

ST.PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

GRADUATE STUDY PROGRAM



**TRENDS OF DISEASE PATTERN CLINICAL OUTCOME AND PREDICTORS OF
OUTCOME OF MEDICAL PATIENTS ADMITTED IN INTENSIVE CARE UNIT AT
ST.PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE IN ADDIS
ABABA,ETHIOPIA**

BY: SELWA BEDRUDIN, (MD ,INTERNAL MEDICINE FINAL YEAR RESIDENT)

THESIS PAPER SUBMITTED TO DEPARTMENT OF INTERNAL MEDICINE AND
PUBLIC HEALTH ,SPHMMC FOR THE PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR SPECIALITY CERTIFICATE IN INTERNAL MEDICINE .

OCTOBER , 2021

ADDISABABA,ETHIOPIA

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Acronyms and Abbreviation

ARDS.....	Acute respiratory distress syndrome
CVA.....	Cerebrovascular accident
CI.....	Confidence Interval
DKA.....	Diabetic ketoacidosis
DOA.....	Date of admission
G.C.....	Gregorian calendar
ICU.....	Intensive care unit
LAMA.....	left against medical advice
LOC.....	Level of consciousness
LOS.....	length of stay
MICU.....	Medical intensive care unit
MV.....	Mechanical ventilation
OR.....	Odds Ratio
PI.....	principal investigator
RF.....	Respiratory failure
SD.....	Standard Deviation
SPSS.....	Statistical package for social science
TBI.....	Traumatic brain injury

Abstract

Introduction

Intensive care unit(ICU) is a special department of a hospital or health care facility that provides intensive care medicine . Mortality rates in the ICU strongly depend on the severity of illness and the patient population analysed . In any hospital, the ICU care unit has the highest mortality rate of any unit. Research on ICU outcomes provides valuable information on developing more improved models for patient-centered outcomes, better individual outcome prediction, and alternative outcome predictions under different treatment paradigms.

Method and material: A hospital based crosssectional study using secondary data from chart review was conducted among adults who were admitted at Medical ICU of the hospital between September, 2019 to October,2020 G.C . Data was entered in to Epi-Info version 3.1 then exported and analyzed using Statistical Package for Social Sciences (SPSS) for windows version 25.0. Statistical significance was considered at a p value of < 0.05.

Result: Common diagnosis that led to ICU admission were infectious and parasitic diseases origin (55.1%), followed by diseases of the cardiovascular origin (16.8%)and disease of the respiratory system (15.3%). The most common specific indication for ICU admission was pneumonia, constituting 31.6% of all admission. Cardiac disease were the commonest (13.3%) co-morbid conditions. Overall mortality rate of patients admitted in medical intensive care unit in the hospital was 47%. Multiple organ failure was the leading cause of death(49.5%).Time of admission, source of admission, consciousness during admission, length of ICU stay, frequency of ICU admission, co-morbid illness and complication were predictors of death at medical ICU.

Conclusion: This study clearly demonstrated that the high mortality rate of medical patients in intensive care unit in St. Paul's Hospital Millennium Medical College. . The independent factors associated with the highest risk of death are; time of admission, length of ICU stay, frequency of ICU admission and complication.

Further studies, preferably prospective cohort studies are needed to identify and characterize the underlying causes of mortality in the study area and elsewhere.

Keywords: SPHMMC, intensive care unit , admission pattern, clinical outcome

Section1:Introduction

1.1Background

Intensive care units (ICU) are the areas where patients with severe and life-threatening illnesses and injuries require constant, close monitoring and support from specialist, trained nurses equipment and medications in order to ensure normal bodily functions.patients belonging to lower socioeconomic status who could be salvaged if given critical services can't afford the treatment; thereby affecting the outcome (1,2). The prevalence of critical illness in developing countries is disproportionately high in view of the disproportionate burden of diseases such as HIV/AIDS, malaria, tuberculosis and trauma(3).

The current guidelines of the Society of Critical Care Medicine state, “in general ICUs should be reserved for those patients with reversible medical conditions who have a reasonable prospect of substantial recovery. Advanced age and poor functional status are reported to be the commonest reasons for ICU refusal(4).Timely mobilization of the ICU team and its support services plays an important role in the efficient use of acute care facilities, for the coverage, triage, and outreach management of critically ill patients outside the ICU. Shared protocols between the ICU and other departments of the hospital (e.g., the emergency department) enhance throughput and decrease overall hospital mortality of critically ill patients(5).

The diagnosis and treatment of patients with acute life-threatening diseases with a purpose to restore them to their previous health and quality of life is the goal of the ICU(6). In any hospital critical care team consist of critical care, intensivist,pulmonary critical care specialist,internist, residents, critical care nurses ,medical pharmacist, nutritionist, ICU technicians, physician, assistants, physical therapist , primary care physicians, respiratory therapists, other professionals, also referred to as the multi professional team model. Multi professional team optimizes care for patients(7).

Mortality rates in the ICU strongly depend on the severity of illness and the patient population analyzed. Across different ICUs, 6.4% to 40% of critically ill patients were reported to die every year despite intensive care medicine. Mortality in patients depends on factors such as demographic and clinical characteristic of population, infrastructure, non-medical factors (management and organization), admission practice and also by ICU performance. Increasing age were associated with higher adjusted odds of death at 30 days also Multiple clinical factors were associated with increased 30-day mortality including sepsis, vasopressor support, and acute respiratory failure or use of mechanical ventilation, duration of mechanical ventilation, length of ICU stay, mean arterial pressure at admission, and mental status at admission were significantly associated with the clinical outcome of ICU patients(8–10). The reported disease characteristics and mortality rates of patients admitted to ICUs in sub-Saharan Africa vary widely from one population to another(11).

In ICU mortality rates range from 9.3% in North America and 15.5% in Western Europe to 32.9% in Nigeria and 50.4% in Ethiopia show the mortality rate in developing country is higher compared to developed country (11–13). In Ethiopia, the first MICU was introduced more than 30 years ago in Addis Ababa Tikur Anbessa Hospital from that time onward the number of intensive care service is increasing in both public and private hospitals of the country(10).

