STUDY ON THE ROLE OF THROMBOCYTES, ERYTHROCYTE SEDIMENTATION RATE, AND ALBUMIN LEVELS IN THE PROGNOSIS OF HEAD INJURY PATIENTS

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Abstract

Introduction: Head injury is a global issue as a result of industry and transportation development that cause a large number of accident victims. Head injury still constitutes a serious health problem nowadays. The number of incidents, level of disability and mortality rate are still high 75- 80% of the total number of head injury are mild, moderate and severe.

Aim and Objectives: To study the role of Thrombocytes, ESR and serum albumin for prognosis of Head injury.

Methods: Clinically diagnosed with Head injury patients and admitted to Neurosurgery department at National Institute of Medical Science & Research, Jaipur. Blood sample was taken within 24 hrs. as per protocol.

Results: The severity of head injury with Glasgow coma scale (GCS). The status of the parameter compared as well as their association and role in prognosis analyzed.

Conclusion: Thrombocytes, ESR and albumin can become a useful and affordable marker. Serum albumin used as prognostic biomarker in predicting outcome on patients with Head injury.

Key words: Head injury, Thrombocytes, ESR, Hypoalbumin, GCS

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INTRODUCTION

Head injury is a global issue as a result of industry and transportation development that causes a large number of accident victims. The head injury still constitutes a serious health problem nowadays. The number of incidents, level of disability, and mortality rate are still high 75-80% of the total number of head injuries are mild, moderate, and severe. [1,2] Thrombocytes have a major function in the process of inflammation and haemostasis maintenance. Thrombocytes can be a reflection of pro-inflammatory and prothrombotic conditions in the pathophysiological process of disease (standard value 150×10^3/ µL).[3] The inflammation process that occurs in head-injured patients can cause platelet activation and increase platelet production.[4,5] Injured cerebrovascular structure activates thrombocytes because of endothelial disruption. Active thrombocytes activate intrinsic cascade to form intravascular thrombosis due to vascular inflammation.[6,7]

Erythrocyte sedimentation rate is considered a better marker for clinical monitoring throughout the disease over time and for chronic inflammatory diseases. The rate of ESR in plasma is influenced by the level of acute-phase reactant proteins. ESR is commonly used by medical practitioners to help them in monitoring the progression of inflammatory diseases.[8] ESR begins to increase within 24 to 48 hours (normal value ≥ 20 mm/h) after the onset of inflammation (slower than CRP), then gradually decreases after the inflammation subsides. Therefore, ESR is considered a better marker for clinical monitoring throughout the disease over time and for chronic inflammatory diseases.[9]

Albumin is the major protein in human plasma accounting for about 60% of the total plasma protein. Albumin is produced by the liver at a rate of 9-12 g/day. As serum albumin levels more than 3.4 g/dL predict a good favourable prognosis, maintaining serum albumin levels above 3.5g/dL is a pathway for a speedy recovery. Maintaining good nutritional support and preventing calorific deficit can accelerate good outcomes[10]. Du Chen, Long Ba, et al, have studied the use of serum albumin along with pre-albumin to predict the poor outcome in TBI but observed serum albumin serves as a better marker.[11]

The most commonly encountered medical conditions in patients with TBI are eyes, ears, nose, and throat problems, psychiatric or behavioural disturbances, hypertension, and musculoskeletal injury at mild-to-moderate severity.[12]

AIM OF THE STUDY:

The present study aims to study the role of Thrombocytes, ESR, and serum albumin in the prognosis of Head injury.

MATERIALS AND METHODS:

After Institutional ethical approval, the present study is carried out at department of Biochemistry is association with department of Neurosurgery in National Institute of Medical Science & Research, Jaipur. In this cohort study, we included clinically diagnosed 54 patients with head injuries were admitted to the Neurosurgery department, National Institute of Medical Science & Research, Jaipur. The blood sample was taken within 24 hrs. as per protocol and consent was obtained from each patient's attender. The severity of head injury was assessed using Glasgow coma scale (GCS). Inclusion criteria were head injury patients admitted within 24 hours with Glasgow Coma Scale (GCS) from 3 to 14. Age 18 to 70-year with both sexes, clinically diagnosed head injury patients. Exclusion criteria were patients below 18 years of age and pregnant women. Thrombocytes, ESR estimated in the central laboratory, and Serum Albumin was estimated on fully automated, Huma star-200 by photometric colorimetric (BCG: Bromocresol Green) method.

Inclusion criteria: Age 18 to 70-year with both sexes, clinically diagnosed head injury patients who admitted in Neurosurgery department at National Institute of Medical Science & Research, Jaipur.

Exclusion criteria: Patients having Solid organs disease, Chronic diseases such as Tuberculosis and chronic renal disease, patients on anticoagulants and antiplatelet therapy, pre-trauma fever, pre-existing hepatic insufficiency, any hemolytic disorders, HIV and Pregnant woman were excluded from the study.

