CLINICAL OUTCOMES AND THEIR ASSOCIATED FACTORS FOR POST- ICU PATIENTS ADMITTED IN THE WARDS AT MUHIMBILI NATIONAL HOSPITAL AND MUHIMBILI ORTHOPAEDIC INSTITUTE, DAR ES SALAAM TANZANIA.

By

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A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences.

Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***Clinical Outcomes And Their Associated Factors For Post-ICU Patients Admitted In The Wards At Muhimbili National Hospital And Muhimbili Orthopaedic Institute,Dar es salaam Tanzania*** in (Partial)fulfillment of the requirements for the degree of Master of Medicine (Anaesthesiology) of Muhimbili University of Health and Allied Sciences.

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DECLARATION AND COPYRIGHT

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

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DEDICATION

This work is dedicated to my daughter Fiona, my wife Debora and my mother Betty.

ABSTRACT

Background: Mortality in the ward after ICU discharge is considered a quality parameter, and is commonly defined as a source of unexpected or avoidable mortality. A worse outcome is associated with the physiological reserve before ICU admission. Unfortunately locally no studies have been done to establish the extent of mortality in the ward post-ICU and their associated factors and measures designed to address them.

Objective: This study was designed to determine the clinical outcomes and their associated factors for post-ICU patients admitted in the wards from the two intensive care units of Muhimbili National Hospital and Muhimbili Orthopaedic Institute, Dar es Salaam, Tanzania.

Methods: A descriptive cross sectional study was conducted over a ten-month period from June 2009 to march 2010. All patients admitted at the two ICUs who consented and later discharged from ICU to the general wards during the study period were enrolled. Demographic information, reason for admission, nature of admission, Clinical Sickness Score (CSS) at admission to ICU, Length of stay in ICU, Mortality in the ward, Cause of death in the ward were documented and were critically evaluated.

Results: In this study 582 patients were enrolled, 183(31.4%) died in ICU, further 39(9.8%) died in the general wards. Sepsis was the most common cause of death post-ICU accounting for 16(41.03%), Higher CSS score at admission, length of ICU stay were associated with mortality. Independent predictor of post-ICU mortality was severity of illness at admission to ICU as predicted by CSS at admission to ICU.

Conclusions: This study shows that post-ICU mortality in the wards in this centre is less than that found in other countries of the developing world. The common cause of death in the ward post-ICU was sepsis. This provides knowledge that to update either our antibiotic use protocols or infection control protocols. The data collected also indicates that the determinants of post-ICU mortality in the ward was Clinical Sickness Score at admission to ICU and was that the independent predictor of post-ICU ward mortality and the overall ICU and post-ICU death in hospital.

Recommendations. An in depth study should be done in order to investigate as to why many post-ICU patients in the wards died due to sepsis. This would call for detailed study of the isolated microorganism pattern and their appropriate antimicrobial sensitivities.

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ABBREVIATIONS:

APACHE:	Acute Physiology and Chronic Health Evaluation.
ASA	American Society of Anaesthesiologists.
CSS	Clinical Sickness Score.
ENT	Ear Nose and Throat.
GCS	Glasgow Coma Scale.
HDU	High Dependency Unit.
ICU	Intensive Care Unit.
MNH	Muhimbili National Hospital.
MOI	Muhimbili Orthopedic Institute.
MPM	Mortality Prediction Model.
MUHAS	Muhimbili University of Health and Allied Sciences.
SAPS	Simplified Acute Physiology Score.
TISS	Therapeutic Intervention Scoring System.

1.0 INTRODUCTION AND LITERATURE REVIEW.

1.1Background

Intensive care as a specialty has developed from nothing in less than 50 years. Its origins stem from the successful use of positive pressure ventilation to treat respiratory failure due to poliomyelitis in Copenhagen in 1952. It has gone through considerable change. The introduction of new treatments, technological developments, the increase in life expectancy and the growth of chronic diseases which at some time require intensive care support are some of the factors which have determined the rapid changes in this new specialty. [1]

Despite recent advances in caring for the critically ill it still is a challenge in developing Countries, where health needs often outstrip available resources in ICU. Admission patterns and outcome in some ICUs in developing countries have been described previously and all reports show evidence of the need for improvement in funding, manpower, training and equipment. Intensive care unit (ICUs) in most of the developed world are high-technology facilities with the most advanced medical technology, electronic monitoring, mechanical ventilation and other life-support measures, as well as up-to-date drugs and highly trained and skilled personnel. [2-4]

ICU serves patients with acute physiological derangement and organ failure but who have potentially reversible disease. They also provide a service for those who can benefit from more comprehensive observation and complex treatment than is available on standard hospital wards.[5, 6]

Critical care patients differ with respect to the reason for their admission to the ICU, and these differences are likely to result in different expectations regarding their health. Therefore, when measuring outcomes in intensive care patients, we should take into account the possibility that outcomes will vary by admission diagnostic category.[7]

The length of patient stay varies widely, most patients are discharged within 1-2 days, commonly after post operative respiratory and cardiovascular support and monitoring some

patients however may require support for several weeks or months, these patients often have multiple organ dysfunction.[8]

Admission to an Intensive Care Unit is expensive and it is important to be clear that the benefit derived by each patient justifies the considerable use of resources. When a patient survives an intensive care admission but subsequently dies prior to hospital discharge, questions may be prompted about both care and treatment received on the main ward, and suitability of the patient for intensive care treatment.[9]

Basic monitoring requirement for serious ill patient are heart rate, blood pressure, respiratory rate, oxygen saturation, hourly urine output, temperature and blood gases. Equipment include mechanical ventilators, humidifiers, oxygen masks, cardiac monitors, resuscitation trolleys, ambu bags, laryngoscope, tracheal tubes, defibrillators, central venous pressure measurement and stethoscopes.[10]

Although a minority of patients require access to an intensive therapy unit after major surgery a substantial number require closer supervision for 24-72 hours that can be provided at ward level. [11]

1.2 TRIAGE

Triage is derived from the French *trier,* meaning "to sort." Or is a system of assigning priorities of medical treatment based on urgency, chance of survival, this can be also used in ICU or in hospital emergency. Often needed because the number of potential ICU patients exceeds the available beds. ICU/Critical Care Director should have the authority and responsibility to triage. Triage decisions may be made without patient/surrogate consent.
Triage decisions may be made despite an anticipated untoward outcome. May use the same prioritizing criteria listed under admission such as ICU admission criteria should select patients who are likely to benefit from ICU care. ICU care has been demonstrated to improve outcomes in severely ill, unstable patient populations. ICU practitioners should understand

tools for assessing severity of illness and prognosis of critically ill patients. Existing predictive instruments have only been applied to patients already admitted to an ICU and have not been tested as preadmission screening tools. Both extremes of the risk of death spectrum are not ideal ICU patients: those "too well to benefit" and those "too sick to benefit." Defining these groups may be difficult solely based on diagnosis. Criteria defining "substantial benefit" are subject to interpretation based on 3 models for defining those that will benefit most from the ICU, and give clinical examples of patients and conditions that can be separated based on the parameters of each model.

