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STUDY OF SERUM ALBUMIN LEVEL IN COMMUNITY ACQUIRED PNEUMONIA

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ABSTRACT: INTRODUCTION AND AIM: Patients who are admitted to hospital with pneumonia are at risk of subsequent recurrent pneumonia and death even after discharge. This risk may be even higher in patients, who have a low serum albumin level on admission. This study was conducted to determine serum albumin level in patients with CAP as compared to healthy individuals and to observe the correlation of serum albumin level with severity of CAP. **METHODOLOGY:** This study was carried in department of TB-chest at Gandhi medical college, Bhopal. The study includes 30 cases of CAP and 30 age and sex matched healthy controls. The cases were divided according to CRB-65-BTS criteria, in less severe pneumonia group A (score0-1, n=16), moderate pneumonia group B (score2-3, n=8), very severe pneumonia group C (score4, n=6). The serum was assayed quantitatively for albumin in biochemistry department and compared statistically. **RESULTS:** Patients with CAP have low levels of serum albumin (mean value 2.91 ± 0.09 gm/dl) and this value further decreases significantly with increasing severity of pneumonia ($p<0.001$). In control group, mean value of serum albumin was 3.21 ± 0.10 g/dl with no significant effect of age and sex. In pneumonia cases, serum albumin shows decreasing trend along with increasing severity of pneumonia with statistically significant ($p<0.001$) difference in mean serum albumin level in all three CAP groups with different level of severity. **CONCLUSION:** Serum albumin may be a good easily available and cheap indirect marker of not only nutritional status of the patient but also, it can be correlated with severity of community acquired pneumonia and thus prognosis.

KEYWORDS: serum albumin, community acquired pneumonia.

INTRODUCTION: Community acquired pneumonia (CAP) is a common life threatening infectious disease and remains a common and persistent cause of morbidity and mortality.[1] Serum albumin concentration has been used as an indicator of nutritional status for years and hypo-albuminemia was related with poor outcome in several clinical conditions, including CAP.[2-5] Malnourishment status has been associated with risk of CAP and the clinical degree of malnutrition correlates with morbidity and mortality in both young children and elderly people.[6-11]

One of the factor that facilitates the development of pneumonia and act as negative prognostic factor and prediction of death in these patients, is low albumin level.[12-15] In a recent study by Lee et al., it was reported that albumin was associated with 28-day mortality in patients hospitalized with a CAP diagnosis.[16] The inflammatory reaction was reported as a primary reason for hypoalbuminemia in elderly patients with CAP.[15]

This short observational study was conducted to determine trend of serum albumin level in patients with CAP as compared to healthy individuals and to observe the correlation of serum albumin level with severity of CAP.

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METHODOLOGY: This study was carried in department of TB-chest at Gandhi medical college, Bhopal. This was a short observational study. The study was approved by the local ethics committee, and informed consent was obtained from all patients included in the study. The study included 30 cases of CAP and 30 age and sex matched healthy controls.

Patients were >18 years adults, infected from the community, with at least two clinical signs and symptoms related to pneumonia (fever > 38°C, cough, chest pain, dyspnea or crackles on auscultation) and new infiltration on chest x-ray were included in the study. Patients were excluded if they were immunocompromised (like HIV, DM, organ failures, autoimmune disorder and history of using immunosuppressants), who had been hospitalized and/or used any antibiotic in last one month and having severe dehydration. A detailed history of patients was recorded.

Comorbidities [i.e., Chronic Obstructive Pulmonary Disease (COPD), bronchiectasis, malignancy etc] were noted. Routine recommended lab-investigations were done. The severity of CAP was assessed clinically using the CRB-65 score for all patients.[17] The cases were divided according to CRB-65-BTS criteria, in less severe pneumonia (score0-1, n=16), moderate pneumonia (score2-3, n=8), very severe pneumonia (score4, n=6). Blood sample from each of these patients (within 2 hours of the time of presentation) as well as from control group was collected and the serum was assayed quantitatively for albumin by bromo-cresol green method, in department of medical biochemistry.

The mean serum albumin level values for control, cases with reference to age- sex and also in all the three different severity group was calculated and statistically compared (t value and p value) to see the trend and its significance.

RESULTS: Age of all subjects ranged between 20-75yrs and there is no difference, when observed and compared in different age and sex groups. Among control group, the mean value of serum albumin observed was 3.21±0.10 gm/dl whereas the mean value of serum albumin in cases was 2.91±0.09 gm/dl (p<0.001, HS).

	Cases CAP(n=30)	Control (n=30)	t-value	p-value	Remarks
Serum Albumin(g/dl)	2.91+_0.09	3.21+_0.10	16.023	<0.001	HS
Table1: Mean Serum albumin Level in CAP and normal healthy control					

	Male	Female	t-value (M/F)	p-value (M/F)	significance
Cases	2.92+_0.07	2.91+_0.08	0.74	>0.05	NS
Control	3.19+_0.09	3.22+_0.12	0.21	>0.05	NS
t-value(case v/s control)	12.18	10.45			
P value(case v/s control)	<0.001 HS	<0.001 HS			
Table 2: Sex-wise comparison of mean serum albumin level among case-control group					

The mean value of serum albumin found in less severe CAP group A (n=16) was 2.98±0.04 gm/dl, moderately severe CAP group B (n=8) 2.94±0.02 gm/dl and very severe CAP group C (n=6) was 2.83±0.07 gm/dl. Which shows significant difference in serum albumin with increasing severity of CAP, when statistically compared between these groups (p<0.001, HS).

