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Original Research Article

Preoperative serum albumin as predictor of adverse outcome in emergency abdominal surgery

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ABSTRACT

Background: Serum albumin is a useful indicator of protein energy malnutrition, which may and may not be clinically apparent, but is linked to a significantly higher risk of morbidity and mortality. In this study, we assess the post-operative morbidity with relation to pre-operative albumin status, in patients undergoing emergency abdominal surgery.
Methods: In this hospital based observational study, 96 patients undergoing emergency abdominal surgery at Assam Medical College and Hospital were included. Hypoalbuminemia was diagnosed if serum albumin level was less than 3.5 gm/dl. Types of surgery and postoperative complications were included in the study. Any association between preoperative serum albumin level and postoperative morbidity was assessed. Study period was between May 2020 to May 2021.
Results: Pre-operatively, 56 patients had hypoalbuminemia (serum albumin <3.5 g/dl) and 40 patients had normal albumin levels (≥3.5 g/dl). Out of 96 patients, 32 (33.3%) developed complications postoperatively. 25 patients (44.6%) out of 56 patients with hypoalbuminemia (with serum albumin <3.5 g/dl) had complications. 7 patients (17.5%) with albumin level ≥3.5 g/dl had complications. Surgical site infection was found in 7 (17.5%) cases with albumin >3.5 g/dl and 21 (37.5%) cases with less than 3.5 g/dl ($p \leq 0.033$). Wound dehiscence was found in 1 (2.5%) case with >3.5 g/dl serum albumin against 9 (16.1%) cases with less than 3.5 g/dl ($p \leq 0.031$). Mean length of hospital stay was found to be higher i.e. 9.73±4.85 days in patients with hypoalbuminemia, compared to 6.45±3.31 days with those having albumin level ≥3.5 g/dl.
Conclusions: Preoperative albumin is a useful low-cost prognostic predictor for predicting surgery outcome.

Keywords: Serum albumin, Emergency surgery, Morbidity

INTRODUCTION

Malnutrition is prevalent in roughly 30% of surgical patients with gastrointestinal illnesses, and up to 60% of those whose hospital stay has been extended due to post-operative complications. There is substantial proof that patients with malnutrition have a higher risk of complications and death than individuals with adequate nutrition.[1,2]

Initially, serum albumin was misinterpreted, and the significance of serum albumin in assessing a person's nutritional makeup was overlooked. Albumin, a negative acute-phase protein. When there is acute illness or stress, a reduction in serum albumin occurs due to alterations in hepatic metabolism, and loss of albumin into the interstitium. It also shows an immediate response to surgical stress. As a result, it may meet the criteria for predicting a difficult post-operative course.

This study is an attempt to analyze the correlation between preoperative hypoalbuminemia and surgical complications encountered in patients undergoing emergency abdominal surgery.

METHODS

In this hospital based observational study,96 patients undergoing emergency abdominal surgery at Assam Medical College and Hospital were included. Data on type of surgery, post-operative complications were collected. Patients with no significant comorbidity admitted and operated within 24 hours were included in the study. The study period was between May 2020 to May 2021. Serum albumin level of 3.5 g/dl was considered the standard baseline in the study.[9] Serum albumin level was less than 3.5 gm/dl was considered as hypoalbuminemia. The association between preoperative serum albumin level and postoperative morbidity was assessed.

Exclusion criteria

It included: patients with chronic debilitating disease like-patients having anemia with hemoglobin <7 g/dl, liver failure, nephrotic syndrome, diabetic patients; immunocompromised patients; femoral hernias; perforation due to medical causes like typhoid ulcer perforation; patients with associated head injury, orthopedic injury, renal injury, chest trauma; and patients who did not give consent to be included in the study.

Ethical clearance was obtained from the institutional ethics committee (human) of Assam Medical College and hospital prior to the conduction of the study.

Statistical analysis was done with help of Chi-square test and t-test using statistical package for the social sciences (SPSS) version 16. A p value of <0.05 was considered statistically significant.

RESULTS

Of the 96 patients studied, 63.5% were male and 36.5% were female. Pre-operatively, 56 patients had hypoalbuminemia (serum albumin <3.5 g/dl) and 40 patients had normal albumin levels (≥3.5 g/dl). The mean preoperative serum albumin level of the patients included in the study was 3.26 g/dl with standard deviation (SD) of 0.57.

Table 1: Indications for emergency laparotomy.