Prioritization Model

Priority 1: unstable patients in need of intensive treatment and monitoring that cannot be provided outside of the ICU. This includes ventilator support and vasoactive drug infusions. Priority 1 patients have no limits placed on the extent of therapy they are to receive.

Priority 2: patients requiring intensive monitoring and potential for immediate Intervention no therapeutic limits are stipulated for these patients. Priority 3: unstable critically ill patients who have a reduced likelihood of recovery because of underlying disease or the nature of their acute illness. Patients may receive intensive treatment to relieve acute illness but limits on therapeutic efforts may be set, such as no intubation or resuscitation. Priority 4: patients who are generally not appropriate for ICU admission. Admission of these patients should be on an individual basis, under unusual circumstances and at the discretion of the ICU director. These fall into two categories either too well to benefit based on low risk. Examples given are patients after peripheral vascular surgery, hemodynamically stable diabetic ketoacidosis, mild congestive heart failure, conscious drug overdose or too sick to benefit based on condition consistent with imminent death. Examples given are patients with severe irreversible brain damage, irreversible multi-organ system failure, metastatic cancer unresponsive to therapy, patients with decision making capability who decline services typically provided by ICUs, comfort care only.[12]

1.3 Discharge Criteria

The status of patients admitted to an ICU should be reviewed continuously to identify patients who may no longer need ICU care. Patient are discharge from ICU if physiologic status has stabilised and the need for ICU monitoring and care is no longer necessary. Also when a patient's physiological status has deteriorated and / or become irreversible and active interventions are no longer beneficial, withdrawal of therapy should be carried out in the intensive care unit. Other considerations are; Stable haemodynamic parameters, stable respiratory status (patient extubated with stable arterial blood gases) and airway patency, oxygen requirements not more than 60%, intravenous inotropic/ vasopressor support and vasodilators are no longer necessary, patients on low dose inotropic support may be discharged earlier if ICU bed is required. cardiac dysrhythmias are controlled, neurologic stability with control of seizures, patients who require chronic mechanical ventilation (eg motor neuron disease, cervical spine injuries) with any of the acute critical problems reversed or resolved, patients with tracheostomies who no longer require frequent suctioning.[13]

Goldhill *et al* describe a 'patient-at-risk' team who identified patients with abnormal physiological parameters before ICU admission, leading to early expert advice and active management. [14] Whilst triage of patients for ICU care is important, it is often a difficult decision and patients will often be given the benefit of the doubt. Doctors delivering intensive care often have to decide which patients can benefit most. Scoring systems have been developed in response to an increasing emphasis on the evaluation and monitoring of health services. These systems enable comparative audit and evaluative research of intensive care. Scoring systems have various characteristics such as age, physiological variables, type of admission (scheduled surgical, unscheduled surgical, or medical), and variables related to underlying disease: acquired immunodeficiency syndrome, metastatic cancer, and haematological malignancy. This factors have been recognised as important in increasing the risk of death before discharge from hospital after intensive care.[15]

1.4 Types of scoring systems

Scoring systems in intensive care can be either specific or generic. Specific scoring systems are used for certain types of patients whereas generic systems can be used to assess all, or nearly all, types of patient.

The scoring system may be either anatomical or physiological. Anatomical scoring systems assess the extent of injury whereas physiological systems assess the impact of injury on function. Scores from anatomical scoring systems, once assessed, are fixed whereas physiological scores may change as the physiological response to the injury or disease varies.

The Glasgow coma scale is still in general use in intensive care. The scale avoids having to describe a patient's level of neurological function in words and the assumption that colleagues understand the same meaning from those words.[16]

The later scoring systems developed for intensive care has been generic. Two main approaches have been used; one is aimed at measuring severity by treatment intensity and the second at measuring severity by patient characteristics.

1.5 Measuring severity by treatment

The Therapeutic Intervention Scoring System (TISS) published in 1974 was developed to quantify severity of illness among intensive care patients based on the type and amount of treatment received. The underlying philosophy was that the sicker the patient, the greater the number and complexity of treatments given. By quantifying this, a proxy measure of the severity of illness for a patient could be obtained.

The system scored 76 common therapeutic activities and was last updated in 1983. A simplified version based on 28 therapeutic activities has been published and a version for patients in high dependency units has been proposed. Another approach is to assess the severity of organ dysfunction based on the type and amount of treatment received. These organ failure scoring systems are used to give a probability of hospital death which takes into account the severity of dysfunction in each organ system and the effect on prognosis of dysfunction in several organ systems.

1.6 Measuring severity by patient characteristics and physiological measurements

A significant number of patients survive the critical illness with sequelae that severely limit the quality of life and with expectations for a full functional recovery.[17]
Several investigators have shown that increasing severity of illness or dependency of care at time of ICU discharge adversely affects hospital mortality. [18]

The first generic physiological scoring system developed to quantify severity of illness by patient characteristics was the Acute Physiology and Chronic Health Evaluation (APACHE) method. The original system was too complex and time consuming to collect routinely, so two derivations were developed—the APACHE II and Simplified Acute Physiology Score (SAPS) the system. These were both subsequently updated to APACHE III in 1991 and SAPS II in 1993. An alternative system is the Mortality Prediction Model (MPM II).physiological measurements.[16]

Scoring systems provide a means for comparing results, ensuring consistent standards and evaluating changes in therapy. The APACHE II system depends partly on the results of laboratory tests which are not normally available at the current study area (Tanzania). SAPS II score provides an estimate of the risk of death without having to specify a primary diagnosis. The SAPS II score is made up of 17 variables – 12 physiological variables, age, and type of admission (scheduled surgical, unscheduled surgical, or medical), and 3 variables related to underlying disease: acquired immunodeficiency syndrome, metastatic cancer, and haematological malignancy. Points assigned for each variable vary from 0 to 3 (for temperature) up to 0 to 26 for Glasgow coma scale. For sedated patients, Glasgow coma scale before sedation is used.[19]

A simplified illness severity score, the Clinical Sickness Score (CSS), was developed in Central Africa in 1986 and provided an objective measurement of illness severity it is essentially the Glasgow Coma Score with cardiorespiratory and temperature scores, and a weighting for age. The score weighting, where appropriate, is based on that used in APACHE

II. The scoring system based on (CSS) according to pulse rate, blood pressure, respiration rate, urine output, Glasgow Coma Scale, temperature and age. CSS was significantly associated with outcome, there being no significant difference between actual and predicted outcomes the proportional change in score from admission was also significantly associated with outcome on each subsequent day in ICU. In terms of predicting survival a score of 12 or less had a specificity of 93%, sensitivity of 36.3% and an overall accuracy of 68.5%. A score of 14 or less had a specificity of 95.8%, sensitivity of 28.5% and accuracy of 66.8%. The CSS provides an objective measure of illness severity for critically ill patients in Africa, an illness severity scoring system based on clinical observations alone.[20]