Research on ICU outcomes provides valuable information on developing more improved models for patient-centered outcomes, better individual outcome prediction, and alternative outcome predictions under different treatment paradigms(14). In any hospital, the ICU care unit has the highest mortality rate of any unit. For this reason, there has been ample interest in measuring ICU outcomes and patterns of admission both in terms of mortality and resource utilization. The outcome in the MICU is mostly dependent on the severity of illness at the beginning of intensive care admission and the clinical management of the patients in the unit (15).

ICU length of stay (LOS) can adversely affect the health status by increasing the risk of infection, complications, and possibly mortality rate. Operationally, it impacts upon ICU bed availability and the time spent in the ward before admission to ICU is also prolonged. this is a known factor to affect patients outcome also level of consciousness, time of admission were strongly associated with clinical outcome early admitted and conscious patients are more likely to survive than the others (16,17).

1.2 Statement of the problem

In different region of the world the present study was done to provide information about the trends of admission in the ICU and their outcome along with association between age and the primary disease with the outcome. Globally, crude ICU mortality rates range from 9.3% in North America and 15.5% in Western Europe to 32.9% in Nigeria and 50.4% in Ethiopia(11–13)

In sub-Saharan Africa the availability of intensive care unit (ICU) services is limited by a variety of factors, including lack of financial resources, lack of available technology and well-trained staff. In Africa, the ICU mortality rate is high as it compared to the other developed continents. The mortality rate in Nigeria, Uganda, Tanzania, and Kenya were 32.9%, 40.1%, 41.1%, and 53.6% respectively(3,9,11,13). Different studies showed that the mortality rate of ICU patients in Ethiopia is relatively similar to other Africa countries. studies done in , Addis Ababa, Mekelle and gonder showed that the mortality rate was 32% ,27% and 38.7 % respectively(12,17,18).

The overall mortality of the MICU at St. paul's hospital millennium medical college was 39 %. The highest mortality rate (45.8%) was observed in 2010; the lowest mortality rate (27.7%) was observed in 2008. Proportionally, more patients in the age group (≥ 45 years) died compared to young (≤ 27 years) patients, 47.9% versus 30.6% ($P < 0.001$) .which may be due to lack of equipment, investigative facilities, patient's factors and other related factors.(15).

However From the previous research which was done in our hospital the mortality rate in ICU were high compared to other hospital in Addis Ababa and one of the identified gap was lack of intensivist but other determinant factors like source of admission, time of admission (Early vs late admission ,) because each hour delay in admission has 1.5% increase in mortality, ICU characteristic ,presence of complications and length of stay were not assessed.

1.3 Significance of the study

The goal of intensive care unit is timely diagnosis and treatment of patient with acute life threatening disease to reduce mortality and morbidity. Study conducted around the world both in developing and developed countries shows that overall in ICU mortality rate is quite higher specially in developing countries. From the previous research which was done in our hospital the mortality rate in ICU were high compared to other hospital in Addis Ababa and one of the identified gap was lack of intensivist but other determinant factors like source of admission, time of admission (Early vs late admission ,) because each hour delay in admission has 1.5% increase in mortality, ICU characteristic , presence of complications level of consciousness during admission and length of stay were not assessed.

Currently the hospital ICU is managed by multiprofessional team model like modern icu setups as intensivist, cardiologist ,gastroenterologist,neurologist,hematologist,pulmonologist and residents so this research will answer the question of does the involvement of intensivist and other subspecialitis have impact on patient outcome or there are other important determinant factors which were not thoroughly investigated by researches done in the field so far that have more impact on patients outcome. Also understanding the disease patter and outcome of patients admitted in ICU in our set up will give us an insight where more focus is to be given, it will help with prioritizing the patient and resource as we are in resource limited country, It will identify the predictors of prolonged stay and proper timing of ICU discharge and It will give a feedback to each subspecialty unit to identify their gaps and deliver evidence based intervention.

In this study mortality rate might decrease due to involvement of intensivist and other subspecialties on patient management compared to previous study or might increase due to increase patients turn over.

Section 2: Literature review

A 5 years prospective longitudinal study in UK on quality of life after ICU admission by B.cuthberton,S.Roughton,D.Jenkison et al. The result shows that admission to the ICU has a high mortality, a poor physical quality of life and a low quality adjusted life years gained compared to the general population for 5 years after discharge. Critical illness associated with ICU admission should be treated as a life time diagnosis with associated excess mortality, morbidity and the requirement for ongoing health care support(19).

Prospective study was done in **Saudarabia** by Y.arabi,S.venkatesh,S.hadad et.al. The ICU mortality rate was 20.4%; the majority (89.6%) of deaths occurred in the first 14 days **in contrary** a result from Pennsylvania. The observed in-hospital mortality rate was 9.6% and the observed 30-day mortality rate was 12.3% **similarly** A prospective cohort study which was conducted in **USA** by V.Mayr,M.Dunser. ICU mortality was 9.5%, In-hospital mortality after discharge from the ICU was 4.3%. Overall mortality of critically ill patients in the hospital was 13.5%. Malignant tumour disease was the most frequent cause of in-hospital death of critically ill patients after discharge from the ICU and the major factors identified were age, gender, type of admission and severity of illness (20,21)

In Karachi, Pakistan a retrospective study was done. the 3 most common causes of admission were hepatic disease, followed by cerebrovascular accident (CVA), septic shock and respiratory infection with congestive cardiac failure. Patients on mechanical ventilation (MV) with sepsis seemed with higher mortality rates. Similar study in **Himalaya region in india**, over all in ICU mortality was 28.6%. Survival was inversely related to age. Mortality was not associated with sex. The common major factor identified in both studies were age and source of admission (1,7)

