing nations such as Tanzania, has been decreasing. Nevertheless, a substantial portion of maternal fatalities in these regions, including Tanzania, result from avoidable factors like excessive blood loss, complications related to severe pre-eclampsia and eclampsia, multiple organ failure, delayed medical attention, and the absence of prenatal care (Geller et al., 2018). These elements serve as significant contributors to mortality among women facing critical health challenges (Adeniran et al., 2015)

The admission of critically ill obstetric patients to the Intensive Care Unit (ICU) is a crucial obstetric intervention. It plays a vital role in preserving the lives of these patients, thereby lowering maternal mortality rates and reducing perinatal fatalities. Globally the ICU admission among critically ill obstetric patients differs depending on the country's infrastructures, availability of resources, health policies, and different populations, observed to be highest in developing countries and lower in developed countries (Sriram & Robertson, 2008; Vasquez etal., 2007)

Several factors are associated with ICU admission among critically ill obstetric patients including hemodynamic instability, respiratory complications, neurological complications, disordered hemostasis, renal complications, sepsis, hypertensive disorders of pregnancy, obstetric hemorrhage, and septic abortion.

Various research studies have been done to evaluate the reasons for admitting critically ill obstetric patients to the Intensive Care Unit (ICU). Among these studies, the most commonly identified indication for ICU admission has been hypertensive disorders of pregnancy (including pre-eclampsia, eclampsia, and HELLP syndrome), followed by obstetric hemorrhage and sepsis (Selo-Ojeme et al., 2005; Sriram & Robertson, 2008)

Several studies have aimed to explore demographic risk factors associated with the admission of critically ill obstetric patients to the Intensive Care Unit (ICU). Some of these studies have indicated that patients who are older than 30 years are more likely to be admitted to the ICU compared to those under 30 years of age. However, it's important to note that in a similar study, no statistically significant difference was found in the risk of ICU admission between those above 30 years and those below that age threshold.

Furthermore, another study has revealed an association between the risk of ICU admission among critically ill obstetric patients and the presence of underlying medical conditions such as sickle cell disease, viral hepatitis, and malaria during pregnancy (Porreco & Barkey, 2010)

Among critically ill obstetric patients requiring admission to the ICU, a noteworthy association was observed about the mode of delivery. Specifically, individuals who underwent a Cesarean section (CS) and experienced blood loss exceeding 500 ml were found to have a higher likelihood of being admitted to the ICU compared to those who delivered through spontaneous vaginal delivery (SVD). This association was determined to be statistically significant (Selo-Ojeme et al., 2005).

Numerous studies have consistently indicated that maternal factors, including parity, gestational status (multiple or single), race, and whether the patient is in the antepartum or postpartum phase, are not associated with the risk of ICU admission among critically ill obstetric patients (Adeniran et al., 2015; Bibi et al., 2008; Crozier & Wallace, 2011; Selo-Ojeme et al., 2005)

2.2 Maternal outcome after admission to maternity ICU among critically ill obstetric patients

Different studies have assessed maternal outcomes after ICU admission, results differ depending on the country's geographical location, resources available, and financial status of the country**.**

Two studies conducted in Australia revealed that there were no maternal deaths among the 56 women observed during the study period. However, eight patients experienced functional or physical disabilities as a result of peripartum complications.

Several other studies done in developed countries assessing outcomes after ICU admission have seen maternal mortality rates ranging between 2-4% by different investigators (Porreco & Barkey, 2010; Sriram & Robertson, 2008).

2.3 Studies done in developing countries show a higher number of maternal mortality and complications following ICU admission.

A study done in Pakistan showed the mortality rate after ICU admission among critically ill obstetric patients after ICU admission to be 33% and is highest in those patients with sepsis, followed by those patients who have peripartum hemorrhage (Bibi et al., 2008). Another study done in Ghana showed mortality rate among obstetric patients admitted to ICU to 26% and was higher in women above the age of 25 years, which is consistent with other studies done in Nigeria and emphasized the lack of infrastructure such as availability of hospital beds as contributing factor to high mortality rate (Anane-Fenin et al., 2021).

An additional study conducted in India has reported a maternal mortality rate of 25% among obstetric patients admitted to the ICU. This rate was notably higher among women with inadequate prenatal care compared to those who received good prenatal care (Bhadade et al., 2012).

Despite a high number of admissions of critically ill obstetric women at MNH Upanga Maternity ICU, no studies have been done to assess the indication of admission to maternity ICU and outcome after admission to maternity ICU. Little is known about the conditions that predispose if not addressed in time and effectively might lead to admission to maternity ICU and might lead to adverse outcomes including maternal mortality.

3.0 MATERIALS AND METHODOLOGY

3.1 Study design

The research employed an analytical hospital-based cross-sectional study design, which aimed to analyze the medical records of critically ill obstetric

3.2 Study area

The research was carried out at Muhimbili National Hospital, which is situated within the Ilala District of the Dar es Salaam region. The region has a population of approximately 4,364,541 million people, as reported by the National Bureau of Statistics in 2022. Within the Dar es Salaam region, there are five municipalities, namely Kinondoni, Temeke, Ilala, Ubungo, and Kigamboni.

The obstetrics and Gynecology Department stands out as among the extensive clinical divisions inside the medical facility, with two dedicated maternity blocks. This department provides comprehensive care to both inpatients who are admitted to the hospital and outpatients who attend clinics. Notably, the obstetric unit plays a pivotal role in receiving referrals from various healthcare facilities, including regional hospitals in Dar es Salaam (Amana Regional Referral Hospital, Temeke Referral Hospital, and Mwananyamala Referral Hospital), healthcare facilities in the Coastal region (Tumbi hospital, Mkuranga hospital, and Bagamoyo hospital) and also from private hospitals situated in different parts of Dar es Salaam. Additionally, on occasion, patients from other regions also seek care and referrals from this unit.

