ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTEMENT OF EMERGENCY MEDICINE

ASSESSMENT OF PATTERNS OF ADMISSION, OUTCOMES AND ASSOCIATED FACTORS OF PATIENTS ADMITTED IN ADULT INTENSIVE CARE UNITS OF DILLA UNIVERSITY REFERRAL HOSPITAL, DILLA, SOUTHERN ETHIOPIA, 2020

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THESIS REPORT SUBMITTED TO ADDISABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE DEPARTMENT OF EMERGENCY MEDICINE FOR A PARTIAL FULFILLMENT OF THE REQUIREMENT'S FOR MASTERS DEGREE OF SCIENCE IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING

JUNE, 2020
ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTEMENT OF EMERGENCY MEDICINE

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Full title of the research project	ASSESSMENT OF PATTERNS OF ADMISSION, OUTCOMES AND ASSOCIATED FACTORS OF PATIENTS ADMITTED IN ADULT INTENSIVE CARE UNITS OF DURH, DILLA, SOUTHERN ETHIOPIA, 2020
Duration of study	MAY 4 –14/2020
Study Area	DURH HOSPITAL, DILLA, SOUTHERN ETHIOPIA
Total cost of the project	A total of twenty seven Thousand fifty six Ethiopian birr **(27,056 ETB)**
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ACKNOWLEDGMENT

First of all I would like to express my deep gratitude to AAU College of health science department of emergency medicine for facilitating this research program and my advisors Mrs. Mebrat Michael (MSc, EMCCN) and Dr. Temesgen Beyene (MD, Assistant professor) for their guidance, comment and over all assistance on accomplishing this thesis.

Also my deeply grateful goes to Dilla University for sponsoring me to take this regular MSc program and my friends who help me to become successful in my thesis writing.

Finally I would really like to thanks to my Darling for her material and moral support. She has been giving me full of true love and encouragement.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAU- Addis Ababa University

AICU- Adult Intensive Care Unit

ARDS-Acute Respiratory Distress Syndrome

CHF- Congestive Heart failure

DURH- Dilla University Referral Hospital

HC- Health Center

HIV/ AIDS - Human Immune Virus/Acquired Immuno Deficiency Syndrome

ICU- Intensive Care Unit

MI-Myocardial Infarction

MICU- Medical Intensive Care Unit

MV- Mechanical Ventilator

PE- Pulmonary edema

SICU- Surgical Intensive Care Unit

SPSS - Statistical Package for Social Science

TBI -Traumatic Brain Injury

ABSTRACT

Background: Patients are more advantageous from detailed observation, monitoring and treatment than the generally available in the standard ward or department. The most common causes of admission to intensive care unit (ICU) are postoperative treatment, infectious disease, trauma and obstetric complication. Study done in Ethiopia shows that mortality rate in the ICU was found to be high and diseases of cardiovascular origin were the major reason for ICU admission and death. **The objective** of this study was to assess pattern of admission, outcomes and associated factors of patients admitted in ICU of DURH, Dilla, Southern Ethiopia, from May 4 to 14/ 2020.

METHOD: A retrospective study was conducted on 252 adult patients who admitted in ICU from august, 2017 to January 2020. Data was collected by using data extraction tool from their medical records. The study participants' cards were selected using systematic random sampling method using a list of their medical record numbers. The collected data was checked completeness and consistence. The coded data was checked and entered into EPI data version 4.6. Then the data exported into statistical package for social science (SPSS) version 25 for data analysis. Binary and multivariate logistic regression analysis was conducted to identify factors significantly associated with outcome variables

Results*:* Cardiovascular origin 86(34.1%) and infectious disease 39(15.5%) were the most common causes of admission in the ICU. Mortality rate of adult ICU was 77(30.6%). The main causes of deaths were shock 23(29.9%) followed by acute respiratory distress syndrome (ARDS) 9(11.7%). Age greater than 60 years, peripheral oxygen saturation less than 90%, length of stay less than four days in the ICU, patients with mental status of lethargic and unconsciousness were at high risk of mortality among patients admitted to ICU

Conclusion and Recommendation: in this study, the overall mortality was considerably high. This finding gives hint the importance of focusing on early detection of cause and critically follow patients admitted with shock, congested heart failure and acute respiratory distress syndrome (ARDS). Therefore, strengthen action to improve the readiness of health care to respond to these non-communicable diseases. Health professional working in the ICU should follow patients strictly and early referee for critical cases.

CHAPTER ONE

1. INTRODUCTION

1.1 Background

An Intensive Care Unit (ICU) is a hospital unit dedicated to managing and monitoring patients with life-threatening conditions which is specially staffed and equipped separate and self-contained. It has special expertise and support equipment for vital functions and uses the skills of medical nursing and other professionals trained in addressing these problems(1).

Critical care describes the range of services delivered to a patient with a life-threatening critical illness condition; with the primary objective of avoiding mortality which involves the highest level of continuing care and treatment of the critically ill patient, being patient recovery and return to earlier health and functional capacity. Timely access to an appropriate level of critical care improves survival and critically ill patient outcomes. However, despite the best efforts of the critical care team, the burden of illness is sometimes overwhelming, and death is inevitable(2).

Initially most ICUs were either medical (MICU), mostly treating acute respiratory failure, or surgical (SICU) primarily treating postoperative surgical patients. In addition, cardiologists introduced separate coronary care units (CCU). Today many ICUs in smaller centers are combined medical-surgical ICUs, although the separation of care by patient diagnosis persists in large medical centers(3). The modern ICU has developed from the combination of lessons learned from respiratory and coronary care with continued motion provided by the clinical and technological development in resuscitation, pharmacological and mechanical circulatory support and advances in renal replacement therapy, respiratory failure, cerebral oedema and multi-organ failure(4).

There is a worldwide increase in the demand for critical care services related to the aging of the population, the extended survival of previously incurable diseases, the increase number of immunocompromised patients and the availability of new therapies or surgeries that typically require intensive care support(5). ICU is not only improves the chances of patients with desperate illness but also likes to promote an improvement in general level of medical & nursing care(6). The decisions on patient admission and discharge should be based on common clinical criteria in order to guarantee equity(7).

ICUs have varying qualities and quantities of infrastructure necessary for the provision of proper critical cares services in sub-Saharan Africa(8). The disease characteristics and mortality rates of patients admitted to ICUs in sub-Saharan Africa vary widely from one population to another. The regional hospitals send their critical patients to these referral hospitals for ICU care(9). ICU care in Ethiopia has been announced a few decades ago. Tikur Anbessa specialized hospital established the first ICU in Ethiopia(10). Patients more advantage from detailed observation, monitoring and treatment than the generally available in the standard ward or department(11).

The result of ICU outcomes such as “death” or “survival” in critical care medicine can be assessed by means of indicators such as mortality rates. Also evaluation of the outcomes of medical interventions can assess the effectiveness of treatment, making it possible to take better decisions, to further improve quality of care, to standardize, conduct and to ensure effective management of the high-level resources needed to deliver intensive care services thereby optimizing resource utilization and although mortality in patients depends on many factors such as demographic and clinical characteristic of population, infrastructure and non-medical factors (management and organization), case mix, and admission practice, it is also affected by ICU performance(12).The most common admission to ICU are postoperative treatment, infectious disease, trauma and obstetric complication(13).

