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ASSESSMENT OF MORTALITY PATTERN AMONG PATIENTS ADMITTED TO MEDICAL ICU IN TASH DURING THE LAST FIVE YEARS (Sep2009-Aug2014), ADDIS ABABA, ETHIOPIA.

MSc. Research Thesis

By: Marye Getnet

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Declaration

The undersigned declared that this thesis work is my original work in partial fulfillment for degree of Master in Emergency Medicine and Critical Care Nursing. All source of materials used for this thesis work and all people and institutions who gave support during this thesis work are fully acknowledged.

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Acronyms

AKI: Acute Kidney Injury

AMI: Acute Myocardial Infarction

ARDS: Acute Respiratory Distress Syndrome

CAP: Community Acquired Pneumonia

CHF: Congestive Heart Failure

COPD: Chronic Obstructive Pulmonary Disease

DKA: Diabetic Keto-acidosis

GBS: Guillain Barre Syndrome

HIV/AIDS: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

HTN: Hypertension

ICU: Intensive Care Unit

LD : Liver Didease

MICU: Medical Intensive Care Unit

MRN: Medical Record Number

MV: Mechanical Ventilation

RF: Relapsing Fever

SNNP: South Nations Nationalities Peoples

TASH: Tikur Anbesa Specialized Hospital

TB: Tuberculosis

UGIB: Upper Gastro-intestinal Bleeding

VHD: Valvular Heart Disease

Abstract

Background**:** *Critically ill patients are usually treated in the intensive care unit (ICU) where the hospital highest mortality rates occur. Even though, few studies which had been conducted on specific single diseases indicated that the magnitude and causes of ICU mortality in developed and rarely in developing countries, information on medical Intensive Care Unit (MICU) mortality pattern is essentially nonexistent in Ethiopia as in the rest of the world.*

Objective: *The objective of this study is assessment of mortality pattern among patients admitted to medical ICU of TASH during the last five years (Sep2009-Aug2014), A.A, Ethiopia*.

Methodology: *A retrospective chart review study was conducted from December 2014 to May 2015 in medical intensive care unit (MICU) of TASH, A.A, Ethiopia. An appropriate structured checklist was utilized for data collection.*

Results: *Four hundred thirty six death charts were reviewed by using pretested structured check list. From these 223(51.1%) were males and 213(49.1%) were females. The overall mortality /magnitude of medical ICU death/ was 29%. Stroke is the leading cause of MICU death accounting for 15.8% followed by CHF (13.8%), AMI (8%), severe pneumonia (6.9%), HIV/AIDS (6.4%), sepsis (4.6%), shock (4.4%). Majority of deceased patients had deranged vital signs and changed mental states at MICU admission, i.e. 97.5%, 95.4% , 86.2% , 84.9% , 70% , 53.4% had deranged pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, oxygen saturation and body temperature respectively and 44.3% and 43.3% were comates and confused mental states respectively. The leading complication/immediate cause of death/ was respiratory failure accounting (32.8%) followed by shock (23.9%), multi organ failure (22%), cardiovascular failure (16.1%), cardiopulmonary arrest (3%) and central nervous system failure (0.9%).*

Conclusion and Recommendation:

The overall medical ICU mortality remains high, non-communicable diseases are posing significant health problems in terms of mortality and among all non-communicable diseases, stroke and cardiac diseases were the most important health problems in terms of MICU mortality. Set up and strengthen national non-communicable diseases control program. Programs promoting public awareness and life style changes to prevent non-communicable diseases need to be promoted. Further studies should be conducted on admission and outcomes of patients in medical ICU.

CHAPTER ONE:

INTRODUCTION

1.1. Background of the Study

The modern concept of intensive care unit have been innovated by an anesthetist in Denmark over half a century ago during the polio pandemic [1]. Since then, worldwide, intensive care units (ICUs) have significantly improved the quality of care and outcomes of critically ill patients, mostly in developed countries/high-resource settings/ [2]. In sub-Saharan Africa, ICUs have varying qualities and quantities of infrastructure necessary for the provision of proper critical care services [3]. The reported disease characteristics and mortality rates of patients admitted to ICUs in sub-Saharan Africa vary widely from one population to another. Intensive care unit is an expensive and scarce resource. In the face of growing demand, progressive decisions regarding appropriate levels of critically ill patient care may become necessary [4].

Patients requiring intensive care may require support for instability (hypertension/hypotension), airway or respiratory compromise (such as ventilator support), acute renal failure, potentially lethal cardiac arrhythmias, or the cumulative effects of multiple organ failure, more commonly referred to now as multiple organ dysfunction syndrome. They may also be admitted for intensive/invasive monitoring, such as the crucial hours after major surgery when deemed too unstable to transfer to a less intensively monitored unit. Intensive care is usually only offered to those whose condition is potentially reversible and who have a good chance of surviving with intensive care support. A prime requisite for admission to an intensive care unit (ICU) is that the underlying condition can be overcome (5).

The ICU is the ideal setting for mortality predictive scoring systems because of the population in ICU is well defined, patient care is well circumscribed, and there is a lot of evidence that the severity of illness in the ICU is the major determinant of hospital mortality [6].

Critically ill patients are usually treated in the intensive care unit (ICU) where the hospital highest mortality rates occur (7). Critically-ill medical patients have a high mortality rate in ICU. Critically ill patients are medically complex and may benefit from a multidisciplinary approach to care. Over four million intensive care unit (ICU) admissions occur annually in the United States each year (8). These patients are often at high risk of death (mortality) for critical illness syndromes such as lung injury and sepsis ranges from 25% to 50% and 20% of Americans die with intensive care services. Intensive care unit around the world, admit critically ill patients for advanced organ support with the goal of improving patient outcomes. Early identification and management of patients having the highest risk of death may contribute to better understanding of these injuries and their outcome (9, 10).

Despite the advances in modern medicine and intensive care, the incidence of sepsis in intensive care units (ICUs) continues to rise. In an international study of 1265 ICUs, 60 percent of ICU patients at the time of survey were considered infected, with infection being a strong independent predictor for mortality. The risks of infection in general and with a resistant pathogen in particular increased with the length of patient stay in the ICU. Several factors contribute to the high incidence of these infections in ICU and the associated poor patient outcomes (11).