In **enugu Nigeria** retrospective study was done by F.Onyekwulu,S.A. In these study neurosurgical cases account the highest admission in the ICU out of these 70.9% was due to severe traumatic brain injury (TBI). Internal medicine admission accounts 9.4% most common indication was complete heart block. The overall ICU mortality rate was 34.6%. **on the contrary** a study from **western Kenya** by H.lalani,W.Wawerusika,T.Mwogi et.al shows ICU mortality was 53.6%, and 30-day mortality was 57.3% and the most common diagnosis of admission were respiratory failure (RF) 53%. common major factors identified in both studies

were age, sex and length of mechanical ventilation. **on the other hand In Tanzania** retrospective study was conducted by S.H.R, M.J.A, S.J et al. intracranial injury was the most common admission diagnosis in all age group. The overall in-ICU mortality was 41.4% out of these renal failure (acute and chronic), shock, burns and septicemia were conditions with the highest in-ICU mortality rate of over 80% each. (11,9,22)

In Ethiopia at at Nigst Eleni Mohammed Memorial Hospital (NEMMH) cross-sectional study was conducted by S. mohammed, O. Abdi, B. Getish. The most common admission diagnosis was small bowel obstruction (15.4%) followed by head injury (13.9%). level of consciousness (LOC), sex and LOS for more than 14 days were strongly associated with clinical outcome. over all mortality were 46.42%. on contrary a similar study which was conducted **In jimma** university by A. Asrat, W. Mirkuzie, A. yemane et al. the most common causes of ICU admission was cardiovascular disorder (CVD) accounting 30.4%. the commonest co morbidities were infectious disease which accounts for 51.7%. over all mortality rate was (37.7%) similarly a result from **gonder university** The leading admission diagnosis was CVD (36.1%) of which the most common was myocardial infarction (MI) (19%). The overall mortality rate of the MICU was 38.87%. but HIV infection was 5% of all admission and Respiratory disease (27.2%) were the commonest co-morbid condition. cardiogenic shock (57.1%) had the highest case fatality ratio (53.5%). (17,23,24)

In Ayder hospital , Mekele, a cross sectional study was done In this study the three most common reason for admission in the ICU were Cardiovascular, infectious and neurological diseases. The overall death in the MICU was 27.5%. The most common cause of death was all types of stroke. in this study the independent predictors of death were increased age, HIV positivity and diagnosis of admission of ARDS, septic shock and status epilepticus. similar hospital based retrospective study was done at **St. paul's hospital millennium medical college (SPHMMC)**. The study shows that the most common admission was diabetic ketoacidosis (14.9%) followed by stroke. over all ICU mortality was (39%) The highest mortality rate (45.8%) was observed in 2010; the lowest mortality rate (27.7%) was observed in 2008. the leading causes of death was all stroke which accounts (12.2%) mortality increased with increasing age. The common factors identified in the study were age and severity of disease at admission. There was no significant sex difference in terms of outcome (15,18)

Section 3:Study Objectives

3.1 General objective

- To assess trends of disease pattern, outcome and predictors of outcome of Medical patients admitted in intensive care unit of SPHMMC in Addis Ababa, Ethiopia .

3.2 Specific objectives

- To describe disease pattern of ICU admitted patients
- To determine clinical outcome of patients admitted in ICU
- To identify predictors of clinical outcomes of ICU admitted patients
- To determine important ICU complications

Section 4. Methods and materials

4.1 Study area and design

The Hospital based retrospective cross-sectional study was conducted at St. Paul's Hospital Millennium Medical College. It is the second largest hospitals in the capital Addis Ababa with a catchment population of more than 5 million. The hospital was established in 1961 by the late emperor Haile Selassie. In 2007 it became a Medical College, its core services including the provision of medical care, teaching and research. The hospital provides extensive outpatient and a limited inpatient treatment service. The hospital Medical intensive care unit (MICU) was opened in late 2006. Initially the ICU was a six-bed general intensive care unit, staffed by three full-time ICU doctors (two Internists and an Anesthesiologist) and 10 trained ICU nurses currently the bed has increased to 15 since late February 2019 and staffed with residents, pulmonary critical care specialists, Internist, and trained nurses. It is general ICU serving adult medical (50%), surgical (33.3%) and obstetrics and gynecology (16.6%) patients. It also has bedside dialysis machine, portable x-ray, point of care ultrasound and ECHO. The new ICU is designed according to international dimension with 1st world bed and having 15 mechanical ventilators and patients monitors. Average number of patients admitted each year is around 256. Since March 2020 the ICU has divided into COVID and non COVID ICU having 15 and 6 beds respectively. On COVID ICU has 6 beds with 5 mechanical ventilators and there is no specific bed allocation for each department. This study period considered to conduct the research from September 1, 2019 to September 30, 2020 in non COVID ICU.

4.2 Study period

The study was conducted from May 1 to August 31, 2021.

4.3 Source population

All patients admitted in intensive care unit from September 1, 2019 to September 30, 2020.

4.4 Study population

All charts of medical patients admitted in intensive care unit from September 1, 2019 to September 30,2020 who fulfilled the inclusion criteria.

4.5 Inclusion and exclusion criteria

Inclusion criteria

All adult medical patients admitted in intensive care unit from September 1,2019 to September 30,2020

Exclusion criteria

- Age under 18 years
- Incomplete charts
- Gynaecology and obstetric patients
- Patients admitted for observation
- Surgical patients

4.6 Sampling method

Sample size

All medical patients admitted in intensive care unit from September 1, 2019 to September 30 , 2020 were included in the study.

Sampling procedure

This study had included all medical patients admitted in intensive care unit of this hospital and who fulfilled the inclusion criteria during the study period .

4.7 Variables

Dependent variable

- Outcome of patients

Independent variables

Sociodemographic

- Age
- Sex
- Place of residence

Institution related

- Length of stay
- Intervention during ICU stay
- Source of admission
- Frequency of admission

Disease related

- Presence of comorbid illness
- Diagnosis during admission
- Immediate causes of death
- Consciousness level during admission ,Any complication during ICU stay

Section 5 Operational definitions

Average length of stay: Sum of total length of stay of each patients in days.

In ICU mortality: $\text{No of deaths} \div [\text{total number of admissions}] \times 100$

Primary diagnosis: Major problem which make the patient seek admission.

Clinical outcome: In this research clinical outcome indicates patients who are discharged improved, transferred, died and left against medical advice.