A descriptive retrospective cohort study done in Tanzania, ICU of Kilimanjaro Christian Medical Centre, tertiary referral and university teaching hospital, a total of 680 patients were admitted in a one year from May 1/2015 to April 30/2016 and the

most common causes of admission was fracture which accounts 24% followed by intestinal obstruction 23% and mortality rate was 25.6%(14).

Research conducted in Tanzania using a three years (2009 to 2011) patient records data of all four ICU of tertiary hospital, result showed that there were a total of 5627 patients admitted. Trauma was the leading diagnosis which accounts 22.2% followed by infectious disease 19.7% and mortality rate was 41.4%(9).

Study done in Democratic Republic of the Congo, Lubumbashi University Teaching Hospital, a retrospective cross sectional study carried out a two year data collected from 2013 to 2015 in the Lubumbashi University Teaching Hospital ICU, a total of 453 patients admitted and there were 198 deaths and a hospital mortality rate of 43.7 %(15).

A one-year retrospective study which is done in Ethiopia, ICU of Tikur Anbessa specialized hospital conducted from 2013 to 2014 showed that a total of 280 patients were admitted and TBI had the major reason for admission which accounts 25 (8.9%), the second most admission was DKA 18 (6.3%), among these, patients transferred to ward are 16 (88.9%) and the third commonest admission was MI 17 (6.1%)(16).

1.2 Statement of the Problem

Intensive care unit is relatively young in developing countries(17). The provision of adequate and equitable care for patients in the developing regions, particularly sub-Saharan Africa is one of the greatest challenges of 21th century. Health systems as management of critically ill patients requires significant human, infrastructural, and financial resources typically limited in these countries(9).

Currently, the ICU is where the highest number of deaths occurs in most hospitals. The number of deaths in ICU varies depending on the case mix, age, length of hospital stay, and the level of organization of the unit(18).

Study on the assessment of the worldwide burden of critical illness by the Intensive Care over Nations (ICON) audit, 10 069 patients were included from ICUs of different continents shows that Overall, 2973 patients (29.5%) had sepsis on admission or during the ICU stay and ICU mortality rates were 16.2% across the whole population and 25.8% in patients with sepsis. Hospital mortality rates were 22.4% in the whole population and 35.3% in patients with sepsis (19).

According to global burden of disease report; deaths from non-communicable diseases are expected to climb from 28. I million a year in I990 to 49.7 million by 2020-an increase in absolute numbers of 77 percent(20).

Hospitalization based studies, which showed that ARDS proportion ranging from 7.1% to 12.5% of incidence proportion of all ICU admissions in Europe and 19% in 14 ICUs of Ireland, among the admitted patients(21).

According to global national income, there was a stepwise increase in the adjusted risk of in-hospital death(19). In the United States (US) alone, there were around four million ICU admissions annually with an average proportion of deaths of 8-19%, accounting for 500,000 deaths. From the hospital services, ICU is one of the most cost-intensive units. The US spent over 81 billion dollars in ICU care in 2005 alone, 13.7% in hospital costs and 4.1% in national health expenditure and these increased costs were largely associated with the length of stay in the ICUs. The daily ICU bed

cost is three times higher than from a bed in the general wards. Moreover, the cost for ICU services is still escalating mainly due to advances in medical technology and changes in disease epidemiology, with a rise of 12% over 6 years (22).

A one year retrospective study of admission and outcomes of patients admitted to ICU of Kamuzu central hospital in Malawi, a total of 253 patients were admitted and about a third of the patients (33.6% n = 85) were due to postoperative surgery. There were 154 deaths representing an overall mortality of 60.9%, 1 patient (0.4%) was referred to another facility and 90 patients (35.6%) were discharged from the ICU to either high dependency unit or general ward. The commonest cause of death was Sepsis and which accounted 39.6%, n = 61 of the deaths. Younger age of less than 40 years and increased patients' length of stay in the unit were significantly and positively associated with mortality ($P < 0.05$ 23)(23).

Another study done in Kenya, retrospective cohort of 450 patients from January 1,2013 to April 5, 2015 analysis shows that the most common presenting conditions are acute respiratory failure which accounts 53%,Traumatic and non-traumatic coma (Glasgow Coma Scale score, <8) 49% , postoperative monitoring 24% and ICU mortality was 53.6%(24).

Study done in Jimma university specialize hospital and Ayder Comprehensive Specialized hospital in Tigray, Ethiopia, shows that mortality rate in the ICU were found to be high which is 37.7% and 27% respectively. disease of cardiovascular origin(30.4%, 26%) were the major reason for ICU admission(10,25). The high mortality rates among patients admitted to ICU reflects numerous challenges at various levels of critical care service delivery in the Ethiopia. Hence a need to strengthen critical care services to improve treatment outcomes for patients admitted to ICU of the facility (23). Enhancement of the outcome parameter in critical care is at the present time anticipated not to come from new technologies or treatment, but from delivering the right care at the right moment in a safe way (27). Economic pressure is also one of the problems that many hospitals and health systems face. Improving the efficiency of health services is the key objective for health care managers and policy makers (22).

So in resource limited country like Ethiopia with only limited beds available for ICU and high number of patients (27), it's important to have basic understanding of what patients are admitting, treating and the outcome of treatment. Since its opening, many patients have been admitted and treated. However there is no data or study up to date in the ICU of DURH that indicates which category of patients (emergency medical, emergency surgical, trauma, gynecology…) represent majority of the patients, which of these patients uses the resource in ICU and how many of them died or if they stayed longer than they should increasing the cost on patient. Understanding of admission patterns and outcomes of patients admitted in adult ICU in the hospital is essential for better planning of resources required to better respond to the more prevalent medical and surgical conditions presenting to the ICU among the population being served by the hospitals.

1.3 Significance of Study

Data regarding patterns of admission and outcomes in the Adult Intensive Care Unit (AICU) are well documented in developed countries, but limited in developing countries like Ethiopia. Assessment of the patterns of admission and outcomes of critically ill patients admitted to ICUs in low-income countries may help with the identification of priorities and resources required to improve care for patients who are likely become critically ill.

Therefore the primary intent of this study was to assess the patterns of admission and outcomes of patients admitted in the adult ICU of DURH, Dilla, Southern Ethiopia and the result was used as a base line to improve quality of service and may add general knowledge for clinicians on understanding of the magnitude morbidity and causes of mortality.

Also knowing of patterns of admission and general determinants of outcomes in ICU patients may help in indicate what therapy and research should focus on to improve the short and long term outcomes of critically ill patients, guiding priorities for intervention program, monitoring of public health program, allocating and distribution resources within the health sectors, offering clues for epidemiological researches.

Additionally finding obtained from this study may also significant importance for health managers to identify common cause of morbidity and mortality admitted in ICU.

Lastly, the finding obtained from this may have significant importance for researchers those who want study on the same inquiry as a secondary source data and highlighted various starting points for future research, specifically the need for further data capture on a national level in Ethiopia critical care.