This would allow an assessment to be made of the effectiveness and value of intensive care in the developing world, and comparisons to be made of different ICU's. Data from seven sub-Saharan African countries indicates that the majority of patients served are surgical. Comparison between intensive care units is difficult due to lack of laboratory support, which precludes the severity sickness scores used internationally.[21]

Scores can only predict the likelihood of a certain outcome. The change in score from admission is a measure of the response to treatment and this response influences prognosis[22]

ICUs provide a service for patients with potentially recoverable diseases who benefit from more detailed observation and treatment than is usually available on the general wards. Patients may be discharged from the ICU when their physiologic status has stabilized and the need for ICU monitoring and care is no longer necessary.[23]

Most deaths occurring after ICU discharge were due to continuing organ failure, rather than the step down to the less intensive level of care on the ward.Traditionally, the success of critical care has focused largely on mortality and assessment of the health of survivors in terms of physiological, radiological, and biochemical measurements of impairment. Objective measures, for example, the ability to return to work, have been used to gauge a patient's quality of life. Such a measure could be inappropriate in a society of rising unemployment and an ageing population.[24]

Mortality post-ICU mortality has been reported to range from 6% to 27%. Data suggest that keeping at-risk patients in the ICU for a further 48 hours might reduce mortality after ICU discharge by 39%.[25]

A significant number of patients survive the critical illness with sequelae that severely limit the quality of life and with expectations for a full functional recovery.

Transfer from the ICU to a ward is associated with a significant reduction in clinical observation and monitoring, with the ratio of nurses to patients varying from 1: 4 to 1: 10, compare to ICU were the ratio is 1:1 there is also fewer medical staff on the wards, with the least numbers of nurses and doctors at night. Similarly, elderly patients with surgical or medical illness have shown to be at greater risk of death than those younger than 50 years. The increase vulnerability of elderly patients is attributed to more co- existing diseases diminished physiological vigour, myocardial infarction and cardiopulmonary resuscitation.[26]

1.7 Characteristics of ICU and post-ICU patients.

A study done in the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria, by Mato et al found that, a total of 1 447 patients were admitted. In ICU there were 658 males and 789 females (male/female ratio 1:2). Ages ranged from 4 months to 90 years, the median age was 30 years and the mean age was 31.7±5.6 years. The highest proportion of admissions (48.7%) was from the Department of Obstetrics and Gynaecology, and the lowest from Ophthalmology and Anaesthesia (0.1%). Postoperative cases made up 62.1% of total admissions. Average length of stay was 8.1±2.8 days, median 4.5 days and the ICU a mortality rate was 352 (24.3%)[27]

A study done by Adamu et al in the Federal Medical Centre Gombe, North-Eastern zone of Nigeria found that there were a total of 114 admissions into the critical care unit and the majority (66.7%) of these were trauma related cases (45.6%) constitutes the most common disease entity responsible for admission into the ICU, this were due to severe head injuries , extra cranial injuries consisting of major burns, thoracoabdominal injuries, spinal injury,

facial gunshot and a polytrauma patients. There were overall 74 (65%) survivals and 40 (35%) deaths resulting into overall ICU mortality rate of 35%.[28]

The reported ICU mortality rate varies between 15-35% depending on the case mix, age, length of stay and organizational aspects of the unit[29]

Another study done at (ICU) of the University of Benin Teaching Hospital 1999 show that the outcome of patients admitted has Mortality rate of 35.1%, 12.1% discharged home and 50% were transferred to the general hospital wards.Mortality was highest in the 21–40 years group (32%). This was followed by the 0–20 years age group (9.4%), which included 57 paediatric patients aged 0–17 years, it was also found the duration of stay in the ICU is an index of severity of morbidity, although it cannot be interpreted in isolation. The mean duration of stay was 7.1 days.[30]

A study done by Watters et al at ICU of University Teaching Hospital, Lusaka, Zambia 1989, Six hundred and twenty-four patients admitted over an eleven month period. Sixty-seven (24.8°/o) of the deaths occurred in the wards after ICU discharge.[20]

Boniface at MNH, Tanzania 2003 revealed that age, sex, length of ICU stay for medical cases and number of physician visit were not seen to be associated with the patient outcome in the ICU, the overall mortality in the ICU among medical cases was 58.1% [31]

A study done by Hariharan in surgical ICU in Queen Elizabeth Hospital, Barbados West Indies 2001 found that during the period of study, 438 patients were admitted to the surgical ICU, of which 62 patients died (overall mortality rate 14.2%). Of these patients, 380 (86.8%) stayed for less than two weeks and 58 (13.2%) patients stayed more than two weeks in the ICU. Mortality of the prolonged stay patients were significantly higher than that of the patients who stayed less than two weeks in the ICU.[32]

ICU stay was calculated as the number of calendar days from ICU admission to discharge, and was considered prolonged if it exceeded 14 days.[33, 34]

Prolonged ICU stay can adversely affect the health status by increasing the risk of infection, complications, and, possibly, mortality.[34]

Although there have been many different suggestions regarding the exact definition of prolonged ICU stay, studies have recommended and used 14 days and above as the appropriate duration to categorize intensive care patients into this group.[35, 36]

In other study done by Sinclair et al Royal Devon and Exeter hospital found that the predictive power of CSS score to that of APACHE II identified survivors and non survivors with similar power (p less than 0.001). There was a highly significant correlation between the two scoring systems for hospital survivors and non survivors together (r = 0.5418, r2 = 0.28, p = less than 0.0001) and for hospital survivors alone (r = 0.6102, r2 = 0.37, p = 0.0001). Admission Clinical Sickness Score and APACHE II scores had similar predictive power in this study.[37]

A study done by Elie et al 2003 in seven ICUs near Paris, France, found that Admission category (nature) of admission to ICU majority were medical accounting for 938 (67.7%) patients, scheduled surgery for 244 (17.6%) patients and emergency surgery for 203 (14.7%) patients. Their outcome was (77.3%) of medical cases died in the ward post-ICU, emergency surgery (4.6%) and elective/scheduled (17.8%).[25]

Age should not be considered as a factor related to in-hospital mortality of elderly patients not requiring invasive ventilator support in ICU. In a study done by Leong et al at Tan Tock Seng Hospital in Singapore found that, no statistical relationship between age and hospital mortality and ICU mortality instead, markers of illness severity, such as the APACHE II score, a high risk diagnosis and the number of organ failures were better indicators for mortality. [38]