The healthcare providers within the maternity unit are well-qualified to deliver obstetric care to patients. This skilled team comprises medical consultants, medical specialists, residents, registrars, interns, nursing officers, and nurse midwives, all dedicated to ensuring the highest standards of care for expectant mothers and their newborns.

The majority of pregnant women attend antenatal clinics and deliver at MNH annually, as indicated by the MNH databases. For instance, in 2022, a significant number of 10,2580 women gave birth at the hospital. The labor ward at the hospital comprises a total of four rooms furnished with 17 delivery beds. These beds are primarily intended for the admission of pregnant women who are at or beyond 28 weeks of gestation and are in active labor, awaiting delivery. Usually, patients are admitted to the labor ward and then guided to a suitable ward depending on their diagnosis and the planned course of management.

Upon admission, the initial contact with the patient is usually made by a nurse midwife who records the patient's relevant information. The care priority is then assigned based on the urgency of the case, with emergency cases receiving immediate attention, followed by those who are in stableconditions.

The Maternity ICU at Muhimbili National HOSPITAL 4 BEDS. It is located within the maternity building's first floor. The Intensive Care Unit (ICU) is consistently staffed round the clock with three critical-care intensive physicians. Additionally, it is equipped with registered nurses who hold advanced cardiac life-support certification. Moreover, there is easy access to consultants from various medical and surgical specialties. It is also equipped with monitoring equipment such as cardiac monitors, respiratory support equipment, and intravenous equipment such as infusion pumps, suction machines, one dialysis machine and medical storage unit.

A compact high-dependency care unit is in place, complete with four beds. This facility enables continuous monitoring of arterial blood pressure and the administration of intravenous medications to manage blood pressure, provide seizure prophylaxis, and address other obstetric-related needs. Patients in need of mechanical ventilation support, inotropes, or those experiencing multiple organ failure are admitted to the maternity ICU.

3.3 Study population

The study population encompassed critically ill obstetric patients who were admitted to the Maternity ICU at Muhimbili National Hospital during the timeframe spanning from January 2020 to December 2022.

3.4 Sample size

The review involved all critically ill obstetric patients admitted to Muhimbili National Hospital, Dar es Salaam from January 2020 to December 2022

3.5 Sampling technique

A purposeful sampling method was employed to include the medical records of critically ill obstetric patients who were admitted to the Maternity ICU between January 2020 and December 2022. The patient information was retrieved from a registry database accessible in the maternity ICU admission book. A list of these patients was generated using their unique patient file numbers from the registry. This list was then cross-verified with the MNH electronic database by the medical records department to ensure accuracy and eligibility.

The eligible patient files were included in the study.Patient’s files were retrieved and pertinent data was extracted to fulfill thestudy's objectives. This method was chosen for its practicality, especially when working with available records, but it is essential to recognize potential limitations regarding sample bias and representativeness. It may not provide a completely random or comprehensive selection of cases.

3.6 Criteria for inclusion and exclusion

3.6.1: Inclusion criteria

The study encompassed the inclusion of all medical files belonging to critically ill obstetric patients who were admitted to the MAICU at Muhimbili National Hospital throughout the study period.

3.6.2 Exclusion Criteria

We omitted medical files that lacked complete information that would affect the study objective, excluded patients that were admitted to HDU and all patients that were not pregnant or passed pueperium.

3.7 Variable of the research

3.7.1 Dependent variable

Maternal outcome

3.7.2 Independent variable

The study's independent variables include;

i. Characteristics related to patient demographics
ii. Past medical history
iii. Obstetric history
iv. Indications for Maternity ICU admission

3.8 Data collection method.

During the data collection phase, the primary source for obtaining patient file numbers for critically ill obstetric patients admitted to the maternity icu was the registry book at the icu. To ensure all patients admitted during the study period were included, the list in the icu registry book was cross-checked with electronic records available in the mnh database, then using hospital registration numbers and patients' files were traced from the medical records department. A designated research assistant took on the responsibility of retrieving the medical records for these patients from the mnh databases. This retrieval process was facilitated by using the patient file number.

Subsequently, the identified files from the medical records were reviewed by the researcher to ensure completeness. Data collection itself was conducted by a research assistant. To ensure the efficient tracking of required files, a dedicated research assistant was consistently present in the MNH study area. Data collection activities span three months.

3.9 Instruments for data collection

The instrument for collecting data to fulfill the primary objective of the study was structured checklist. This checklist was structured into three distinct sections; the first section included the demographic and obstetric characteristics. This included gathering information on age, level of education, religion, occupation, gravidity status, gestational age parity, and admission status. The second section of the data collection tool centered on determining the reasons for ICU admission among critically ill obstetric patients admitted to the maternity ICU. The third section of the data collection tool employed recorded the outcome of the mother following their admission to the maternity ICU.

3.10 Recruitment and Training of Research Aides.

A pair of research assistants with backgrounds in medicine were selected for this study. These assistants underwent a comprehensive two-day orientation program. During this orientation, they were acquainted with the study's objectives, details of the data collection tools, how to effectively use the checklist for data collection and the principles of research ethics.

The primary responsibility of these research assistants was to extract data from the medical files of critically ill obstetric patients admitted to the Maternity ICU. They accessed these records from the hospital's database, retrieved files from the medical records department extracted files gathered the necessary information from the files, and then entered the collected data into the SPSS software for analysis.

Additionally, the researcher overseeing the study offered continuous supportive supervision to the research assistants. This support was provided as needed, particularly in cases of missing information in the patient's medical records or during the data entry process. The researcher

also conducted daily quality checks on the collected data throughout the data collection period to ensure accuracy and reliability.

3.11 Pre-testing of data collection tool

Before commencing the study, a pre-testing phase for the data collection tool was carried outat MNH Upanga Hospital. This pre-testing involved the evaluation of twenty (20) files belonging to women who have a history of maternity ICU admission. This step was designed to ensure the effectiveness and suitability of the data collection tools and methods, necessary adjustments were done before the actual study began.

