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Original Article

Preoperative Hypoalbuminemia as a Predictor of Postoperative Complications in Elective GI Surgery

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ABSTRACT

Background: *Serum albumin is a key biomarker that reflects the nutritional and inflammatory status of patients and plays a critical role in predicting surgical outcomes. Hypoalbuminemia, or low serum albumin levels, has been associated with increased risk of postoperative complications. This study aimed to assess preoperative hypoalbuminemia as a predictor of postoperative complications in elective GI surgery.* ***Methods & Materials:*** *This prospective observational study was conducted at Department of Surgery, Sir Salimullah Medical College and Mitford Hospital, Dhaka, from from July 2021to December 2021. A total of 38 patients were selected as study subjects by purposive sampling technique. Each group had 19 patients (Group A: Albumin level <3.5 g/dL, Group B: Albumin level ≥3.5 g/dL). Data were analysed using SPSS version 24.0.* ***Result:*** *Serum albumin levels were significantly lower in Group A both preoperatively and on the 1st postoperative day (p <0.001). Overall, 52.6% of patients developed postoperative complications, most commonly abdominal SSI (18.4%), with significantly higher complication rates in Group A (89.5%) compared to Group B (15.8%) (p<0.001).* ***Conclusion:*** *In this study, it is observed that following major abdominal surgery, post-operative complications (abdominal SSI, wound dehiscence, wound infection, anastomosis fistula, reoperation, anastomosis fistula and mortality) were significantly more among pre-operative hypoalbuminaemic patients than no-hypoalbuminaemic patients.*

Keywords: *Hypoalbuminemia, Postoperative Complications, Elective GI Surgery, Wound Infection*

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INTRODUCTION

Albumin is an important protein that transports hormones, fatty acids and exogenous drugs; it also maintains plasma oncotic pressure. Albumin is considered as negative active phase protein because it decreases during injuries and sepsis. Serum albumin has traditionally been used as a quantitative measure of a patient's nutritional status because of its ready availability and low cost. Hypoalbumenia may be due to combination of decreased albumin production, increased loss, acute dilution or fluid shift from vascular space. Albumin can be lost through epidermal, renal or gastrointestinal sources. Patients with acute emergency condition are classic for developing hypoalbumenia due to their poor nutritional status. The correct assessment of nutritional status of such patients is crucial since malnutrition is a risk factor for morbidity and mortality. Albumin is a direct measure of nutritional and immunological status and one of the essential components of wound healing process [1]. Protein metabolism is significantly disturbed after any kind of traumatic event, for example, surgery, sepsis, burn injuries. Albumin has been identified as a reliable indicator of this process. The importance of acute phase proteins during the early postoperative phase impairs hepatic albumin synthesis to facilitate the production of these acute phase molecules (CRP, fibrinogen, and macroglobulin) needed in the host defense process. Basal energy expenditure increases nearly 10-fold in the early postoperative phase, and up to 20% of the body's store in protein can be consumed within ten days to favor gluconeogenesis. The most important postoperative losses of albumin however are due to sequestration into the third space. Serum albumin less than 3.5 g/dL was regarded as hypoalbuminemia [2]. It was observed that the rate of complications were more in patients with serum albumin levels less than 3.5 g/dl in the study [3]. Complications are defined as any deviation from the normal postoperative course. Many studies have shown that low preoperative serum albumin is a risk factor for postoperative complications. Hypoalbuminemia was associated with poor tissue healing, decreased collagen synthesis in the surgical wounds or at the anastomosis and impairment of immune responses, such as macrophage activation and granuloma formation. However, no study has been reported relating to

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hypoalbuminemia and outcomes in major gastrointestinal surgery in our country until now. We aimed to identify the relationship between preoperative hypoalbuminemia and the development of complications following open elective major gastrointestinal surgery in our institution [4]. The outcomes of interest will be delayed wound healing, wound dehiscence and anastomotic leak within 5 days of operation and death within 30 days of post operation [5]. Delayed wound healing was counted as prolongation of healing for more than 7 days due to interruption of normal process of wound healing and death within 30 days post operation. When a participant encountered one of the named outcomes of interest, it will be measured as an adverse outcome [6]. This study aimed to assess preoperative hypoalbuminemia as a predictor of postoperative complications in elective GI surgery.