Non-communicable diseases, including cardiovascular diseases, are the leading cause of medical intensive care unit death globally, and the burden of disease is rising fastest among lower-income countries. Cardiovascular diseases increased greatly in Ethiopia from 18% to 46% of all medical intensive care unit admissions over the last 30years (12).

Intensive care medicine is a developing discipline in almost all low developed countries. Financial restraints due to inadequate insurance and national health systems together with severe logistic and educational problems account for high morbidity and mortality rates in ICUs of low developed countries. More studies on the current state of intensive care medicine in low developed countries are needed to provide reasonable aid to improve the care of the most severely ill patients in the poorest countries of the world.

The purpose of this study is to assess the magnitude of medical intensive care unit mortality, to identify the diseases causing intensive care unit mortality and to determine the severity, complications and managements of patients before medical intensive care unit death in medical intensive care unit of Tikur Anbessa Specialized Hospital during the study period, A.A, Ethiopia.

1.2. Statement of the problem

In recent decades, intensive care medicine has developed into a highly specialized discipline covering several fields of medicine. Whereas the total number of hospital beds in the United States decreased by 26.4% from 1985 to 2000, intensive care unit (ICU) beds increased by 26.2% during the same period, underlining the high demand for intensive care medicine (13).

Mortality rates in the ICU strongly depend on the severity of illness and the patient population analyzed. Across different MICUs, 6.4% to 40% of critically ill patients were reported to die despite intensive care medicine has somewhat developed [14, 15]. Although patho-physiological processes and new treatment approaches are extensively analyzed in laboratory and clinical research, comparably less data are available on the causes of death, short- and long-term outcomes of critically ill patients, and associated risk factors. Mostly, data on specific prognostic criteria for single diseases have been published. However, little is known of the exact causes of death and the impact of general risk factors that may uniformly complicate the course of critically ill patients irrespective of the underlying disease (16). Knowledge of such general determinants of outcome in a critically ill patient population would not only help improve prognostic evaluation of ICU patients, but also indicate what therapy and research should focus on to improve the short and long term outcomes of critically ill patients[17, 18].

As expected from a medical ICU of a developing country, the main causes of admission and deaths remain infectious diseases. Epidemiologic transition from infectious diseases to acute/chronic non-communicable diseases is not that much expected to occur to an appreciable degree in the low and middle income countries like Ethiopia's. Besides expectations, the evidences presented suggest that there is significant segment of the urban community in major cities of the country undergoing the first or middle phase of an epidemiologic transition to acute and chronic non-communicable diseases and there is disproportionate use of the health facility by the urban community developing the chronic non-communicable diseases trend. This new epidemiologic development being noticed over the last few decades is an alarming development for a country bearing high burden of infectious

diseases. The additional cost of treatment of these new diseases (non-communicable diseases) will further drain the already weak health sector. Since these non communicable diseases mainly affect the productive part of the population/society the impact on development will also be significant. Therefore the burden of these diseases (non-communicable diseases), their risk factors and there mortality pattern should be studied among the vulnerable socioeconomic groups with the objective of developing an effective preventive strategy (19).

Even though, few studies based on single diseases indicated that the magnitude and causes of MICU mortality, information on medical Intensive Care Unit (ICU) mortality pattern is essentially nonexistent in Ethiopia as in the rest of Sub Saharan Africa (20). Most of the statistics available on mortality in this country is what is collected from health facilities as the 10 top causes of hospital death. Mortality statistics can be used for evaluating the health situation of a given population. Since it has several advantages when compared to other sources of health information such as morbidity data in that death is a unique event, and because of its finality, it should be clearly defined. Statistics on cause of death are useful in explaining trends and differentials in overall mortality ; guiding priorities for intervention program as well as socio-medical and biomedical research ; monitoring of public health program ; allocating and distribution of resources within the health sector ; and offering clues for epidemiological research(21).

Mortality in MICU is the most widely measured outcome parameter. Improvement of this outcome parameter in critical care is nowadays expected not only to come from new technologies or treatment, but also from delivering the right care at the right moment in a safe way. The measurement of mortality as an outcome parameter confronts us with a problem in providing follow-up to the results. Especially when proven structure and process interventions are applied already, the cause of a suboptimal performance cannot be deduced easily. One possibility is to evaluate the causes of MICU death and to judge preventability (22).

Meeting the challenges to improve the production of medical intensive care unit mortality statistics in lower and middle income countries will require new techniques, new technologies and new thinking about sustainable, representative, reliable systems for determining the magnitude and causes of death (23)

Overall, worldwide, regionally (continentally) and nationally including Ethiopia, there were no organized information/data on medical intensive care unit mortality pattern. So, due to the scarcity of data on magnitude and cause specific mortality of medical ICU patients in Ethiopia as compared to other countries, there is a great need to conduct an extensive study on hospital based, particularly ICU basis to obtain reliable information on this area.

1.3. Significance of the Study

The study may add knowledge for clinicians on understanding the magnitude and causes of mortality in MICU of TASH, even in the country at large. In addition the study may provide base line information on medical ICU mortality pattern for researchers. The data obtained in this study, may be used by concerned bodies for planning and evaluating ICU safety measures. The recommendations given if considered are going to benefit the Hospitals at large on prevention of ICU mortality.

CHAPTER TWO:

Literature Review

Several recent reports have called attention to the process of health transition in the developing world. The aging of the population, reduction in fertility, improved preventive and therapeutic control of infectious diseases, and the westernization of life styles may all contribute to a decrease in the disease burden attributable to communicable disease and to an increase in that attributable to degenerative and manmade diseases (24). A health transition can be regarded as the combined effect of a demographic transition, involving change in fertility and mortality pattern, and an epidemiological transition involving changes in the environment and lifestyles (25).

The studies done in different countries indicated that the overall medical intensive care unit (MICU) mortality remains high in few developed countries and most of the low and middle income countries. For example the overall medical ICU mortality 30% in Nigeria (26), 22.5% in Tunisia (27) and 17% in France (27) and study was conducted in Mulago hospital Uganda indicated that ICU mortality is particularly high in low income countries such as Uganda, where factors such as illness severity and infrastructural constraints are magnified and the overall ICU mortality was 43.7% and mortality among medical admission was 59.6% compared to 37.4% among surgical admission (28).