In a study of deaths after ICU discharge, Wallis et al, Ninewell Hospital UK found that about three-quarters of patients who died after the discharge were either at risk of dying or were expected to die; however, 20% were expected to survive but died. The predominant causes of death among patients expected to survive were pneumonia, sepsis, and myocardial infarction, consistent with the reasons for unexpected deaths after discharge from the ICU.[39]

Rafael Fernandez et al Hospital de Sabadell, Spain found a total of 1,159 patients were transferred to the ward, where 111 (9.6%) finally died and 1,048 (90.4%) were discharged from hospital.[40]

Study done by Saquid at el Rochester medical ICU, 2005 found that The ICU and hospital mortality rates were 11.9% and 19.3%, respectively. The median observed ICU length of a stay was 1.5 days.[41]

Yung-Che Chen, et al 1999 Linkuo Chang Gung Memorial Hospital found that there were 326 patients (112 women, 214 men) admitted to the ICU. A total of 203 patients (62.3%) were discharged to the general wards and 123 (37.7%) died during their ICU admissions. Of the 203 live discharges from the ICU and 39 (19.2%) subsequently died in the hospital. The time from the last ICU discharge to death ranged from 1 day to 62 days, with a median of 8 days. Ten patients (25.6%) died within 1 week of their ICU discharges, and the cause was mostly septic shock 4 patients and acute respiratory failure 3 patients.[42]

Another study done in by Zanten, 2010 Gelderse Vallei Hospital, Ede, The Netherlands, found that cause of death in the ward post- ICU were Sepsis 28(30.1%), Irreversible cerebral damage19(20.4%), Congestive heart failure/cardiac arrest 13(14%) Pneumonia 12(12.9%),Renal failure, Thromboembolic disease ,Aspiration, , Malignancy 6(6.5%)[43]
Ridley and Purdie in Western Infirmary, hospital Glasgow, Scotland found that the cause of death in 158 patients who died after discharge from ICU malignancy was the commonest cause of death in the ward post-ICU accounting for 31%[44]

A study done by Azoulay et al 2005 in spain, International observational cohort study including 28 ICUs in eight countries, found that after ICU discharge pneumonia, clinical sepsis and bloodstream infection increased the risk of ICU death. Post-ICU death occurred in 195 (10.4%) patients and was associated with age, chronic respiratory failure, immunosuppression, cirrhosis; Post-ICU death was more common among medical patients and patients with hospital-acquired infection or microbiologically documented infection and was less common in patients with pneumonia. The main risk factors were patient and infection characteristics, severity at ICU admission, and persistent organ dysfunction at ICU discharge. [45]

Another study done in Waikato Hospital ICU, Hamilton New Zealand 1997 found total ICU admission 6741, whom 5283(89%) survived in the ICU, 525(9%) died in ICU and 108(2%) died on the ward post-ICU. 25% of these were cases of hypoxic cerebral damage followed by, cerebrovascular accidents, renal failure, cardiac and respiratory failures as other major causes. Cardiac arrest was the main cause of death.[39]

2.0. STATEMENT OF THE PROBLEM

Until recently, an ICU stay was deemed successful if a patient survived to go to the ward. Practitioners in intensive care have historically paid little attention to the long term outcomes of their patients. Also, little consideration has been taken to patients dying in the ward, or soon after leaving hospital or indeed if the patient went home with an appalling quality of life.[46] Studies from other centres have reported post-ICU mortality in the wards to be between (6.1 – 27%).[20, 25, 40, 42, 43, 47-49]

A study done at the ICU of the University Teaching Hospital, Lusaka, Zambia 1989, Six hundred and twenty-four patients admitted over an eleven month period. Found that Sixty-seven (24.8%) of the deaths occurred in the wards after ICU discharge.[20]

No study has been conducted in Tanzania on the outcome of patients discharged from the ICU and their associated factors. Hence data from this study will help us to know the extent of the problem of mortality in our wards and its cause, Thus will help us to have proper planned management after discharge from the ICU, whilst assist upgrading our current management and policy of post-ICU patients in the ward.

3.0. STUDY RATIONALE

The outcome of ICU patients is well studied and documented well in developed countries, but it is less documented in developing countries like Tanzania, where there is a gap of information on outlines of patient's outcomes in the ward, post-ICU discharge so as to know their clinical outcomes and their associated factors.

No study in Tanzania has been done to know the extent of the post-ICU mortality and their associated factors. Therefore this study was intended to determine the actual post-ICU outcome of patients and their associated factors in the ward. By knowing the outcome of patients in the wards after ICU discharge and associated factors would result in early detection of patient's deterioration, early institution of rational treatment that will in turn reduce the duration of hospital stay and therefore improve the patients' outcome.

Thus this research finding will help to fill the existing clinical information gap and thus we can share critical care skills effectively with the staff in the wards and hence improving the quality of patients care.

4.0. STUDY OBJECTIVES

4.1. Broad objective

To determine the clinical outcomes and their associated factors for post-ICU patients admitted in the wards from the two intensive care units.

4.2. Specific Objectives.

1. To determine the outcome of ICU patients by age and sex.
2. To determine reason for admission to the ICU.
3. To determine the outcome of post-ICU patients in the ward by sex, age, Clinical Sickness Score (CSS) at admission, nature of admission and duration of ICU stay.
4. To determine the common causes of death in the ward post-ICU.

5.0 Methodology

5.1 Study Design

This was descriptive cross sectional study.

5.2. Study Settings

The study was conducted in the tertiary 12 bedded MNH and MOI ICU's located in Muhimbili complex, Dar es Salaam the largest city in Tanzania with an estimated population of over 4 millions people. [54]

These are national referral and University Teaching Hospital of the Muhimbili University of Health and Allied Sciences (MUHAS) with bed capacity of 1500 and 136 respectively. The ICUs has bed capacity of about 8 beds for MNH and 4 beds for MOI. The units lack scoring systems for critically ill patients and patients are admitted based on clinical diagnosis. The ICU at MNH is multidisplinary it admits both medical and surgical patients while the one at MOI admits neurosurgical patient, Trauma and Orthopedic cases. The ICU's admits adult patients and pediatric patients above 5 year, for the younger kids are admitted in MNH at Acute pediatric Care Unit (APCU) but this unit is lacking in MOI. The hospitals lack a step down facility (high dependency unit).

ICU at MOI each bed is equipped with a mechanical ventilator (Drager Savina), cardiac monitors (Drager infinity vista XL, Drager infinity Delta).Other equipment includes 3 intracranial pressure monitors, one defibrillator in each unit, infusion pumps and blood warmer as well equipment for securing the airway. Basic resuscitation drugs are available. Neither arterial cannulation nor an arterial blood gas analysis is done in this tertiary center. The same equipment applied to MNH ICU except intracranial pressure monitors. Both units have registered nurses some specialized in critical care nursing. Nurse to patient ratio is 1:1

Anesthesiologist, Surgeons, and Physicians perform daily ICU rounds in both units. Anesthesiologist on call makes the final decision on whether to accept the patients for ICU admission. Admission is arranged by consultation with the on-call ICU consultant (anaesthesiologist) or their nominated deputies via direct telephone call to the ICU land line or mobile phone and consultations are accepted 24h a day. Patients admitted directly from the Accident and Emergency department or by transfer from another hospital will always be

recorded as under the care of the duty medical or surgical team or other special unit (e.g. Paediatrics, Orthopaedics, Obstetric & Gynecology, neurosurgical, surgical, dental or Ear Nose Throat (ENT) as appropriate.