Non-survived: if patient was died.
Survived: Patient who are alive at the time of discharge or transferred to ward or left against medical advice

Source of admission: The area from where patient is transferred or referred

Early admission: Those who were immediately admitted within 72 hours of critical illness.

Delayed admission: Those admitted after 72hours of critical illness.

Conscious: Those patients who are oriented with time place and person at the time of admission

Unconscious: Those who are not oriented with time place and person

4.8 Data Collection and quality assurance

Data collection

Data was collected using a data abstraction tool that consists of questions to address socio-demographic variable(sex ,age and address) , diagnosis during admission, LOS, consciousness level ,and outcome of patients (death,discharged improved , LAMA and transferred) from patients registration books and charts of patients admitted in the ICU from September 1, 2019 to September 30, 2020. Data collection was undertaken by six general practitioners who were trained by using checklists prepared in English language and have used patients chart number to avoid multiple data collection. At the end of data collection, patient's charts were replaced with its original place properly. The primary investigator have rechecked the data collection forms on daily basis to ensure their completeness and accuracy. Any ambiguity and other problems of data collector was addressed. The temple had internal consistency checks. The study was done as per ethical code of conduct.

Data Quality Assurance

The principal investigator was provided supportive supervision to the data collector to make sure that it was performed according to the protocol .Each day the collected data was checked for accuracy and completeness. An hour-long training was given to data collectors (General practitioners of SPHMMC on the components of the checklist and how to fill the data into a computer.

4.9 Data Management and Analysis

Data Management

Records of the study population was assessed for completeness before data entry and the entered data was checked by the data supervisor on a daily basis for any incompleteness and/or inconsistency.

Data analysis

Data was cleaned, edited and entered into Epi data version 3.1 and analyzed using SPSS software (version 25.0). Characteristics of study participants were analyzed using descriptive statistics. After multi-collinearity was checked using VIF < 10 and Tolerance test > 0.1, variables having p value ≤ 0.2 at bivariate logistic regression analysis were fitted into multivariable logistic regression. Bivariate and multivariate logistic regression was used to identify the association between dependent and independent variables. Multiple logistic regressions with a calculation of adjusted odds ratios were used to determine the influence of covariant on mortality. Statistical significance was considered at a p value of < 0.05. Odds ratio with 95% confidence interval was used to show the strength of association between independent and dependent variables.

4.10 Ethical Consideration

clearance was sought from the Institutional Review Board of SPHMMC. The participant's names were not collected and the data was de-identified after the data abstraction tool was completed. The collected data was stored in a secure location and only the lead investigator was having access to this location.

4.11 Result Dissemination Plan

After the data was analyzed, the results of the research was presented to SPHMMC's department of internal medicine. The findings will be sent for publication on relevant scientific journals and disseminated online so that they can be of use for other academic researchers and clinical practitioners.

Section:5 Result

Variable	Category	Frequency(N)	Percent (%)
Age (years)	<20	30	15.3
	20-40	86	43.9
	41-60	60	30.6
	61-80	20	10.2
Sex	Male	91	46.4
	Female	105	53.6
Residence	Urban	142	72.4
	Rural	54	27.6
Source of admission	Emergency ward	100	51
	Other Wards	93	47.4
	Other hospitals	3	1.5
Time of admission	Early admission	105	53.6
	Late admission	91	46.4
Level of consciousness	Conscious	109	55.6
	Unconscious	87	44.6
Frequency of ICU admission	Unknown	74	37.8
	First admission	93	47.4
	Readmission (≥ 2)	29	14.8
Length of ICU stay	Less than a week	111	56.6
	One week to two weeks	39	19.9
	More than two weeks	46	23.5

Pattern of disease during admission and co-morbidity in medical Intensive Care Unit

Common diagnosis that led to ICU admission were infectious and parasitic diseases origin (55.1%), followed by diseases of the cardiovascular origin (16.8%) and disease of the respiratory system (15.3%). The most common specific indication for ICU admission was pneumonia, constituting 31.6% of all admission. Sepsis accounted for (16.8%) and acute respiratory syndrome for (13.3%), NYHA class IV stage C for (8.2) of the admission. Cardiac disease were the commonest (13.3%) co-morbid conditions in patients admitted in medical intensive care unit followed by two or more comorbid diseases(12.8%)[Table 2].

Table 2: Pattern of admission and comorbid diseases in Medical Intensive Care Unit in St. Paul's Hospital Millennium Medical College from September 1, 2019 to September 30, 2020 (N=196)

Admission diagnosis	Number of patients(N)	Percent (%)
Infectious and Parasitic diseases	108	55.1
Pneumonia	62	31.6
Sepsis	33	16.8
Tuberculosis	1	0.5
Meningitis	7	3.6
GBS	3	1.5
Tetanus	2	1.0
Diseases of the Cardiovascular system	33	16.8
NYHA class IV stage C	16	8.2
Acute myocardial infection	10	5.1
Hemorrhagic shock	2	1.0
All stroke	4	3.1
Hypertension	1	0.5
Diseases of the Respiratory system	30	15.3
Acute respiratory syndrome	26	13.3
PTE	3	1.5
Pulmonary hemorrhage	1	0.5
Diseases of the Nervous System	6	3.1
Status epileptics	6	3.1
Endocrine, Nutritional and Metabolic diseases	5	2.6
Hypoglycemia	2	1.0
Pheochromocytoma	1	0.5
Myxedema coma	1	0.5
Thyroid storm	1	0.5
Diseases of the Digestive system (DS)	4	2.0

Mesenteric ischemia	1	0.5
Hepatic encephalopathy	1	0.5
Acute pancreatitis	2	1.0
Injury, Poisoning and External Causes	4	2.0
All poisoning	4	2.0
Miscellaneous Conditions	6	3.1
Comorbid illness		
No comorbidity	70	35.7
Cardiac disease	26	13.3
Hypertension	23	11.7
Retroviral infection	21	10.7
≥ two comorbidity	25	12.8
Diabetes mellitus	9	4.6
Malignancy	7	3.6
Asthma/COPD	6	3.1
Others *	9	4.6

