



**St. Paul Hospital Millennium Medical College**  
**graduate study program**

**Prevalence and effect of hypoalbuminemia in patients admitted to Addis  
Ababa burn, emergency and trauma hospital intensive care unit: a one year  
crosssectional study**

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**Addis Ababa, Ethiopia**

**October, 2021**



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# ABSTRACT

**Background-** Hypoalbuminemia is a frequent and early biochemical derangement in critically ill patients. And it is considered as a marker of disease severity and predictor of increased morbidity and mortality. Even though hypoalbuminemia is a significant problem in critical ill patients well studied information in intensive care units in developing countries is relatively rare.

**Objectives -** The objective of this study is to investigate prevalence of hypoalbuminemia and its association with disease severity and clinical outcome of illness in critically ill patients admitted to AaBET ICU, from May 1, 2020, through May 31, 2021

**Methods -** One year cross sectional study was conducted at AaBET intensive care unit (ICU). The study was conducted in the Intensive Care Unit of Addis Ababa Burn Trauma and Emergency hospital. All patients admitted to the AaBET ICU from May 1, 2020, through May 31, 2021, whose albumin level was measured are study population and minimum sample size calculated was 176. And total cases in the study period was 274 among this 181 subjects were included, 93 subjects were excluded. Data was collected by retrospective medical record review using a structured questionnaire by 2 trained residents. Data was entered to Epi-info version 3.5.3 and exported to SPSS Version 24 for analysis. Bivariate and multivariate logistic regressions were used to analyze the association between dependent and independent variables and P-value <0.05 at 95% CI was declared statistically significant association.

**Results:** From the total of 181 cases majority 150 (82.9%) were male and 31 (17.1%) were females. The mean age was 35.1 years and majority 123 (68%) are in age group 25-

64 years. Major reason for admission to the ICU were Trauma 147(81.2%) (Majority 107(81.1%) have Brain injury), followed by Medical 22(12.2%). From the total cases the majority has hypoalbuminemia after ICU admission 164 (90.6%) after 48 hrs of admission to ICU and 177 (97.8%) at discharge and mean sr albumin level at 48hrs of admission and at discharge is 2.7g/dl ( $\sigma = 0.74$ ) and 2.05g/dl ( $\sigma = 0.67$ ) respectively. Based on severity 82 (45.3%) of patient's have sever hypoalbuminemia ( $< 2.5$ g/dl) and 82 (45.3%) were in moderate range between 2.6g/dl - 3.5g/dl after 48hr of ICU admission. And at discharge majority were in sever range, 125 (69.1%). In Bivariate analysis, female Patient 2.56 times [(AOR=2.56) 95% CI (1.14, 5.76)] more likely have death than male patients. And medical patients has more mortality than trauma and non-traumatic surgical cases with [(AOR = 2.77) 95% CI (1.10, 6.96)]. Albumin level after 48hr of admission and albumin level immediately before discharge were negatively associated death. And low serum albumin level after 48 hrs with [p value =0.048, 95% CI, (0.055-0.990)] and at discharge with [p value =0.00, 95% CI, (0.075-0.468)] negatively associate with HAP but no association with prolonged MV and ICU stay. In the multivariate analysis, female Patient 4.7 times [AOR=4.7) 95% CI (1.68, 13.1)] more likely have death than male patients.

**Conclusion:** Hypoalbuminaemia is a common finding in critically ill patients and low albumin level will predispose patients to hospital acquired infections and increase mortality.

**Keywords:** prevalence, outcome, hypoalbuminemia , critical ill, Intensive care unit,

AaBET hospital

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## **LIST OF ACRONYMS**

AaBET – Addis Ababa Burn, Emergency and Trauma hospital

BP- Blood pressure

CVS- cardiovascular system

ED- Emergency department

Eg – example

g- gram

GC-Gregorian Calander

GFR- Glomerular filtration rate

g/d- gram per day

G/dl- gram per deciliter

HAP- Hospital acquired pneumonia

hr- hour

ICU –intensive care unit

MAP- Mean arterial pressure

Mg/dl- Miligram per deciliter

MV- Mechanical ventilation

PEM- protein energy malnutrition

PSO<sub>2</sub> - Partial pressure of oxygen saturation

SPHMMC – Saint Paul’s Hospital Millennium Medical College

VAP- Ventilator associated pneumonia

UTI- Urinary tract infection

Sr – serum

# 1 Introduction

## 1.1 Background

Albumin is body's predominant serum-binding protein. It has several important functions. It constitutes two-thirds of total plasma protein and contributes about 80% of the plasma colloid osmotic pressure. It also transports various substances, including bilirubin, fatty acids, metals, ions, hormones, and exogenous drugs. (1)

Serum albumin is commonly measured in hospitalized patients. It usually included among the parameters used for nutritional assessment, and recently its use has become even more widespread. (2)

hypoalbuminemia is defined as total albumin  $\leq 3.5$  g/dL. And it is a common problem among critical ill patients. (3)

Common causes of hypoalbuminemia are diminished synthesis (Eg, malnutrition, malabsorption, or hepatic dysfunction), increased losses (Eg, urinary losses with nephropathy or protein-losing enteropathy) or diversion of synthetic capacity to other proteins (acute-phase reactants).(4)

Inflammatory disorders can accelerate the catabolism of albumin while simultaneously decreasing its manufacture. During critical illness, capillary permeability increases and alters albumin exchange between intravascular and extravascular compartments (5, 6)

## **1.2 Statement of the problem**

Hypoalbuminemia is a marker of disease severity and has been associated with prolonged ventilator dependence and length of intensive care stay thus serum albumin is considered as a predictor of increased morbidity and mortality.(7, 8)

Human serum albumin is an important parameter for the routine assessment of the nutritional status of patients with acute and chronic conditions (9)

Even though many studies shows, impact of low albumin level on mortality and morbidity of critical ill patients especially in those patients with acute or chronic infection, malnutrition or other underlying comorbid illness, the exact prevalence of hypoalbuminaemia and the association between serum albumin levels and ICU outcome is still unclear in developing countries where malnutrition, acute and chronic infections are more prevalent including our country Ethiopia.

So this research will investigate the magnitude of hypoalbuminemia in critical ill patients, also will answer if low serum albumin level has the same impact on morbidity and mortality as in other settings and what associated factors influence low serum albumin level. And this will help in giving especial attention and emphasis, if the problem is really significant and has negative outcome in giving ICU care so that solving the problem and working on prevention will be mandatory.

### **1.3 Significance of the study**

Predicting the prognosis of patients admitted in intensive care unit (ICU) is important for evaluating the quality of ICU care and making decisions regarding further management there are many scoring systems or parameters for predicting prognosis including mortality.(7)

There are literatures done in developed countries on prevalence and outcome of hypoalbuminemia also its association with different disease entities and age groups. Even though the significance of hypoalbuminemia is large enough in developing countries there is no adequate studied data on prevalence and outcome of hypoalbuminemia in multidisciplinary ICU like AaBET ICU.

The rationale for selecting this problem area is due to the fact that knowing and understanding the magnitude and outcome of low serum albumin in critically ill patients will help to identify the gap and work on the prevention by identifying appropriate cause and intervene for improvement of quality of care.

Additionally the result of this research will be used to provide a feed back to AaBET hospital for better resource allocation, planning for the betterment of nutrition and prevention of hypoalbuminemia. Furthermore all the results will be communicated to the emergency medicine and critical care department and all concerned bodies as a baseline information.

## 1.4 LITRATURE REVIEW

Hypoalbuminemia occurs in a variety of disease states and is associated with an increased rate of complications during hospitalization, resulting in an increased length of stay.

In one study, non-survivors had lower serum albumin concentrations on admission to the ICU, and their albumin concentrations decreased more rapidly in the first 24-48hr. The albumin concentration on admission was not a sensitive indicator of outcome, but the value at 24-48 hr accurately indicate outcome. (9)

A meta-analysis was conducted of 90 cohort studies, with 291,433 total patients. It evaluates hypoalbuminemia as an outcome predictor by multivariate analysis and, separately, of nine prospective controlled trials with 535 total patients on correcting hypoalbuminemia. Hypoalbuminemia was a potent, dose-dependent independent predictor of poor outcome. Each 10-g/L decline in serum albumin concentration significantly raised the odds of mortality by 137%, morbidity by 89%, prolonged intensive care unit and hospital stay respectively by 28% and 71%, and increased resource utilization by 66%. The association between hypoalbuminemia and poor outcome appeared to be independent of both nutritional status and inflammation. Analysis of dose-dependency in controlled trials of albumin therapy suggested that complication rates may be reduced when the serum albumin level attained during albumin administration exceeds 30 g/L.(9)

A retrospective study of traumatic brain injury patients was conducted in UK. And 138 patients were studied the majority of patients (65%) had a severe injury (Glasgow Coma Scale score <9). Seventy percent of patients had a favorable outcome. Albumin levels decrease considerably from normal values in the first few days after injury irrespective of outcome.