Statistical analysis: Categorically data is presented as frequency and percentage (%), and measurement data with normal distribution is presented as mean ± S.D. The independent predictors of head injury were determined by univariate and multivariate logistic regression analysis odds ratio (OR) and 95% of confidence of interval (CI) will be calculated. The statistical analysis is carried out on SPSS and Microsoft

excel. P value <0.05 is considered as statistically significant.

RESULTS:

The severity of head injury with Glasgow coma scale (GCS). The status of the parameter compared as well as their association and role in prognosis analyzed. A total of 54 patients with head injuries (49 males and 5 females) with GCS 3 -14 were included in the study (Severe, GCS ≤ 8. Moderate, GCS 9–12). The mean age of the patient was 40 ± 11 years. Thrombocyte activity increased due to inflammation (Table 1, fig 1**)**. This study found the mean 22.3 ± 4.2 ESR levels in head injury were increased (Table 2, fig 2**)** and in head injury patients it indicates the severity of the head injury. Serum albumin in a patient with a head injury was in the range of 1.2– 3.8 g/dl within 24 hours and the mean value of albumin was 3.3 ± 0.7 g/dl (Table 3, fig 3**)**.

Table 1. Range of Thrombocytes

Range of Thrombocytes $10^3/\mu L$	**Number of patients (%)**	**Mean ± SD**	**p-value**
<150	5(9.3%)	292.7±135	0.000000563 (Significant)
150-450	36(66.7%)		
>450	13(24.1%)		

Fig. 1 Thrombocytes

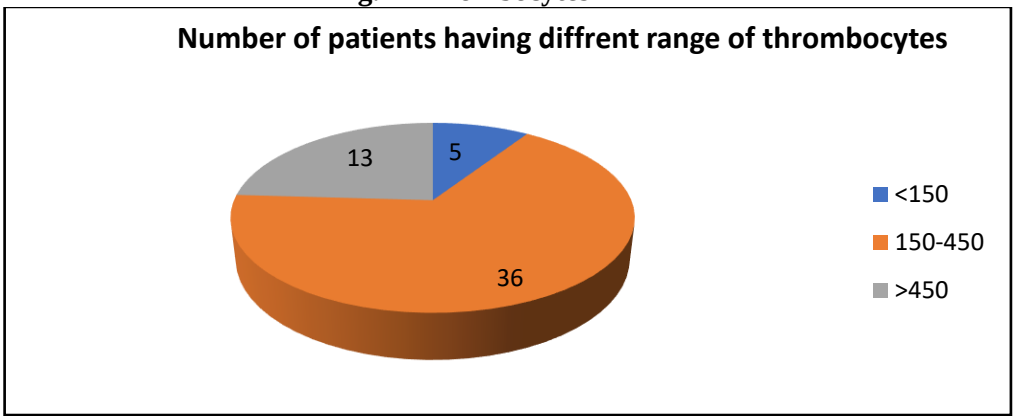


Table 2. ESR

Range of ESR mm/h	**Number of patients (%)**	**Mean ± SD**	**p-value and statistical significance**
0-20	17(31.5%)	22.3 ± 4.2	0.006496 (Significant)
>20	37(68.5%)		

Fig. 2 ESR

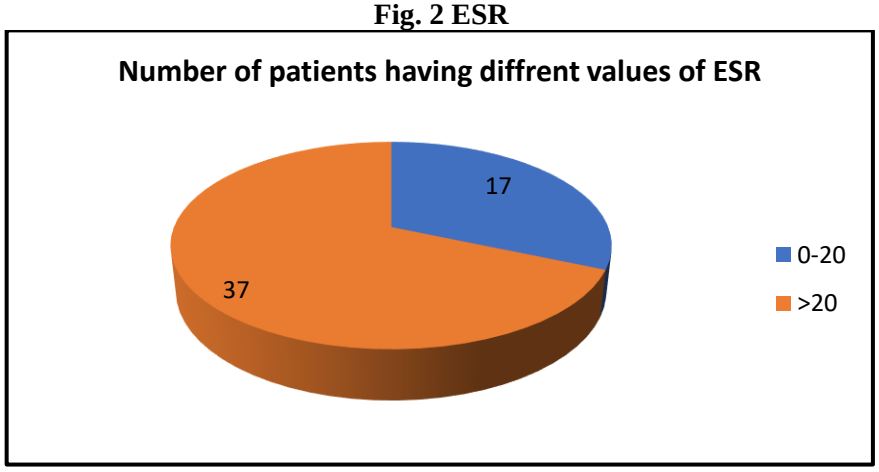
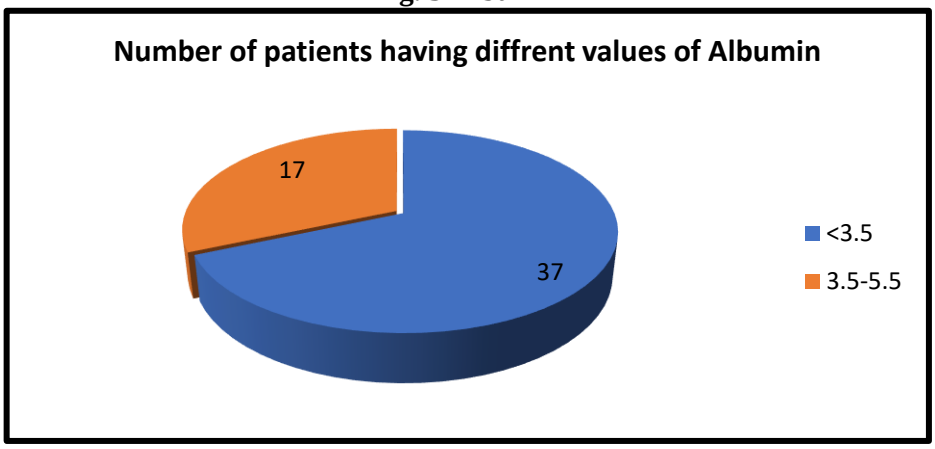