Others*: *epilepsy, renal disease, chronic liver disease*

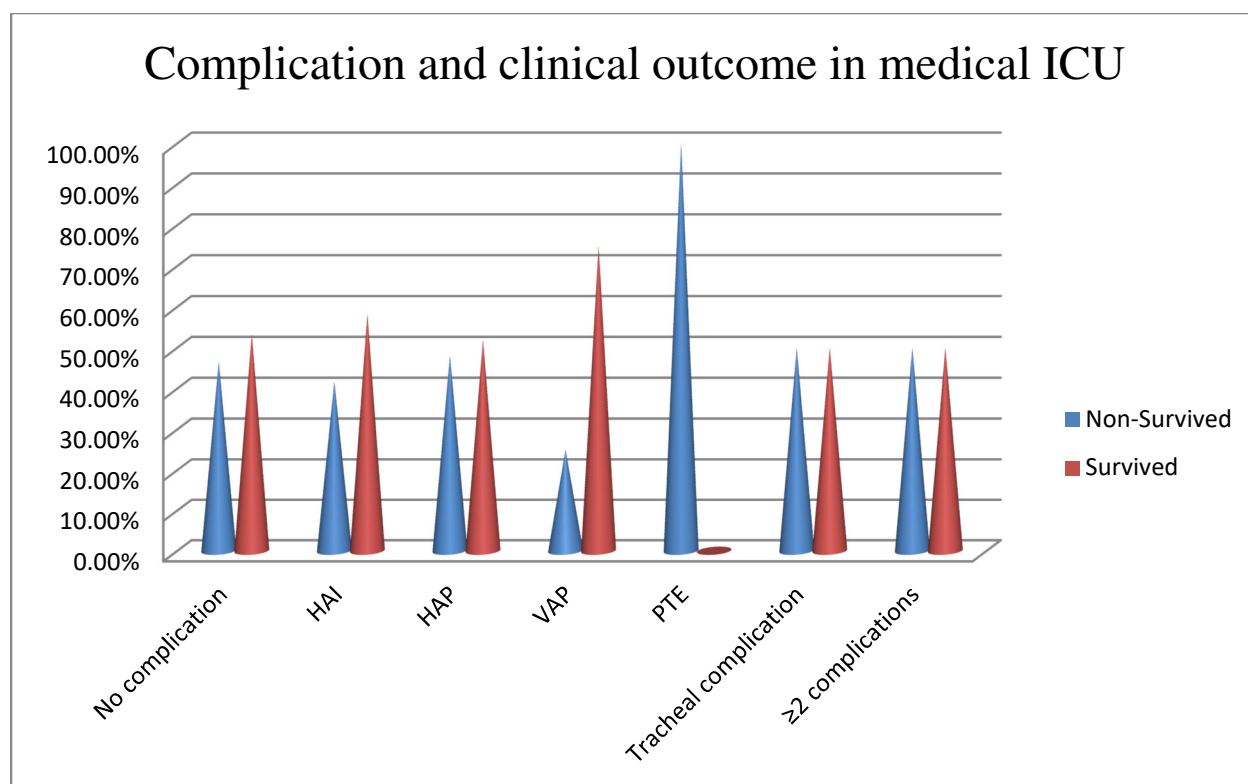


Figure 1: complication and clinical outcome in patients admitted in Medical Intensive Care Unit in St. Paul's Hospital Millennium Medical College from September 1,2019 to September 30,2020 (N=196)

Among those who developed pulmonary thromboembolism, all of the patients were non-survived. Hospital acquired infection (41.7%) and hospital acquired pneumonia (48.1%) were other complications which more pronounced in non-survivors.

Interventions given during ICU admission

Majority (41.3) of patients were received mechanical ventilation and antibiotics followed by 33.2% of mechanical ventilation, vasopressor and antibiotics and 5.1 % Vasopressor and antibiotics during medical ICU admission.

Table 3: Interventions given during admission in Medical Intensive Care Unit in St. Paul's Hospital Millennium Medical College from January 1 to July 31, 2021 (N=196)

Intervention	Number of patient	Frequency (%)
Mechanical ventilation and antibiotics	81	41.3
Mechanical ventilation, vasopressor and antibiotics	65	33.2
Vasopressor and antibiotics	10	5.1
Mechanical ventilation, tracheostomy and antibiotics	7	3.6
Mechanical ventilation, tracheostomy, vasopressor and antibiotics	3	1.5
Antibiotics and others**	30	15.3

Others:** *NG tube, UFH, Omeprazole, Anti-pain, HAART, Anti-TB, Antihypertensive, Anti-seizures, Lasix, Digoxin, chest tube*

Clinical outcome of patients admitted in Intensive Care Unit

Overall mortality rate of patients admitted in medical intensive care unit in the hospital was 47% [95% CI:40.8-52.6]. Multiple organ failure (49.5%), sudden cardiac arrest (28.3%) and cardiopulmonary arrest (13%) are the three leading cause of death. Multiple organ failure^{2°} to refractory septic shock (23%), sudden cardiac arrest ^{2°} to massive PTE (3.6%) and sudden cardiac arrest ^{2°} to refractory shock (3.1%) were the most common specific immediate cause of death for patients admitted in medical ICU (Figure 2). There was no statistical difference in age and sex between non-survivor and survivor (p-value=0.602 and 0.263 respectively). Of the non-survivors, 32(16.32.1%) died within first 24hr of ICU admission. On comparing the outcome of patient with the area from where patient was shifted to ICU, this finding showed that high mortality was there in patients who were shifted from ward as compared to those patients who were shifted from emergency or from other hospitals. This was found to be statistically significant (p-value =0.01).