Admission of patients from another hospital must be arranged with the ICU Medical staff before transfer of the patient to ICU. Resuscitation or admission must not be delayed where the presenting condition is imminently life-threatening, (e.g. profound shock or hypoxia), unless clear advanced directives are available. Admission disputes must be referred to the on-call ICU consultant. Admission will be arranged by the ICU consultant or their nominated deputies provided that a bed is available. If admission is delayed or impossible due to bed unavailability the ICU staff will discuss and if appropriate, assist in the process of alternative specialized care.

Until the patient enters the ICU his/her medical care remains the responsibility of the referring physician.

Our ICU's provides services that include both intensive monitoring and intensive treatment for patients with actual or potential vital system failures, which appear reversible with the provision of ICU support. During times of high utilization and scarce beds, patients requiring intensive treatment (Priority 1) have priority over monitoring (Priority 2) and terminally or critically ill patients with a poor prognosis for recovery (Priority 3). Eligibility for ICU admission and discharge is also based upon reversibility of the clinical problem as well as the likely benefits of ICU treatment and expectation of recovery. It is the responsibility of the patient's attending physician to request ICU admission and to promptly accept back patients meeting discharge criteria. It is the responsibility of the ICU consultant or their nominated deputies to decide if a patient meets eligibility requirements for ICU. In case of conflict regarding admission or discharge criteria, the ICU consultant will decide which patient should be given priority.

5.3. Study Population

All patients admitted at the two ICUs and those discharged from ICU to the general ward during the study period were included in the study.

5.4. Sample Size

The following formulas for sample size estimation were used to calculate the minimum sample size. [50]

$$\text{Sample size (N)} = Z^2 P \frac{(1-P)}{d^2}$$

Where:

Z=percentage of normal distribution corresponding to level of significance.

If significance is 5% Z=1.96

P= prevalence =0.248 of mortality in the ward after ICU discharge.[20]

This prevalence was taken from study done in Zambia as is among of the developing country like Tanzania found in Sub - Sahara Africa.

d= marginal error which was taken to be 5%

Then,

$$N = \frac{(1.96)^2 * 0.248\ (1-0.248)}{(0.05)^2} = \frac{(1.96)^2 * 0.248 * 0.752}{(0.05)^2}$$

$$N = 286$$

There for n = 286 patients as minimum number.

In this study a total number of 582 patients were recruited.

5.5. Duration of the Study

The study was conducted from June 2009 to March 2010.

5.6. Sampling Procedure and Recruitment

All patients who were admitted at MNH and MOI ICU and who consented for the study were enrolled in to the study. Participants were explained the aim of the study and all procedure involved .Accompanying relative ,parents or guardian were requested to give an informed written consent for patients who could not give consent due to impaired level of consciousness or under 18 years.

5.7. Eligibility Criteria

Patients were included into the study if was admitted to the ICU and consent for participation was obtained from patient or guardian.

5.8. Exclusion Criteria

Patients were excluded from the study if was readmitted to the ICU, those who remained in the ward or ICU at the end of the study and those who consent for participation was not obtained.

5.9. Study Tools

A questionnaire was used information collected included as per Appendix 12.1 was obtained. Demographic information such as age and sex was obtained, history related to admission and physical measurement based on CSS on Appendix 12.2 was included.

5.10. Data Collection

ICU nurse on call informed the author on all new admission .Assessment and data collection was done by principal investigator. History was taken to ascertain the demographic details (age and sex), reason for ICU admission and nature of admission to ICU, and. A detailed physical examination with regard to CSS was done immediately once the patient is admitted within 15 minutes of admission. Pulse rate and systolic BP were measured and monitored using the (Drager infinity vista XL, Drager infinity Delta).Respiratory rate was the number of breaths per minute and was counted manually per min. Urine output in one hour in urine bag on catheterized patient or direct collection in bed pan and the volume was measured by graduated measuring cylinder was recorded. Axillary temperature was measured using mercury thermometer. Glasgow coma scale was recoded using the recording scale on appendix 12.3. Further CSS of each patient admitted to the ICU were scored on admission and obtained overall median score for the patients was recoded. The minimum score was 0 and the maximum score was 28. Patients were observed for outcome in ICU and in the ward until hospital discharged.

5.11. Definition of terms.

Outcome death or alive was assessed by comparing the proportion of admitted patients who died in period of study and was compared based on reason for ICU admission, age, sex, CSS at admission, nature of admission duration of ICU stay and duration of ward discharge.

Nature of admission was defined as (patient admitted based on emergency surgery, elective/schedule surgery (included patients who had surgeries that were scheduled with at least 24 hours notice) or non surgical emergency/medical).Length/duration of ICU stays was defined as the time from admission to the time of discharge from the ICU. Post-ICU death is defined as death occurring between ICU discharge and hospital discharge.[51]

5.12. Data Entry, Cleaning and Analysis

Information obtained was collected using structured questionnaires, which were checked daily for completeness and consistencies. Data entry and cleaning was done using EPI info software version 6. Data was analyzed using the Statistical Package for Social Science (SPSS) version 16. Analyses included, descriptive statistics were expressed in percentages, mean, median where appropriate and categorical variable like sex, alive or dead were analyzed accordingly.

Frequency tables were obtained and these showed the proportion of people in the study population with and without the assessed outcome. Comparison of proportions was done using Chi square and fisher's exact test. Comparison of continuous variable was done using appropriate parametric test (t-test, anova) and non parametric tests (mann- whitney). Univariate and multivariate logistic regression were performed to compare appropriate variables and odds ratios 95% confidence interval and p values were recorded.

Multivariate logistic regression with forward conditional elimination to examine all covariate effects of each factor was done. P-values of less than or equal to 0.05 was considered statistically significant.

5.13. Ethical Considerations

The study received ethical clearance from the Research and Publication committee of MUHAS and the Ethics department of MNH and MOI. (Appendix 12.7)

6.0 RESULTS

Fig 1. Patients flow chart.

