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ESTIMATION OF SERIAL SERUM ALBUMINS LEVELS IN CRITICALLY ILL PATIENTS ADMITTED AT TERTIARY CARE HOSPITAL

General Medicine

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ABSTRACT

Background: Serum albumin has been the subject of extensive studies as a prognostic marker in various contexts. The aim of this study was to estimate the role of serial serum albumin estimation as prognostic marker in critically ill patients who were on mechanical ventilator for 5 days or more. **Aim:** The main aim of the study was to evaluate the role of serial albumin concentration among the patients who are in mechanical ventilation for more than 5 days in MICU, GGH, Kadapa **Methods and materials:** 50 critically ill patients were included in the study who required mechanical ventilation for 5 days or more. Detailed history was noted and clinical examination was down .Serum albumin measurement was done on day one, day three, day five and 10. Applying logistic regression analysis ,an equation was obtained with serum albumin levels as variables , to predict the outcome of the patient. **Results:** The results of this study showed that serial measurement of serum albumin can accurately predict the outcome of the patient in cases.The mean levels of survivors were significantly higher on all days than non survivors.The severity of decline of serum albumin over the days affects the prognosis of the patient. The serum albumin levels on third day is the strongest predictor of outcome of the patient. **Conclusion:** The serial serum albumin levels are a strong predictor of the outcome of the patient. Critically ill patients should be managed aggressively if they are predicted to have an unfavorable outcome to improve their outcome.

KEYWORDS

Serum albumin ,critically ill patients,mechanical ventilation

INTRODUCTION:
Albumin helps in maintaining the colloid oncotic pressure , works as a carrier protein and is helpful in various functions of body like metabolic , as antioxidant etc[1]. Because of disease severity , patients in ICU have higher mortality risk.Therefore,it is imperative to recognise the patients in whom poor outcome is predicted at admission itself, to facilitate prompt management to alleviate the predict mortality.

The usage of serum albumin as a marker for prognosis in I'll patients was evaluated in many studies .It has been described that the decreased level of albumin is related with increased mortality, increased length of hospital stay and readmission rates etc[2]. Daily albumin estimation in critically ill patients can be used as an indicator to predict the weaning ability from mechanical ventilation.Literature have shown that serum albumin has also been used as a nutritional and metabolic index among the pateints.

Hypoalbuminemia is noted in septic shock patients and next to major surgeries in addition to other illness . A recent study done to assess the relationship between the level of serum albumin and morality among the ICU patients showed that likelihood of survival declines by 70.6% as the negative trend becomes 63.4%and 76.4% when the albumin levels reaches less than 2.45mg/dl and 1.45mg/fl respectively.

Literature have shown that decreased serum albumin is recognised to be a strong independent and dose -dependent, predictor of bad outcome. With every reduction by20gm/dl, mortality morbidity odds become 137% and 89% respectively. It is also associated with 28 rise in length of ICU stay and 66%increase resource utilisation.

Literature have also shown that albumin in serum is decreased in non structure and the decrease is very rapid during the initial 24-48 hours of admission.

Aim:
To study the role of serial serum albumin concentration among the patients who are in mechanical ventilation for more than 5 days in MICU,GGH,Kadapa.

Objectives:
Primary objective:-Estimation of serial serum albumin levels as a prognostic marker in critically patients who are on mechanical ventilation for more than 5 days and its outcome.

Secondary objective: .
To correlate albumin levels of demographical, etiological parameters and requirement of advanced procedures and monitoring in critically ill patients.

Study design :This study was a cross sectional study

This study was conducted in:Government medical college,Kadapa

Study duration:
This study was conducted from june 2021 to August 2022 over a period of 14 months after the approval of hospital ethical committee.

Study population:
Totally 50 patients admitted in MICU on mechanical ventilation for more than 5 days were included in this study.

Inclusion criteria:
All patients in MICU on mechanical ventilation for more than 5 days

Exclusion criteria:
- Patients on ventilator support who died within 5 days of admission to MICU
- Patient who weaned from ventilator support within 5 days of being put on ventilator support

Ethical clearance:
Before collection of data, all subjects were briefed about the purpose of the study and written informed consent was obtained. All investigations were done free of cost and no financial burden imposed on the patient. Ethical clearance was obtained from the institutional ethics committee.