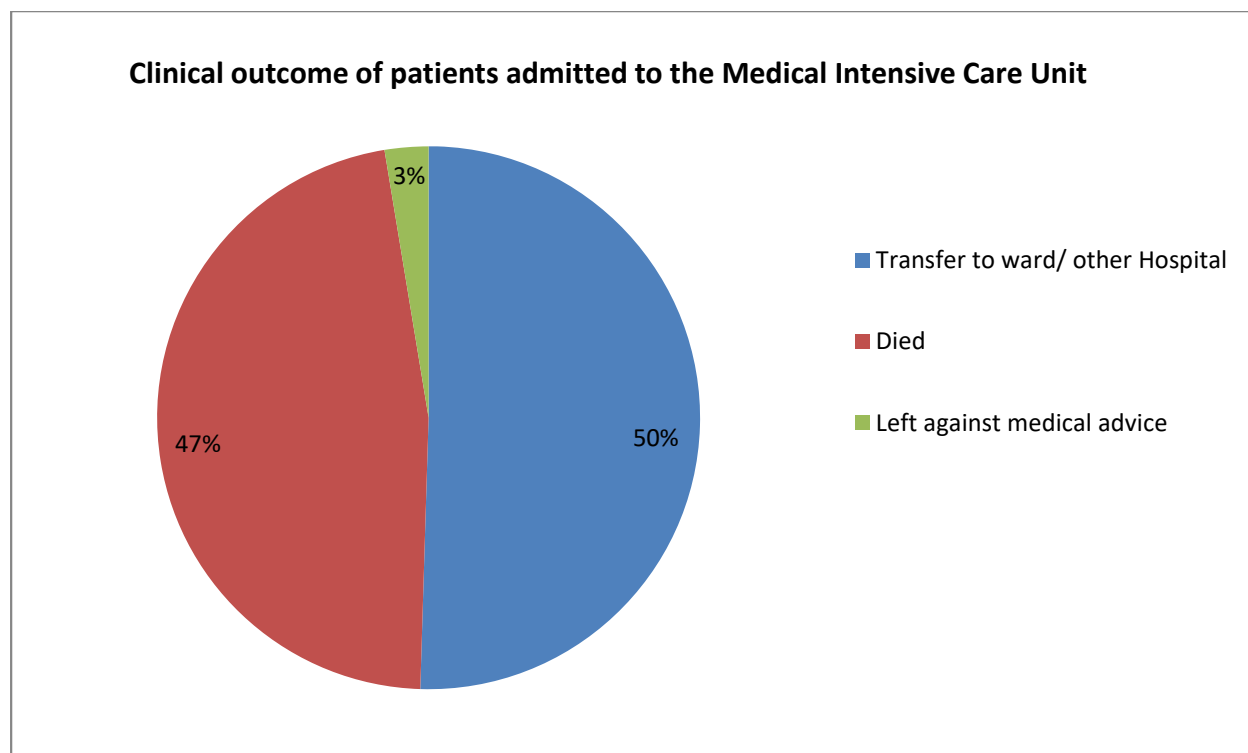


Figure 2: clinical outcome of patients admitted in Medical Intensive Care Unit in St. Paul's Hospital Millennium Medical College from September 1,2019 to September 30,2020 (N=196)

Predictors of clinical outcome of patients admitted in ICU

The result on the binary logistic regression revealed that residence, time of admission, source of admission, consciousness during admission, length of ICU stay, frequency of ICU admission, co-morbid illness and complication were predictors of death at medical ICU. In multivariable logistic regression, all significant variables in binary logistic regression were adjusted. The result showed that the odd of death was 4.32 times higher among the patients who were admitted late/delayed than their counter parts [AOR=4.32, 95% CI: 2.03-9.21]. Patients who stayed less than one week in medical ICU were 2.5 times more likely died than those who stayed more than two weeks [AOR=2.51, 95% CI:1.05-5.98]. Those patients who developed one more complications were 3.4 times more odds of mortality than who did not develop the complication [AOR=3.42, 95%CI: 1.62-7.22]. Another factor significantly associated with patient death was frequency of admission. Death in medical ICU was 3.2 times higher among patients who were readmitted (two or more times) than first admission [AOR=3.21, 95% CI: 1.11-9.23].

Table 4: Predictors of death at Medical Intensive Care Unit in St. Paul's Hospital Millennium Medical College from September 1, 2019 to September 30, 2020 (N=196)

Variable	Category	Clinical outcome		95% confidence interval	
		Non-survivor	Survivor	COR	AOR
Residence	Urban	71 (77.2%)	71 (68.3%)	1.57[0.83-2.97]	1.44 [0.68-3.07]
	Rural	21 (22.8%)	33(31.7%)	1	1
Time of admission	Early	33(35.9%)	72(69.2%)	1	1
	Late	59(64.1%)	32 (30.8%)	4.02[2.22-7.3]	4.32 (2.03-9.21)**
Source of admission	Emergency	42 (45.7%)	58 (55.8%)	1	1
	Ward	48 (52.2%)	45 (43.3%)	1.47[0.83-2.60]	0.61[0.28-1.32]
	Other hospitals/ HC	2 (2.2%)	1 (1.0%)	2.76[0.24-31.47]	4.02[0.31-52.05]
Conscious during admission	Conscious	44 (47.8%)	65 (62.5%)	1	1
	Un Conscious	48 (52.2%)	39 (37.5%)	1.82[1.03-3.22]	1.77[0.89-3.54]
Length of ICU stay	Less than a week	59 (64.1%)	52 (50.0%)	1.61[0.80-3.23]	2.51[1.05-5.98]*
	One week to two weeks	14 (15.2%)	25 (24.0%)	0.8[0.33-1.92]	0.81[0.28-2.35]
	More than two weeks	19 (20.7%)	27 (26.0%)	1	1
Frequency of ICU admission	Unknown	32 (34.8%)	42 (40.4%)	1	1
	First admission	40 (43.5%)	53 (51.0%)	0.99[0.54-1.84]	0.78[0.37-1.64]
	Readmission (≥ 2)	20 (21.7%)	9 (8.7%)	2.92[1.17-7.26]	3.21[1.11-9.23]*
Comorbid illness	Yes	69 (75.0%)	57 (54.8%)	2.47[1.34-4.55]	1.72[0.843-3.53]
	No	23 (25.0%)	47 (45.2%)	1	1
Complication	Yes	41 (44.6%)	22 (21.2%)	2.3[1.60-5.6]	3.42[1.621-7.22]*
	No	51 (55.4%)	82 (78.8%)	1	1

**p-value<0.01, *p-value <0.05

Section 6 Discussion

Intensive care unit is the main sets up of the hospital, where the severely sick patients get admitted and requires a vast use of up to date equipment, attention and highly skilled staff. The outcome of patients admitted to ICU depends on the clinical condition of patient arrival, level of training and experience of staffs, resource, infrastructure and capacity of the unit. In developing countries where financial resources are limited training and retraining of staff, infrastructure and advanced ICU may not be adequate. It also demands clear admission protocol and a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients (25,26).

