

# Evaluation of Albumin, Fibrinogen Levels with Orthopedics Traumatic Patients' Outcome after Massive Transfusion in Tertiary Care Hospital at Peshawar

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## ABSTRACT

**Objective:** Objective of study was assessment of fibrinogen and albumin levels association with orthopedics traumatic patients' outcome who received massive transfusion

**Study Design:** Observational / cross sectional study.

**Place and Duration of Study:** This study was carried out at orthopedic department of a tertiary care Hospital, Peshawar from March 2014 to July 2015

**Materials and Methods:** In all patients, the initial resuscitation was performed as soon as admitted to the emergency room. Blood samples were obtained at admission and after 24 h. Part of the serum was frozen and stored at -70°C for determination of fibrinogen and albumin by an immunoturbidometric assay. Electrolytes, hemoglobin, and hematocrit levels were measured on admission. For early restoration, normal saline or ringer was used, clinical events were recorded thereafter until death or hospital discharge.

**Result:** We were studied forty six traumatic patients with severe limb injuries and result showed that 20 patient (41.3%) and 27 (58.7%) were alive. There was significant difference outcome observed in fibrinogen level after 24 h and in case of albumin levels, there was no significant difference observed.

**Conclusions:** When orthopedics traumatic patients received massive transfusion, fibrinogen level play significant role in determination of these patients, while serum albumin is not important factor.

**Key Words:** Albumin, coagulopathy, fibrinogen, massive blood transfusion

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## INTRODUCTION

Serum albumins are globular proteins which are soluble in water and less soluble in salt solution. Albumin are not glycosylated like other blood plasma proteins. Albumin containing substance is called albuminoids, such as egg white. It is transport protein.<sup>1-3</sup> In blood plasma, serum albumin is important protein.<sup>4</sup> It binds water and biomolecules (bilirubin, thyroxine (T4), cations, hormones, pharmaceuticals and fatty acids), colloidal osmotic pressure is also maintained by albumin.

Vitamin D and its metabolites are bind with Vitamin D-binding protein as well as to fatty acids. The there is isoelectric point<sup>4,9</sup> for albumin. Serum albumin is synthesized in liver and which further synthesized large proportion of all plasma protein. Serum albumin is 50% of human plasma protein.<sup>[7]</sup> For maintaining the oncotic pressure, serum albumin control blood volume (also known as colloid osmotic pressure).<sup>[7]</sup> They also Serum albumin play as carriers for molecules of low water solubility. It is also carrier for (lipid-soluble hormones, bile salts, phenobuta-zone, unconjugated bilirubin, apoprotein, clofibrate & phenytoin, calcium, ions, and some drugs like warfarin) Blood clots are formed due to fibrinogen in human and it is glycoprotein. Three nodules held together to form fibrinogen by a very thin thread and its diameter between 8 and 15 Angstrom (Å). The fibrinogen molecule is converted into fibrin during clot synthesis. Shape is rod-like with dimensions of  $9 \times 47.5 \times 6$  nm and at physiological pH (IP at pH 5.2) showed negative charge. Hepatocytes are formed fibrinogen in liver.<sup>6</sup> Afibrinogenemia or disturbed function of fibrinogen is mentioned in a some cases.<sup>7</sup> Without pathological result it cause either thromboembolic complications or bleeding. More common are acquired deficiency stages

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that can be detected by laboratory tests in blood plasma or in whole blood by means of thrombelastometry.<sup>8</sup> After hemodilution, in trauma patients and blood losses are caused acquired deficiency and also in sepsis, during some stages of disseminated intravascular coagulation (DIC), deficiency of fibrinogen patient, by infusion of fresh frozen plasma (FFP) the correction of bleeding is possible, cryoprecipitate by fibrinogen concentrates. There is increasing report in patients with bleeding that correction of fibrinogen deficiency or fibrinogen synthesis disorders are very important.<sup>9</sup> Prevalence of death due to Trauma is higher in young age. Causes of large number of death are<sup>10</sup> Hemorrhagic shock and exsanguinations, accounting for more than 80% of deaths in the operating room and after injury nearly 50% of deaths in the first 24 h.<sup>11,12</sup> According latest study, trauma patients need massive transfusion not less than 5% of civilian patient after admissions<sup>10,11</sup> Main complications are coagulation defects in trauma patients.<sup>12,13</sup> Consumption of clotting factors with major blood loss and controlling blood pressure after administration of colloids and crystalloids for platelets and dilutional coagulopathy are linked with coagulation. Fibrinogen is also a positive acute-phase protein whose level reportedly increases in inflammatory disease, infection, or tissue damage.<sup>13</sup> The trauma coagulopathy is associated with patients mortality.<sup>14</sup> Also during severe trauma, the most typical changes included a depressed muscle protein synthesis, an increased synthesis of total liver proteins and positive acute-phase proteins, and decreased synthesis of negative acute-phase proteins like albumin.<sup>15</sup> Aim of this study was evaluation of fibrinogen and albumin levels and their association with orthopedics traumatic patients' outcome who received massive transfusion.