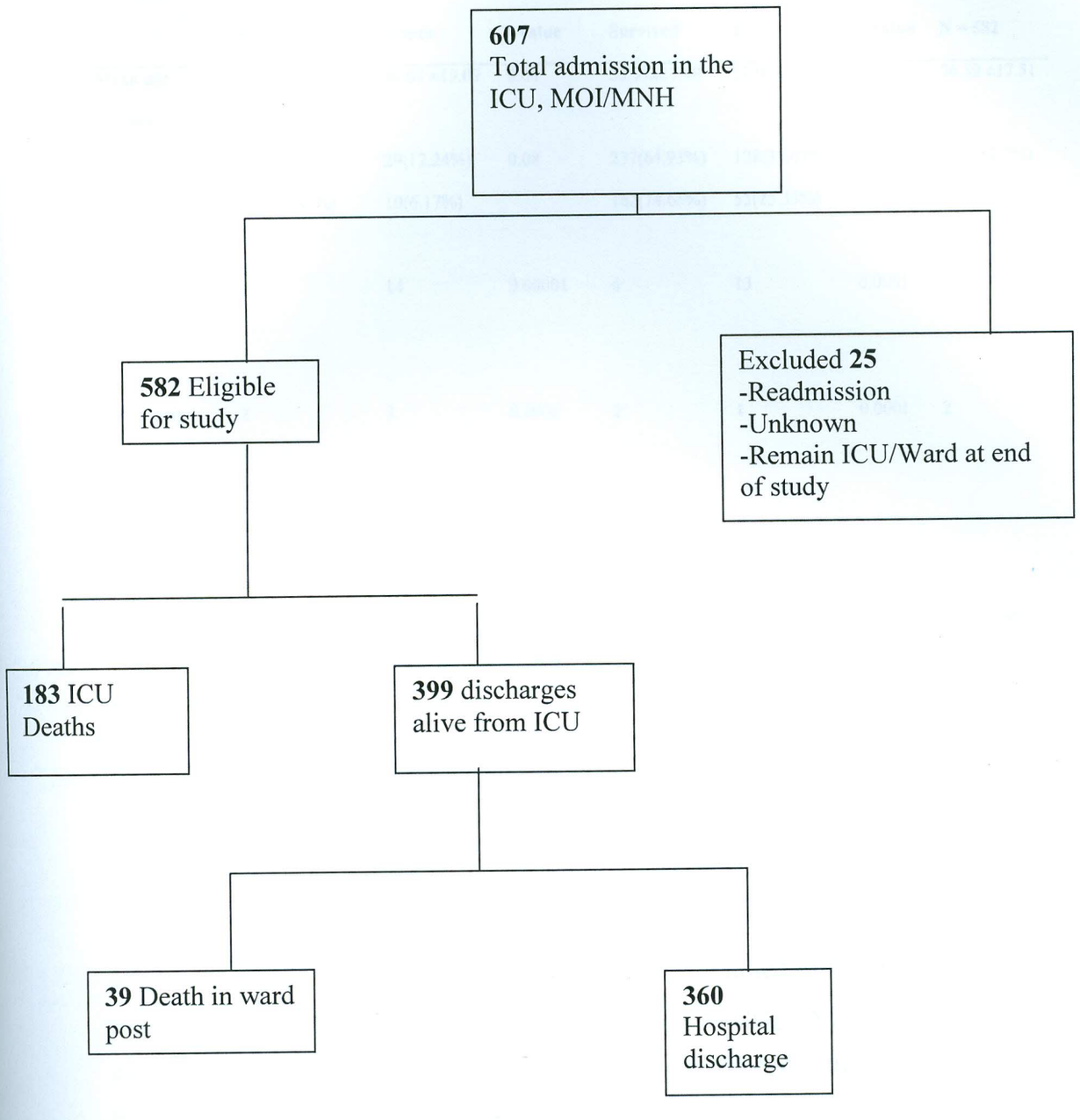


Table 1 Baseline characteristics of patients admitted in the ICU and in the ward post-ICU and their outcome.

	Ward			ICU			All patients
	Survived	**Death**	**P-value**	**Survived**	**Death**	**P- value**	**N = 582**
Mean age (years)	35.47 ±17.25	40.64 ±19.09	0.04	35.97±17.48	37.94±17.54	0.02	36.59 ±17.51
Male	208(87.76%)	29(12.24%)	0.08	237(64.93%)	128(35.07%)	0.015	365 (62.7%)
Female	152(93.83%)	10(6.17%)		162(74.65%)	55(25.35%)		217(37.3%)
Admission CSS Median	6	14	0.00001	6	13	0.0001	7
ICU stay (days) Median	2	3	0.0001	2	1	0.0001	2
Nature of Admission							
Schedule surgery	179(98.35%)	3(1.65%)		182(90.55%)	19(9.45%)		201(34.5%)
Emergency surgery	143(83.14%)	29(16.86%)	0.0001	172(50.11%)	124(41.89%)	0.0001	296(50.9%)
medical	38(84.44%)	7(15.56%)		45(52.94%)	40(47.06%)		85(14.6%)

During the 10 month period a total of 607 patients admitted in the ICUs and enrolled in this study but only 582 were included for analysis after excluding 25 patients due some reason.(see patent flow chart figure 1). Among them 365(62.7%) were males and 217(37.3%) were females, with 1:2 female to male ratio.

The mean age was 36.59 ± 17.51 and the range was 5 – 91 years. Age group 27- 37 years constituted 168(28.9%) of all patients (Fig 2). The median duration of ICU stay was 2 days.

Among the 582 ICU admitted patients, 399(68.6%) patients were discharged alive from the ICU and 183(31.4%) died in the ICU, whilst 39(9.8%) died during their post-ICU hospital stay in the wards. Total of 360 (61.9%) were discharged alive from the hospital wards. (Table 1). Proportion of patients who died in ICU and in the ward post-ICU was 222(38.1%).

More male died in ICU 128(35.07%) than female 55(25.35%) p = 0.015.The mean age for ICU survivor and those who died was 35.97 ± 17.48 and 37.94 ± 17.54 respectively (p = 0.02).

The mean age for those who died in the wards post-ICU was higher than those who survivors in the ward post-ICU, mean ages 40.64 ± 19.09, 35.47 ± 17.25 respectively. This observation was statistically significant p = 0.04. (Table 1)