This study aimed to determine admission pattern, clinical outcome and predictors of clinical outcome of patients admitted in medical ICU of St. Paul's Hospital Millennium Medical College. The most common diagnoses accounted more during admission were Infectious and Parasitic diseases followed by diseases of the Circulatory origin and disease of Respiratory origin. The study done in this study area a decade ago showed that diseases of the Circulatory System, 334(26.6%), followed by Infectious and Parasitic diseases, 247(19.6%), and Endocrine, Nutritional and Metabolic diseases, 203 (16.2%) were the most common reasons for admission to the MICU [15]. This implies that the admission due to infectious and parasitic and circulatory system diseases is still not changed.

This study also supported by study conducted in northwest Ethiopia, in which the commonest categorical diagnosis at admission was all type Cardiovascular, respiratory and infectious diseases with 36.1%, 17.9% and 13.11% of occurrence, respectively [23]. There was higher case fatality ratio of pneumonia, sepsis, acute respiratory distress syndrome in this study, which is in agreement from Addis Ababa University Tikur Anbessa Specialized Hospital, severe pneumonia (56.4%) [15] and Gonder Ethiopia, ARDS (54.4%) [23] and different from Mekelle, septic shock (58%) [18].

Overall mortality rate of medical patients admitted in intensive care unit in this hospital was found to be 47% [95% CI: 40.8-52.6], which is in line with the studies carried out in sub-Saharan African countries of Tanzania (41.4%) [11], Uganda (40.1 %,) [27], Hosanna (46%) [28] and Jimma Ethiopia (50.4%) [12]. However, this was lower than studies done in Lagos Nigeria (67%)

[29] and Western Kenya (53.6 %,) [9]. It is apparent that the mortality in this study far exceeds rates reported in developed countries [21, 30, 31] and Tigray (27%) [18], Addis Ababa (Tikur Anbessa) Ethiopia (39%)[15], India (28.6%) [1] and Enugu Nigeria (34.5 %,) [22]. This discrepancy in mortality pattern could be explained by difference in patient profile and the quality of care delivered by the centers.

Predictors of mortality were also identified in this study. It was found that Patients who stayed in ICU for less than a week were more likely to die than patients who stayed more than two weeks which is comparable with the previous study done in St. Paul's Hospital Ethiopia [15], Austria and central Europe [21, 32] but contrary to studies in other developed countries which reported non-survivors staying longer than survivors [33,34]. This contradiction could be due to delays in care seeking among the patients, lack of protocol of management, lack of medications, poor criteria of admission to ICU, poor pre-hospital care, lack of adequate emergency medical services, and appropriate diagnostic and therapeutic facilities including drugs for the care of these patients in the hospital and the ICU.

Time of admission was strongly associated with ICU mortality. The odd of death was higher among those patients who were admitted late/delayed than their counter parts which is supported by the studies done in different regions of the countries (35-37). Association between delay to ICU admission and higher mortality rate reflects worsening of organ dysfunction during this period. Despite the care provided by ward healthcare workers while patients were waiting for ICU bed availability, these healthcare providers were not trained in critical care and were not as experienced in caring for ICU patients. Furthermore, hospital wards are neither designed nor staffed to provide extended longitudinal care for the critically ill patient. These patients have better outcomes when treated in ICUs with close and continuous involvement by critical care physicians [38, 39].

Frequency of admission was also significantly associated with ICU mortality. Death in medical ICU was higher among patients who readmitted (two or more times) than first admission, in agreement with other studies, which can be hypothesized that prevention of ICU re-admission could have significantly improved long-term outcome of these critically ill patients [40, 41].

Patients with complication were at higher risk of mortality than those without, which is similar to studies done in Austria, in which the number of pre-existent diseases significantly reduced one year survival in this critically ill patient population[21]. This observation can be explained simply by progression of the underlying disease but might also be associated with a more rapid progression of chronic disease after the period of critical illness with a high degree of physiologic derangement.

Section 7 Conclusion

This study clearly demonstrates that the high mortality rate in patients medical intensive care unit in St. Paul's Hospital Millennium Medical College. Multiple organ failure 2ry to refractory septic shock was the most common cause of death in medical ICU. The most common diagnoses during admission were infectious and parasitic diseases, diseases of the circulatory origin and disease of respiratory origin. Pneumonia, sepsis, acute respiratory distress syndrome were among the most common specific disease that led to ICU admission. Cardiac diseases were the most common co-morbid conditions in patients admitted in medical intensive care unit. The independent factors associated with the highest risk of death are; time of admission, length of ICU stay, frequency of ICU admission and complication.

Recommendation

Further studies, preferably prospective cohort studies that include evaluation of individual level behavioral and psychological factors, environmental exposures, medical conditions, biological factors, and genetics characteristics are needed to identify and characterize the underlying causes of mortality in the study area and elsewhere.

Mortality in ICU is a complex cluster of problems with a set of overlapping factors and influences. Owing to this such studies should avoid treating mortality as a single entity. Rather, future studies should be designed to evaluate common pathophysiological pathways that may

lead to high mortality. This study also missed a long term follow up of patients after getting shifted out of ICU. This drawback should be addressed in a new prospective study.

Limitation of the study

The limitations of the study include the chart review; the available data only supported categorization of patient by primary diagnosis and relied on the clinical soundness of the attending physician in patients' diagnoses which may vary from individual to individual based on experience, qualifications and other factors. Information pertaining to several predictors of death previously reported was not available for this study. Another finding which this study missed is long term follow up of patients after getting shifted out of ICU. Physiologic data necessary to calculate severity of illness, like the Apache score were lacking. It did not calculate prognostic score, standard mortality ratio.