3.12 Data management

The researcher conducted daily manual checks to assess the completeness, accuracy, and consistency of the collected data. If any missing data or inconsistencies are identified, the researcher revisited the patient files and make the necessary adjustments to ensure data quality and reliability. Additionally, data obtained from a printed file generated through the observed checklist was securely stored in a locked file cabinet, with access restricted to the researcher exclusively. A digital copy of the data entered in SPSS was stored on a computer, protected by an authorized password accessible only to the researcher, and will be destroyed after publishing the study. These measures were implemented to maintain the confidentiality and security of the collected data.

3.13 Data analysis

Following data collection, the data underwent a coding process and thorough completeness checks before being fed into the SPSS software, version 23 for analysis. Descriptive statistics was presented as frequencies, proportions, percentages, mean with standard deviation, and median with range and charts. The primary outcome variable was the outcome of the critically ill obstetric patients upon exiting from the ICU (dead or alive). Multiple logistic regression analysis was employed to generate hazard ratios for relations with the participants' indications of admission to maternity ICU, demographics, and clinical characteristics such as age, mode

of delivery, and existing medical comorbidities. The significance level was set at a p-value of < 0.05 and at 5%, and 95% confidence intervals were reported. Variables with significant p-values <0.2 in the univariate analysis were entered into a multivariable regression model for adjusted hazard ratio. This statistical approach helped to summarize and present the data effectively.

3.14 Ethical consideration

Approval from the Institutional Review Board (IRB) at Muhimbili University of Health and Allied Sciences (MUHAS) was obtained before data collection. Additionally, authorization to conduct the research from Muhimbili National Hospital was facilitated through the Head of the Teaching, Research, and Consultancy Unit.

Maintaining the confidentiality and anonymity of the participants was a priority. Patient names were not included in the observation checklist or the dataset in SPSS; instead, codes were used. This approach safeguarded the privacy of the individuals involved in the study and upheld ethical standards.

3.15 Study limitation and mitigation.

This study was limited to information bias since it was a retrospective study depending on information recorded by clinicians hence is prone to missing information and data. To ensure that all necessary data and information were acquired I went through the hospital database in the Maternity ICU, medical records and identified all women who were admitted to the maternity ICU during the study period and retrieved patients' files from medical records, and obtained the necessary information to complete the study. The files that had missing information that affected the study objectives were not involved in generating data for the study.

4.0 RESULTS

4.1 Background and clinical characteristics of study participants

During the study period, there was a total of 28,740 admissions in the obstetrics and gynecology department. Among them, 209 women (0.7%) were critically ill obstetric patients who required maternity ICU admission. There were 22 missing files .187 women contributed data analysis while others were missing files. Nearly half of all admissions were in 2022(45.5%).

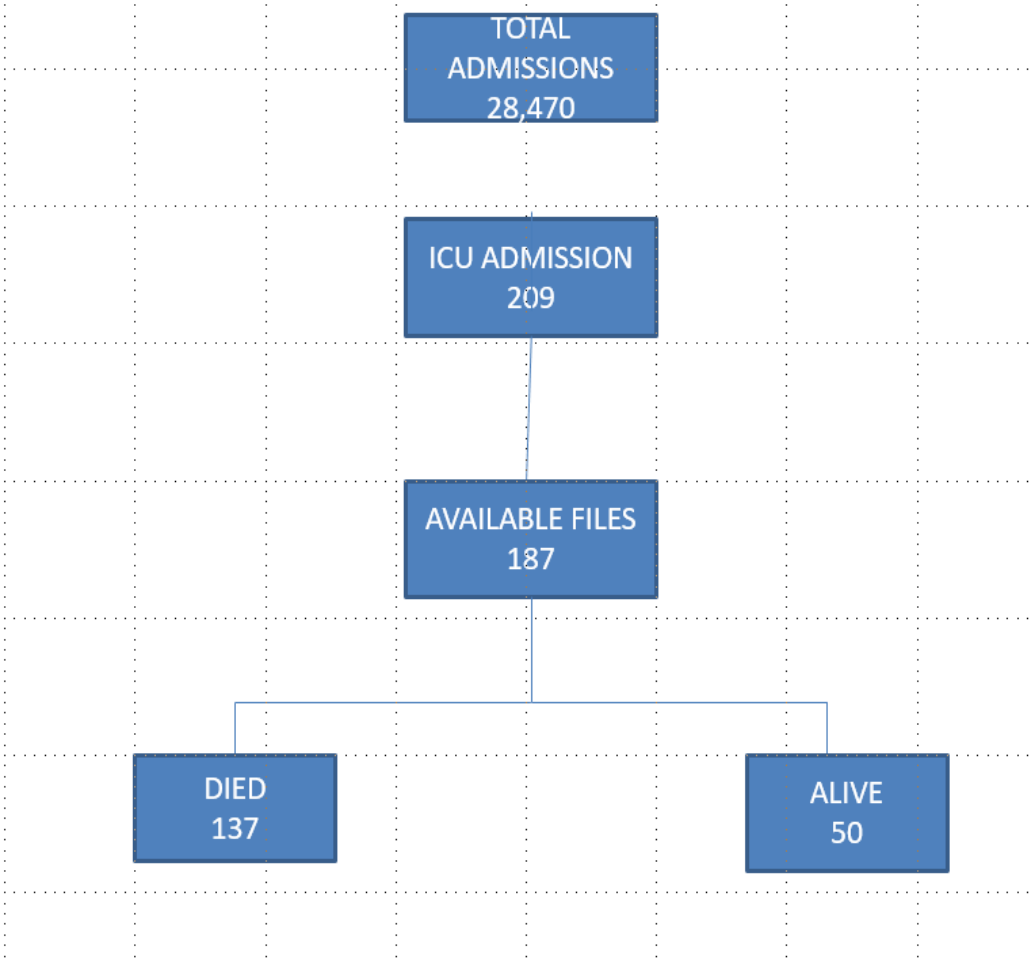


Figure 1: Patient flow diagram

The background and clinical characteristics of the participants

Nearly half (49.7%) of participants were aged between 25 and 35, with a median age of 33 years and IQR of 28-38 years. The majority of the participants were referral cases 92.2%, were postpartum on admission (65.8%), and about 99.5% attended antenatal clinic (ANC). Among those who were already delivered 51.9% had delivered vaginally. (Table 1)