Statistical analysis:
The data collected was verified for completeness before entering the Microsoft excel spread sheet.The validation of the data was checked at regular intervals. Data analysis was performed with an intention to treat approach using Statistical Package for Social Sciences (SPSS IBM).

The quantitative data was expressed in frequency and percentage. To test the statistical significance of the difference in the mean of continuous functional outcome in the subgroup analysis, Student's t

test/ Mann Whitney U test was applied and to test the statistical significance of the difference in proportion of categorical factors, Chi square test was used.

DISCUSSION:

The presents study was conducted among 50 critically ill patients on mechanical ventilation with the objective to assess if serial serum albumin concentration may be used as a prognostic predictor in critically sick patients who have been on a mechanical ventilator for more than 5 days. Serial serum albumin concentrations were used as a prognostic marker to determine whether the patients would die in the hospital or be discharged.

Etiopathological diagnosis:

The present study included 50 patients from different etiology. Among the 50 patients, majority had neurological disorders, consisting of 15 cases. It includes stroke in 16% cases, Guillain Barre syndrome in three cases (6%), Tubercular meningitis in two cases (4%). Myasthenia gravis in 1 case (2%) and Normal pressure hydrocephalus in two cases (4%). Respiratory disorders were seen among 9 patients comprising of COPD in seven cases (14%) and Community acquired pneumonia in two cases (4%). Five patients (10%) had Organophosphorous poisoning. 9 patients (18%) had Infective causes, comprising of 3 patients (6%) with cerebral malaria and 6 patients (12%) had septicemic shock. Five patients (10%) had diabetic nephropathy. Metabolic disorders was seen among 3 cases (65) including hyponatremic metabolic encephalopathy in 2 case (4%) and hypoglycemic seizures in one patient (2%). Remaining 4 patients had trauma, snake bite, left ventricular failure and esophagus carcinoma in one each.

In a study done by Banga A et al[3]. sepsis (24%) is the most common ailment, followed by COPD (22%), and severe pneumonia (20%)

Causes for commencement of Mechanical Ventilation:

In the present study, 60% patient was initiated on mechanical ventilation due to Acute Respiratory Distress Syndrome, 18% had to put on mechanical ventilation due to coma, 14% due to acute respiratory failure on COPD and 8% due to neuromuscular disease. Majority of the study participants (26%) had aspiration pneumonia and 12% had septicemic shock. According to a study done by Esteben C et al[4], 68.8% of patients had acute respiratory failure with acute respiratory distress syndrome, 16.7% had acute respiratory failure with coma, 12.8% had acute respiratory failure associated with chronic pulmonary disease, and 1.8 percent had acute respiratory failure associated with neuromuscular disease.

Patients suffering from chronic diseases and related "chronic critical illness" are becoming more common as the world's population lives longer. Every year, up to 20 million patients require admission to intensive care units (ICUs) and mechanical breathing (MV). Short-term survival has improved as a result of advances in patient management, but at the cost of a rising group of patients who are partially or completely dependent on MV. Despite poor long-term results, the prevalence of these ventilator assisted persons (VAIs) ranges from 6.6 to 23 per 100,000 causing challenging clinical and organisational challenges for patients, carers, and health services, as well as considerable human and financial resource consumption.

Outcome of patients:

The present study included 50 patients, out of which 12 patients expired in hospital (24%) and 38 patients (76%) was discharged from hospital. In a study done by Takegawa R et al[5], showed that Mortality was seen among 18.4%.

Serum albumin as prognostic indicator:

In the present study, the mean albumin level was 3.24 ± 0.19, 3.02 +0.26, 2.50 ± 0.25 and 1.97 ± 0.37 respectively on day 1, 3,5 and 10 in non- survivor group. Similarly in survivor group it was 2.79 ± 0.92, 2.71 ± 0.85, 2.62 ± 0.64 and 2.46 ± 0.67 respectively on day 1, 3,5 and 10. In a study done by Yap FM et al[6], In comparison to non-survivors, survivors exhibited greater admission albumin (2.57 g/dl vs 2.10 g/dl, p0.005). Similar findings were found in another study, with survivors having a higher mean albumin concentration (18.3 4.6 g/L) than non-survivors (15.7 5.1 g L) The mean blood albumin levels on day one was reported to be 3.2 g/dl (0.7 g/dl) in one study, which is similar to the present study.The present study has shown that among the non-survivors, majority had values less than 3.5 on day 1, 3,5 and 10. Inspite of low serum level at admission, nearly 27 survived. In a study done by Kendall H et al[7], with the objective to assess the association between albumin trend and mortality among the study participants, In patients who died vs those who lived, the serum albumin trend was more negative, and individual albumin measurements were lower.