## MATERIALS AND METHODS

In all patients, the initial resuscitation was performed as soon as admitted to the emergency room. Blood samples were obtained at admission and after 24 h. Part of the serum was frozen and stored at -70°C for determination of fibrinogen and albumin by an immunoturbidometric assay. Electrolytes, hemoglobin, and hematocrit levels were measured on admission. For early restoration, normal saline or ringer was used, clinical events were recorded thereafter until death or hospital discharge.

**Statistical analysis:** Descriptive statistical method (frequency, percentage), mean  $\pm$  standard deviation, and Statistical Packages for Social Sciences (SPSS), version 17 for Windows software were used to statistically analyze the data. Comparison of variable changes between two patients' outcome was used by independent t-test. Regression model was used to determine the role of variables on patients' outcome. In this study,  $P < 0.05$  was regarded meaningful.

## RESULTS

We were studied forty six traumatic patients with severe limb injuries and result showed that 20 patient (41.3%) and 27 (58.7%) were alive. There was significant difference outcome observed in fibrinogen level after 24 h and in case of albumin levels, there was no significant difference observed.

In final outcome of traumatic patients regression model showed significant role who received massive transfusion odds ratio 0.48, 95% confidence interval 0.15–0.92,  $P = 0.02$ ). Result showed in table 1, 2 & 3

**Table No.1: Comparison of hemoglobin and clinical finding between two groups of traumatic patients (dead and alive)**

Parameters	Dead Patients N=20	Alive patients N=26
Age	37.4 $\pm$ 10.9	38.3 $\pm$ 9.9
ISS Score	26.9 $\pm$ 1.3	27.9 $\pm$ 1.2
Hemoglobin g/d	9.2 $\pm$ 1.4	9.2 $\pm$ 0.9

ISS: injury severity score

**Table No.2: Comparison of fibrinogen and clinical finding between two groups of traumatic patients (dead and alive)**

Parameters	Dead Patients N=20	Alive patients N=26
Age	37.4 $\pm$ 10.9	38.3 $\pm$ 9.9
ISS Score	26.9 $\pm$ 1.3	27.9 $\pm$ 1.2
Fibrinogen at admission g/dl	45.9 $\pm$ 11.9	47.1 $\pm$ 11.3
Fibrinogen after 24 h g/dl	125.2 $\pm$ 19.1	86.3 $\pm$ 13.9

ISS: injury severity score

**Table No.3: Comparison of albumin and clinical finding between two groups of traumatic patients (dead and alive)**

Parameters	Dead Patients N=20	Alive patients N=26
Age	37.4 $\pm$ 10.9	38.3 $\pm$ 9.9
ISS Score	26.9 $\pm$ 1.3	27.9 $\pm$ 1.2
Albumin at admission g/dl	33.2 $\pm$ 1.7	33.9 $\pm$ 2.1
Albumin after 24 h g/dl	32.3 $\pm$ 1.9	32.9 $\pm$ 2.2

ISS: injury severity score

## DISCUSSION

Massive bleeding leads to loss, consumption, and dilution (by volume therapy) of coagulation factors.<sup>16</sup> The first factor critically decreased is fibrinogen.<sup>17</sup> The aim of any hemostatic therapy is to minimize blood loss and transfusion requirements. Morbidity and mortality are increased with increased transfusion in traumatic patients.<sup>17,18</sup> With coagulopathy, mortality is virtually quadrupled with similar injury severity patient.<sup>17</sup>

Massive transfusion is associated with impair coagulation in multiple trauma patients.<sup>17,18</sup> In the study by Stinger et al.,<sup>19</sup> Those patient received massive transfusion fibrinogen levels was significantly increased. Mortality is linked with fibrinogen levels.<sup>19</sup> Georg et al.,<sup>20</sup> Higher rates of survival is linked with higher plasma fibrinogen level.<sup>20</sup> New study showed that Pre- and postoperative bleeding, fibrinogen level of 150-200 mg/dl is also higher.<sup>20</sup> A high fibrinogen play role in case of loss high blood amount as protective effect, we were given to priority to administer fibrinogen concentrate correction in multiple trauma patients of incorrect fibrin synthesis.<sup>21</sup> The critical threshold was suspected at a level below 100 mg/dl as shown by Hiippala et al.<sup>22</sup> Myburgh<sup>23</sup> showed that no evidence of any survival benefit associated with resuscitation with hyperoncotic albumin. In our study, like previous studies fibrinogen levels are important role in determining the final outcome for trauma patients. Although in medical literature, various factors such as severity of injury, age, and hemoglobin level has shown to be effective in patient mortality.<sup>24</sup> However, in our study, both patients groups were similar and provided high reliability. Unlike studies<sup>15</sup> that have been conducted in patients with head trauma, albumin concentration did not play a role for prediction in patients with limb injuries after receiving massive transfusion.

## CONCLUSION

When orthopedics traumatic patients received massive transfusion, fibrinogen level play significant role in determination of these patients, while serum albumin is not important factor.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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