CHAPTER TWO

2. LITERATE REVIEW

2.1 Admission patterns of Adult Patients Admitted in ICU

The patients suitable for ICU admissions are those who are or may become critically ill, that those who need or may need any organ supports not given in the other wards of hospital(7). Previous studies have provided some epidemiological data regarding types of patients and treatments used in intensive care units (ICUs) and outcomes for patients in ICUs at a local and a national level.

Study on the assessment of the worldwide burden of critical illness, by the Intensive Care over Nations (ICON) audit, 10 069 patients were Included from ICUs of different continents shows that Overall, 2973 patients (29.5%) had sepsis on admission or during the ICU stay(19).

Another study which was done in Pakistan, Karachi adult ICU of medical Patients, 241 adults were admitted to the ICU. Diagnoses included. Hepatic diseases 12.9%, Congestive heart failure(CHF) and Pulmonary edema(PE) 6.2%, Cellulitis 0.8%, Cerebral Vascular Accident(CVA) 11.6%, Hypertensive Crisis 4.1%, Arrhythmias 0.8%, Diabetes with complication 2.5%, Carcinoma 0.4%, 2.1% Tuberculosis with complication, Respiratory issues 9.5%, Acute coronary syndrome 5.4%, Kidney diseases 5.4%, Sepsis 10.4%, Gastrointestinal bleed 3.3%, Heat stroke 0.4%, Central nervous system Infection7.9%, Poisoning 3.3%, Shock 1.2%, Acute gastroenteritis with complication 5.8%, Surgical and Gynecological issues were 5.4% and 0.4%(26).

Related study conducted in Bangladesh, which is analysis of 1255 ICU Patients at a Tertiary Military Hospital, the frequency of admission into ICU was more from medical discipline (59.92%) than other disciplines like surgical (37.52%),

gynecological, obstetric and other disciplines (2.55%). The incidence of survival was 53.86% from medical, 69% from surgical and 84.38% from gynecological, obstetric and other disciplines and mortality was 46.14%, 31% and 15.62% respectively. Occurrence of total ventilator support provided in all disciplines was 45.34%(4).

Study done in South Africa which is outcomes after 30 days ICU admission shows that the majority of admissions (73.7%) occurred on an emergency basis, with 68.4% occurring in the postoperative period. Approximately half were for non-communicable disease (49.6%), followed by trauma (29.0%) and infectious disease (21.5%)(27).

A 5-year review study done in ICU of University of Nigeria Teaching Hospital Enugu, A total of 766 patients were admitted during the period and neurosurgical patients were the most common cause admission of which accounts 316 (41.2%). From these neurosurgical cases, 224 (70.9%) were due to severe traumatic brain injury (TBI). The lowest number of cases 10 (1.3%) admitted as a result of critical incidents in anesthesia. An overall admission of 92.4% (207) was for severe TBI due to motor vehicular accident (MVA)(28).

Study done in intensive care units of tertiary referral hospitals of Tanzania, the total number of patients admitted to the four ICUs was 5627, overall trauma (22.2%) was the main disease category followed by infectious disease (19.7%). Traumatic brain injury (12.5%) was the leading diagnosis in all age groups, while pneumonia (11.7%) was the leading diagnosis in pediatric patients (<18 years)(9).

Study done at Jimma University Specialized Hospital, there were 370 admissions to the ICU during the study period. The overall major causes included trauma, cardiac disease, acute abdominal presentations, septic shock, tetanus and hysterectomy secondary to uterine rupture. Medical diagnoses accounted for 50.1% of admissions followed by surgery (43.2%) and obstetrics (5.8%). The main cause for surgical admission was trauma and for medical admission was cardiac disease(29).

Studies conducted in Ayder comprehensive specialized hospital in Tigray, Ethiopia, a total of 1,211 patients were admitted to MICU. Males constituted a higher proportion

(55.6%) than females (44.4%). The commonest admissions were patients with cardiovascular diseases (26%), followed by infectious diseases (20%) and neurological diseases (19.8%). The commonest specific causes of admission to the Unit were diabetic ketoacidosis and heart failure, constituting 16% each, followed by stroke (15.2%)(10).

A five years retrospective from 2007 to 2012 a total of 1,256 cases notes review study on admission patterns and outcomes in the medical intensive care unit of St. Paul's hospital Millennium medical college, Addis Ababa, Ethiopia, shows that Diabetic ketoacidosis was the leading cause of admission accounts 187(14.9%), followed by all Strokes 103 (8.2%) and also Strokes were the leading causes of death, accounting for 12.2% of total deaths(30).

2.2. Outcomes of Adult Patients Admitted in ICU

Provision of intensive care services to critically ill patients is a global enterprise and the care is advancing but in resource-limited settings, it is lagging far behind and ICU mortality is still higher due to various reasons(31). Critically ill patients are admitted to the intensive care unit to reduce morbidity and mortality associated with acute illness, trauma or surgical procedures(32).

Study on the assessment of the worldwide burden of critical illness by the Intensive Care over Nations (ICON) audit, 10,069 patients were Included from ICUs of different continents shows that ICU mortality rates were 16.2% out 22.4% of hospital mortality rates across the whole population and 25.8% in patients of ICU and 35.3% in patients of the hospital population were due to sepsis(19).

A study done in India tertiary care hospital of Himalayan region, there were a total of 2316 patients admitted to ICU, most of the patients were shifted from emergency (48.5%) and it was associated with better outcome. out of 2,316 patients, 49.6% patients were shifted out of ICU in stable condition while mortality was 28.6%. Around 21.8% patients left ICU against Medical advice(33).

Another study which is done in Pakistan, Karachi adult ICU of medical Patients, 241 adults were analyzed, out of 241 admitted adults 39(16.2%) died, 16(6.6%) left against medical advice and 146(60.6%) were improved and subsequently discharged(26).

Related study done in Bangladesh, which is analysis of 1255 ICU Patients at a Tertiary Military Hospital, the incidence of survival was 53.86% from medical, 69% from surgical and 84.38% from gynecological, obstetric and other disciplines and mortality was 46.14%, 31% and 15.62% respectively(4).

Study done in South Africa which is outcomes after 30 days ICU admission shows that here were a total of 59 (25.9%) deaths within the first 30 days after admission. In-ICU mortality was 19.7% and there were 12 (5.3%) in-hospital deaths following discharge and two (0.9%) out-of-hospital deaths. Thirty day survival was known for 174 (76.3%) admissions with a 33.9% mortality rate(27).

Study done in intensive care units of tertiary referral hospitals of Tanzania and A 5-year review study done in ICU of University of Nigeria Teaching Hospital Enugu, shows that A total mortality rate were 41.4% and 34.6% respectively(9,28).

Study done on Clinical outcomes of patients admitted in intensive care units of Nigist Eleni Mohammed Memorial Hospital of Hosanna, Southern Ethiopia, a total of 280 clients were enrolled into the study of which 46.42% died (32).

Studies done in Ayder comprehensive specialized hospital in Tigray, Ethiopia, a total of 1,211 patients were admitted to MICU and the overall mortality was 27%. The commonest cause of death was stroke (17%), followed by septic shock (11%) (10).