An international study done on extension of infection in medical ICU reported that, infection is a major cause of morbidity and mortality in intensive care units worldwide (29). Infection and related sepsis are the leading cause of death in non-cardiac ICUs, with mortality rates that reach 60%. Importantly, the incidence of sepsis and, hence, the number of infection-related MICU death is increasing. Another similar study was conducted and indicated that ICU mortality in patients admitted to the MICU because of infection, sepsis, and septic shock was 10.1%, 17.5%, and 53.3%, respectively(30, 31), and a study was done on epidemiology and outcome of

Severe Sepsis and Septic Shock in Intensive Care Units in Mainland China indicated that severe sepsis and septic shock are among the main factors contributing to mortality in intensive care units (MICUs), with the overall MICU mortality of 33.5% (32,33).

Across the world tuberculosis (TB) remains an important public health problem, especially in developing countries. Every year, almost 2 million people die of TB, most of them in low- and middle-income countries. Despite the availability of curative therapy, a large proportion of patients with TB are being hospitalized. In hospital mortality rates remain high, particularly among patients with TB requiring intensive care unit (ICU) admission. Acute respiratory failure caused by TB necessitating mechanical ventilation (MV) has been associated with mortality rates between 25.9% and 81% [34, 35). Some studies reported a few factors that contribute to mortality among critically ill patients with TB. Disseminated disease, usually in the setting of human immunodeficiency virus (HIV) infection, has been recognized as an important predictor of ICU death. Acute respiratory distress syndrome (ARDS), sepsis and multiple organ failure also carry a very high mortality. The studies done in developing countries indicated that in developing countries the overall ICU mortality among tuberculosis patients admitted to MICU was 56.7% (36, 37).

Deliberate self-poisoning is a major health problem worldwide and is a common reason for young adults to be admitted to hospital and high mortality in medical ICU. The United Kingdom has one of the highest rates of deliberate drug overdose in Europe. The epidemiology of self-poisoning varies between countries and changes over time. These changes are related to both trends in prescribing and, increasingly, to the availability of illicit substances. The study was carried out in United Kingdom on Epidemiology and outcomes of patients admitted to critical care after self poisoning reported that the magnitude of ICU mortality from self poisoning was 4% (38).

A retrospective cross-sectional study was carried out on epidemiology and outcome of severe community acquired pneumonia admitted to intensive care unit showed that the community-

acquired pneumonia (CAP) is a frequent and severe infection, and is considered the primary cause of death from infection, and the sixth most common cause of overall mortality in Western countries of ICU which is 26.6% of overall mortality with the median ICU length of stay 13 (6 to 25) days and the common causes of ICU mortality were multi-organ failure, refractory hypoxemia and persistent neurological failure (39).

A study was conducted on causes of death and determinants of outcome in critically ill patients reported that MICU mortality was 8.7%, and the major immediate causes of death of critically ill patients in the MICU were Acute refractory multiple organ dysfunction syndrome (47%), Refractory cardiovascular failure (17.8%), Chronic refractory multiple organ dysfunction syndrome (11.6%), Central nervous system failure (7.9%), Acute cardiac arrest (4.2%), End-stage tumor disease (3.4%), Intractable intestinal ischemia (2.5%), Pulmonary failure (1.1%) and Acute or chronic liver failure(0.8%). Independent risk factors for death in the ICU were central nervous system failure and cardiovascular failure were the two most important risk factors for death in the MICU (32).

A retrospective cohort study was conducted in Europe on Characteristics and outcomes of cancer patients in European MICUs reported that increasing numbers of cancer patients are being admitted to the intensive care unit (ICU), either for cancer related complications or treatment-associated side effects have the highest ICU mortality of 58% (40).

Few studies indicated that globally, the incidence of acute kidney injury (AKI) and its ICU mortality has increased steadily in recent years. AKI is commonly seen in critically ill patients in ICU, and contributes to the failure of other organs and systems in such patients (41). The duration of AKI can be used to predict disease severity and outcome although even transient AKI is linked to increased mortality. The risk of death in AKI patients shows an incremental increase corresponding to disease stage, (42) and similar study was done on Risk Factors for Mortality in Patients with Septic Acute Kidney Injury in Intensive Care Units in Beijing, China indicated that AKI intensive care unit mortality was 44.4% with different factors (43).

The global incidence of tetanus is still estimated at one million cases annually, with a mortality rate ranging of 50% -60% depending on the availability of well equipped intensive care unit. About one million cases of tetanus occur annually worldwide, resulting in death of about half a million people each year (44). A case series study was carried out in Pakistan on socio demographic characteristics, clinical profile and outcome of the tetanus patients in medical ICU indicated that in the developing countries tetanus is common in adults due to lack of effective immunization program, inappropriate treatment of injuries and decline in protective antibodies in elderly with the overall tetanus ICU mortality of 68.2% (45)

Asthmatic patients if severe enough require admission to an intensive care unit (ICU) and most of them need mechanical ventilation. Pendergraft et al. reported as 9.4% hospital death rate among patients admitted to the ICU and requiring intubation in the year of 2000(46) and the other study showed that a hospital death rate of 15.4% in a similar group of patients treated in critical care units during 1995–2001 and similar study was carried out in Australia on improved outcomes from acute severe asthma in intensive care units indicated that the hospital mortality for the 8-year cohort was 3.2% and over the 8 years there was a significant decline in mortality to a minimum of 1.1%(47) .

A sixteen years prospective case series study was done in Ethiopia, Black Lion Specialized Hospital medical ICU shows that the overall mortality of medical ICU was 1117 from 3548 MICU admissions, which was 32%. From the top fifteen causes of admission (malaria, tetanus, acute myocardial infarction, sepsis, upper gastro intestinal bleeding (UGIB), pneumonia, stroke, organophosphate poisoning, DKA, GBS, meningitis, CHF, VHD, pulmonary edema, relapsing fever and status epileptics) that accounted for 72% of total admissions were responsible for 69% of all deaths. Severe and complicated malaria is the leading cause of death accounting for 10.3% of total deaths followed by tetanus (6.4%), acute myocardial infarction(6.3%), sepsis (5.4%), upper gastro intestinal bleeding (UGIB) (5%), pneumonia (4.4%), stroke (4%), organophosphate poisoning (3.9%) , DKA, GBS, meningitis (each 3.7%), CHF, VHD (3.6%), pulmonary edema (3.3%), relapsing fever (3.1%) and status epileptics(2.1%). Medical ICU mortality increased with increasing age group 27.4%, 32.1% and 35.5% for those less than 25,

25 to 50 and greater than 50 years of age respectively. The mean hospital stay for those who died was 2.61days. Fifty percent of those who died stayed 2 or fewer days in the MICU (19).