Table 3. Albumin

Range of Albumin g/dl	**Number of patients (%)**	**Mean ± SD**	**p-value and statistical significance**
<3.5	37 (68.5%)	3.3 ± 0.7	0.006496 (Significant)
3.5-5.5	17 (31.5%)		

Fig. 3 Albumin



DISCUSSION

The present study demonstrates that role of Thrombocytes, ESR and Albumin from Brain injury patients have an impaired response. We found in this study Thrombocyte activity increased due to inflammation. Our study found the mean 22.3 ± 4.2 ESR levels in head injury were increased and in head injury patients it indicates the severity of the head injury. Serum albumin in a patient with a head injury was in the range of 1.2– 3.8 g/dl first 24 hours and the mean value of albumin was 3.3 ± 0.7 g/dl.

Head injury incidence is increasing day by day, now a days, most Commonly due to increase in the number of road traffic accidents Which in turn is due to the increasing number of vehicles on the road. [13]

The mean platelet value in the severe head injury group patients was 1.63±0.54 lacs while it was 1.69±0.40 lacs in patients of moderate head injury patients in our study. This is further supported by the study of Martin et al., was recorded thrombocytopenia to be an independent risk factor for progressive head injury. This study observed a significant decrease in platelets counts in patients having progressive head injury.[14]

Platelets count in head injury patients was within the normal range, and none of them had thrombocytosis. Few head injury patients had thrombocytopenia instead. These results supported several previous studies, which also found that the platelet count in head injury patients was still within the normal range.[15,16] The decreased platelets count in TBI patients can occur due to the increased platelet consumption (consumption coagulopathy), where the coagulation system was activated when the blood passes through the injured brain tissue post-brain injury .[16]

In study of Bray C et al [17] the mean ESR levels in head injury patients were within the normal range, and only 28.2% of them had elevated ESR levels (ESR >20 mm/h). These results could occur because the ESR examinations were carried out on the 1st-day post-injury, where the ESR levels did not change rapidly at the beginning of the inflammatory process and would return to normal range in a longer time than other acute phase reactants.[17]

ESR was increase within 24–48-h after the onset of inflammation (slower than CRP), then gradually decreases after the inflammation subsides. Therefore, ESR is considered as a better marker for clinical monitoring over the course of the disease over time and for chronic inflammatory diseases. [18,19] ESR is reported increase in acute ischemic stroke and reflected the severity of local brain damage.[20] In head injured patients, ESR level does not increase significantly in the acute phase of inflammation but last longer when compared to CRP which is other acute-phase reactant protein.[21]

In our study ESR levels were increased and in head injury patients it indicates the severity of the head injury. Low serum albumin levels significantly poor outcomes. One study found serum albumin at admission could be used as a sensitive and specific marker of burn severity and an indicator of mortality in adult patients with burn.[22] Chen et al [11] was recorded the serum albumin within 24 hours after admission could predict poor outcomes (GOS: 1–2) in patients with severe head injury. Multiple explanations have been given for the occurrence of hypoalbuminemia in head injury patients, which includes suppression of synthesis of albumin by the liver, increased consumption of albumin during stressful conditions, or loss of albumin during massive hemorrhage.[11] Leite et al [23] was found hypoalbuminemia at admission to a paediatric

intensive care unit (PICU) was associated with higher 60-day mortality. Proponents of the Lund concept [24] have been using the albumin to decrease oedema in brain injury patients and say that it is equivalent to the conventional methods given by the Brain Trauma Foundation.[25] Moreover, albumin could improve the metabolic activity of neuron by favouring the transfer of pyruvate from astrocytes to neurons.[26] The latter finding is extremely important since it suggests that albumin does not merely improve flow but re-equilibrates the balance between oxygen transport and demand. Albumin also has a favourable therapeutic time window allowing administration within a clinically feasible delay.[27]

CONCLUSION:

Thrombocytes increased in the inflammation process due to the increased activity of platelet in head injury patients. ESR is elevated in head injury patients, it indicates inflammation severity in head injury. Albumin can become a useful and affordable marker. Low serum albumin levels significantly poor outcomes and are used as a prognostic biomarker in predicting outcomes in patients with Head injury.

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