Study done at ICU of Jimma University Specialized Hospital, Ethiopia, there were 370 patients chart analyzed. The overall ICU mortality rate was 50.4%. Corresponding mortality rates were Medical diagnoses 53.6%, surgery 48.0% and obstetrics 42.9%, respectively. The main cause of death for surgical was head injury carrying a mortality of 52.1% (29).

A five years retrospective from 2007 to 2012 a total of 1,256 cases notes review study on admission patterns and outcomes in the medical intensive care unit of St. Paul's hospital Millennium medical college, Addis Ababa, Ethiopia, shows that the mortality of the MICU was 39 %. The highest mortality rate (45.8%) was observed in 2010; the lowest mortality rate (27.7%) was observed in 2008. Out of 1256 MICU admissions, 272 patients (48.6%) died within 2 days of admission (30).

2.3. Factors Associated with Outcome of Adult Patients Admitted in ICU

Study on the assessment of the worldwide burden of critical illness by the Intensive Care over Nations (ICON) audit, 10 069 patients were Included from ICUs of different continents shows that using a multilevel analysis, the unconditional model suggested significant between-country variations (var=0.19, p=0.002) and between hospital variations (var=0.43, p<0.0001) in the individual risk of in-hospital death. There was a stepwise increase in the adjusted risk of in-hospital death according to decrease in global national income(19).

A retrospective cohort of 450 patients from January 1,2013, to April 5, 2015, was evaluate to identify factors associated with mortality at Moi teaching and referral hospital, Kenya, there were factors associated with high adjusted odds of mortality were; age younger than 10 years (adjusted odds ratio [aOR], 3.59; P < 0.001), ages 35–49 years (aOR,3.13; P = 0.002), and age above 50 years (aOR, 2.86; P = 0.004), with reference age range 10–24 years; sepsis (aOR, 3.39; P = 0.01); acute stroke (aOR, 8.14; P = 0.011); acute respiratory failure or mechanical ventilation (aOR, 6.37; P , 0.001); and vasopressor support (aOR, 7.98; P , 0.001). Drug/alcohol poisoning (aOR, 0.33; P = 0.005) was associated with lower adjusted odds of mortality(34).

Study done on Clinical outcomes of patients admitted in intensive care units of Nigist Eleni Mohammed Memorial Hospital of Hosanna, Southern Ethiopia, a total of 280 clients were enrolled into the study and patient with head injury is about six times

more likely to die in the intensive care unit than patients with small bowel obstruction (AOR 6.620 (95% CI ((468-93.584)(32).

A retrospective cross-sectional study on associated factors among patients admitted in medical intensive care unit at University of Gondar Comprehensive and specialized hospital, Northwest Ethiopia, shows that in the multivariate analysis, mortality was associated with need for mechanical ventilation (AOR=5.87, 95% CI: 3.24 - 10.65) and abnormal mental status at admission (AOR = 2.8.8, 95% CI: 1.83-4.29). Patients who stayed less than four days in MICU are 5 times more likely to dies than who stayed(AOR= 5.58, 95% CI: 3.58- 8.69)(31).

CHAPTER THREE

3. OBJECTIVE

3.1. General Objective

To assess patterns of admission, outcomes and associated factors of patients admitted in adult ICU of DURH, Dilla, Southern Ethiopia, from May 4 to 14/ 2020.

3.2. Specific Objectives

1) To assess patterns of admission of patients admitted in adult ICU of DURH
2) To assess outcomes of patients admitted in adult ICU of DURH
3) To identify associated factors with outcome of patients admitted in adult ICU of DURH

CHAPTER FOUR

4. METHODOLOGY

4.1. Study Period and Area

The study was conducted from May 4 to 14/2020 at ICU of DURH. DURH found in Gedio zone Dilla town(administrative city of Gedeo zone) which is far 89km from city of SNNPR Hawassa and 359km from capital city of Ethiopia Addis Ababa to south west. ICU of DURH established in august 2017. The hospital has a total of 196 beds out of these 8 ICU beds which is 4.08% from the total with 3 functional MV and 5 nonfunctional MV, 8 noninvasive hemodynamic monitoring device for each bed, 1 portable ultrasound, 1 defibrillator and 8 infusion pumps. Also. Adult intensive care unit was considered as it has been providing services for all critically ill patients admitted from different departments. Catchment population of DURH is two millions living in SNNPR and Oromia regional state. More than 10 health institutions refer their patients to this teaching hospital. It runs by internists, general surgeons, anesthetists, and 3 BSc in emergency and critical care nursing, 10 clinical nurses with a one month training and four untrained clinical nurses. Very important health professions in the ICU like Intensivists, anesthesiologist, nutritionist, or respiratory therapist not available in the hospital (According to administrative office report)

4.2. Study Design

A retrospective cross sectional study design was used based on the ICU logbook and charts. Patients admitted to AICU from August, 2017 to January, 2020.

4.3. Source of Population

All recorded charts of adult patients admitted in ICU of DURH hospital.

4.4. Study Population

Selected Charts of adult patients admitted in ICU of DURH from August, 2017 to January, 2020

4.5. Inclusion and Exclusion Criteria

4.5.1. Inclusion Criteria

Selected patients' medical record chart was included with admission, discharges either with improvement or refer to other institution or against on medical advice and deaths in the ICU during the study period.

4.5.2. Exclusion Criteria

Patients' charts of incomplete information will excluded from the study.

4.6. Sample Size Determination

The sample size was determined for assessment of patterns of admission and outcomes of patient admitted to adult ICU using formula of single population proportion of P= 46.42% which is taken from a research done in Clinical outcomes of patients admitted to ICU of Nigist Eleni Mohammed Memorial Hospital of Hosanna, Southern Ethiopia (32),

P= 46.42% with 5% margin of error n= (1.96)2*(0.46)*(1-0.46))/ (0.05)2 =382	382

Based on the above assumption, the sample size was 382.

Adjusted correction population formula was used since charts of patients are taken from less than 10, 000,

$nf = no/ (1+no/N)$, which becomes 240

Where:

nf= sample size after using correction formula and

no= sample size before using correction formula,

N= total number of patients admitted in ICU during the previous two and half years, which is 753.

A total of 252 patients' chart was used after adding 5% contingency for incomplete chart.

4.7. Sampling Technique

Systematic random sampling technique was used to select 264 patients' charts from the entire admission charts to conduct the study by using the formula interval size (k) = N/n: 753/252 becomes nearly every 3 patient's chart was selected after the first chart is selected by lottery method

Where N= number entire admission charts

n =decide sample size that I want or need then take every K'th unit

4.8. Study Variables

4.8.1 Dependent Variables: -outcome (alive or death) of patient admitted to AICU.

4.8.2 Independent Variables: socio demographic data (Age, gender, residence area), clinical diagnosis at admission, presence of comorbid illness, source of referral, frequency and category of admission, vital sign at admission, intervention during ICU stay and length of stay in the ICU

4.9. Operational Definitions

ICU Mortality- is calculated as the number of deaths of patients given a particular diagnoses divided by the total number of patients with that diagnosis.

Admission pattern- is concerned with the frequency and distribution of disease, injury and other health related events and their cause(31).

Incomplete chart- is the presence of missing of all the necessary information of patients based on the standard formats attached at the annex(36).