A study was conducted in USA on Association of gender with outcomes in critically ill patients indicated that MICU mortality was 7.2% for men and 7.9% for women and there was a statistically significant interaction between gender and age, that is for patients <50 years of age , women had a lower mortality compared to men but among patients >50 years of age there was no statistically significant difference in the MICU mortality between men and women (48).

A study was conducted in Toronto on long-term outcomes and clinical predictors of hospital mortality in very long stay intensive care unit patients indicated that patients with very long stays (mean length of stay 48.5 days) in the ICU appear to have low mortality rate(8%) with a reasonable chance of survival (49), and the other study conducted in TASH MICU shown that patients with very short stay in MICU appear to have high mortality rate and the mean hospital stay for those who died was 2.61 days and 50% of those who died stayed 2 or fewer days in the medical intensive care unit (MICU) (19).

CHAPTER THREE:

OBJECTIVES

3.1. General Objective

The general objective of this study is assessment of mortality pattern among patients admitted to MICU in TASH during the last five years (Sep 2009-Aug 2015), A.A, Ethiopia.

3.2. Specific Objectives

1. To assess the magnitude of mortality among patients admitted to MICU of TASH during the last five years, A.A, Ethiopia.

2. To identify common diseases causing mortality among patients admitted to MICU of TASH during the last five years, A.A, Ethiopia.

3. To assess the severity of disease and complications associated in these groups of patients in the MICU of TASH.

4. To assess the management of these patients in the MICU of TASH.

CHAPTER FOUR:

METHODS AND MATERIALS

4.1. The Study Area and Period

The study area was Addis Ababa which is the capital city of Ethiopia. The city has 49 hospitals. Thirteen are public hospitals**.** Of these public (governmental) hospitals six of them are under Addis Ababa city administration. Other five hospitals are administered under the federal ministry of health of Ethiopia. The rest two hospitals are under defense ministry of Ethiopia. Thirty six of the city's hospitals are private. (The data obtained from medical service directorate of the federal ministry of health and AARHB)

The study was conducted in medical intensive care unit (MICU) at Tikur Anbessa Specialized Hospital in Addis Ababa from January 1-30/2015. Tikur Anbessa Specialized Hospital is one of the referral Hospital among the five hospitals under Federal Ministry of Health which has its own medical intensive care unit (MICU). The medical intensive care unit has 6 beds, 16 Nurses from these 2 Nurses are intensive care nurse specialist, and about 5-8 monthly exchanged residents.

The study period was from December 2014 to May 2015.

4.2. Study design

This retrospective chart review study was carried out to assess mortality pattern among patients admitted to medical intensive care unit of Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia, for the last five years (Sep 2009-Aug 2014).

4.3. Source of Population

The source population was all medical records/charts/ of patients who were admitted to medical intensive care unit (MICU) of Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia from Sep 2009-Aug 2014.

4.4. Study Population

The study population was all medical records/charts/ of patients who died in medical intensive care unit of Tikur Anbessa Specialized Hospital during the study period (during the last five years (Sep 2009-Aug 2014).

4.5. Inclusion and Exclusion criteria

Subjects for the study were included all deaths in medical intensive care unit (MICU) within the study period. The study was included all age groups greater than or equal to thirteen (>=13) years and all gender of MICU deaths during the study period .The study was excluded deaths charts in MICU with no full information during the study period.

4.6. Sample size

All medical records/charts/ of patients who died in medical intensive care unit having full death information during the study period were the sample size.

4.7. Data Collection and Management

Four data collector nurses were recruited and trained for one day prior to data collection on how to collect the required information by using structured and pretested checklist from MICU death charts and then they were suppervized by principal investigator during data collection period. The data was collected from January 1-30/2015 for 30 days. The completeness of the data collected from the chart review was reviewed and checked daily by the principal investigator in order to maintain consistency.

4.8. Data Collection Instruments

The data was collected consecutively by reviewing MICU death charts for MRN, age, sex of deceased, address, date of ICU admission, the diagnosis at ICU admission, vital signs at admission, mental status at ICU admission, treatment given during admission, complications during admission, date of death, vital signs immediate before death, length of stay of patients using pre-tested and structured instrument (check list).

4.9. Data Quality Control

To assure the quality of data, four data collector Nurses were trained and structured data collection checklist was used. The structured check list was pretested by out of the study period MICU death charts in Tikur Anbessa Specialized Hospital (after August 2014 death charts) before the actual data collection is conducted. During the data collection procedures data collectors were suppervised by principal investigator, all the collected data were reviewed and checked daily for its completeness.

4.10. Data Analysis and Interpretation

The data obtained from chart review was edited, coded and entered into the computer and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 and simple descriptive statistics and thematic analysis was used for qualitative analysis.

4.11. Variables

4.11.1. Dependent variables (outcomes)

- Mortality

4.11.2. Independent variables

- Age
- Sex
- Address of the deceased
- Common diseases causing death
- Complecations

4.12. Ethical considerations

Permission letter to carry out the study was obtained from the Institutional Review Board (IRB) of Addis Ababa University, College of health science, school of medicine, department of emergency medicine, then by showing that permission letter to the stakeholders of the study the data was collected without any obstacles.

4.13. Operational Definitions

Common Diseases Causing MICU Death: The common diseases/etiologies/ and mainly confirmed diagnosis during MICU admission of patients in the medical intensive care unit that causes death.

Intensive Care Unit: It is a specialized section of a hospital that provides comprehensive and continuous care for persons who are critically ill and who can benefit from treatment.

Medical Intensive care Unit: It is one specialized unit of intensive care unit in which critically ill medical patients get comprehensive and continuous intensive care and treatment.

Mortality: The state of being died among patients admitted to medical intensive care unit.