Table 1: Socio-demographic and obstetric characteristics of the study participants N=187

Variable	Frequency (n)	Percent (%)
Year of admission		
2020	29	15.5
2021	73	39.0
2022	85	45.5
Age group (years)		
< 25	31	16.6
25 – 35	93	49.7
>35	63	33.7
Median age in years (IQR)	33 (28, 38)	
Level of education		
None (No formal education)	7	16.7
Primary education	13	31.0
Secondary education	8	19.0
College/University Education	14	33.3
Missing	145	77.5
Occupation[a]*		
Government employee	8	25.0
Non-government employee	4	12.5
Self-employed	10	31.3
Not employed	10	31.3
Missing	155	82.8
Marital status [b]*		
Single	4	12.9
Married	25	80.6
Widowed	1	3.2
Divorced	1	3.2
Missing	156	83.4

Variable	N=187	Frequency (n)	Percent (%)
Patient mode of admission [c] *			
Referral		141	92.2
From home		3	1.8
Transfer from other wards		10	6.0
Missing		33	17.6
Condition on admission			
Pregnant		64	34.2
Post-partum		123	65.8
ANC registration [d] *			
Registered		182	99.5
Not registered		1	0.5
Missing		4	2.1
Mode of delivery			
Vaginal delivery		97	51.9
Planned Caesarean section		4	2.1
Emergency Caesarean section		86	46.0

* Missing data in variable

a **(**n = 32) b (n=31) c (n=154) d (n=183)

4.2 Primary Indications for ICU admissions

Hypertensive disorders of pregnancy were the most common indications prompting ICU admission (26.7%) followed by respiratory 18.7% and neurological complications 13.4%. Sepsis and postpartum hemorrhage accounted for 12.8% and 6.4% of all patients requiring ICU admission respectively.

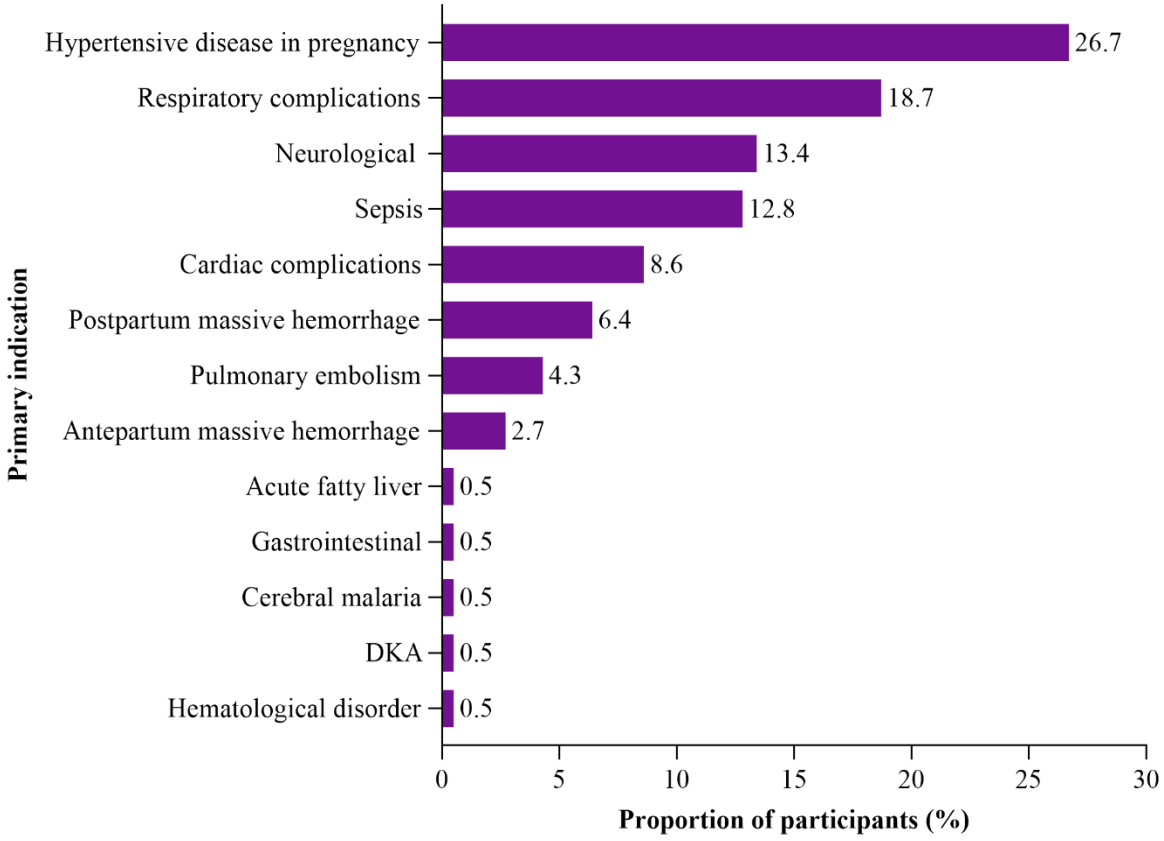


Figure 2: Primary Indications for ICU admissions

4.3 Maternal outcome after admission to maternity ICU

Seventy-three point three percent (137/187) of patients admitted to maternity ICU died, the most common cause of death was sepsis 24.1%, (33/137) followed by pneumonia 32/137 (23.4%) and cardiac diseases 19.7% (27/137)