4.10. Data Collection Procedure

The information recorded on a structured questionnaire/checklist format that adapted form similar studies (34, 37, 41) based on the elements intended to study. Study data contains socio demographic data of study population, average length of ICU stay, vital sign during admission, causes of ICU admission, and outcomes including alive and death for each diagnosis. The data was collected by trained 5 BSc Nurses. Data of patients was collected from patients registration book and cards admitted to the adult ICU.

4.11. Data Quality Control

Structured data collection checklist was used for this study which is adapted from previous related studies. The data was collected by trained 5 BSc Nurses. The completeness and accuracy of the data was checked by 1 supervisor and principal investigator during data collection time every day. The checklist was pretested on 5% of sample size at source population. Vague terms, phrases and questions was identified during the pre-test and also will make possible modification and changes.

4.12. Data Processing and Analysis

After data collection, data was checked for completeness and consistence by principal investigator. The coded data was checked and entered into EPI data version 4.6. Then the cleaned data was exported to and analyzed using statistical package for social science (SPSS) version 25. The descriptive statistics such as mean, frequency and standard deviation of the total number of patients admitted to ICU, gender distribution, age groups, was calculated. Finally, the generated data presented by using statements, frequency table, charts and graphs**.** Logistic regression for outcome of the patients was computed with p-value of < 0.05 considered as statistically significant.

4.13. Ethical Consideration

Permission to carry out the study was obtained from AAU collage of health science, department of emergency medicine ethical review committee then, this research title to be done was evaluated and approved by the research department board of DURH. To ensure confidentiality name and any other personal identities not used during data collection.

4.14. Plan for Dissemination of the Result

The result of this study will presented to AAU College of health science, department of emergency medicine and copy of the research will sent advisors of this research. Then, the document was disseminated to AAU College of health science, department of emergency medicine, DURH, federal Minister of health, and furthermore the manuscript will submitted to be presented on workshop and different seminars and finally submitted to a relevant scientific journal for publication.

Chapter five

5. Result

5.1. socio-demographic and admission characteristics of respondent

A total of 753 patients were admitted from August 2017 to January 2020. From this 128 were pediatrics age group, 113 patients' chart had either incomplete data or could not be found in their card room and excluded. So that, 512 patients' registration book and medical record charts met the inclusion criteria and 252 were included in this study. Of the total admitted patients 128(50.8%) were males and 124(49.2%) were females. The mean age of the respondents during admission was mean ±SD, 38.3± 18.2. The majority 40.5% of respondent were between ages 21-40 years.

The majority of patients admitted in the ICU were come from rural area 153(60.7%) regarding to their residency and from emergency department 155(61.5%) regarding to their sources of admission. From the total of 252 cases reviewed, vast majority of patients had emergency medical problems, which accounted to 214(84.9%) regarding to category of admission who were admitted in the ICU and new admissions were 240(95.2%) regarding to frequency of admissions (table 1).

Table: 1 Socio-demographic and admission characteristics of respondents admitted to ICU of DURH, southern Ethiopia, 2020

Variables	Category	Frequency	Percent
Age	14-20	51	20.2
	21-40	102	40.5
	41-60	71	28.2
	>60	28	11.1
Gender	Male	128	50.8
	Female	124	49.2
Residency area	Urban	99	39.3
	Rural	153	60.7
Source of admission	Emergency department	155	61.5
	Medical ward	72	28.6
	Surgical ward	8	3.2
	Gynecology and obstetrics ward	17	6.7
Category of admission	Emergency medical patients	214	84.9
	Emergency surgical patients	38	15.1
Frequency of admission	New admission	240	95.2
	Readmission(2 times and above)	12	4.8

5.2 Common system wise and specific diagnosis of ICU admission

Most patients had more than one diagnosis while admitted to in the ICU. The study showed that the three most common causes of admission in the ICU system wise were cardiovascular 86(34.1%), infectious disease 39(15.5%) and respiratory 35(13.9%) followed by neurologic disease 26(10.3%) (Figure 1).

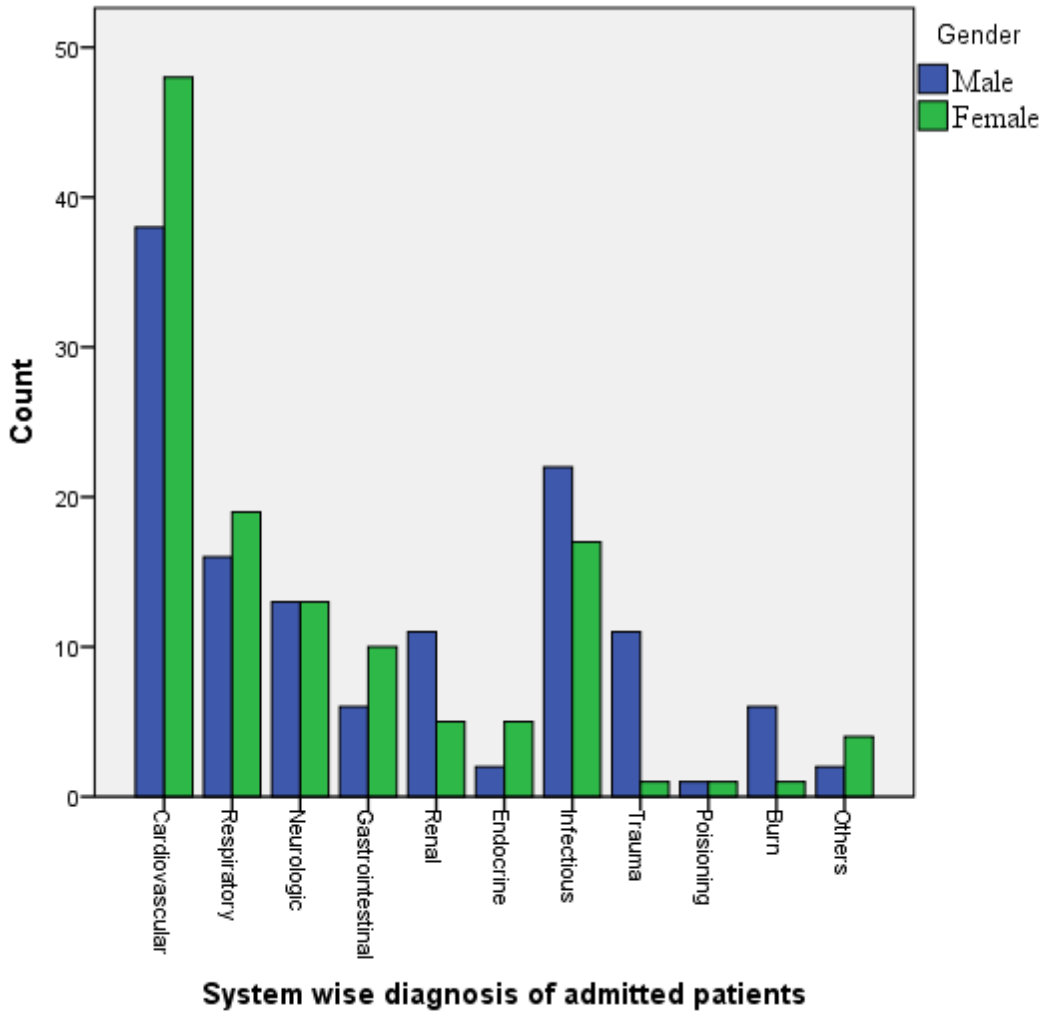


Figure 1: System wise diagonsis of patients admitted in ICU of DURH

Specific diagnosis to most patients admitted in the ICU were due to congested heart failure (CHF) 69(27.4%) followed by shock 62(24.6%) commonly cardiogenic shock 31(12.3%) and septic shock31 (12.3%) and third most common cause was aspiration pneumonia 41 (16.3%) (Table 2).