CHAPTER FIVE

RESULTS

A total of one thousand five hundred four (1504) patients were admitted to MICU during the study period, of which 750 (49.87%) were males and 754 (51.13%) were females. During the study period there were 514 deaths registered to MICU registration book, but only four hundred thirty six (84.8%) death patient charts were found and data was collected from these charts.

A total of four hundred thirty six (436) death cards were reviewed, of which 223 (51.1%) were males and 213 (48.9%) were females with male to female ratio of 1.04:0.96 (Table 1).

The majority of deaths 294(67.4%) were occurred in the age group 13-49 years i.e. below 50 years where as 142(33.6%) deaths were occurred in the age group >=50 years with the mean age of 43.8 (Table 1).

Among these deaths the majority, 279 (64%) deceased patients were from Addis Ababa and the least was from Gambela which accounts 1 (0.2%)(Table 1).

The overall mortality of medical ICU was 436(29%) from 1504 MICU admissions during the study period. Stroke is the leading cause of death accounting for 69 (15.8%) of total death followed by CHF (13.8%), AMI (8%), severe pneumonia (6.9%), HIV/AIDS (6.4%), sepsis (4.6%), shock (4.4%), VHD, tetanus, disseminated TB (each 3.9%), AKI (3.4%), pulmonary edema (2.5%), DKA, GBS (each 2.3%), severe malaria, ARDS (each 2.1%) and others which accounts 13.8%. respectively(Table 2).

Table 1: Distribution of MICU deaths by Socio-demographic characteristics from 2002-2006 E.C , A A, Ethiopia

Characteristics	Frequency	Percent
Age group(years):		
13-14	18	4.1
15-19	41	9.4
20-24	49	11.2
25-29	49	11.2
30-34	36	8.3
35-39	36	8.3
40-44	27	6.2
45-49	38	8.7
50-54	30	6.9
55-59	20	4.6
60-64	34	7.8
>=65	58	13.3
Total	436	100
Sex:		
Male	223	51.1
Female	213	48.9
Total	436	100
Address(region):		
Addis Ababa	279	64
Amhara	34	7.8
Oromia	73	16.7
Tigri	8	1.8
SNNRP	18	4.1
Afar	3	0.7
Somalia	4	0.9
Harar	5	1.1
Benishangul Gumuz	3	0.7
Gambela	1	0.2
Unrecorded	8	1.8
Others	0	0
Total	436	100

Table 2: Distribution of TASH MICU deaths by causes of death from 2002-2006 E.C, A A, Ethiopia

Diseases (Dx.) causing ICU death	Frequency	Percent
DKA	10	2.3
MI	35	8.0
UGIB	6	1.4
CHF	60	13.8
VHD	17	3.9
GBS	10	2.3
Severe pneumonia	30	6.9
Poisoning	4	0.9
Generalized Tetanus	17	3.9
Sepsis	20	4.6
Shock	19	4.4
Sever malaria	9	2.1
Stroke	69	15.8
Meningitis	5	1.1
Status epileptics	5	1.1
HIV/AIDS	28	6.4
Asthma	6	1.4
ARDS	9	2.1
Diseminated TB	17	3.9
Liver disease	8	1.8
Acute kidney injury	15	3.4
COPD	2	0.5
Severe anemia	7	1.6
Hypertension	5	1.1
pulmonary edema	11	2.5
Cancer	4	0.9
Relapsing fever	1	0.3
Others	7	1.6
Total	436	100.0

More males 29(13%), 16(7.25), 14(6.35) and 33(14.7%) were died in the age group 20-24, 40-44, 55-59 and >=65 years than females 20(9.4%), 11(5.1%), 6(2.8%0 and 25(11.7%) and more females 26(12.2%) were died in the age group 15-19 years than males 15(6.7%),but in the rest age groups there was somewhat similarity death between males and females(table 3).

Table 3: Distribution of MICU deaths by age and gender from 2002-206 E.C, A A, Ethiopia

Characteristics	Sex of the deceased				Total	
Age	Male		female			
13-14 years	No-	%	No-	%	No-	%
	8	3.6	10	4.7	18	4.1
15-19 years	15	6.7	26	12.0	41	9.4
20-24 years	29	13.0	20	9.4	49	11.2
25-29 years	23	10.3	26	12.0	49	11.2
30-34 years	17	7.6	19	8.9	36	8.2
35-39 years	18	8.0	18	8.4	36	8.2
40-44 years	16	7.2	11	5.0	27	6.2
45-49 years	19	8.5	19	8.9	38	8.7
50-54 years	15	6.7	15	7.0	30	6.8
55-59 years	14	6.3	6	2.8	20	4.6
60-64 years	16	7.2	18	8.4	34	7.8
>=65 years	33	14.8	25	11.7	58	13.3
Total	223	100	213	100	436	100

According to this study, more deaths 111(25.5%) were occurred in the year of 2002 E. C, where as the least deaths 68(15.6%) were occurred in the year of 2006 E. C. That is there was a little bit reduction of MICU mortality from the year 2002 E.C.to the year 2006 E .C. consecutively with the range of 43(9.9%) deaths. More males 41(18.4%) were died in the year 2006 E.C than females 27(12.7%) and more females 42(19.7%) were died in the year 2005 E.C than males 34(15.2%), but in the rest years there was somewhat similarity death between males and females (Table 4).

Table 4: Distribution of TASH MICU deaths by sex and yearly death from 2002-2006 E.C, A A, Ethiopia

Characteristics		Sex of the deceased				Total	
		male		female			
year in Ethiopian calendar		No	%	no	%	No	%
	Sep 2009-Aug 2010	41	18.4	27	12.7	68	15.6
	Sep 2010-Aug 2011	34	15.2	42	19.7	76	17.4
	Sep 2011-Aug 2012	47	21.0	41	19.2	88	20.2
	Sep 2012-Aug 2013	44	19.7	49	23.0	93	21.3
	Sep 2013-Aug 2014	57	25.5	54	25.3	111	25.5
	Total	223	100	213	100	436	100

Majority of deaths caused by DKA 9/10, CHF 49/60, VHD 15/17, GBS 8/10, pneumonia 23/30, tetanus 12/17, sepsis 15/20, shock 13/19, malaria 7/9, HIV 21/28, TB 16/17 and anemia 6/7 were occurred in the age group of 13-49 years and majority of death caused by MI 26/35 and stroke 38/69 were occurred in the age group of >=50 years (Table 5).