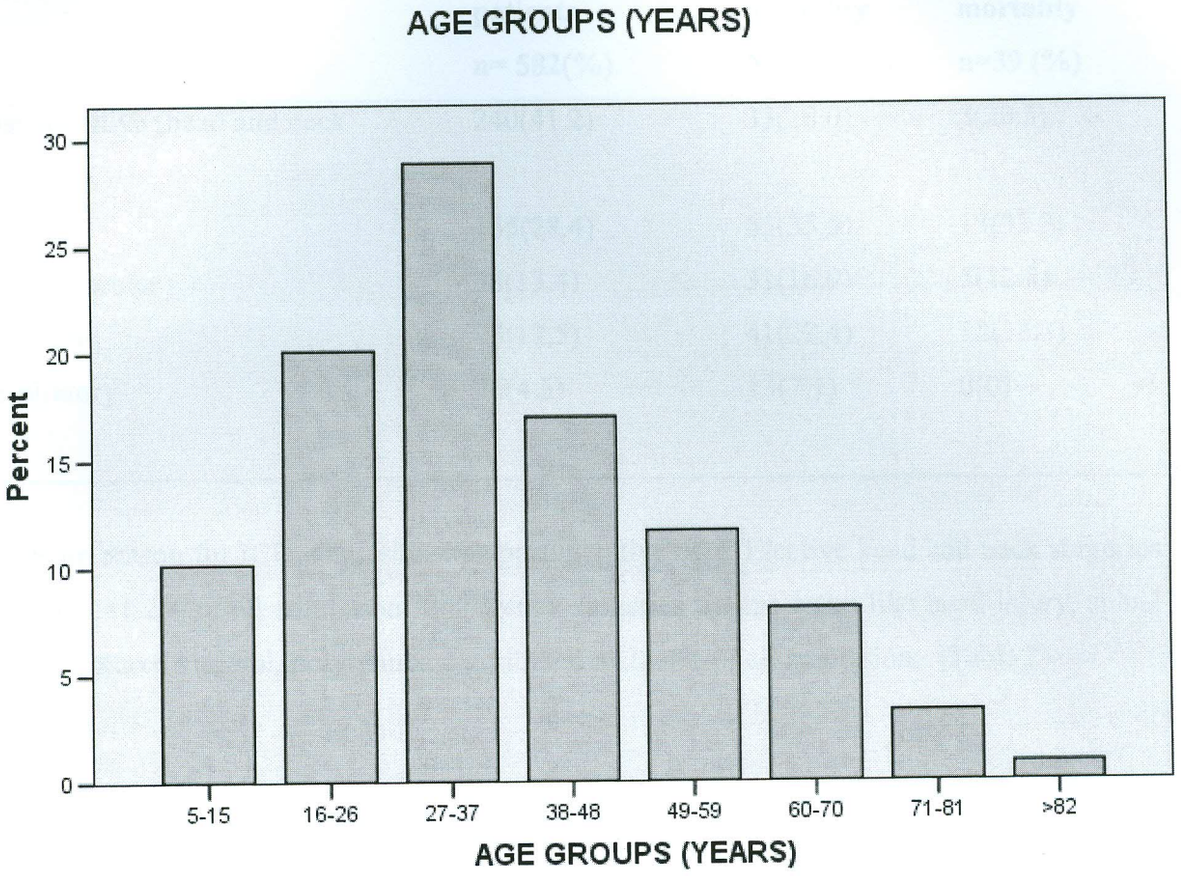
More males died in the wards post-ICU (12.24%) as compared to females (6.17%).However the association was not statistically significant (p = 0.08).(Table 1).

The overall median CSS at admission in ICU to all patients was 7.patient who survived in the ward post-ICU had a median CSS of 6 on admission, while those who died in the ward post-ICU had severe disease with CSS of 14 at the time of admission to ICU. An observation which is statistically significant (p=0.00001)

Patients who survived in the ward post ICU had statistically significant shorter duration of ICU stay than those who died in the ward median (2 days and 3 days respectively) p = 0.0001.(Table 1)

Admission to ICU mainly involved patient from operating theatres, of this (50.9%) patients had an emergency surgery. Highest mortality was significantly observed in the wards post-ICU amongst patients who had undergone emergency surgery (16.86%) , the least was those who had undergone elective/scheduled surgery 1.65%.(p = 0.0001).(Table 1).

Fig 2: Age distribution of study participants.



Majority 28.9% of ICU admissions were in age group 27- 37 years.

Table 2 Major reason for ICU admission and mortality rate in ICU and Ward post-ICU.

Reason for admission to ICU	Number of patients n= 582(%)	ICU mortality N=183 (%)	Ward mortality n=39 (%)
Post operative (head and neck surgeries)	240(41.2)	33(18.0)	8(20.5)
Trauma	165(28.4)	65(35.5)	13(33.3)
Cardiovascular	78(13.4)	31(16.9)	5(12.8)
Infections	73(12.5)	41(22.4)	13(33.3)
Respiratory	26(4.5)	13(7.1)	0(0)

The main reason for ICU admission was postoperative care. Elective head and neck surgeries constitute 41.2% of all admission. Emergency surgeries trauma cases like head injury, spinal injury, ruptured visceral, polytrauma contributed to 28.4% of all admission. (Table 2)

Table 3 Distribution of reported causes of death in the post-ICU patients in the ward.

Cause of death	Number (39)	Percent %
Sepsis	16	41.03%
Cardiac arrest(cardiac failure)	12	30.77%
Cerebral vascular accident	4	10.26%
Malignancy	3	7.69%
Renal failure	2	5.13%
Multi-organ failure	1	2.56%
Severe Pneumonia	1	2.56%
Total	39	100%

The leading cause of death in the wards post ICU was sepsis (41.03%).Other causes of deaths was due to cardiac failure or arrest due to hypoxic brain damage, structural brain damage secondary to trauma prior to ICU admission, cerebral vascular accidents, malignancy ,renal failure , pneumonia, multi organ failure (which include combination of renal failure and heart failure.(Table 3).

Table 4 Univariate and Multivariate analysis of categorical and continuous predictors of post-ICU death of patients in the ward.

Variable	Univariate logistic regression		Multivariate logistic regression	
	OR(95% CI)	P value	OR(95% CI)	P- value
Age	1.0(0.99-1.03)	0.081		Not in the final model
Sex				
Female	1.0(1)	0.049		Not in the final model
Male	2.1(0.99-4.50)			
Nature of admission				
Scheduled surgery	1.0(1)			
Emergency surgery	12.1(3.45-42.47)	0.0001	1.3(0.55-3.21)	0.53
Medical cases	10.9(2.57-47.06)			
Duration of ICU stay(days)	1.12(0.9-1.39)	0.296		Not in the final model
CSS at admission to ICU	73.98(22.2-246.2)	0.0001	67.1(19.69-228.39)	0.0001

With univariate logistic regression nature of admission, emergency surgery, scheduled surgery or non surgical/medical and CSS on admission were determinants of post ICU mortality. With multivariate logistic regression forward stepwise analysis only higher CSS at admission to ICU was a significant independent determinant of post-ICU mortality.

7.0 DISCUSSION

In the ward patients may die because of potential treatable complications that might have been prevented by continued ICU care or a highest level of care. This study was aimed at knowing the clinical outcome and associated factors for post-ICU patient admitted in the wards.

Five hundred and eighty two patients were enrolled into the study. In agreement with other studies, more males 62.7% were admitted in ICU than female.[43] More males died in ICU 35.07% than female 25.35% this can be due to the fact that more males were admitted than female. Those who die in ICU were older 37.94 ±17.54 than those discharged alive from ICU. This finding is similar to other study finding. [54]

In this study, the median length of stay in ICU was 2 days compared to median of 4.5 days in other country as reported by Mato et al.[27] This may be due to the fact that majority of admissions were contributed by postoperative care that required only a shorter ICU stay for the purpose of close monitoring of vital sign and airway management as the centre is lacking the intermediate (HDU) unit.