Table 2: Distributions of common specific admission diagnosis of patients admitted in the ICU of DURH, Dilla, Southern Ethiopia, 2020

Variable	*Frequency*	*Percent*
CHF	69	27.4
Cardiogenic shock	31	12.3
Septic shock	31	12.3
Aspiration pneumonia	41	16.3
SCAP	41	16.3
Complicated pyogenic meningitis	36	14.3
Cerebral/severe malaria	26	10.3
Postoperative after laparotomy	17	6.7
AKI/CKD	36	14.3
Electrolyte abnormality	24	9.5
Cardiogenic pulmonary edema	20	7.9
MI	19	7.5
Stroke	23	9.1
DKA	21	8.3
TBI	14	5.6
ARDS	7	2.8
Anemia	30	11.9
Status epileptics	7	2.8
Sever acute exacerbation of Asthma	5	2.0
Increased ICP	18	7.1
Hypertensive emergency	10	4
Burn	7	2.8
Disseminated TB	14	7.1
Others	11	4.4

5.3. Vital sign of patients during ICU admission

The vital sign of patients during ICU admission, the majority of patients had unstable records. 185(73.4%) patients had high or low pulse rate from the normal range (60-100 beat per minute), 215(85.7%) patients were either fast breathing or respiratory depression and 23(9.1%) had unrecordable blood Pressure (table 3).

Table 3: Distribution of admission vital sign of patients admitted in ICU of DURH, Dilla, southern Ethiopia, 2020

Type of vital sign	*Category*	*Frequency*	*Percent*
Pulse rate (beat per minute)	<60	15	5.9
	60-100	67	26.6
	>100	170	67.5
Respiratory rate (breath per minute)	<12	4	1.6
	12-20	37	14.7
	>20	211	83.7
Mean arterial pressure(mmHg)	<60	21	8.3
	60-100	141	56.0
	>100	67	26.6
Peripheral oxygen saturation	unrecordable	23	9.1
	<90%	76	30.2
	90-100%	176	69.8
Temperature (To)	<36. 5	115	45.6
	36.5-37.5	69	27.4
	>37.5	68	27.0
Mental status	conscious	134	53.2
	Confused	36	14.3
	Lethargic	32	12.7
	unconscious	50	19.8

5.4. Comorbidity illness and treatment given in the ICU

Among the study participant of which had comorbidity illness accounted 134(53.2%). Cardiac illness 55(21%) and hypertension 48(19.0%) were the common comorbid illness among patients admitted in ICU (Table 4).

Table 4: Distributions of comorbid illness of patients admitted in ICU of DURH, Dilla, Southern Ethiopia, 2020

	Frequency	Percent
Cardiac	55	21.8
Hypertension	48	19.0
DM	22	8.7
Asthma	6	2.4
Cancer	3	1.2

The majority 206(87.7%) patients were in antibiotics, 111(44.0%) patients took intranasal oxygen support and 107(54.6%) took anti-stress ulcer medications during ICU admission. (Table 5).

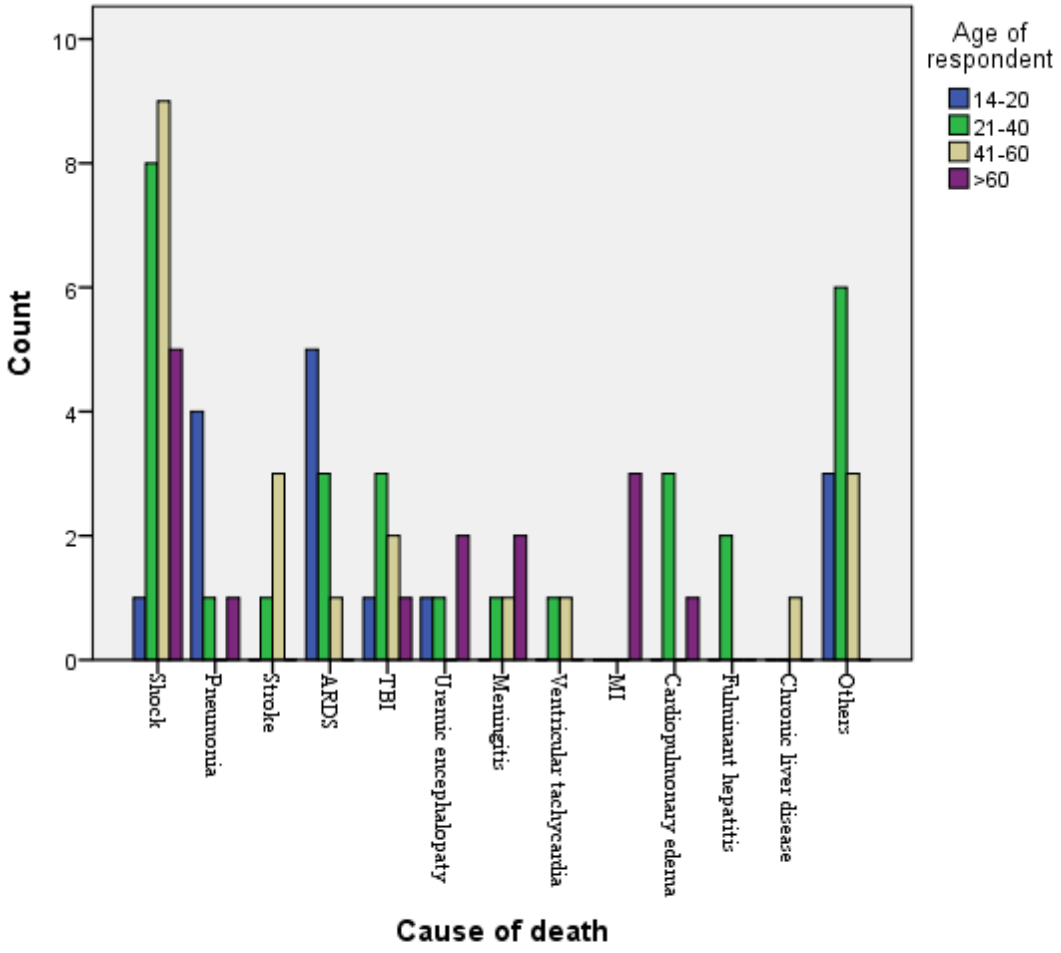
Table 5: A type of treatment given during ICU stay among admitted patients, Dilla, southern Ethiopia, 2020

Types of treatment		**Frequency**	**Percent**
Oxygen support	via intranasal	111	44.0
	via facemask	88	34.9
	by mechanical ventilation with tracheal intubation	23	9.1
	not supported	30	11.9
Antibiotics		206	81.7
Anti-platelet		55	21.8
Anti-thrombin		86	34.1
Anti-pain		147	58.3
Anti-stress ulcer		156	61.9
Inotrope /Vasopressor		79	31.3
Anti-malaria		27	10.7
Anti-Ischemic		36	14.3
Diuretics		139	55.2
Electrolyte		22	8.7
Blood transfused		20	7.9
Anti-Hypertensive		52	20.6
Anti-TB		18	7.2
Salbutamol puff		12	4.8
Insulin		12	4.8
Others		9	3.6

5.5. Clinical outcome of patients admitted to ICU

The overall mortality rate of adult ICU was 77(30.6%). The highest mortality rate 45(58.4%) was observed among males. Compared to gender with age group, more males 15 (33.3%) and females 12 (37.5%) were died in age group 21-40 years.