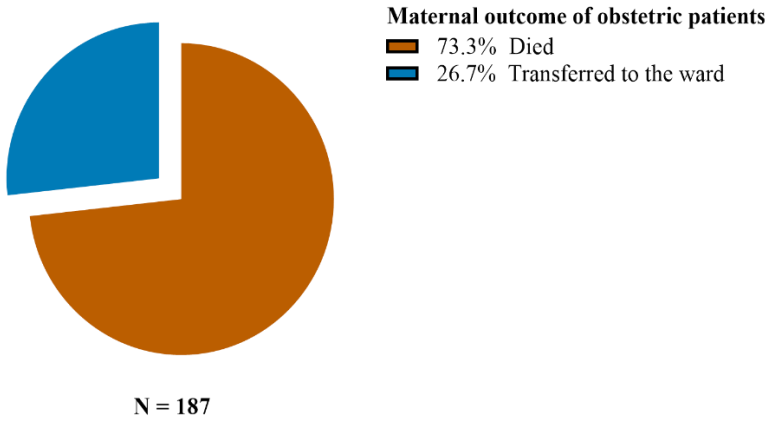


Figure 3: Maternal outcome after admission to maternity ICU

4.4 Factors influencing outcomes following obstetric ICU admission

Older women (over 35 years) had a higher mortality rate (74.6%) following icu admission compared to younger women, although this was not statistically significant. Women who delivered vaginally also had a higher mortality rate (80.4%), but this association was similarly not significant. In contrast, admissions for sepsis, respiratory complications, and cardiac complications were significantly associated with higher mortality. Additionally, women without neurological symptoms at admission were more likely to die than those with neurological complications, with this association being statistically significant.

Table 2: Factors associated with maternal outcomes followed admission in the maternal ICU N =187

	Maternal outcomes in maternal ICU		
Variable	**Died (%)**	**Alive (%)**	**p-value**
Age group (years)			
< 25	21 (67.7)	10 (32.3)	0.748
25 – 35	69 (74.2)	24 (25.8)	
>35	47 (74.6)	16 (25.4)	
Medical comorbidities			
Yes	26 (65.0)	14 (35.0)	0.183
No	111 (75.5)	36 (24.5)	
Mode of delivery			
Vaginal delivery	78 (80.4)	19 (19.6)	0.053
Planned cesarean section	3 (75.0)	1 (25.0)	
Emergency cesarean section	56 (65.1)	30 (34.9)	
Parity			
≤ 1	40 (75.5)	13 (24.5)	0.515
2	24 (80.0)	6 (20.0)	
>2	73 (70.2)	31 (29.8)	

Table 3: Indication of maternity ICU admission and maternal outcomes N =187

Variable	Maternal outcomes in maternal ICU		p-value
	Died (%)	Alive (%)	
Hypertensive disease in pregnancy			
Yes	34 (68.0)	16 (32.0)	0.326
No	103 (75.2)	34 (24.8)	
Sepsis			
Yes	22 (91.7)	2 (8.2)	0.029
No	115 (70.6)	48 (29.4)	
Respiratory complication			
Yes	31 (88.6)	4 (11.4)	0.023
No	106 (69.7)	46 (30.3)	
Neurological			
Yes	9 (36.0)	16 (64.0)	< 0.001
No	128 (79.0)	34 (21.0)	
Cardiac complication			
Yes	16 (100.0)	0 (0.0)	0.007
No	121 (70.8)	50 (29.2)	
Post-partum hemorrhage			
Yes	9 (75.0)	3 (25.0)	1.000
No	128 (73.1)	47 (26.9)	

In a multivariable analysis, women with sepsis were 4 times more likely to die (cor 4.59, 95% ci 1.04-20.28, p-value 0.044). After adjusting for confounders, they were 5 times more likely to die (aor 5.56, 95% ci 1.16-26.72). Women with neurological complications as the primary indication for admission were less likely to die (cor 0.15, 95% ci 0.06-0.37, p-value < 0.001). After adjusting for confounders, the likelihood decreased (aor 0.21, 95% ci 0.08-0.54, p-value 0.001. (table 4)

Table 4: Univariable and multivariable analysis of the factors associated with mortality

		Univariable analysis			**Multivariable analysis**		
Variable	**Category**	**cOR**	**95% CI**	**p - value**	**aOR**	**95% CI**	**p - value**
Age group (years)	>35	1.40	0.55 – 3.59	0.485			
	25 – 35	1.37	0.57 – 3.32	0.487			
	< 25	Ref					
Comorbidities	Yes	0.60	0.28 – 1.28	0.186	0.48	0.20 – 1.14	0.095
	No	Ref					
Mode of delivery	Vaginal delivery	1.37	0.13 – 13.90	0.791			
	Emergency C/S	0.62	0.06 – 6.24	0.687			
	Planned C/S	Ref					
Parity	≤ 1	1.31	0.62 – 2.78	0.487			
	2	1.70	0.63 – 4.56	0.293			
	>2	Ref					
Hypertensive disease in pregnancy	Yes	0.70	0.35 – 1.43	0.327			
	No	Ref					
Sepsis	Yes	4.59	1.04 – 20.28	0.044	5.56	1.16 – 26.72	**0.032**
	No	Ref					
Respiratory complication	Yes	3.36	1.12 – 10.08	0.030	2.62	0.84 – 8.18	0.097
	No	Ref					
Neurological	Yes	0.15	0.06 – 0.37	< 0.001	0.21	0.08 – 0.54	0.001
	No	Ref					
Post-partum hemorrhage	Yes	1.10	0.29 – 4.24	0.888			
	No	Ref					

5.0 DISCUSSION

This study aimed to determine the prevalence, indications, outcomes, and predictors of mortality among critically ill obstetric patients admitted to the maternity intensive care unit (icu) at muhimbili national hospital (mnh). The findings highlight critical issues in maternal healthcare delivery, revealing gaps in managing high-risk pregnancies and icu interventions, as well as the burden of maternal mortality linked to severe complications.