Using binary logistic regression, each of the albumin variables was found to be a significant independent predictor of mortality. The odds of survival improved by 100% for every g/dl increase in entry serum albumin level. An increase of g/dl in minimum serum albumin increased the chances of survival by 150 percent.

In one other study done by Lyons O et al[8], the results showed that univariate analysis found the groups of 10% and between 10% and 25% of the serum albumin frequency distribution as having a higher mortality risk. Their unadjusted odds rates were 6.35 and 2.11, respectively, and their death rates were 31.7 percent and 15,4 percent, respectively. After adjusting for additional outcome indicators such as co morbidity and illness severity, patients in the lowest 25% of the distribution had a 30 day mortality rate of 19.9%, and this considerably higher risk persisted.

In acute disease, injury, surgery, or sepsis, the metabolic system changes to produce massive amounts of acute-phase proteins. Because albumin is not an acute-phase protein, its production may be diminished. This response is assumed to be mediated by the release of cytokines such as tumour necrosis factors and interleukin-2. Synthesis of albumin is expected to be diminished when the number of cells that produce it decreases.Reduced albumin synthesis is accentuated by increased vascular permeability in these acute circumstances, allowing albumin to migrate from the vascular to the interstitial region.Lastly, albumin breakdown could be a factor in albumin levels dropping after prolonged stress. This procedure is possible because albumin can contribute to the amino acid pool after prolonged stress.

Albumin, being a dependable sign of the physiologic reaction to stress, may thus be a useful predictor of weaning. The inability to raise serum albumin concentration indicates that the initial inflammatory response is uncontrollably high, making weaning more difficult.

According to a study, hypoalbuminemia is a potent, reproducible, dose dependent, and significant risk factor for bad outcome in the acutely ill. The consistency and pervasiveness of this connection were both noteworthy. Lower serum albumin was associated with unfavourable outcomes in hospitalised patients in general, as well as in populations having surgery or suffering from renal impairment. The hypoalbuminemia effect was seen in a wide range of clinical outcomes, including mortality, morbidity, length of ICU and hospital stays, and resource consumption.

Duration of Mechanical ventilation:

The present study showed that among the non survivors, 58.3% of the study participants had mechanical ventilation for more than 8 days. In a study done by Esteban A et al, duration for initiation of mechanical ventilation to be 5.9 days ± 7.2 days

According to another study, the length is 10.5 +1.0 days. Because the patients in this study had lower beginning mean blood albumin concentrations, this difference was detected, indicating a longer period of mechanical breathing. The duration of time spent on mechanical ventilation was not a predictor of albumin concentration on ICU admission, according to this study. The profile of variations in serum concentration, on the other hand, has predictive value. The serum albumin levels of non-survivors were shown to be decreasing over time in this investigation.

Duration of ICU stay:

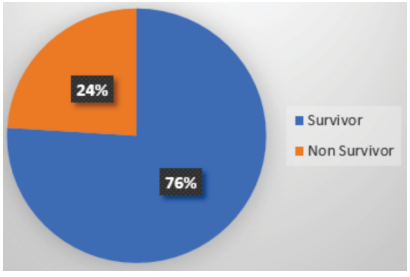
The present study showed that the mean number of days in ICU was 13.44 days in Intensive Care Unit. This mean duration was 10.4 days in survivors and 13.8 days for non survivors.In a study done by Gundpatil DB et al[9], the results showed that the results showed that the area under the curve for mortality prediction for albumin was 0.695.

The threshold levels for albumin, was 2.8 g/dL. The odds ratio for in-hospital mortality was 3.62. Above the threshold, it was shown that odds for increase in ICU stay was 4.73.

This explains why non-survivors in our study cohort spend longer in

the ICU since their serum albumin levels are lower at all times than survivors.