The main causes of deaths were shock 23(29.9%) followed by acute respiratory distress syndrome (ARDS) 9(11.7%), traumatic brain injury (TBI) 7(3.6%), aspiration pneumonia which accounted 6(7.8.8%) and uremic encephalopathy 4(5.2%) (Figure 2).



Figurer 2: causes of death among patients admitted in ICU of DURH

The mean length of stay in the ICU for all patients was 4.48 and it ranged from 1 to 88 days with the major 177 (70.2%) of them were stayed for less than four days. Guilllain Barre syndrome (GBS) diagnosis took the longest length of stay in the ICU which is 88 days.

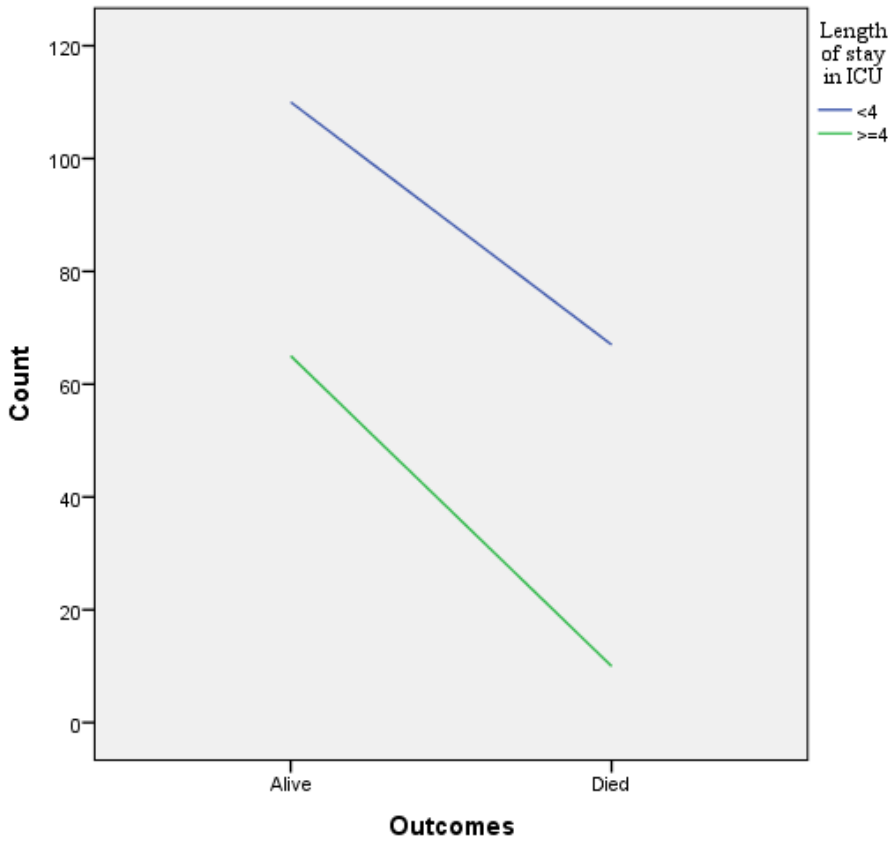


Figure 3: association between length of stay and outcome of patients admitted in ICU of DURH

5.6 Factors associated with the outcomes of patients admitted in ICU

Factors associated with the outcomes of patients admitted to adult ICU showed that patients' with age greater than sixty years, patients who had mental status of lethargic and unconsciousness, level of peripheral oxygen saturation (Spo2) less than 90% and length of stay less than four days were strongly associated with the outcomes of patients at P-value less than 0.05(Table: 6).

Table 6: Bivariate and Multivariate logistic regression which shows factors associated with outcome of patients admitted in the ICU of DURH, Dilla, southern Ethiopia, 2020

Variable	Category	Outcome		COR[95%CI]	AOR[95% CI]	P- value
		Death	Alive			
Age	14-20	15	36	1	1	

	21-40	27	75	0.9[0.4-1.8]	0.8[0.3-2.0]	0.586
	41-60	20	51	0.9[0.4-2.1]	1.1[0.4-2.9]	0.840
	>60	15	13	2.8[1.1-7.2]	4.3[1.3-14.9]	0.020*
Sex	Male	45	83	1.6[0.9-2.7]	1.3[0.6-2.5]	0.521
	Female	32	92	1	1	
Pulse rate (in minute)	60-100	9	58	1	1	
	<60	7	8	5.6[1.6-19.4]	2.7[0.6-15.3]	0.271
	>100	61	109	3.6[1.7-7.8]	2.4[0.9-6.2]	0.080
RR (in minute)	12-20	6	31	1	1	
	<12	1	3	1.7[0.2-19.5]	0.4[0.0-11.7]	0.616
	>20	70	141	2.6[1.0-6.4]	1.8[0.6-5.7]	0.314
MAP(mmHg)	60-100	43	98	1	1	
	<60	8	13	1.4[0.5-3.6]	1.4[0.4-4.8]	0.609
	>100	14	53	0.60[0.3-1.2]	0.4[0.2-1.0]	0.059
	Un-record	12	11	2.5[1.0-6.1]	1.7[0.5-5.6]	0.359
Mental Status	Conscious	27	107	1	1	
	Confused	13	23	2.2[1.0-5.0]	1.5[0.5-4.1]	0.471
	Lethargic	14	18	3.1[1.4-7.0]	3.1[1.1-8.8]	0.031*
	Unconscious	23	27	3.4[1.7-6.8]	3.6[1.5-8.7]	0.004*
Oxygen saturation	<90%	40	110	0.2[0.1-0.4]	0.4[0.2-0.8]	0.007*
	90-100%	37	139	1	1	
Length of stay in days	<4	67	110	4.0[1.9-8.2]	3.4[1.4-7.9]	0.005*
	=>4	10	65	1	1	
Oxygen supported	Via intranasal	23	88	3.7[0.8-16.5]	1.8[0.9-3.9]	0.121
	Via facemask	38	50	10.6[2.4-47.5]	4.2[1.4-13.0]	0.013*
	Via MV	14	9	21.8[4.1-114.7]	0.4[0.1-2.1]	0.281
	Not supported	2	28	1	1	

Note; COR=crude odd ratio, AOR=adjusted odd ration, CI=confidence interval, *significantly associated at P<0.05 and 1.00**:** reference

Chapter six

6. Discussion

This retrospective study describes socio-demography, residence area, source of admission, category and frequency of admission, system wise and specific diagnosis, vital sign during admission, treatment given during ICU stay, length of stay in the ICU, associated factors and outcomes of patients admitted in the ICU over a period of two and half years of 252 patients.