Albumin remained  $<25$  g/L for a longer period of time in patient with an unfavorable outcome (6 days vs. 3 days,  $p = 0.012$ ). And the analysis concluded that serum albumin level seems to be an independent predictor of poor outcome.(10)

The cohort study done in America, included 30,732 patients (mean age  $67 \pm 18$  years, 51% male). Most patients had normal albumin levels on admission ( $n = 20,124$ , 65%), 29% of patients had hypoalbuminemia, mostly mild ( $n = 7,334$ , 24%), and 5% of patients had marked hypoalbuminemia ( $n = 1436$ ). Hyperalbuminemia on admission was evident in 6% of the patients ( $n = 1838$ ). Follow-up (median  $\pm$  standard deviation) was  $1675 \pm 325$  days. Compared with in-hospital mortality with normal albumin on admission (2%), mortality was higher with mild (12%) and marked hypoalbuminemia (34%) and lower with hyperalbuminemia (0.3%). Mortality rate at the end of follow-up was 29% with normal albumin levels, 67% and 83% with mild and marked hypoalbuminemia, respectively. Patients with hyperalbuminemia on admission and before discharge have the best short- and long-term survival. This pattern was similar when analyzed separately in different age groups. In patients with hypoalbuminemia on admission, normalization of albumin levels before discharge was associated with better short- and long-term survival, compared with patients with hypoalbuminemia before discharge.(11)

A retrospective study done in United states investigate whether emergency department (ED) albumin levels predict delayed mortality for patients initially stabilized after blunt trauma. Fifty-one hospital non-survivors who died more than 24 h after admission to a trauma center ED were matched by Injury Severity Score, type and location of injury, age, and gender with 51 survivors. All patients had serum albumin levels determined upon arrival in the ED. The non-survivors had a significantly lower admission albumin of 3.1 g/dL compared to 3.5 g/dL for survivors. Patients with albumin levels  $< 3.4$  g/dL were 2.5 times more likely to die compared to patients with

normal albumin levels. These results indicate that initial hypoalbuminemia in blunt trauma patients is an independent predictor of delayed mortality.(12)

Another study was done in Atlanta to evaluate impact of hypoalbuminemia in the operative Lower extremity orthopaedic trauma patient. Five thousand six hundred seventy-three patients with albumin level available were identified, and 29.6% had hypoalbuminemia. Hypoalbuminemic patients had higher rates of postoperative complications [9.3% vs. 2.6%; relative risk (RR) 1.63] including increased rates of mortality (3.2% vs. 0.4%; RR 4.86, 95% confidence interval 2.66-8.87), sepsis (1.5% vs. 0.5%, RR 2.35), and re intubation (2.3% vs. 0.4%; RR 3.84). Reoperation (5.5% vs. 2.6%, RR 1.74) and readmission (11.4% vs. 4.1%; RR 2.53) rates were also higher in patients with low albumin.(13)

A retrospective, correlational study done on patients admitted to the ICU at a Midwestern regional medical center with a primary sepsis diagnosis was included in the initial sample. Serum albumin trend, admission serum albumin level, and lowest serum albumin level were significant predictors of mortality. The probability of survival decreases by 70.6% when there is a strong negative trend in serum albumin level, by 63.4% when admission serum albumin is  $\leq 2.45$  g/dl, and by 76.4% when the lowest serum albumin is  $\leq 1.45$  g/dl.(14)

A one year retrospective study, of 944 patients done in Nepalgunj Medical College, Banke, Nepal the total number of patients with low serum albumin level was 840 which including 454 males and 386 females. The prevalence of hypoalbuminemia in suspected cases was 88.98%.(15)

A prospective observational study conducted at the PICU of Tertiary care Hospital. Children aged 1 year to 12 years admitted to PICU were included. The prevalence of hypoalbuminemia at admission was 38%. Mean serum albumin level in this study was  $2.54 \pm 0.38$  g/dl. A lower

serum albumin concentration correlated well with higher rates of complications such as ventilator dependency and development of new infections leading to longer length of PICU stay and higher mortality (31.5%). The mean length of PICU stay ( $8.6 \pm 5.1$ ;  $p < 0.001$ ) was statistically longer than those with normal albumin. A Strong negative correlation ( $r = -0.867$ ) found between serum albumin level and the mortality rate. (7)

A retrospective study was done in Hong Kong, China to assess association of serum albumin concentration and mortality risk in critically ill patients. And 1003 patients admitted to intensive Care Unit over an 18-month period studied. Serial serum albumin measurements over 72 hours were compared between survivors and non-survivors, and medical and surgical patients were also compared. Results showed that serum albumin decreased after ICU admission, most rapidly in the first 24 hours, in both survivors and non-survivors. Serum albumin was lower in non-survivors than in survivors, but albumin concentrations poorly differentiated the two groups. Medical patients had higher admission albumin levels than surgical patients, but both subgroups showed a similar albumin profile over 72 hours.(16)

A study done on significance of admission hypoalbuminemia in acute intracerebral hemorrhage patients with spontaneous ICH admitted at Massachusetts General Hospital from 1994 to 2015 were retrospectively analyzed A total of 2010 patients were included (median age 74 years, 54.5% males) of whom 444 (22.1%) had hypoalbuminemia on admission and 763 (38%) died within 90 days. The frequency of pneumonia, urinary tract infection and sepsis was 19.9%, 15.1% and 2.7% respectively. Hypoalbuminemic patients had lower admission Glasgow coma scale, higher frequency of intraventricular hemorrhage and were more likely to have a history of chronic kidney or liver disease. After adjustment for potential confounders, hypoalbuminemia was an independent predictor of pneumonia (odds ratio [OR] 1.76, 95%

confidence interval [CI] 1.34-2.33,  $p < 0.001$ ) and sepsis (OR 2.29, 95% CI 1.22-4.30,  $p = 0.010$ ). Low levels of albumin were also independently associated with higher mortality at 90 days (OR 1.78, 95% CI 1.30-2.44,  $p < 0.001$ ).<sup>(3)</sup>

A study was done on association of a low serum albumin with infection and increased mortality in critically ill patients. And 214 patients among 282 consecutive admissions had at least one measurement of serum albumin during their stay on the ICU and were classified according to their stay on the ICU and were classified according to their lowest value of serum albumin. Mean serum albumin was  $2.88 \pm 0.74$  g/100 ml. Survivors had a mean serum albumin ( $3.18 \pm 0.60$ ) higher than non-survivors ( $2.35 \pm 0.68$  g/100 ml) ( $p < 0.05$ ). 64% of patients were admitted with an abnormally low serum albumin (less than 3.5 g/100 ml) and in 56% of these the initial value was higher than the last. Mortality increased in the groups with lower serum albumin and the level of serum albumin was associated with infection ( $\chi^2 = 73.9$ ) and mortality ( $\chi^2 = 69.7$ ) ( $p < 0.05$ ). The percentage of infected patients who died increased in groups with lower serum albumin.<sup>(17)</sup>

Retrospectively the albumin level of patients admitted to the Department of Internal Medicine and Biomedical Sciences of the University of Parma during the year 2000 evaluated. Sex, age, nutritional status, some laboratory parameters, associated diseases, and length of hospitalization in hypoalbuminemic patients compared with a group of patients without hypoalbuminemia. Hypoalbuminemics (46.5% of patients) were older, more frequently anemic, and had a higher erythrocyte sedimentation rate (ESR) and longer hospitalization; they were mostly normal weight or overweight. These patients also had chronic liver (18.6% vs. 4.5%), onco-hematological (33.8% vs. 12%), and infectious diseases (13.4% vs. 2.3%) and nephropathies (6.3% vs. 2%) more often than patients without hypoalbuminemia. The presence

of onco-hematological diseases was related to anemia (O.R.=5.73; 95% CI: 3.184-10.310), lymphopenia (O.R.=2.76; 95% CI: 1.584-4.801), and hypoalbuminemia (O.R.=2.5; 95% CI: 1.178-5.307). (2)

A cohort study done on geriatric ( $\geq 55$  years) trauma patients, the exposure of interest was albumin level at ED admission ( $< 3.6$  g/dL [PEM] or  $\geq 3.6$  g/dL (No PEM)]. The outcome of interest was 30-day incidence of complications and a total of 130 patients met study eligibility and as a conclusion Serum albumin level at ED admission, but not pre albumin level, is a significant predictor of in-hospital complications in geriatric trauma patients.(18)

A retrospective outcome analysis of 15,511 clinical patients above 40 years old within their first 48 hours of admission.(2) For each 2.5 mg/L serum albumin drop, the risk of prolonged hospital stay increased by 16%, and risk of increased death by 39%.(19)