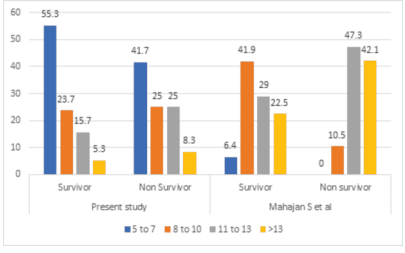
Duration of hospital stay:
In the present study, the mean days in hospital was 16.7 days. Survivors spent 15.8 days in hospital while non survivors spent 13.2 days in hospital.According to one cohort study, hypoalbuminemia is linked to a 71 percent increased risk of a prolonged hospital stay[10]. However, the study's broad inclusion criteria and greater sample size of 2.91,443 patients resulted in significant differences in the findings.



Graph 1:Outcome distribution among the study participants

Table 1: Mean serum albumin on day 10

Variable	Present study		Mahajan S et al	
	Survivor	Non survivor	Survivor	Non survivor
Albumin	2.46	1.97	2.57	2.03



Graph 2 : No. of Days In Mechanical Ventilation

CONCLUSION:
In the present study, 50 critically ill patient of varied aetiology with mechanical ventilation was included in the study.

- Neurological disorders (60%) were more common etiological agent leading to a critical illness
- 60% patient was initiated on mechanical ventilation due to Acute Respiratory Distress Syndrome, 18% had to put on mechanical ventilation due to coma,14% due to acute respiratory failure on COPD and 8% due to neuromuscular disease. Majority of the study participants (26%) had aspiration pneumonia and 12% had septicemic shock.
- 12 patients expired in hospital (24%) and 38 patients (76%) was discharged from hospital
- The mean albumin level was 3.24 ‡ 0.19, 3.02 0.26, 2.50 ‡ 0.25 and 1.97 ‡ 0.37 respectively on day 1, 3 ,5 and 10 in non- survivor group. Similarly in survivor group it was 2.79 ‡ 0.92, 2.71 ‡ 0.85, 2.62 ‡ 0.64 and 2.46 ‡ 0.67 respectively on day 1, 3 ,5 and 10.

REFERENCES

1. Boldt J. Use of albumin: an update. British journal of anaesthesia. 2010 Mar 1;104(3):276-84.
2. Seebacher V, Grimm C, Reinthaller A, Heinze G, Temper C, Hefler L,Polterauer S. The value of serum albumin as a novel independent marker for prognosis in patients with endometrial cancer. European Journal of Obstetrics &Gynecology and Reproductive Biology. 2013 Nov 1;171(1): 101-6.
3. Banga A, Guleria R, Khilnani GC, Khanna S. Serum albumin as A Prognostic Marker in Critically ill patients. JAPI 2003;51:1223-
4. Esteban A, Anzueto A, Frutos F, Alia I, Brochard L, Stewart TE, Benito S, Epstein SK, Apezteguia C, Nightingale P, Arroliga AC, Tobin MJ, Mechanical Ventilation International Study Group: Characteristics and outcomes in adult patients receiving mechanical ventilation: a 28-day international study. JAMA 2002, 287:345-355
5. Takegawa R, Kabata D, Shimizu K, Hisano S, Ogura H, Shintani A, Shimazu T. Serum albumin as a risk factor for death in patients with prolonged sepsis: an observational study. Journal of critical care. 2019 Jun 1;51:139-44.
6. Yap FM, Joynt GM, Buckley TA, Wong ELY. Association of serum albumin concentration and mortality Risk in Critically ill patients. Anaesth Intensive Care 2002, 30(2) :202-7
7. Kendall H, Abreu E, Cheng AL. Serum albumin trend is a predictor of mortality in ICU patients with sepsis. Biological research for nursing. 2019 May;21(3):237-44.
8. Lyons O, Whelan B, Bennett K, O'Riordan D, Silke B. Serum albumin as an outcome predictor in hospital emergency medical admissions. European journal of internal medicine. 2010 Feb 1;21(1):17-20.
9. Gundpatil DB, Somani BL, Saha TK, Banerjee M. Serum urea: albumin ratio as a prognostic marker in critical patients with non-chronic kidney disease. Indian Journal of Clinical Biochemistry. 2014 Jan 1;29(1):97-100.
10. Vincent JL, dubois MJ, Navickis RJ, Wilkes MM. Hypoalbuminemia in Acute Illness: Is There a Rationale for Intervention? A Meta-Analysis of cohort studies and controlled trials. Ann Surg. 2003; 237(3): 319-34.