The prevalence of icu admissions (0.7%) aligns with global trends indicating that maternity icu admissions remain a small fraction of maternity cases (adeniran et al., 2015). However, the mortality rate of 73.3% in this study reveals severe challenges in managing critically ill obstetric patients, underscoring the limitations of early risk identification, timely referrals, and adequate critical care interventions at mnh. The high mortality rate suggests that the icu admissions likely represent cases with advanced complications, admitted after delays in care escalation, reflecting late identification of life-threatening conditions during pregnancy and postpartum care.

The study identified sepsis (24%) as the leading cause of death, followed by pneumonia (23.4%). These findings indicate a significant burden of infections contributing to maternal mortality, suggesting weaknesses in infection prevention and control (ipc) practices. The prevalence of nosocomial infections, particularly sepsis among patients initially admitted for other reasons, points to environmental factors, such as inadequate hygiene standards and cross-infection within the icu. This finding emphasizes the need for continuous ipc training, improved monitoring, and hygiene protocols to minimize preventable infections.

Hypertensive disorders of pregnancy (hdp) were the most common reason for icu admissions (26.7%). This finding reflects the persistent challenge posed by hypertensive conditions in maternal health, especially in developing countries, where delayed diagnosis and suboptimal management are common. Despite advancements in antenatal screening, women continue to experience complications from hdp, reinforcing the need for enhanced antenatal care, timely referrals, and multidisciplinary care teams to manage these cases effectively.

The majority of admissions were postpartum (65.8%), with 51.9% having delivered vaginally. Although vaginal delivery is generally considered safe, the elevated mortality among women who delivered vaginally (80.4%) suggests that many of these deliveries were associated with undetected complications, such as postpartum hemorrhage or sepsis. This observation emphasizes the importance of postpartum monitoring and strengthening emergency obstetric services at the primary healthcare level.

The study also found that older women (over 35 years) were more likely to die (74.6%) following icu admission, consistent with research showing that advanced maternal age is linked to a higher risk of pregnancy complications and chronic health conditions. These findings call for targeted interventions, such as pre-pregnancy counseling and high-risk pregnancy monitoring for older women, to improve outcomes.

Interestingly, women with no neurological symptoms at admission were more likely to die, a finding that might reflect underlying systemic complications that were not immediately apparent but escalated during icu care. This outcome underscores the importance of comprehensive clinical assessments to identify hidden risks that could worsen the patient's condition during icu stays.

The study suggests that while referrals (92.2%) to mnh are common, the late presentation of critically ill patients limits the effectiveness of icu interventions. This delay likely arises from insufficient resources and expertise at lower-level healthcare facilities, underscoring the need for improved referral systems, capacity-building at district hospitals, and better emergency transport services.

In conclusion, this study highlights critical gaps in maternal health management and icu care, including delayed recognition of complications, infection control challenges, and insufficient infrastructure and staffing in the icu. Addressing these issues requires investment in icu capacity, improved maternal healthcare services at lower levels, and early identification of high-risk pregnancies.

The findings also point to the need for policymakers and healthcare providers to develop targeted interventions aimed at reducing preventable maternal deaths. In the conducted study, it was observed that medical conditions such as rheumatic fever, malaria, and viral hepatitis were infrequent among both post-partum and pregnant women admitted to the icu. Interestingly, the presence of medical comorbidities among the study participants did not demonstrate any significant impact on the outcomes of women following admission to the icu. Furthermore, none of the medical comorbidities were found to have influenced the admission of women to the icu, unlike other studies such as (anane-fenin et al., 2021) which showed the positive effect medical commobidies had on icu admission.

6.0 STUDY LIMITATIONS, STRENGTH OF THE STUDY, CONCLUSION AND RECOMMENDATION

6.1 Study Limitations

Data was collected retrospectively only in one tertiary hospital with a small sample size hence there was limited generalizability of findings from the study. Some files of patients admitted to maternity ICU were not found, hence not involved in data collection and analysis. On available files, there was a lot of missing data on patients' level of education, occupation, marital status, and some patient's mode and ANC registration status. How these variables relate to the outcomes of mortality or survival following obstetric ICU admission could not be assessed and this is deemed a study limitation.

6.2 Conclusion

This study highlights significant challenges in managing critically ill obstetric patients at muhimbili national hospital, with a high maternal mortality rate of 73.3%. Sepsis was the leading cause of death, and hypertensive disorders were the most common reason for icu admission. Older women and postpartum patients, especially those with vaginal deliveries, were at higher risk of mortality. The study points to referral delays and inadequate icu infrastructure as key contributors to poor outcomes. Strengthening referral systems, enhancing icu capacity, and improving antenatal and postnatal care are essential to reduce preventable maternal deaths and improve critical care outcomes.

6.3 Recommendation

To improve maternal outcomes at muhimbili national hospital, this study recommends strengthening referral systems for timely transfers and early identification of complications, enhancing antenatal and postnatal care, and expanding icu capacity with adequate staffing and equipment. Infection prevention measures should be enforced through regular training, audits, and controlled visitor policies. High-risk groups, such as older women and postpartum patients, require targeted interventions and close monitoring. A multidisciplinary approach to care and continuous professional development for icu staff are essential. Finally, ongoing research and data tracking should inform evidence-based practices to reduce maternal mortality and improve critical care outcomes.