Emergency department was the most common source of admission into the ICU which accounted 155(61.5%) and the least one was surgical ward 8(3.2%) which is consistent to study done in India(33). Majority of admission constituted by emergency medical patients. This result was not supported by results of previous studies done in Tanzanian and Malawi ICU(23,36). The reason for this gap might be due to rising of non-communicable diseases, different ICU based on the case like medical ICU, surgical ICU and it might be the only hospital with ICU and it may attributed to increase the number of emergency medical patients.

The socio-demographic profile of admitted patients were similar to studies done in northern Ethiopia(31) and southern Ethiopia(32) of which majority causes of admission were CHF 69(27.2%) followed by shock 62(24.6%) and aspiration pneumonia 41(16.3%). It is opposite result to other studies done in Bangladesh and Jimma university specialized hospital, Ethiopia(4,29)where cardiogenic shock 13(18.8%) followed by surgery for acute abdomen 6(8.7%) and TBI 5(7.2%) of patients represent a large proportion of ICU admitted patients. This difference might be due to the reason of most trauma with head injury patients were referred to other hospital because of unavailability of neurosurgeon, anesthesiologist and intensivists.

The magnitude of mortality in this study was 77(30.6%) with [95% CI: 24.9%, 36.3%]. This finding was higher than study conducted in Nigeria. This difference might be due to age group difference which include pediatrics and adult age groups in there study and admission diagnosis differences . In Nigeria common causes of death

were TBI which accounted to 45.7% followed by postoperative cases 40.7% but, based on the result of this study, the leading causes of death patients admitted to ICU were shock 23(9.1%) of a total of death followed by ARDS 9(3.6%) and TBI 7(2.8%) (28).

The finding of this study reveal that age greater than 60 years (P=0.020; CI=1.264-14.874; AOR=4.34), peripheral oxygen saturation less than 90%(P=0.007; CI=0.183-0.767;AOR=0.37) patients with mental status of lethargic (p=0.031; CI=1,107-8.765;AOR=3.12)and unconsciousness (p=0.004; CI=1.501-8.663; AOR=3.61) were at high risk of mortality among patients admitted to ICU and the number of deaths showed that an three times increment trend after patients admitted for length of stay less than four days in the ICU (p=0.005; CI=1.446-7.866; AOR=3.37) which was supported with study conducted in Kenya and northern Ethiopia (31,34).

Chapter seven

Conclusion and recommendation

7.1 Conclusion

In this study emergency department 155(61.5%) was the most common sources admission and vast majority of patients had emergency medical problems. Cardiovascular origin 86(34.1%) and infectious disease 39(15.5%) were the most common causes of admission in the ICU and the most frequently specific diagnosis of admission were CHF 69(27.4%) followed by shock 62(24.6%) and aspiration pneumonia 41 (16.3%). Majority of patients were treated by antibiotics, oxygen by intranasal, anti-stress ulcer drugs, anticoagulant, vasopressor and lipid lowering agents (statin). The finding of this study showed that the overall mortality rate of adult ICU was 77(30.6%). The most common causes of death were shock 17(8.7%) and ARDS 9(321%). Patients with age less than sixty, conscious, peripheral oxygen saturation greater than 90%, and length of stay in the ICU greater than four days had more survival (alive) chance than the other. Length of stay in the ICU less than four days had three times high risk of mortality rate than patients who had greater than four days of stay in the ICU.

7.2 Recommendations

Based on the result of this study; the concerned bodies will be better to do the following recommendation

- The facility authorities and health information technology system workers should strengthen record keeping and also consider electronic recording and storage of patients' data.
- There is a need for action to improve the readiness of health care to respond to these non-communicable diseases. The health workers should emphasize on the importance of educating their patients and families on risk reduction and early screening with regular follow-up to prevent occurrence and complications of non-communicable diseases. Also to decrease risk of

complication and early death, patients should had a good drug adherence to their diagnosis especially for those who had cardiac illness.

- Similar studies are required to fully understand at large about patterns of admission and outcomes of patients admitted to adult ICU at national level.

Strength of the study

This thesis gave me insight for how to do a research. This quantitative study will lay foundation for many other research ideas and it could be used as base for identifying a problem to doing other researches.

Limitation of this study

Firstly, this study didn't assess patterns and outcomes of pediatrics patient admitted in the ICU. Secondly, uses of retrospective study design that why it couldn't assess the severity of admissions by various scoring system.

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ANNEX: I

The checklist was prepared for Assessment of patterns of admission, outcomes and associated factors of patients admitted to adult intensive care unit of DURH, SNNPR, Ethiopia, 2020

Part one socio demographic characteristics			
NO	QUESTION	CODE	
001	Age in years	---------years	
002	Gender	1-male 2-Female	
003	Residence area	1-urbane 2-Rural	
004	Source of admission	Medical ward Emergency department Surgical ward Gynecology and obstetrics ward	
005	Category of admission	1.emergency medical patient 2.emergency surgical patients	
006	Frequency of admission	1.new admission 2.readmission(2 times and above)	
Part two clinical characteristics of disease			
007	Admission date in the ICU	-----/----/---(DD/MM/YY)	
008	System wise diagnosis during admission	Cardiovascular disease Respiratory disease Trauma Infectious disease Neurologic disease	

		Endocrine disease Renal disease Hematologic disease Poisoning Miscellaneous conditions	
009	Common causes of admission by their diagnosis among patients admitted in the ICU	Myocardial infarction (MI) Congestive Heart failure (CHF) Acute respiratory disease syndrome (ARDS) Septic shock Traumatic brain injury (TBI) Diabetic keto Acidosis (DKA) Stroke Human immuno deficiency virus (HIV) infection Pneumonia Cardiogenic shock Pulmonary thrombo embolism (PTE)	
010	vital signs during Admission	Pulse rate (bpm) <60 60-100 >100 No pulse Respiratory rate (bpm) <12 12-20 >20	

		Apnea Mean arterial pressure (mmHg) 65-106 <65 >106 Recordable Peripheral oxygen saturation (SPO2) <90% 90%-100% Temperature (o'c) < 36.5 36.5 - 37.5 >37.5 Mental status Conscious Confused Lethargic Unconscious	
011	Length of stay in the ICU	…… in days	
012	Interventions given in the ICU	1.Mechanical ventilation with facilitation of tracheal intubation 2.Antibiotics 3.Anticoaculants 4.Patients received inotrope support 5.Others(specify)	
Part three information at discharge			

013	Outcome during discharge	1-Alive 2-Died	
014	Causes of death	1. Shock 2.Pneumonia 3.Stroke 4.Acute respiratory distress syndrome 5.Traumatic brain injury 6.Uremic encephalopathy 7.Meningitis 8.Ventricular tachycardia 9.Acute myocardial infarction 10.Cardiopulmonary edema 11.Fulminant hepatitis 12.Chronic liver disease 13.Others(specify)	