Prospective observational study was carried on 100 burn patients, to explore the role of first day levels and subsequent trends of serum proteins as prognostic indicators in acute burns. Mean day one serum values of albumin, globulin, and total protein were significantly higher in the survivors compared to non-survivors. The serial serum values of albumin, globulin and total protein showed rising and declining trends in survivors and non-survivor respectively. Based on the ROC curve, the cut off values at any point during the course below which the prognosis was poor were 16.0 g/L, 18.0 g/L and 39.0 g/L for albumin globulin and total protein, respectively. And the study highlights the prognostic importance of day one value and trend of serum albumin, serum globulin and total protein in acute burns.(20)

A retrospective study was comparing admission serum albumin and hemoglobin as a predictor of outcome in children with moderate to severe traumatic brain injury. A total of 213

patients were included of whom 45 died in hospital. Multivariate logistic regression showed that hypoalbuminemia (serum albumin <30g/L) was independently associated with mortality (adjusted odds ratio [OR]=3.059; 95% confidence interval [CI]: 1.118–8.371; P=.030) in children with moderate to severe TBI, while anemia (hemoglobin <90g/L) was not independently associated with mortality (adjusted OR=1.742; 95% CI: 0.617–4.916; P=.295). Serum albumin was significantly superior to hemoglobin. Hypoalbuminemia was also associated with reduced 14-day ventilation-free days, 14-day intensive care unit (ICU) free days, and 28 day hospital free days. Serum albumin at admission was superior to hemoglobin in predicting the mortality in children with moderate to severe TBI and also associated with reduced ventilator-free, ICU-free, and hospital-free days.(21)

Retrospective Study done in Sao Paulo, Brazil, analysis of 486 patients, protein and lipid levels were lower in the patients who died ( $p<0.05$ ). Albumin levels showed the highest sensitivity and specificity (84% and 83%, respectively), and the area under the receiver-operating characteristic curve (0.869) had a cut-off of 1.95 g/dL for mortality. Patients with albumin levels <2 g/dL had a mortality risk of >80%, with 84% sensitivity and 83% specificity. At admission, the albumin level could be used as a sensitive and specific marker of burn severity and an indicator of mortality.(22)

Another study conducted to evaluate whether admission serum albumin is predictive of outcome in critically ill trauma patients. A prospective data was collected daily on 1023 patients over a 2-year period. Patients were stratified by serum albumin level on admission, age, gender, injury severity, and comorbid conditions. Outcome was measured by ICU and hospital length of stay, ventilator days, incidence of infection, and mortality. Patients with a lower serum albumin level were found to have a significantly greater ICU (17.1 vs 14.2 days) and hospital length of

stay (17.3 vs 20.1 days,  $P < 0.05$ ), ventilator days (11.1 vs 13.5 days,  $P < 0.05$ ), and mortality ( $P = 0.008$ ) when matched for age and injury severity. The relative risk of infection and mortality increased greater than 2.5-fold in patients with increased age and low serum albumin when analyzed by multilinear regression analysis,  $P < 0.001$ . An admission serum albumin level of  $< 2.6$  g/dL is a significant independent predictor of morbidity and mortality in trauma patients.(23)

A retrospective observational study done on low albumin levels are associated with mortality in the critically ill which was done in university of KwaZulu-Natal, Durban, South Africa, the study include 247 adult patients who were admitted to a multidisciplinary ICU. Albumin levels were measured on admission and 48 hours later, alongside other biochemical and clinical parameters to determine whether they were predictive of ICU mortality. The lowest level of albumin on admission was 8 g/L and the highestss was 43 g/L. The incidence of hypoalbuminaemia (using the laboratory reference range) was 93.9% on admission and 99.4% at 48 hours. Receiver operating characteristic curve analysis provided an optimal albumin cut-off of 18.5 g/L. Using this cut-off, hypoalbuminaemia at admission and at 48 hours was associated with increased ICU mortality. Hypoalbuminaemia at admission was an independent predictor of mortality using multivariable analysis (OR 3.74; 95% confidence interval 1.87 - 4.48).(24)

## **2 OBJECTIVES OF THE STUDY**

### **2.1 General Objectives**

To determine the prevalence and effect of hypoalbuminemia among patients admitted to intensive care unit at Addis Ababa Burn and Trauma Hospital (AaBET), Addis Ababa, Ethiopia, from May 01, 2020 up to May 30, 2021.

### **2.2 Specific Objectives**

To determine the frequency of occurrence of hypoalbuminemia at Addis Ababa Burn and Trauma center (AaBET), intensive care unit, Addis Ababa, Ethiopia, from May 01, 2020 up to May 30, 2021

To describe the association between hypoalbuminemia and the outcome of illness at Addis Ababa Burn and Trauma center (AaBET), intensive care unit, Addis Ababa, Ethiopia, from May 01, 2020 up to May 30, 2021

## **3 METHODOLOGY**

### **3.1 Study Setting**

This study was conducted in the Intensive Care Unit of Addis Ababa Burn Trauma and Emergency hospital, which is located in Addis Ababa which is a capital city of Ethiopia. This hospital was established six years back on 15th July 2015 G.C and is part of Saint Paul Hospital Millennium Medical College, which is the second largest hospital in the country. The hospital gives service to emergency cases majorly for burn and trauma patients. AaBET hospital in its emergency medicine and critical care department has 61 functional beds (5 in red side, 12 in orange side, 30 in yellow green, ICU comprised of 11 beds and 3 semi ICU beds. AaBET, ICU is multi-disciplinary ICU. Trauma and neurosurgical patients account the majority of admissions.

### **3.2 Study design and Period**

An institutional based cross-sectional study over a period of 10 month was conducted by reviewing the charts of admissions made to AaBET ICU from Jan 1, 2000, through Oct 30, 2021.

### **3.3 Population**

#### **3.3.1 Source population**

All patients admitted to the AaBET ICU from May 1, 2000, through May 31, 2021.

#### **3.3.2 Study Population and sample size**

Patients admitted over a period of one year (from May 1, 2000, through May 31, 2021) were 274 and among these 181 charts fulfill the inclusion criteria and data collected from the 181 charts. 93 charts were excluded due to incomplete data and lost during the study time. Two records of

serum albumin level were taken, one at 48 hrs of admission and the second, serum albumin level immediately before discharge.

### 3.4 Sample size determination

Minimum sample size will be calculates as follows

Since the prevalence of the problem in the study area is not known, P value is taken as 50% (0.5) and 95% confidence interval was used, with 5% margin of error tolerated; the sample size was determined by using single population proportion formula.

$$n = \frac{(Z_{\alpha/2})^2 p (1-p)}{d^2}$$

Where,

n- Required Sample

z- Standard normal value at 95% CI which is 1.96

p- Estimated population proportion which is 0.5

d- Possible margin of error tolerated which is 0.05

$$n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$$

Since the source population is 274, which is <10,000, population correction formula was used to determine adjusted minimum sample size.

$$nf = \frac{n}{1+n/N}$$

Where n= Initial sample size (384)

N=total number of patients admitted during the study period (675)

nf= minimum final sample size

$$\text{Thus } nf = \frac{n}{1+n/N} = \frac{384}{1+384/274} = 160$$

By adding 10% drop out, the final sample size was = 176

### **3.5 Eligibility Criteria**

#### **3.5.1 Inclusion Criteria**

Patients who are admitted to AaBET ICU during the study period whose serum albumin level determined after 48 hrs of admission and immediately before discharge are eligible and was included in the study. In patients stayed at the ED floor before admission to ICU, serum albumin level determined after 48hrs hospital admission was taken.

#### **3.5.2 Exclusion Criteria**

Those who died immediately with in less than 24 hrs after admission, patients received albumin transfusion before measurement of the initial albumin level and those patients with incomplete records (those who don't have serum albumin measurement at 48 hrs of admission and immediately before discharge) will be excluded.

### **3.6 Study variables**

#### **3.6.1 Dependent variables**

Outcome – survival, complication and death

### 3.6.2 Independent variables

Age, sex, diagnosis (categorized by organ system), length of ICU stay, length of ventilator support, complication, comorbidity (diabetes, hypertension, renal disease, cardiac illness, liver disease), albumin transfusion, serum albumin level, serum hemoglobin level.