Table 5: Distribution of TASH MICU deaths by causes of death and age from 2002-2006 E.C, A A, Ethiopia

Characteristics		Age												
		13-14 years	15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years	50-54 years	55-59 years	60-64 years	>=65 years	Total
Causes of death	DKA	0	1	3	2	2	1	0	0	1	0	0	0	10
	MI	0	0	0	0	1	1	1	6	6	5	10	5	35
	UGIB	0	0	1	0	0	0	1	1	0	0	2	1	6
	CHF	5	8	8	10	7	3	4	4	0	1	4	6	60
	VHD	3	1	2	3	3	1	1	1	0	1	1	0	17
	GBS	0	1	0	1	3	0	0	3	1	0	0	1	10
	Pneumonia	2	2	4	4	1	2	4	4	2	1	0	4	30
	Poisoning	1	0	0	0	0	1	1	0	0	0	1	0	4
	RF	0	0	0	0	0	0	0	0	0	0	0	1	1
	Tetanus	0	3	2	5	2	0	0	0	0	2	0	3	17
	Sepsis	0	0	4	3	2	4	0	2	2	1	1	1	20
	Shock	1	3	2	1	2	1	2	1	1	1	1	3	19
	Malaria	1	1	3	0	2	0	0	0	0	0	1	1	9
	Stroke	0	2	3	3	1	5	8	9	9	2	6	21	69
	Meningitis	0	3	0	0	0	0	0	0	0	0	1	1	5
	S. epileptics	0	1	1	1	1	0	0	1	0	0	0	0	5
	HIV/AIDS	1	5	2	1	2	5	4	1	3	2	2	0	28
	Asthma	0	0	0	0	0	3	0	0	0	0	0	3	6
	ARDS	1	0	3	1	0	1	0	1	1	0	1	0	9
	TB	1	4	2	5	2	1	1	0	0	1	0	0	17
	LD	0	0	2	3	1	1	0	0	0	0	0	1	8
	AKI	0	1	2	2	3	0	0	0	1	1	2	3	15
	COPD	0	0	0	0	0	0	0	0	0	1	0	1	2
	Anemia	2	3	0	1	0	0	0	0	0	0	1	0	7
	HTN	0	1	2	1	0	0	0	0	1	0	0	0	5
	Pul.edema	0	0	3	0	1	4	0	0	0	1	0	2	11
	cancer	0	1	0	1	0	0	0	1	1	0	0	0	4
	others	0	0	0	1	0	2	0	3	1	0	0	0	7
Total		18	41	49	49	36	36	27	38	30	20	34	58	436

According to this study the majority of deceased patients had deranged vital signs at MICU admission, i.e. 97.5% , 95.4% , 86.2% , 84.9% , 70% , 53.4% had deranged pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, oxygen saturation and body temperature respectively. Regarding the mental states, from the total of deceased patients in MICU, the majority of patients had mental status change i.e. 193(44.3%), 189(43.3%) and 49(11.2%) were comates, confused and oriented mental states respectively (Table 6).

Almost all of, 429(98.4%) and 428(98.2%) deceased MICU patients were treated by oxygen (with and without mechanical ventilation) and different types of antibiotics respectively followed by anti-coagulants (77.8%), gastrointestinal prophylaxis (77.5%), opoids (70.9%), vaso-active drugs (53%) and diuretics (49.5%) and the least were treated by insulin, antihistamine and anti-TB(each 3.9%) , broncho-dilators (3.2%) and antimalarials(2.1%) (Table 7).

Table 6: Distribution of TASH MICU deaths by at ICU admission vital signs and mental states from 2002-2006 E.C , A A, Ethiopia

Characteristics	Frequency	Percent
Pulse Rate		
<60b/min	33	7.6
60-100b/min	11	2.5
>100b/min	386	88.5
no pulse	6	1.4
Total	436	100.0
Respiratory Rate		
<12r/min	29	6.7
12-20r/min	20	4.6
>20r/min	385	88.3
Apnea	2	0.5
Total	436	100.0
SBP		
<90mmhg	248	56.9
90-139mmhg	60	13.8
>=140mmhg	95	21.8
Unrecordable	33	7.6
Total	436	100.0
DBP		
<60mmhg	241	55.3
60-89mmhg	66	15.1
>=90mmhg	96	22.0
Unrecordable	33	7.6
Total	436	100.0
SP02		
<90 without 02	137	31.4
90-100% with 02	131	30.0
90-100% without 02	20	4.6
Total	436	100.0
Tamperature		
<36.5oC	27	6.2
36.5-37.5 oC	203	46.6
>37.5 oC	164	37.6
Unrecorded	42	9.6
Total	436	100.0
Mental States		
Comates	193	44.3
Confused	189	43.3
Oriented	49	11.2
Unrecorded	5	1.1
Total	436	100.0

Table 7:Distribution of TASH MICU deaths by type of treatment given during ICU admission from 2002-2006 E.C , A.A , Ethiopia

Type of Rx given during ICU admission	Frequency	Percent
Oxygen	429	98.4
Antibiotics	428	98.2
Anticonvulsants	193	44.3
NSAIDs	152	34.9
Anticoagulants	339	77.8
Vaso-active drugs	231	53.0
Anti-hypertensive	97	22.2
Blood transfusion	76	17.4
GI Prophylaxis	338	77.5
Bronchodilators	14	3.2
Anti-malarias	9	2.1
Diuretics	216	49.5
Digitalis	106	24.3
Anti-TB	17	3.9
HAART	28	6.4
Antihistamines	17	3.9
Opoids	309	70.9
Steroids	160	36.7
Anti-arrhythmias	22	5.0
KCL	93	21.3
Anti-fungal	25	5.7
B-Blockers	75	17.2
ACE-Inhibitors	44	10.1
Insulin	17	3.9
Others	14	3.2

From the total of deceased patients treated by different types of antibiotics [428(98.2%)], the majority, 211(48.4%) were treated by the combination of general antibiotics, 3rd. generation cephalosporin's and high level antibiotics and the least were treated by general antibiotics, 4(o,9%). And also the majority of deceased patients, 387(88.8%) were treated by oxygen with mechanical ventilation and the least, 42(9.6%) were treated by oxygen without mechanical ventilation (Table 8).