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APPENDICES

Appendix 1: Observational Checklist

INDICATIONS AND OUTCOME OF ADMISSION TO MATERNITY ICU AMONG CRITICALLY ILL WOMEN ADMITTED AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM FROM JANUARY 2020 TO DECEMBER 2022

ID No _____

SECTION A: PATIENT DEMOGRAPHIC CHARACTERISTIC

i. Year of birth_____

ii. Religion

1. Muslim [ ]
2. Christian [ ]
3. Other(specify)_____
4. Not documented

iii. Level of education

1. None [ ]
2. Primary school [ ]
3. Secondary school [ ]
4. College/university education [ ]
5. Not documented

iv. Marital status

1. Married [ ]
2. Single [ ]
3. Widowed [ ]
4. Divorced [ ]
5. Not documented [ ]

v. Patient mode of admission

1. Referral [ ]
2. From home [ ]
3. Transfer in from other wards [ ]
4. Not documented

vi. Occupation

1. Government employee [ ]
2. Non-government employee [ ]
3. Self–employee [ ]
4. Not employed [ ]
5. Not documented [ ]

vii. Gravidity status _____

viii. Parity _____

ix. Gestation age _____

x. ANC registration status

1. registered [ ]
2. Not registered [ ]
3. No documentation available [ ]

xi. Mode of delivery

1. Vaginal delivery [ ]
2. Planned cesarean section [ ]
3. Emergency cesarean section [ ]

xii. Medical comorbidities

1. cancer, [ ]
2. heart failure; [ ]
3. active systemic lupus erythematous, [ ]
4. inflammatory poly arthropathy [ ]
5. inflammatory bowel disease; [ ]
6. nephrotic syndrome; [ ]

7. type I diabetes mellitus; [ ]
8. sickle cell disease; [ ]
9. current intravenous drug user [ ]
10. Others [ ]

SECTION B: INDICATION FOR MATERNITY ICU ADMISSION

The primary indication for maternity ICU transfer

1. hypertensive diseases in pregnancy [ ]
2. Massive hemorrhage [ ]
    I. Antepartum [ ]
    II. Postpartum [ ]
3. Sepsis [ ]
4. Medical/surgical disorders
    I. Pulmonary embolism [ ]
    II. Respiratory complications [ ]
    III. Cardiac complications [ ]
    IV. Acute fatty liver [ ]
    V. Neurological [ ]
    VI. Gastrointestinal [ ]
5. Others [ ]

SECTION C: Maternal outcome of obstetric patients admitted in Maternity ICU

1. What is the maternal outcome of obstetric patients admitted to the Maternity ICU?

   i. Transferred to the ward [ ]

   ii. Died [ ]

2. What is the cause of death (If the patient died)

I.	Preeclampsia/eclampsia	[ ]
II.	Antepartum hemorrhage	[ ]
III.	post-partum hemorrhage	[ ]
IV.	Puerperal sepsis	[ ]
V.	Sepsis	[ ]
VI.	Pneumonia	[ ]
VII.	Cardiac diseases	[ ]
VIII.	Venous thromboembolism	[ ]
IX.	Malaria	[ ]
X.	Hepatitis	[ ]
XI.	Pulmonary diseases	[ ]
XII.	Acute fatty liver of pregnancy	[ ]
XIII.	Others	[ ]

Appendix 2: Ethical Clearances

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/2005 Date: 15/01/2024

MUHAS-REC-01-2024-2005
PATHAN M PATHAN
COLLEGE OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: INDICATIONS AND OUTCOME OF ADMISSION TO MATERNITY ICU AMONG CRITICALLY ILL WOMEN ADMITTED AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM FROM JANUARY 2020 TO DECEMBER 2022

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 15/01/2024
EXPIRATION DATE OF APPROVAL: 15/01/2025

STUDY DESCRIPTION:
Purpose:

The purpose of this retrospective observational cohort study is to determine the indication of admission to maternity ICU among critically ill women admitted at Muhimbili National Hospital

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:

https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015058.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Kasusu Nyamuryekung'e
Ag. Chairperson, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations
Box 65001

Appendix 3: Introduction Letter

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote

Ref. No. MNH/CRTCU/Perm/2024/046 Date: 31st January, 2024

Head of Department
- Obstetrics and Gynaecology
- Medical Records
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of Student	**Pathan M. Pathan**
Title	**"Indication and Outcome of Admission to Maternity ICU Among Critically Ill Women Admitted at Muhimbili National Hospital Dar es Salaam form January, 2020 to December, 2022."**
Institution	Muhimbili University of Health and Allied Sciences
Supervisor	Dr. Belina Balandya
Co – supervisor	Dr. Henry Kimwela (MNH)
Period	31st January 2024 to 30th March, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Dr. Henry Kimwela** (MNH) supervisor.

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval

Sincerely,

Dr. Charles K. Pallangyo
For: Head of Clinical Research, Training and Consultancy Unit

c.c DSS, DICT

c.c Dr. Henry Kimwela

c.c **Pathan M. Pathan**

Upanga West, Kalenga Street, Plot No. 1048013, P.O. BOX 65000, Dar es Salaam, Tanzania
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
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Appendix 4: Permission Letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote:
Ref. No. HD/MUH/T.127/2021

30th January 2024

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

Re: INTRODUCTION LETTER

We would like to inform you that the bearer of this letter is Pathan M. Pathan with Reg. No. HD/MUH/T.127/2021 is a student at Muhimbili University of Health and Allied Sciences (MUHAS) "pursuing MMed. Obstetrics/Gynaecology.

As part of his studies, he will be doing an elective research titled: "**Indications and Outcome of Admission to Maternity ICU Among Critically Ill Women Admitted at Muhimbili Nationa Hospital, Dar es Salaam from January 2020 to December 2022"** he is being supervised by Dr. Belinda Balandya from MUHAS and Dr. Henry Kimwela from MNH.