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Groups of cases	t- value	p- value	Significance
A v/s B	4.49	<0.001	HS
B v/s C	12.85	<0.001	HS
C v/s A	16.69	<0.001	HS
Table 3: severity score (CRB)- wise group comparison of Mean serum albumin level			

DISCUSSION: Patients who are admitted to hospital with pneumonia are at risk of subsequent recurrent pneumonia and death even after discharge. This risk may be even higher in patients, who have a low serum albumin level on admission.[18] Albumin is the most abundant plasma protein in the human body. It serves not only nutritive, antioxidants and buffering functions but also it helps in maintaining osmotic pressure and biochemical transport functions. The rate of the albumin synthesis is decreased in the acute phase of inflammation. Hypoalbuminemia is a predictor of worse prognosis in hospitalized and critically ill patients.[19]

The role of hypoalbuminimea in causing a bad course of pneumonia is more related to malnutrition, which is often a case in elderly hospitalized patients.[5,20] However, decreased albumin levels during acute infection is also directly caused by underlying inflammatory process and to some extent, could provide an illustration of severity of infection. The endotoxin from Gram negative bacteria, cytokines like IL-6, chemokines also cause capillary leakage of albumin.

Thus, Increasing concentration of proinflammatory cytokines, specially IL-6, in the inflammation process, inhibits albumin synthesis in the hepatocytes, as well as increases albumin catabolism and redistribution to the extravascular compartment, the end result is reduced circulatory albumin level.[9] This potentially profound decrease in synthesis rate is due to the fact that albumin is a negative acute phase protein. Cytokines produced during inflammation shunt amino acids to increase synthesis of acute phase protein important to the inflammatory process.[21]

Lee et al [16] reported that low albumin was associated with mortality in patients hospitalized due to CAP. Similarly, the serum albumin level on admission, was found to be predictive for mortality in CAP patients.[17,21,22] Hedlund et al[15] suggested that low albumin level result from the inflammatory process per se. Dahn et al[23] suggested that an extra vascular protein redistribution, sometimes together with increased peripheral protein catabolism is the major cause responsible for hypoalbuminemia.

Our study has also preliminarily shown the trend that patients with CAP have low levels of serum albumin (mean value 2.91+_0.09 gm/dl) and this value decreases significantly with increasing severity of pneumonia (p<0.001). In pneumonia cases, serum albumin shows decreasing trend along with increasing severity of disease with statistically significant (p<0.001) difference in mean serum albumin level in all three CAP groups with different level of severity.

Akpinar E E et al[2] in a prospective observational study in 216 CAP patients, also have shown that low albumin level was independent predictor for development of complications and need for ICU. The cut-off level of albumin in prediction of ICU need was 3.39 g/dl (sensitivity 71%, specificity 71%). Also low albumin level was independent predictive factor for the development of complications and the cut-off level of albumin in prediction of development of complication was 3.44 g/dl (sensitivity 79%, specificity 69%).

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Viasus D et al [24] investigated, whether serum albumin levels within 24hr of admission correlate with outcomes in community-acquired pneumonia (CAP). During the study period, 3463 patients with CAP requiring hospitalization were studied. The median value of albumin was 3.1 g/L (IQR 28–35). As levels of serum albumin decrease, the risk of complications significantly increases (P <.001). Decreased albumin levels were also associated with prolonged time to reach clinical stability (P <.001), prolonged hospital stay (P <.001), ICU admission (P <.001), the need for mechanical ventilation (P <.001) and 30-day mortality (P <.001).

After adjusting for potential confounders in a multivariate logistic regression analysis, serum albumin levels at admission (−5 g/L decrease) were independently associated with a higher risk of 30-day mortality (OR 2.11, 95% CI 1.73–2.56). For predicting primary end point, hypoalbuminemia (<30 g/L) significantly increased the area under ROC curves of PSI and CURB-65 scores (P ≤.02) and identified those patients with higher risk of complications classified into low and high risk groups by these scores. They concluded that **s**erum albumin level within 24hr of admission is a good prognostic marker in CAP. Physicians should consider albumin level when evaluating the severity of illness in patients with CAP.

Limitation of our study includes less numbers of study subjects and similar trend as has been observed in other large studies. Biomarkers like procalcitonin and B-type natriuretic peptide have been found to be predictive for the prognosis of CAP.[25,26] But, Serum albumin can be further studied in detail, as an indirect and easily available and cheap alternative marker of not only nutritional status of the patient but also, it can be correlated with diagnosis and severity of community acquired pneumonia. Further detailed studies are needed in future on this subject with good number of study subjects.

CONCLUSION: Serum albumin may be a good easily available and cheap indirect marker of not only nutritional status of the patient but also, it can be correlated with severity of community acquired pneumonia and thus prognosis.

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