In this study, the proportion of patients admitted in ICU who died was 31.4%. The reported ICU mortality varies between 15-35% in developing country[29]. Although in this observed mortality rate is within this value it is however higher than an overall ICU mortality of 24.3% recorded in Nigeria.[27] ICU mortality rate in developed countries range from 20% - 30%. [33, 52]

The difference in mortality may be due to difference in diagnosis on admission. About 50.9% of the studied patients were post emergency surgery patents due to major trauma and infected bowel surgeries. In the Nigeria study done by Mato et al 62.1% were post caesarian section, admitted for post operative care as there were no beds in the wards. Another contributing factor is the fact that MNH and MOI are mainly tertiary referral hospitals in the country. In this setting and similar to what is found in many African settings, adequate pre-hospital care is

virtually non-existent and there is always a delay in evacuation of patients to the hospitals making it practically infeasible to establish appropriate early care to critically ill cases, due to poor referral system and infrastructure available in our setup. Hence this warrants a further research in the future.

In this study main reason for admission in the ICU was postoperative patients (41.2%) however study done by Wallis et al they found that this contributed 50.6% of patients.[53] Discrepancy could be explained by the fact that in our study area other surgeries like vascular surgeries are admitted in separate ICU compared to this study were they combine all cases in the same ICU.

Ward deaths constituted 9.8% of all patients admitted in the ward post - ICU and this was lower finding in contrast to a study done in developing country like Zambia, whereby it was found to be (24.8%), [20]while it is similar to what was seen in the developed countries where the post-ICU ward mortality ranged from 6% to 27%. [25, 40, 43, 48].

Majority of patients who died in the ward post-ICU were more aged than the survivors. This finding is similar to the finding in another study by Kass et al where they found that ward deaths were more aged than the ward survivors. [47]

In this study more males die than female in the ward post ICU. This was similar to the study done by Zanten et al were they found that 58.5% of males die in the ward post ICU.[43]

Patients who survived in the ward post -ICU had shorter duration of ICU stay (median days 2) than those who died in the ward (median days 3). This is consistent with other study by Wallis et al were they found the median length of ICU stay in days for ward survivors were 4.3 while for those who die in the ward median days were 6.5. [53]

In this study the CSS was found to be higher in the ward death and lowest in survivors, which was consistent with another study done by Sinclair et al in Zambia, found that The CSS on admission for survivors was lower than for the non-survivors .[20] This finding indicates

patients were severely ill at the time of admission to ICU. Patients who were at risk of dying after ICU discharge were those with poor health status with more severe acute disease at ICU admission and prolonged severity of illness and organ failure at the time of admission to ICU. So in this study those who died in the ward post-ICU they were severely ill compared to those who died in the ICU at the time of admission as scored by CSS. This may mean patients were discharged from ICU to the wards prematurely. Admittedly CSS at discharge from the ICU was not done as to ascertain or to rule out premature discharge from the ICU as median length of ICU stay was 2 days. Probably this may contribute to wards death post-ICU due to short duration of ICU stay. This warrants a further study to elucidate whether the post ICU death were due to premature discharge or otherwise.

In another study by Azoulay et al [25] reported that the highest mortality post-ICU in the wards was amongst non surgical/medical condition accounting for 77.3% followed by emergency surgery 17.8% and least was elective/scheduled surgery 4.6%, similar to the findings in this study, highest mortality was observed in emergency surgery 16.86% followed by non surgical/medical cases 15.56% and least was scheduled surgery 1.65%.

With multivariate logistic regression forward stepwise analysis only higher CSS at admission to ICU was a significant independent determinant of post-ICU death. This was consistent with other study findings by Elie et al 2003 France, which showed that poor health status, a more severe acute disease at ICU admission, and prolonged severity and organ failure as predicted by scoring system were the risk factors for post -ICU deaths.[54]

In this study the leading cause of death in the ward post – ICU was sepsis accounting for (41.03%) which was higher than reported from other studies.[38, 42-44, 55] This emphasises that infection was a common problem in the ICU patients, which may indicate probably it was undertreated or pre-existing sepsis this may even be infection of nosocomial origin. The reason for high mortality of patients with sepsis is that they frequently need organ support as they are prone to renal failure or intractable hypotension, which requires frequent monitoring of vital signs and or close nursing intervention. However, this situation is rarely feasible in our

hospital wards because of shortage of medical and nursing staffing, the unavailability of electrocardiography, oxygen saturation monitoring and non existence of intermediate care unit (HDU) which would improve survival to the patients in the wards. Thus ward deaths might have been prevented as the patients have come at the end of long and debilitating illness with little reserve.

Study done by Mpoki 2000 Tanzania found that nosocomial infections are significantly higher prevalent in patients admitted to the intensive care unit at Muhimbili medical centre. The pattern of nosocomial infections among our patients was not different from what is being reported in other centres world wide and the infections to urinary tract top the list 90% followed by pneumonia 62.5%, bacteraemia 15.0% and surgical wound infections 36.4% .Gram negative organism were the leading pathogens in these conditions and it was observed that equipment used in ICU harbours some microorganisms, which may play a role in causing infections in our patients. Staff working in ICU also were found to harbour some micro organisms which could infect patients under their care.[56] What we see in the ward as post-ICU sepsis could be a manifestation of nosocomial infection.

Pneumonia was the least cause of mortality in our environment 1(2.56%). This is different finding from other study were they found pneumonia were the leading cause [43, 53, 55]
This may be explained that in our environment, the majority of the ICU admission were younger compared to the other studies done, where they found majority were elderly with little organ reserve that made the major population in the ICU. Also routine physiotherapy is done to all ICU patients daily.

8.0 CONCLUSION

The common cause of death in the ward post-ICU was found to be sepsis. In this study the determinant of post-ICU mortality in the ward was Clinical Sickness Score at admission to ICU and was the independent predictor of post-ICU ward mortality and the overall hospital mortality of ICU patients. Patients who died in general wards after ICU discharge were older and had higher CSS at admission to ICU.Further the length of stay in the ICU was longer amongst patients who died in the ward post-ICU.

9.0 **RECOMMENDATION.**

An in depth study should be done in order to investigate as to why many post-ICU patients in the wards died due to sepsis. This would call for detailed study of the isolated microorganism pattern and their appropriate antimicrobial sensitivities. Also a step down unit (HDU) is required for tertiary level hospital with skilled personnel.

10.0 STUDY LIMITATION.

The scoring system use based on clinical data, the use more advanced severity scoring systems would demand the presence of advanced laboratory equipment, monitoring equipment and expertise which is lacking in developing countries.

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