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

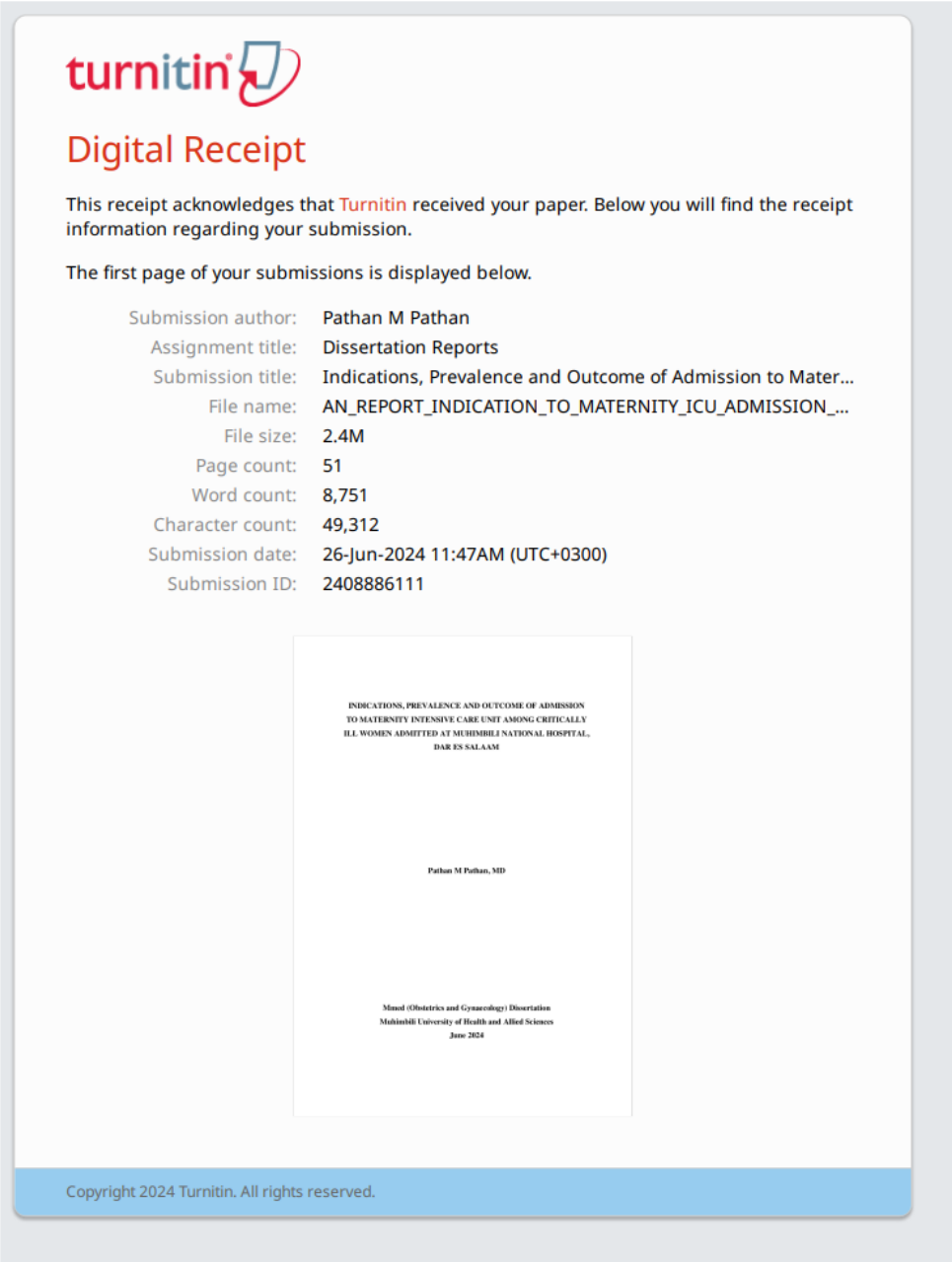
We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c. Pathan M. Pathan

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix 5: Turnitin Receipt



turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

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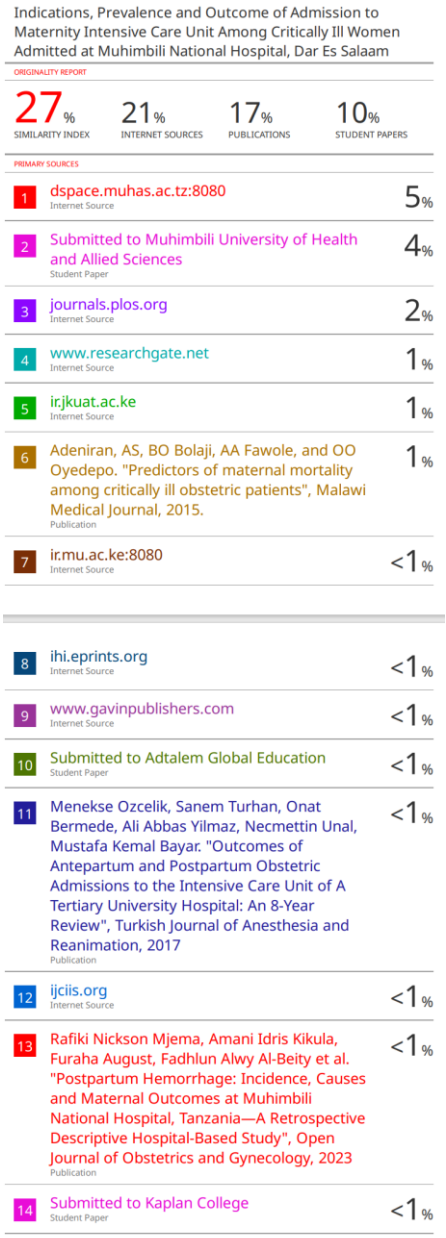
INDICATIONS, PREVALENCE AND OUTCOME OF ADMISSION TO MATERNITY INTENSIVE CARE UNIT AMONG CRITICALLY ILL WOMEN ADMITTED AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM

Pathan M Pathan, MD

Mmed (Obstetrics and Gynaecology) Dissertation
Muhimbili University of Health and Allied Sciences
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