Indications	Number of patients	Percentage
Perforated peptic ulcer	36	37.6
Acute intestinal obstruction		
Malignant	24	30.2
Non malignant	5	
Appendiceal perforations	14	14.5
Incarcerated ventral hernia	6	6.2
Strangulated hernia	11	11.5

25 patients (44.6%) out of 56 patients with hypoalbuminemia (with serum albumin <3.5 g/dl) had complications.7 patients (17.5%) with albumin level ≥3.5 g/dl had complications. The most common indication for emergency abdominal surgery was peptic ulcer perforation 36 (37.6%), followed by acute intestinal obstruction 29 (30.2%). Surgical site infection was commonest complication found in 28 (29.1%) cases. Wound dehiscence was found in 10 (10.4%) case. Mean length of hospital stay was found to be higher i.e. 9.73±4.85 days in patients with hypoalbuminemia, compared to 6.45±3.31 days with those having albumin level ≥3.5 g/dl.

Table 2: Post-operative morbidity associated with hypoalbuminemia.

Complications	S. albumin <3.5 g/dl (56)	S. albumin >3.5 g/dl (40)	Total (96), p value
Surgical site infection (%)	21 (37.5)	7 (17.5)	P<0.033
Wound dehiscence (%)	9 (16.1)	1 (2.5)	P<0.031
Mean length of hospital stays (days)	9.73±4.85	6.45±3.31	P<0.05

Table 3: Sex distribution.

Sex	Number	Percentage
Male	61	63.5
Female	35	36.5
Total	96	100

Table 4: Age distribution.

Age (years)	Total no.
18-27	11
28-37	24
38-47	24
48-57	16
58-67	12
68-77	6
≥78	3

DISCUSSION

Preoperative malnutrition has been an important risk factor for postoperative morbidity and mortality for over 70 years. Serum hepatic protein (albumin, transferrin, and prealbumin) levels have long been connected to nutritional status in clinical practice.[3]

Hormones like insulin and growth hormone are examples of factors that stimulate albumin synthesis. Pro-inflammatory mediators such as interleukin-6 (IL-6), interleukin-1 (IL-1), and tumor necrosis factor may inhibit

albumin production.[4] Albumin accounts for 75% of the oncotic plasma pressure.[5] Plasma albumin binds to free fatty acids, bilirubin, steroid hormones, calcium, and copper and transports them.[6] It has been demonstrated that the albumin-heme complex has a lipid antioxidant action.[5] Albumin moderate inflammation, minimize oxidative damage.[5] Albumin serves as a source of amino acids for tissue protein synthesis.[6] Perioperative levels of serum albumin have been shown to be powerful predictors of morbidity and mortality.[7] Hypoalbuminemia was linked to poor tissue healing, reduced collagen production in surgical wounds or anastomoses, and impaired immunological response.[8] Preoperative serum albumin plays a critical role in determining a patient's postoperative outcome after major surgery.[5]

The most common indication for emergency abdominal surgery was peptic ulcer perforation 36 (37.6%), followed by acute intestinal obstruction 29 (30.2%). In a study of 50 patients undergoing emergency exploratory laparotomy, it was found that 29 of the 50 patients (58%) had complications. Of these, the most commonly observed complication was wound dehiscence and sepsis. patients with complications had a mean preoperative albumin level of 2.78 g/dl ($p<0.05$). The preoperative albumin values had an inverse relation with the length of hospital stay, whereas the reduction in albumin levels had a positive correlation with the length of hospital stay.[9]

Truong et al performed a systematic literature review through an electronic search of MEDLINE from PubMed and the Cochrane library found that hypoalbuminemia has a major impact on the length of stay in the hospital, the rate of surgical site infections, the likelihood of enterocutaneous fistulas, and the development of deep vein thrombosis.[10]

Hu et al, on 42,483 patients undergoing gastrointestinal surgery found that serum albumin <3.5 g/dl was associated with wound dehiscence ($p<0.0001$).[11] In the present study SSI was found in 17.5% cases with ≥3.5 g/dl albumin whereas the incidence of SSI increased to 37.5% with <3.5 g/dl albumin. Mean length of hospital stays was found to be 6.45±3.31 days in cases with ≥3.5 g/dl albumin whereas it increased to 9.73±4.85 days with <3.5 g/dl albumin. There was a significant association of all these complications with preoperative hypoalbuminemia.

Limitations

Limitations of the study include: single institute study, small sample size due to COVID crisis, timing of pre-operative albumin estimation was not mentioned, and relation of surgical complication with albumin is only studied, diabetes mellitus, uraemia and jaundice, disseminated malignancy and acquired immune deficiency syndrome (AIDS) are other contributors are not considered in this study.

CONCLUSION

Preoperative albumin is a useful prognostic predictor for predicting surgical outcome, especially in emergency surgery. It is a simple-to use test. Post-operative morbidity in surgical patients could be decreased by assessing albumin levels in preoperative period, as hypoalbuminemia has adverse relation with surgical outcome. So, it is preferable to have normal albumin perioperatively.

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