### 3.7 Operational definition

Hypoalbuminemia- serum albumin level  $<3.5$  g/dl

Normal albumin 3.5-4.5 g/dl

Marked hypoalbuminemia  $<2.5$  g/dl

Mild hypoalbuminemia 2.5-3.5 g/dl

Hyperalbuminemia  $>4.5$  g/dl (11)

Anemia – Hemoglobin  $<12$ g/dl

Mild -  $>10$ g/dl

Moderate -7-10g/dl

Sever - $<7$ g/dl

**Complications-** nosocomial infection, decubitus ulcer, failed extubation, prolonged MVstay, prolonged ICU stay, organ failure, edema

**Outcome-** conditions of patients written on patients chart at discharge time (improved and death)

**ICU Mortality:** is calculated as the number of deaths of patients admitted to ICU divided by number admission

**Prolonged ICU stay-** duration of ICU stays more than 21 days (25)

**Prolonged MV use** – stay of patients on mechanical ventilation for >14 days (26)

### **Organ failure**

- CVS- systolic BP<90, MAP<65
- Neurologic- Glasgow coma scale score <4 ,Fixed, dilated pupils (new deterioration not explained by primary brain lesion)
- Hematologic- Hemoglobin level <5 g/dL, WBC count <  $3 \times 10^3$  , Platelet count <20,000/ $\mu$ L
- Renal – serum creatinin increase 3\* or creatinin >4mg/dl or GFR<75%
- Respiratory- Pso<sub>2</sub> < 90% , PCo<sub>2</sub> > 45mmhg

## **3.8 Data collection tools and procedures**

### **3.8.1 Data collection process**

Structured and standardized questionnaires were developed in English language which was adopted from a similar research and modified during literature reviews. Questionnaire was pre tested for validity. The study questionnaire consists of four sections. Section one: demographic data (age, sex) Section two: pattern of admission, Section three; level of albumin and hemoglobin level Section four; outcome of patients. The data collectors were two second year emergency medicine and critical care residents and data was collected on working days. Training was given to data collectors for two days. Then necessary data was extracted by reviewing patient's chart. Completeness and accuracy checked by the research conductor.

### **3.8.2 DATA QUALITY CONTROL**

Data was collected by residents who received training for two days and supervision was done by the principal investigator on daily basis throughout the data collection period. After completion of the data collection, each questionnaire has been checked for completeness.

### **3.8.3 Data Analysis**

After the data collection the data was cleared, coded and enter to computer by using epi info Version 3.5.3 and SPSS version 20.0.0 for analysis. Data analysis was included descriptive statistics, including frequency, percentage, and mean. Crude and adjusted odds ratio was analyzed with a 95% confidence interval (CI). P-value <0.05 was declared a statistically significant association.

### **3.9 Ethical consideration**

Ethical clearance and approval to conduct this research was obtained from St. Paul's hospital millennium medical college institutional research review board, Addis Ababa. To ensure confidentiality name and other personal identities was not be used during data collection.

### **3.10 Dissemination of results**

The result of the study will be reported to SPMMC, emergency medicine and critical care department and will also be presented to medical/scientific community on different national and international meetings. Finally it will be summited for national and international review for publication on different research Journals.

## 4. Result

### 4.1 Socio demographic characteristic of patient's admitted to the ICU

During the study period, 276 patients were admitted, 181 of whom met the inclusion criteria for this study. The remaining 94 patients were excluded because of incomplete medical record and lost charts during data collection period. Majority 150 (82.9%) were male and 31 (17.1%) were females. The Patients age ranged from 3 to 80. The mean age of the patients was 35.1 years. The majority 123 (68%) belong to the age group 25-64 years.

**Table 1 Socio-demographic Characteristics**

| <b>Socio<br/>demographic<br/>variables</b> | <b>Male</b> |          | <b>Female</b> |          | <b>Total</b> |          |
|--------------------------------------------|-------------|----------|---------------|----------|--------------|----------|
|                                            | <b>No</b>   | <b>%</b> | <b>No</b>     | <b>%</b> | <b>No</b>    | <b>%</b> |
| <b>Age</b>                                 |             |          |               |          |              |          |
| 1-15                                       | 9           | 5        | 4             | 2.2      | 13           | 7.2      |
| 16-24                                      | 27          | 14.9     | 3             | 1.7      | 30           | 16.6     |
| 25-64                                      | 101         | 55.8     | 22            | 12.2     | 123          | 68       |
| >=65                                       | 13          | 7.2      | 2             | 1.1      | 15           | 8.3      |

### 4.2 Length of Stay in ED

Majority 45.3% (n=82) patients stay >24hr in ED before admission and 8.3% (n=15) of patients stay in ED for more than 7 days.

**Table 2 frequency of length of stay**

| Days  | Frequency | Percent |
|-------|-----------|---------|
| <24hr | 82        | 45.3    |
| 1-3   | 48        | 26.5    |
| 4-7   | 36        | 19.9    |
| >7    | 15        | 8.3     |

### 4.3 Admission Categories

From the total 181 charts reviewed, the majority of reasons for admission to the ICU were Trauma 147(81.2%), followed by Medical 22(12.2%) and none traumatic neurological condition 12(6.6%).

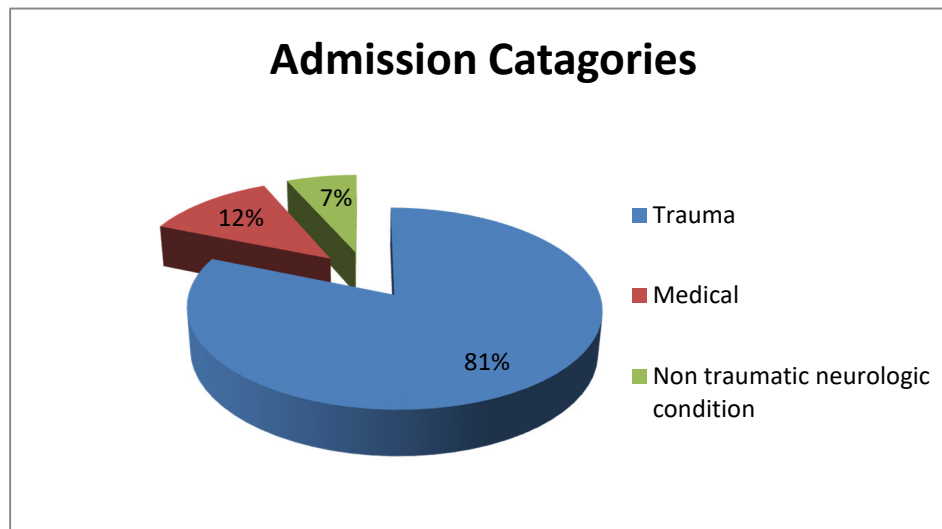


**Figure 1: Distributions of admission category of patients**

A total of 147 (81.2%) of the case were Trauma, the major causes of trauma was road traffic accident 79(53.7%), followed by falling down accident 27(18.4%). 24 (16.3%) were assault

including stone and stick injury, 9 (6.1%) cases were burn and 6 (4.1%) of cases were gun shoot.

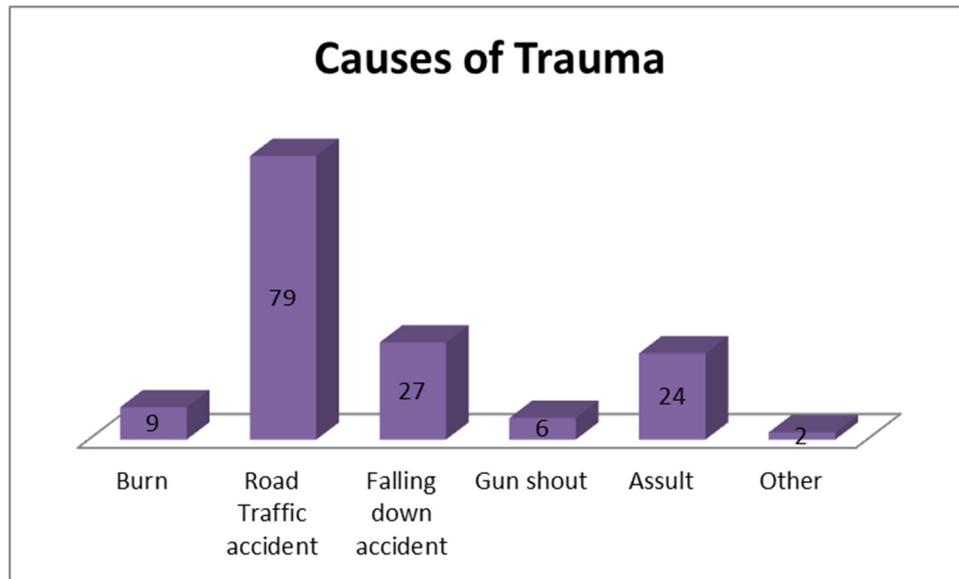


**Fig 2:- Causes of Trauma**

Majority 107(81.1%) trauma patients have Brain injury, 43(32.8%) had orthopedic trauma, 36 (27.5%) had chest trauma, 24(18.3%) had abdominal trauma and 16 (12.2%) had spinal cord injury.