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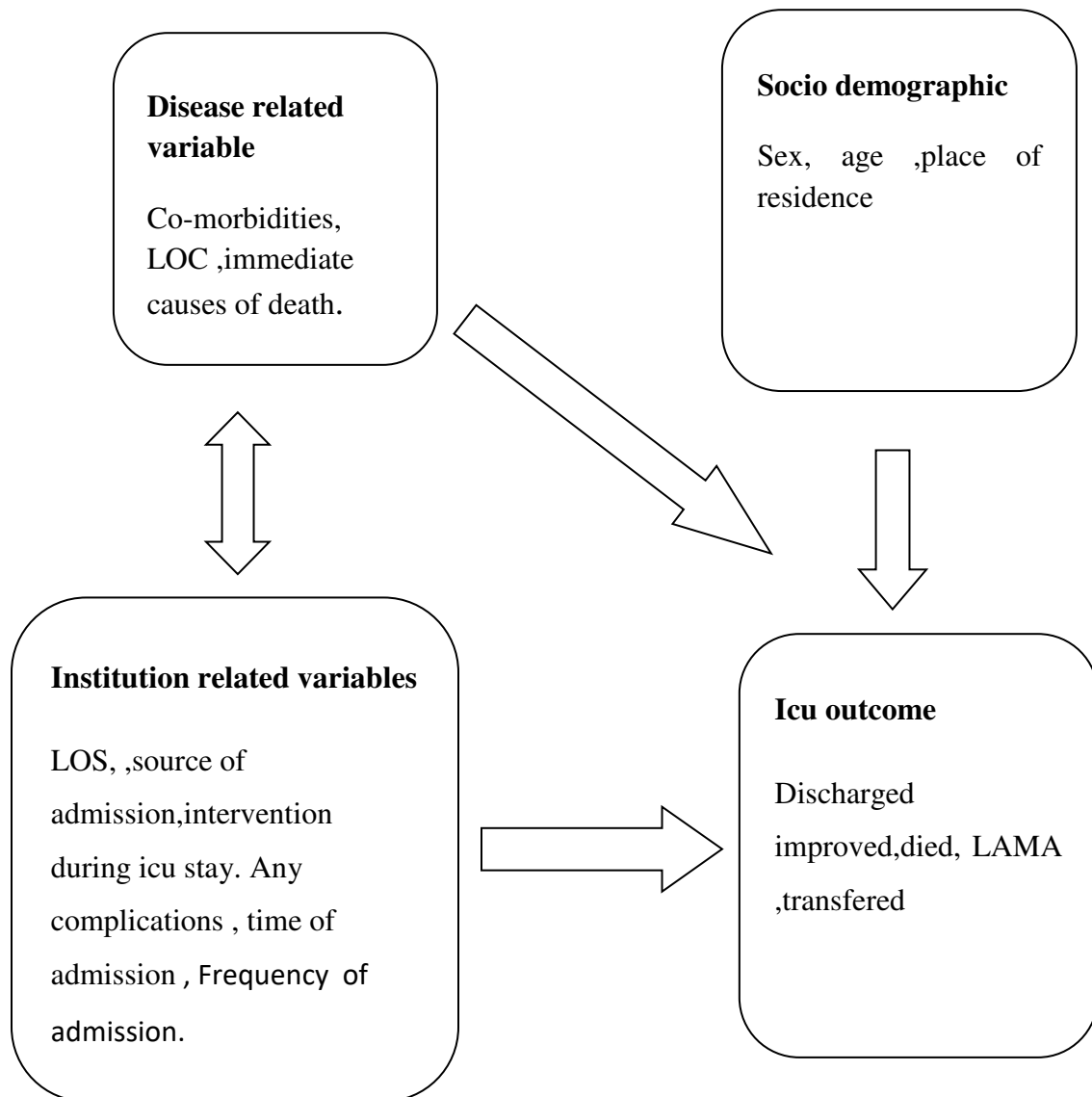
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section 8 :lists of tables and figures

8.1 Conceptual frame work based on literature review



8.2 Data collection check list

Socio demographic characteristic			
NO		CODE	
1	Age in year	years	
2	Gender	1- male 2-female	
3	Place of residence	1-urban 2-Rural	
Institution related			
7	Date of admission in ICU	//....//....(DD/MM/YY)	
8	Date of transfer	//....//....(DD/MM/YY)	
9	Source of admission	1-Emergency 2-ward 3-From other hospitals	
10	Frequency of ICU admission	1-specify the number of visit 2-Unkown	
11	Intervention during ICU stay	specify	
12	Length of ICU stay		
13	Any complication	Specify	
14	Time of admission	1-early admission 2-delayed admission	
Disease related			
15	Diagnosis during admission	Specify	

16	Presence of comorbid illness	Specify	
17	Immediate cause of death	Specify	
18	Consciousness level during admission	1-Conscious 2-Unconscious	
	Outcome		
19	Clinical outcome	1-Transfer to ward /other hospital 2-Died 3-LAMA 4-Discharged improved	

Information sheet

Research Title: TRENDS OF DISEASE PATTERN CLINICAL OUTCOME AND PREDICTORS OF OUTCOME OF MEDICAL PATIENTS ADMITTED IN INTENSIVE CARE UNIT AT ST.PAUL'S HOSPITAL MILLENIUM MEDICAL COLLEGE IN ADDIS ABABA,ETHIOPIA

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Sponsor St. Paul's Hospital Millennium Medical College

Assuarance Of Investigator

I the undersigned resident agree to accept all responsibilities for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research and Publication Directorate and /or Department of Public Health of St. Paul's Hospital Millennium Medical College. I declare that this research project is my original work and it has never been presented in this or any other higher institution and all the resources and materials used in the research work have been dully acknowledged

Name of the Resident: Selwa bedrudin

Signature: _____

Date: _____

Approval of Advisors

Name of Public Health Advisor:Mr.GetachewTilahun

Signature:_____

Date:_____

Name of Clinical Advisor:Dr.GebeyawAlemnew

Signature: _____

Date: _____