Table 8: Distribution of TASH MICU deaths by type of antibiotics and oxygen treatment given during ICU admission from Sep.2002-2006 E.C , A A, Ethiopia

Types of oxygen and antibiotics given during ICU admission	Frequency	Percent
Type of antibiotics:		
general antibiotics	4	0.9
3rd gen. cephalosporin's	14	3.2
general antibiotics and 3rd gen. cephalosporin's	199	45.6
general antibiotics, 3rd gen. antibiotics and high level antibiotics	211	48.4
Total	428	98.2
Type of oxygen administration:		
Oxygen with MV	387	88.8
Oxygen without MV	42	9.6
Unrecorded	7	1.6
Total	436	100

Another important information obtained from the present study was the complications/immediate causes of ICU deaths/ during MICU admission, from these the major complications,143(32.8%), 104(23.9%) , 96(22%) and 70(16.1%) were respiratory failure, shock, multi-organ failure and cardiovascular failure respectively and the least complications, 13(3%), 4(0.9%), 3(.07%), 2(0.5%) and 1(0.2%) were cardiopulmonary arrest, central nervous system failure, acute liver failure, acute renal failure and electrolyte imbalance respectively(Table 9).

Table 9**:** Distribution of TASH MICU deaths by type of complications (immediate cause of death) during ICU admission from 2002-2006 E.C , A A, Ethiopia

Complications (Immediate causes of ICU deaths)	Frequency	Percent
Multi organ failure	96	22.0
Cardiovascular failure	70	16.1
Central nervous system failure	4	0.9
Cardiopulmonary arrest	13	3.0
Electrolyte imbalance	1	0.2
Respiratory failure	143	32.8
Acute liver failure	3	0.7
Acute renal failure	2	0.5
Shock	104	23.9
Total	436	100.0

Regarding the length of stay the majority of deceased patients at ICU, 207(47.5%) were stayed between 1-5 days and the least, 6(1.4%) were stayed more than thirty days (>30 days) with the mean length of stay 16.7 days (Table 10).

Table 10: Distribution of TASH MICU deaths by length of stay at MICU till death from 2002-2006 E.C , A A, Ethiopia

Length of stay at ICU till death	Frequency	Percent
<1 day	76	17.4
1-5 days	207	47.5
6-10 days	78	17.9
11-15 days	27	6.2
16-20 days	17	3.9
21- 25 days	13	3.0
26-30 days	12	2.8
>30 days	6	1.4
Total	436	100.0

CHAPTER SIX

Discussion

This study attempted to identify the major causes of death and the magnitude of MICU mortality among patients admitted to MICU of Tikur Anbessa Specialized Hospital during the last five years. In this study the overall mortality/magnitude of mortality/ was 29%. Even though there was a little bit mortality reduction from 2002-2006 E.C, the overall MICU mortality remains high during the last five years. This finding was consistent with other study conducted in Nigeria where at national level revealed that the overall MICU mortality was 30% (16). The other study which was conducted in Ethiopia, on pattern of admission and outcome of Tikur Anbessa Specialized Hospital MICU indicated that the overall MICU mortality was 32% (19). On the contrary, studies conducted at the national level in Tanzania and France indicated that the overall MICU mortality was 22.5% and 17% respectively (27). This difference in our MICU and other areas may be due to different availability of infrastructure, skilled personnel, and resources making it better or difficult to provide optimum care to critically ill patients and contributing to the reduction or dauntingly high mortality rate.

According to this study, stroke is the leading cause of MICU death accounting for 15.8% of total death followed by CHF (13.8%), AMI (8%), severe pneumonia (6.9%), HIV/AIDS (6.4%), sepsis (4.6%), shock (4.4%). The study conducted in the same Hospital and in the same setting showed that the leading cause of death was severe malaria accounting 10.3% of total death followed by tetanus (6.4%). This difference may be due to burden of non-communicable diseases and reduction of malaria epidemic. This showed that the increase in relative and absolute frequency of acute complications of non-communicable diseases heralds an emerging epidemic of non-communicable diseases related to life style changes mostly in the urban rarely in the rural well to do in addition to existing problems of infectious diseases. Causes of medical ICU mortality in other study reports showed that sepsis 17.5%(31), severe sepsis and septic shock 33.5%(32), disseminated TB 56.7%(36), poisoning 4%(38), pneumonia 26.6%(39), cancer 58%(40), AKI 44.4%(43), tetanus 68.2%(45) and asthma 9.4%(46) has medical ICU mortality. This difference

may be due to different factors like different types of patients and ICU service provided, adequate or inadequate availability of standard treatment guidelines, personnel, and infrastructure and also with the difference of study design, methodology, and the like.

Another important information obtained from this study was the complications/immediate causes of ICU deaths/ during MICU admission, from these the leading complication/immediate cause of death/ was respiratory failure accounting (32.8%) followed by shock (23.9%), multi organ failure (22%). This is contrary to study was conducted in Innsbruck Medical University (Austria) on causes of death and determinants of outcome in critically ill patients reported that the leading immediate cause of death of critically ill patients in the MICU was multiple organ dysfunction syndrome (47%) followed by cardiovascular failure (17.8%)(32). It tells us there was no similarity with the leading cause of death may be due to in our setup respiratory failure patients might appear late and may not get proper respiratory support care because of limited resources, but there was a little bit similarity with cardiovascular failure and cardiopulmonary arrest i.e. 16.1% and 3% in this study respectively and 17.8% and 4.2% in the above study respectively.

In this study mortality rates were almost similar between males and females i.e. males were 14.8% and females were 14.2% mortality rate from the total admission of medical ICU and for patients <50 years of age, females had high mortality compared to males, that is 70% for females and 65% for males. A study was conducted in USA on Association of gender with outcomes in critically ill patients also indicated that MICU mortality rates were similar between males 7.2% and 7.9% females from the total of admission and for patients <50 years of age, women had a lower mortality compared to men(54).

The present study 294(67.4%) deaths were in the age group 13-49 years i.e. below 50 years where as 142(33.6%) deaths were in the age group >=50 years and also 24.8%, 42.7% and 32.6% of mortality for those less than 25, 25 to 50 and greater than 50 years of age respectively. A study conducted in the same Hospital and in the same setting showed that 59.5% deaths were less than 50 years and medical ICU mortality increased with increasing age

group, 27.4%, 32.1% and 35.5% for those less than 25, 25 to 50 and greater than 50 years of age respectively.