**Table 3:- Distributions of Trauma patients based on mechanism of injury and affected organ**

|                              | Burn    | Road<br>Traffic<br>accident | Falling<br>from height | Gun shout | Assault    | Others  |
|------------------------------|---------|-----------------------------|------------------------|-----------|------------|---------|
| <b>Sex</b>                   |         |                             |                        |           |            |         |
| Male                         | 5(3.4%) | 67(45.6%)                   | 23(15.6%)              | 6(4.1%)   | 24(16.3%)  | 2(1.4%) |
| Female                       | 4(2.7%) | 12(8.2%)                    | 4(2.7%)                | 0         | 0          | 0       |
| <b>Affected organ system</b> |         |                             |                        |           |            |         |
| Brain injury                 | 1(0.8%) | 61<br>(46.6%)               | 19<br>(14.5%)          | 2 (1.5%)  | 22 (16.8%) | 1(0.8%) |

|                    |   |               |          |          |          |         |
|--------------------|---|---------------|----------|----------|----------|---------|
| Abdominal trauma   | 0 | 15<br>(11.5%) | 5 (3.8%) | 3 (2.3%) | 1 (0.8%) | 0       |
| Chest trauma       | 0 | 22<br>(16.9%) | 7 (5.4%) | 3 (2.3%) | 3(2.3%)  | 1(0.8)  |
| Orthopedic trauma  | 0 | 32<br>(24.6%) | 6 (4.6%) | 1 (0.8%) | 4(3.1%)  | 0       |
| Spinal cord injury | 0 | 5 (3.8%)      | 8 (6.2%) | 1 (0.8%) | 2(1.5%)  | 0       |
| Neck trauma        | 0 | 0             | 0        | 1(0.8%)  | 0        | 1(0.8%) |
| Other              | 0 | 1(0.8%)       | 0        | 0        | 0        | 0       |

There were a total of 9 burn patients, the cause for burn admissions were electrical burn 4(44.4%), flame burn 4(44.4%) and scald burn 1(11.1). Majority 8 (88.9%) total body surface areas burnt were >30% and 1 (11.1 %) total body surface area burnt were 15-30%.

**Table 4: - Description of Burn patient**

|                                     | Electrical | Flame     | Scald     |
|-------------------------------------|------------|-----------|-----------|
| <b>Sex</b>                          |            |           |           |
| Male                                | 3 (33%)    | 1 (11.1%) | 1 (11.1%) |
| Female                              | 1 (11.1%)  | 3 (33%)   | 0         |
| <b>Age</b>                          |            |           |           |
| 1-15                                | 0          | 0         | 1 (11.1%) |
| 16-24                               | 2 (22.2%)  | 3 (33%)   | 0         |
| 25-64                               | 2 (22.2%)  | 1 (11.1%) | 0         |
| >=65                                | 0          | 0         | 0         |
| <b>Total Body surface area Burn</b> |            |           |           |
| 15-30%                              | 0          | 1 (11.1%) | 0         |

|      |           |           |           |
|------|-----------|-----------|-----------|
| >30% | 4 (44.4%) | 3 (33.3%) | 1 (11.1%) |
|------|-----------|-----------|-----------|

There were a total 22 (12.2%) medical cases, from the total medical cases neurologic conditions were 17 (73.9%), infectious 4 (17.4), respiratory failure 6 (26.1%) and cardiovascular 2 (8.7%).

From the total 115 patients underwent surgical procedure. Out of which neurosurgical procedures was done for 83 (72.2%) of patients, Orthopedic surgery for 22 (19.1%), Minor procedure was done for 14(12.2%) of patients, abdominal surgery for 10(8.7%), chest surgery 1(0.9%) and 4 (3.5%) received other procedure.

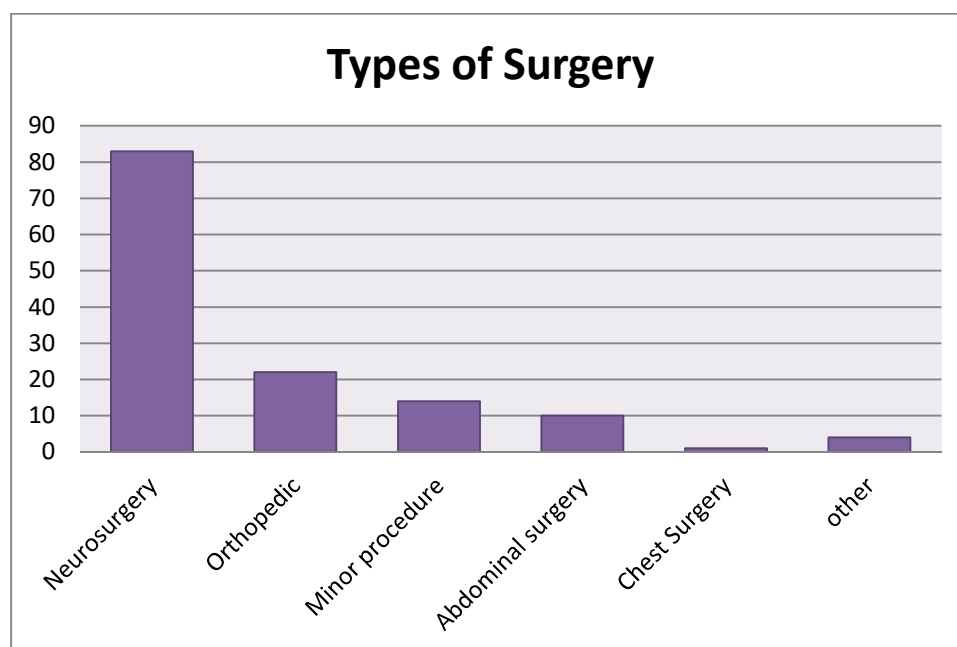


**Fig 3:- Types of surgery**

#### 4.4 Albumin and hemoglobin level

From the total of 181 cases the majority has hypoalbuminemia after ICU admission which accounts around 164 (90.6%) after 48 hrs of admission to ICU and 177 (97.8%) at discharge. The mean sr albumin level at 48hrs of

admission and at discharge is 2.7g/dl ( $\sigma = 0.74$ ) and 2.05g/dl ( $\sigma = 0.67$ ) respectively.

When we classify according to their severity 82 (45.3%) of patient's have sever hypoalbuminemia ( $< 2.5$ g/dl) and 82 (45.3%) were in moderate range between 2.6g/dl - 3.5g/dl after 48hr of ICU admission. And immediately before discharge majority were in sever range, 125 (69.1%) and 52 (28.7%) has moderate hypoalbuminemia.

**Table 5:- Serum Albumin level of patients**

| Albumin Level                                     | Frequency | Percent |
|---------------------------------------------------|-----------|---------|
| <b>Albumin level after 48 hrs</b>                 |           |         |
| $< 2.5$                                           | 82        | 45.3    |
| 2.5 – 3.5                                         | 82        | 45.3    |
| 3.6 – 4.5                                         | 16        | 8.8     |
| $> 4.5$                                           | 1         | 0.6     |
| <b>Albumin level immediately before discharge</b> |           |         |
| $< 2.5$                                           | 125       | 69.1    |
| 2.5 – 3.5                                         | 52        | 28.7    |
| 3.6 – 4.5                                         | 4         | 2.2     |
| $> 4.5$                                           | 0         | 0       |

Majority of the patient's hemoglobin level after 48hr of ICU admission 71(39.2%) were  $> 12$ g/dl, 67(37%) were 7g/dl– 10g/dl, 40 (22.1%) were 10g/dl- 12g/dl and 3 (1.7%) were  $< 7$ g/dl. Majority of the case review immediately before discharge hemoglobin level were 91(50.3%).

**Table 6:- Hemoglobin level of patients**

| Hemoglobin Level | Frequency | Percent |
|------------------|-----------|---------|
|------------------|-----------|---------|

| <b>Hemoglobin level after 48 hrs</b>                 |    |      |
|------------------------------------------------------|----|------|
| < 7                                                  | 3  | 1.7  |
| 7 – 10                                               | 67 | 37   |
| 10.1 -12                                             | 40 | 22.1 |
| >12                                                  | 71 | 39.2 |
| <b>Hemoglobin level immediately before discharge</b> |    |      |
| < 7                                                  | 2  | 1.1  |
| 7 – 10                                               | 91 | 50.3 |
| 10.1 -12                                             | 50 | 27.6 |
| >12                                                  | 38 | 21   |

**Table:- 7 albumin level with mechanical ventilation**

Among 181 charts reviewed around 61(33.7%) patients had prolonged MV stay

|                                                   | <b>Days in Mechanical Ventilator</b> |             |               |                |               |
|---------------------------------------------------|--------------------------------------|-------------|---------------|----------------|---------------|
|                                                   | <b>1 - 3</b>                         | <b>4 -7</b> | <b>8 - 14</b> | <b>15 – 21</b> | <b>&gt;21</b> |
| <b>Albumin level after 48hr</b>                   |                                      |             |               |                |               |
| <2.5g/dl                                          | 10(6.3%)                             | 12(7.5%)    | 15(9.4%)      | 11(6.9%)       | 20(12.6%)     |
| 2.5- 3.5g/dl                                      | 16(10.1%)                            | 15(9.4%)    | 20(12.6%)     | 13(8.2%)       | 11(6.9%)      |
| 3.5-4.5g/dl                                       | 4(2.5%)                              | 4(2.5%)     | 1(.6%)        | 3(1.3%)        | 3(1.3%)       |
| >4.5g/dl                                          | 1(.6%)                               | 0           | 0             | 0              | 0             |
| <b>Albumin level immediately before discharge</b> |                                      |             |               |                |               |
| <2.5g/dl                                          | 18(11.3%)                            | 18(11.3%)   | 26(16.4%)     | 23(14.5%)      | 27(17%)       |
| 2.5- 3.5g/dl                                      | 11(6.9%)                             | 13(8.2%)    | 10(6.3%)      | 4(2.5%)        | 7(4.4%)       |
| 3.5-4.5g/dl                                       | 2(1.3%)                              | 0           | 0             | 0              | 0             |

## 4.5 Treatment in ICU

From the total 172(95%) of the patient received GI prophylaxis, 170 (93.3%) received Antipain, 168(95%) of the patient received DVT prophylaxis, 162 (89.5%) of the patient received

Mechanical ventilation support, 161 (89%) of the patient received Antibiotics, 148 (81.8%) of the patient received sedation and 110 (60.8%) of the patient received seizure prophylaxis.

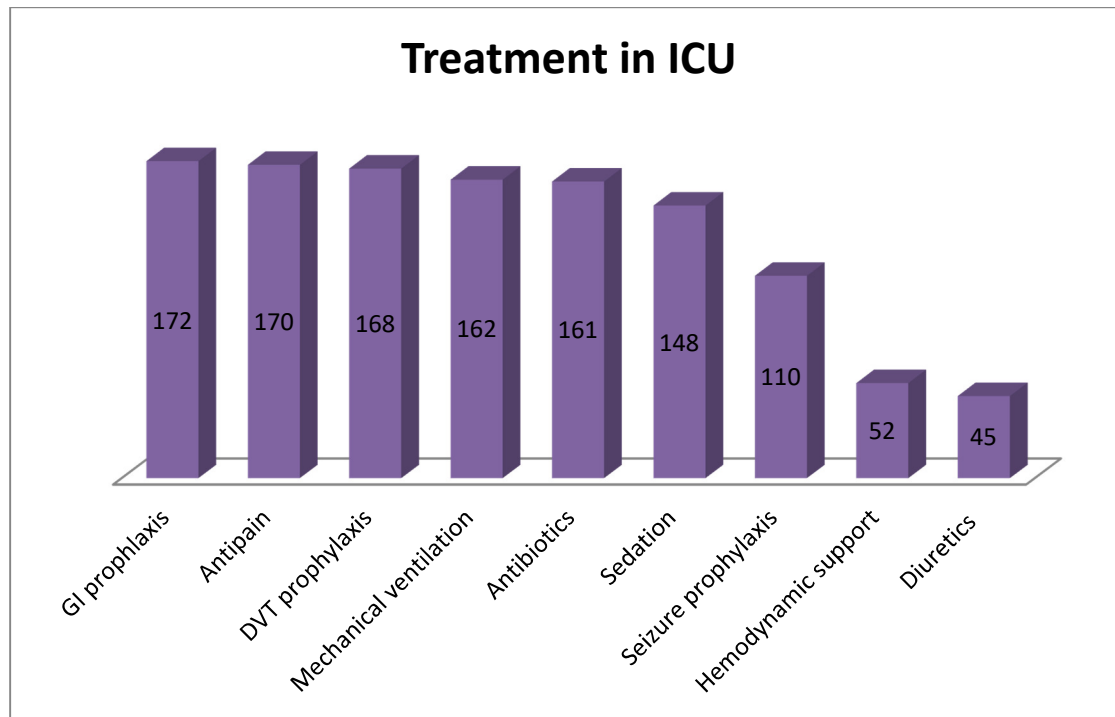


**Fig 4:- Treatment in ICU**

#### Blood and Albumin Transfusion

From the total case review 79(43.6%) of patient's received blood. Majority 36 (19.9%) of patients received one unit blood, 23 (29.1%) of patients received 2 unit blood, 14(17.7%) received 3 unit blood and 6 (7.6%) of patients received more than 3 unit blood. Only 9 patients received albumin, 6 (66.7%) received 1 unit Albumin and 3 (33.3%) received 2 unit albumin.

#### 4.6 Complication in ICU

**Table 8:- ICU complication with mechanical ventilator stay**

|  | Days in Mechanical Ventilator |
|--|-------------------------------|
|--|-------------------------------|

| ICU Complications    | 2 - 3     | 4 -7     | 8 - 14    | 15 – 21   | >21       |
|----------------------|-----------|----------|-----------|-----------|-----------|
| Bed Sore             | 0         | 2 (1.3%) | 4(2.5%)   | 6(3.8%)   | 18(11.3%) |
| ICU induced delirium | 0         | 0        | 1(0.6%)   | 0         | 0         |
| Organ failure        | 0         | 3 (1.9%) | 4(2.5%)   | 3(1.9%)   | 2(1.3%)   |
| VAP                  | 0         | 1(0.6%)  | 2(1.3%)   | 4(2.5%)   | 9(5.7%)   |
| HAP                  | 8(5%)     | 9(5.7%)  | 19(11.9%) | 17(10.7%) | 12(7.5%)  |
| UTI                  | 2(1.3%)   | 4(2.5%)  | 10(6.3%)  | 10(6.3%)  | 23(14.5%) |
| None                 | 22(13.8%) | 12(7.5%) | 7(4.4%)   | 1(0.6%)   | 0         |
| Others               | 3 (1.9%)  | 4 (2.5%) | 11 (6.9%) | 4(2.5%)   | 9(5.7%)   |

From the total reviewed cases 46 patients were develop edema after ICU admission. Majority 27(58.7%) were develop grade 2 edema, 9(19.6%) developed grade 1 edema, 8(17.4%) developed grade 3 edema and 2(4.3%) developed grade 4 edema.

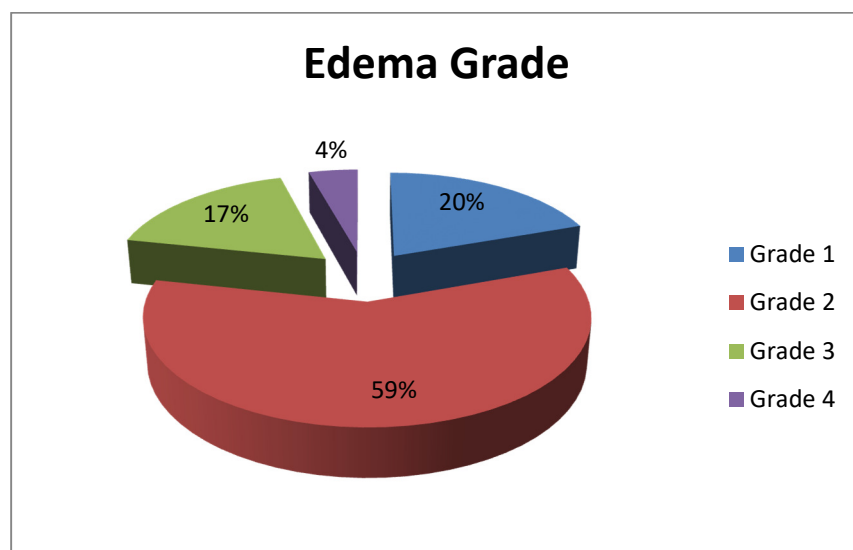


**Fig 5: - Edema grade**

#### 4.7 Out Come of the patient

A total of 181 cases were revised. From these majority 94(51.9%) were transferred to respective ward, 41(22.7%) were discharge improved and 46(25.4%) were Died.

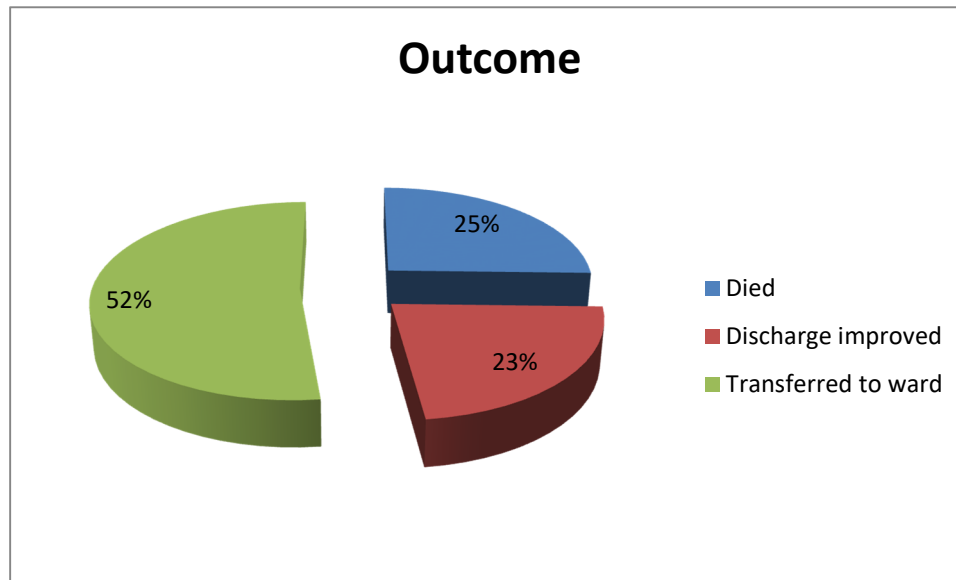


**Fig6:- Outcome**

**Table 9:- Out come with albumin level**

|                                            | Out Come |                    |                     |
|--------------------------------------------|----------|--------------------|---------------------|
|                                            | Died     | Discharge improved | Transferred to ward |
| Albumin level after 48hr                   |          |                    |                     |
| <2.5g/dl                                   | 34       | 17                 | 21                  |
| 2.5- 3.5g/dl                               | 9        | 20                 | 53                  |
| 3.5-4.5g/dl                                | 2        | 4                  | 10                  |
| >4.5g/dl                                   | 1        | 0                  | 0                   |
| Albumin level immediately before discharge |          |                    |                     |
| <2.5g/dl                                   | 40       | 23                 | 62                  |
| 2.5- 3.5g/dl                               | 6        | 16                 | 30                  |
| 3.5-4.5g/dl                                | 0        | 2                  | 2                   |

#### 4.8 Length of stay at ICU

From the total 49 (27.1%) of patients were stayed in ICU for 15- 30 days, 45(24.9%) for 8-14 days, 43(23.8%) for 3-7 days, 36(19.9%) for >30 days and 8(4.4%) for <3 days.