In this study, 64.9% of diseased patients stayed < 5 days at MICU till death with the mean length of stay 16.7 days. The study conducted in TASH MICU shown that patients with very short stay in MICU appear to have high mortality rate with the mean length of stay 2.61 days and 50% of those who died stayed 2 or fewer days in the medical intensive care unit (19). This similarity of majority of patients died with very short stay might be due to the same setting, high severity of diseases at ICU admission, inappropriate management and care of the patient, inadequate availability of medical instruments as well as drugs, shortage of highly qualified personnel and other so many reasons. And also the difference of mean length of stay might be due to chronic illnesses contributed to stay long in ICU till death. A study was conducted in Toronto shown that patients with very long stays (mean length of stay 48.5 days) in the ICU appear to have low mortality rate (8%) with a reasonable chance of survival (60),

CHAPTER SEVEN

Conclusion and Recommendations

7.1. Limitation of the study

1. The main limitation of this study was absence of studies similar to this study in Ethiopia as well as in the rest of the world.

2. Insufficient training on Biostatistics, Epidemiology and Research methodology including SPSS.

3. Shortage of time to analyze well.

4. Since, this study was retrospective chart review study:

- Some patient death charts were not obtained during data collection
- Information obtained from patient charts might not be adequate and correct
- The diagnosis at ICU admission might be biased by the physician
- Patients vital signs and treatment given might not be well registered

7.2. Conclusion

In this study, it has been found that, even though there was a little bit mortality reduction year to year, the overall medical ICU mortality remains significantly high in Tikur Anbessa Specialized Hospital medical ICU. Non-communicable diseases are posing significant health problems in terms of mortality in MICU of TASH. Among all non-communicable diseases, stroke and diseases of cardiovascular origin were the most important health problems in terms of MICU mortality.

Medical ICU patients at ICU admission had severe disease with the evidence of deranged vital signs and changed mental status. Due to the severity of the diseases the management and care of the patients would be challenged and the consequence would be death.

Most of all Medical ICU patients were treated by different types of antibiotics and oxygen with mechanical ventilation. And also majority of MICU patients were treated by different types of drugs such anticoagulants, gastrointestinal prophylaxis, opoids and diuretics.

7.3. Recommendations

Based on the results of this study the following recommendations have been made:

- Mortality rate in MICU was found to be significantly high. Hence, responsible bodies need to seek for possible ways of reducing this unacceptably high mortality in MICU by designing quality control mechanisms.

- Set up and strengthen national non-communicable diseases control program. Programs promoting public awareness and life style changes to prevent non-communicable diseases need to be promoted.

- Documentation and data keeping needs attention and should be improved in MICU as well as in the chart room.

- Further studies should be conducted on admission and outcomes of patients in medical ICU.

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Appendix: Checklist

Addis Ababa University

College of Health Science

School of Graduate Studies

Department of Emergency Medicine

The checklist was prepared for Assessment of mortality pattern among patients admitted to medical intensive care unit of Tikur Anbessa Specialized hospital Addis Ababa, Ethiopia, 2014/2015.

S.No.	Questions	Choices of Answers	
01	MRN	…….	
02	Age of the deceased	……years	
03	Sex of the deceased	1.Male 2.Female	
04	Address of the deceased	1. Addis Ababa 4.Tigri 7.Somalia 10.Gambela 2. Amhara 5.SNNRP 8.Harar 11. Unrecorded 3. Oromiya 6.Afar 9.Benishangul 12. Others	
05	Date of ICU admission	……dd……..mm……yy	
06	The main diagnosis at ICU admission which causes ICU death	1. DKA 2. MI 3. UGIB 4. CHF 5. VHD 6. GBS 7.Severe Pneumonia 8. Poisoning 9. Relapsing Fever 10. G.Tetanus 11. Sepsis 12. Shock 13. Severe malaria 14. Stroke 15. Meningitis 16. Status-epileptics 17. HIV/AIDS 18. Asthma 19. ARDS 20. Diseminated TB 21 .Liver disease 22. Acute kidney injury 23.COPD 24. Severe anemia 25. Hypertension 26. Pulmonary edema 27. Cancer 28. Others (specify) ……	

07	Vital signs at ICU admission	1. PR: 1. <60b/min 2. 60_100b/min 3. >100b/min 4. No pulse 2. RR: 1. <12r/min 2. 12_20r/min 3. >20r/min 4. Apnea 3. BP: 1. <90/60mmhg 2. 90/60_139/89mmhg 3. >140/90mmhg 4. Unrecordable 4. SPO2: 1. < 89% with 02 2. <89% without 02 3. 90_100% with 02 4. 90_100% without 02 5. T: 1. < 36oC 2. 36_38oC 3. >38oC 4. Unrecorded	
08	Mental status at ICU admission	1. Comates 2. Confused 3. Oriented 4. Unrecorded	
09	Treatment given during ICU admission	1. Oxygen: 1. With MV 2. Without MV 3. Unrecorded 2. Antibiotics: 1. General antibiotics 2. 3rd Gen. Cephalosporines 3. High level antibiotics 3. Anticonvulsants 4. NSAIDs 5. Anticoagulants 6. Vasoactive drugs 7. Antihypertensives 8. Blood transfusion 9. GI prophylaxis 10. Bronchodilators 11. Antimalarials 12. Insulin 13. Dirutics 14. Digitalis 15. Anti-TB 16. HAART 17. Antihistamines 18. Opoids 19. Steroids 20. Antiarrhythmia 21. KCL 22. Antifungal 23. B-Blockers 24. ACE-Inhibitors 25. Others (specify)……	
10	Complications (immediate cause of death) during ICU admission	1. Multi organ failure 2. Cardiovascular failure 3. Central nervous system failure 4. Cardiopulmonary arrest 5. Electrolyte imbalances 6. Respiratory failure 7. Acute liver failure 8. Acute renal failure 9. Shock: 10. Others (specify)……..	
11	Date of ICU death	……dd……mm……..yy	

12	Length of stay at ICU till death	----------	