#### 4.9 Determinant factors

In order to investigate the association of selected socio demographic variables with outcome, both bivariate and multivariate analysis were used. In Bivariate analysis sex, Admission categories, albumin level after 48hr of admission and albumin level immediately before discharge were significantly associated death. While other factors including hemoglobin level doesn't show significant association with mortality.

Female Patient 2.56 times [(AOR=2.56) 95% CI (1.14, 5.76)] more likely have death than male patients. And medical patients has more mortality than trauma and non-traumatic surgical cases with [(AOR = 2.77) 95% CI (1.10, 6.96)]. Albumin level after 48hr of admission and albumin level immediately before discharge were negatively associated death.

Association of serum albumin level at 48hr and at discharge with the complications (prolonged mechanical ventilation, prolonged ICU stay and hospital acquired pneumonia) was done with bivariate analysis. And it shows that sr albumin level both at 48 hr and at discharge doesn't show significant association with prolonged mechanical ventilation and prolonged ICU stay. On the other hand low serum albumin level after 48 hrs with [p value =0.048, 95% CI, (0.055-0.990)] and at discharge with [p value =0.00, 95% CI, (0.075-0.468)] negatively associate with HAP.

In the multivariate analysis sex of the patient and albumin level after 48hr were retained as determinant. Albumin level was negatively associated with the outcome. Female Patient 4.7 times [AOR=4.7) 95% CI (1.68, 13.1)] more likely have death than male patients.

**Table 10:- Multivariate logistic regression Factors associated with patients in ICU**

| Variables                                                 | Death         |               | COR (95% CI)       | AOR (95% CI)       |
|-----------------------------------------------------------|---------------|---------------|--------------------|--------------------|
|                                                           | No<br>(n=135) | Yes<br>(n=46) |                    |                    |
| <b>Sex</b>                                                |               |               |                    |                    |
| Male                                                      | 117           | 33            | 1                  | 1                  |
| Female                                                    | 18            | 13            | 2.56 (1.14, 5.76)* | 4.7(1.68, 13.1)**  |
| <b>Admission<br/>Catagories</b>                           |               |               |                    |                    |
| Trauma                                                    | 113           | 34            | 1                  | 1                  |
| Medical                                                   | 12            | 10            | 2.77(1.10, 6.96)*  | 2.01(0.71, 5.65)   |
| None traumatic                                            | 10            | 2             | 0.66(0.13, 3.18)   | 0.53(0.96, 2.96)   |
| <b>Albumin Level after<br/>48hr</b>                       |               |               |                    |                    |
| <2.5                                                      | 48            | 34            | 1                  | 1                  |
| 2.5- 3.5                                                  | 73            | 9             | 0.17(0.07, 0.39)** | 0.21(0.08, 0.53)** |
| 3.6- 4.5                                                  | 14            | 2             | 0.20(0.04, 0.94)*  | 0.34(0.06, 1.72)   |
| >4.5                                                      | 0             | 1             | 000                | 000                |
| <b>Albumin level<br/>immediately before<br/>discharge</b> |               |               |                    |                    |
| <2.5                                                      | 85            |               |                    |                    |
| 2.5-3.5                                                   | 46            | 40            | 1                  | 1                  |
| 3.6- 4.5                                                  | 4             | 6             | 0.27(0.11, 0.70)*  | 0.34(0.11, 0.94)   |
|                                                           |               | 0             |                    |                    |

\*has association , \*\*has significant association

## 5 Discussion

This study attempted to investigate the prevalence and effect of hypoalbuminemia in critically ill patients. So according to this research result, from the total of 181 cases the majority has hypoalbuminemia after ICU admission which accounts around 164 (90.6%) after 48 hrs of admission to ICU and 177 (97.8%) at discharge. The mean sr albumin level at 48hrs of admission and at discharge is 2.7g/dl ( $\sigma = 0.74$ ) and 2.05g/dl ( $\sigma = 0.67$ ) respectively.

When we classify according to their severity 82 (45.3%) of patient's have sever hypoalbuminemia ( $< 2.5\text{g/dl}$ ) and 82 (45.3%) were in moderate range between 2.6g/dl - 3.5g/dl after 48hr of ICU admission And immediately before discharge majority were in sever range, 125 (69.1%) and 52 (28.7%) has moderate hypoalbuminemia.

Despite lack of adequate data on prevalence and outcome of hypoalbuminemia in critical ill patients in Africa especially in our country there is one study done in university of KwaZulu-Natal, Durban, South Africa, which has comparable result with this research. It shows that the incidence of hypoalbuminaemia (using the laboratory reference range) was 93.9% on admission and 99.4% at 48 hours.(24)

Another study done in in Nepalgunj Medical College, Banke, Nepal the total number of patients with low serum albumin level was 840 among 944 patients with prevalence of 88.98%.(15)

Our result shows lower sr albumin level in majority of patients both at 48hrs and at discharge both in survivors and non survivors with mean sr albumin level after 48hrs of admission in survival is 2.7g/dl ( $\sigma = 0.67$ ) and 2.24g/dl ( $\sigma = 0.79$ ) in non-survival. And at discharge there is lower mean sr albumin level in non survivors which is 1.6g/dl ( $\sigma = 0.71$ ) than survivors 2.3g/dl ( $\sigma = 0.69$ ).

One retrospective study which is comparable with this result which was done in Hong Kong, China showed that serum albumin decreased after ICU admission, most rapidly in the first 24 to 48 hours, in both survivors and non-survivors. Serum albumin was lower in non-survivors than in survivor.(16)

Another study shows comparable result that Survivors had a mean serum albumin ( $3.18 \pm 0.60$ ) higher than non-survivors ( $2.35 \pm 0.68$  g/100 ml) ( $p < 0.05$ ). (17)

A study done in United States, the non-survivors had a significantly lower admission albumin of 3.1 g/dL compared to 3.5 g/dL for survivors. (12)

On the other hand study conducted at the PICU of Tertiary care Hospital shows; prevalence of hypoalbuminemia at admission was 38%. Mean serum albumin level in this study was  $2.54 \pm 0.38$  g/dL.(7) This difference is may be due to age and time difference at which albumin level is taken. Since our reserch is done including all age groups including elderly also albumin level taken after 48 hrs and albumin needs time to decline that's why the prevaence shows significant difference from our study. But the mean sr albumin level is still comparable.

In Bivariate analysis albumin level after 48hr of admission and albumin level immediately before discharge were negatively associated death. [(AOR = 2.77) 95% CI (1.10, 6.96)]

In the multivariate analysis sex of the patient and albumin level after 48hr were retained as determinant. Albumin level was negatively associated with the outcome.

A study done in university of KwaZulu-Natal, Durban, South Africa, Hypoalbuminaemia at admission was an independent predictor of mortality using multivariable analysis (OR 3.74; 95% confidence interval 1.87 - 4.48). An admission serum albumin level of  $< 2.6$  g/dL is a significant

independent predictor of morbidity and mortality in trauma patients. This study shows comparable result with our study even though it is done with sr albumin level at admission. (24)

A prospective observational study conducted at the PICU of Tertiary care Hospital shows strong negative correlation( $r = -0.867$ ) found between serum albumin level and mortality rate. (7)

Another study done, non-survivors had lower serum albumin concentrations on admission to the ICU. And the value at 24-48 hr accurately indicate outcome. (16)

A study on Massachusetts General Hospital Low levels of albumin were also independently associated with higher mortality at 90 days (OR 1.78, 95% CI 1.30-2.44,  $p < 0.001$ ). (3)

Study done at a Midwestern regional medical center, a strong negative trend in serum albumin level, by 63.4% when admission serum albumin is  $\leq 2.45$  g/dl (14)

Retrospective Study done in Sao Paulo, Brazil, analysis of 486 patients, protein and lipid levels were lower in the patients who died ( $p < 0.05$ ). (22)

Study done in United States shows patients with albumin levels  $< 3.4$  g/dL were 2.5 times more likely to die compared to patients with normal albumin levels. These results indicate that initial hypoalbuminemia in blunt trauma patients is an independent predictor of delayed mortality. (12)

Another study done in clinical patients above 40 years old within their first 48 hours of admission, shows for each 2.5 mg/L serum albumin drop and risk of increased death by 39%. (19)

Also one study shows mortality is higher also with low sr albumin level at discharge which is done in America and it shows mortality was higher with mild (12%) and marked hypoalbuminemia (34%) In patients with hypoalbuminemia on admission, normalization of

albumin levels before discharge was associated with better short- and long-term survival, compared with patients with hypoalbuminemia before discharge. (11)

Also our result shows negative association of low serum albumin level after 48 hrs and at discharge with hospital acquired pneumonia. With [p value =0.048, 95% CI, (0.055-0.990)] and [p value =0.00, 95% CI, (0.075-0.468)] respectively.

A study which has comparable result done in Massachusetts General Hospital hypoalbuminemia was an independent predictor of pneumonia (odds ratio [OR] 1.76, 95% confidence interval [CI] 1.34-2.33,  $p < 0.001$ ) and sepsis (OR 2.29, 95% CI 1.22-4.30,  $p = 0.010$ ). (3)

Another study shows, mortality increased in the groups with lower serum albumin and the level of serum albumin was associated with infection ( $\chi^2 = 73.9$ ) and mortality ( $\chi^2 = 69.7$ ) ( $p < 0.05$ ). (17)

On the other hand this research doesn't show significant association of both low serum albumin levels at 48hr and at discharge with prolonged mechanical ventilation and ICU stay.

This result shows difference with one study done in university of KwaZulu-Natal, Durban, South Africa, which shows that lower serum albumin level were found to have a significantly greater ICU (17.1 vs 14.2 days) and hospital length of stay (17.3 vs 20.1 days,  $P < 0.05$ ), ventilator days (11.1 vs 13.5 days,  $P < 0.05$ ). (24) And this could be due difference on study population and disease entity. Which majority of the study population in the above study were non-surgical and medical patients whereas most of our patients are young and trauma (mostly TBI patients) with neurosurgical interventions done. This may help for the fast recovery as seen from clinical experience. But to conclude it needs further study in the future.

Also this research also shows that hemoglobin level doesn't show significant association with mortality and this is comparable with retrospective study which was comparing admission serum

albumin and hemoglobin as a predictor of outcome in children with moderate to severe traumatic brain injury. Multivariate logistic regression showed that hypoalbuminemia (serum albumin <30 g/L) was independently associated with mortality (adjusted odds ratio [OR]=3.059; 95% confidence interval [CI]: 1.118–8.371; P=.030) in children with moderate to severe TBI,(21) while anemia (hemoglobin <90 g/L) was not independently associated with mortality (adjusted OR=1.742; 95% CI: 0.617–4.916; P=.295).(21)

## **6 Conclusion**

Hypoalbuminaemia is a common finding in critically ill patients and low albumin level associate with poor outcome. Majority of patients admitted to AaBET ICU has moderate to severe range of hypoalbuminemia after 48hrs of admission which further decrease during their stay and make most of the patients in sever hypoalbuminemic at discharge. And this has deleterious effect on outcome. Low albumin will predispose patients to hospital acquired infections and increase mortality.

## **7 Recommendation**

On the basis of findings obtained from this study the following recommendations were made:

For health institutions;

It is highly recommended for the institutions to have appropriate balanced dietary supply to critically ill patients admitted to ICU.

For those health professionals who are working in ICU;

Health professionals working in the institution should give attention to identify risk factors of hypoalbuminemia and manage accordingly. And since sr albumin level has great association with the outcome measurement of serial albumin level including admission sr albumin level will help to detect hypoalbuminemia and intervene early and prevent further decrement by ordering appropriate nutrition depending on patient's clinical condition.

Also there was poor record keeping practice and some of the valuable information's were missing from records of patients admitted to the ICU, hence it's highly recommended for the institution to develop a check and balance system.

For future researchers;

It will be more valuable if further studies conducted, on association of serum albumin level with nutritional status, significance of albumin transfusion on changing outcomes, and significance of hypoalbuminemia in medical ICU patients with multiple comorbidities.

## **8 Strength and limitations of the study**

### **8.1 Strength**

This study is the first of its kind in the hospital, and it could give knowledge about how hypoalbuminemia is common and its clinical significance also generates new ideas for further studies.

### **8.2 Limitation**

Some of the limitations of this study include; being a hospital based cross sectional study, the findings are not generalizable to general population, and don't address cause and effect of issues

raised completely, besides incomplete patients charts and missing of important information on the chart was a biggest challenge.

Some of the charts were lost in the study period.

Nutritional status which is a major risk factor for hypoalbuminemia is not included in the data since this information is not adequately found in the charts.

Lack of similar study in similar set up made comparison a bit difficult, and the study looked at data's for one year only.

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### **Assurance of Principal Investigator**

I here declare that this is my original work has never been presented in this or any other university and all the source material used for this thesis have been duly acknowledged.

Name of the student: **Dr Hanan Kedir**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **Approval of the Primary Advisor**

Name of the primary advisor: **Dr**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **Approval of the Co-Advisor**

Name of the primary advisor **Dr**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

A. ANNEX

1. Age in years \_\_\_\_\_
2. Sex                      A. Male                      B. Female
3. how long did the patient stay before admission to the ICU \_\_\_\_\_ in days
4. Admission category
  - A. Trauma                      D. None traumatic neurosurgical conditions
  - B. Medical
  - C. Surgical                      E. Others please specify \_\_\_\_\_
5. If trauma what is the mechanism
  - A. Burn                      D. Gun shout
  - B. Road traffic accident                      E. Assault including stone and stick injury
  - C. Fall down accident                      F. Others specify \_\_\_\_\_
6. If trauma which organ system affected more than one answer is possible
  - A. Brain injury
  - B. Abdominal trauma                      F. spinal cord injury
  - C. Chest trauma                      G. neck trauma
  - D. Orthopedic trauma                      H. others specify \_\_\_\_\_
7. If the patient sustain burn injury what type?
  - A. chemical                      B. electrical                      C. flame                      D. scald
8. Total body surface area burnt
  - A. <15%                      B. 15-30%                      C. >30%
9. If the cause of ICU admission is medical which system is affected more than one answer is possible
  - A. Neurologic                      D. Cardiovascular
  - B. Infectious                      E. Endocrine
  - C. Respiratory                      D. Others specify \_\_\_\_\_s
10. If the cause is surgical what type of surgical intervention was done more than one answer is possible
  - A. Abdominal surgery                      E. Orthopedic surgery
  - B. Vascular surgery                      F. Minor procedure (chest tube insertion)
  - C. Chest surgery                      G. Others specify \_\_\_\_\_
  - D. Neurosurgery
11. Serum albumin level after 48hrs of ICU admission \_\_\_\_\_ in g/dl
12. Serum albumin level immediately before discharge \_\_\_\_\_ in g/dl

13. Hemoglobin level after 48hrs of ICU admission \_\_\_\_\_ in g/dl

14. Hemoglobin level immediately before discharge \_\_\_\_\_ in g/dl

15. Comorbidities (more than one can be chosen)

A. Diabetes Mellitus

E. Liver disease

B. Hypertension

F. Neoplasia

C. Cardiac diseases

G. None

D. Renal disease

H. Other specify \_\_\_\_\_

16. Treatment given in ICU : more than one option is possible

A. Mechanical ventilation support

F. GI prophylaxis

B. Hemodynamic support

G.DVT prophylaxis

C. Antibiotics

H. Sedation

D. Diuretics including mannitol

I. Anti-pain

E. Seizure prophylaxis

J .Others specify \_\_\_\_\_

17. Blood transfusion A. Yes

B. No

18. If yes amount of blood transfused \_\_\_\_\_ in units

19. Albumin transfusion A. Yes

B. No

20. If yes amount of albumin transfused \_\_\_\_\_ in unit

21. How long did the patient stayed on mechanical ventilator \_\_\_\_\_ in days

22. Complications in the ICU

A. Bed sore

F. UTI

B. ICU induced delirium

G. Tracheo esophageal fistula

C. Organ failure

H. NONE

D. VAP

I. Others specify \_\_\_\_\_

E. HAP

23. Does the patient developed Edema after ICU admission

A. Yes

B. No

24. If **Yes** grade

Grade 1

B. Grade 2

C. Grade 3

D. Grade 4

25. Outcome of the patient

A. Died

B. Discharge improved

C. Transferred to respective ward

26. Length of stay at the ICU before death or discharge from ICU \_\_\_\_\_ in days