METHODS & MATERIALS

This prospective observational study was conducted at the Department of Surgery, Sir Salimullah Medical College and Mitford Hospital, Dhaka, from July 2021 to December 2021. Patients who were admitted for any elective major gastrointestinal surgery under the Department of Surgery in Sir Salimullah Medical College & Mitford Hospital were considered as the study population. A total of 38 patients were selected as study subjects by purposive sampling technique. Each group had 19 patients (Group A: Albumin level <3.5 g/dL, Group B: Albumin level ≥3.5 g/dL). After collection of all the required data, these were checked, verified for consistency, and tabulated using the SPSS/PC 24 software. Statistical significance was set as a 95% confidence level at 5% acceptable error level. Data were presented as the proportion of valid cases for discrete variables and as means ± standard deviations and/or medians with interquartile ranges for continuous variables. Independent sample T was done for the continuous variables, whereas the Chi-square test was done to express the association between categorical variables. A p-value of <0.05 was considered significant. Written informed consent was taken from each patient.

Inclusion criteria:

- Age ranges between 18 to 70 years.
- The patient undergoing the following surgical procedures will be included in this study –
- Gastric surgery (total or partial gastrectomy) & gastro-jejunostomy
- CBD exploration & choledocho-jejunostomy
- Whipple's procedure
- Resection & Anastomosis
- Hemi Colectomy
- Total colectomy
- Gut restoration (ileostomy & colostomy reversal)
- Anterior Resection
- Abdominoperineal resection (APR)

Exclusion criteria:

- Patients with jaundice
- Patient with severe anemia
- Chronic renal disease
- Diabetes Mellitus
- patients on steroids or chemotherapy

RESULTS

Among 38 respondents, the majority of patients were in the age group of 31-40 years (28.9%, n=11), followed by the age group of 51-60 years (23.7%, n=9). The mean age of the Group A patients was 42.2 ± 14.3(SD) years and Group B patients were 39.6 ± 13.2(SD) years. The age distribution of the subjects and the mean age were matched between the two groups (p >0.05).[Table I]

Table – I: Distribution of the study population by age (*n*=38)

Age (Years)	Group A (n=19) n (%)	Group B (n=19) n (%)	Total (n=38) n (%)	p-value
Age group				
18-20	2 (10.5)	1 (5.3)	3 (7.9)	0.93*
21-30	2 (10.5)	4 (21.1)	6 (15.8)	
31-40	5 (26.3)	6 (31.6)	11 (28.9)	
41-50	4 (21.1)	3 (15.8)	7 (18.4)	
51-60	5 (26.3)	4 (21.1)	9 (23.7)	
61-70	1 (5.3)	1 (5.3)	2 (5.3)	
Total	19 (100)	19 (100)	38 (100)	-
Mean age ± SD	42.2 ± 14.3	39.6 ± 13.2	40.9±13.8	0.57**

**Chi-square test and **Independent student t-test were performed to compare between two groups; Group A: Albumin level <3.5 g/dL; Group B: Albumin level ≥3.5 g/dL*

Among 38 respondents, the majority of patients were male in both groups (Group A- 57.9% and Group B- 52.6% respectively). Both groups were statistically similar regarding gender distribution (p >0.05). [Table II]

Table – II: Gender Distribution among Respondents (*n*=38)

Gender	Group A (n = 19)	Group B (n = 19)	Total (n = 38)	p-value
Male	11 (57.9%)	10 (52.6%)	21 (55.3%)	> 0.05
Female	8 (42.1%)	9 (47.4%)	17 (44.7%)	

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There was a significant difference found in the pre-op and 1st POD findings of serum albumin levels of both groups. Pre-operative Serum albumin levels were significantly lower in Group A patients compared to Group B patients (p <0.001) and on the 1st postoperative day, serum albumin levels were significantly higher in Group B patients compared to Group A (p <0.001). [Table III]

Table – III: Pre-op and 1st POD findings of Serum Albumin level of the study population (*n*=38)

S. Albumin (g/dL)	Group A (n=19) Mean ± SD	Group B (n=19) Mean ± SD	p-value*
Pre-op	3.1 ± 0.25	4 ± 0.32	<0.001
1st POD	2.74 ± 0.21	3.9 ± 0.33	<0.001

**An independent student t-test was performed to compare between two groups; Group A: Albumin level <3.5 g/dL; Group B: Albumin level ≥3.5 g/dL*

Table IV shows the postoperative outcomes of the study population. Out of 38 patients, 20 patients' i.e. 52.6% had postoperative complications and 18 patients i.e. 47.4% had no complications. The most common complication was found to be abdominal SSI (18.4%) followed by in decreasing order wound dehiscence (10.5%), wound infection (7.9%), reoperation (7.9%), and anastomosis fistula (2.6%). Mortality was seen in 5.3% of cases. [Table IV]

Table – IV: Post-operative outcomes of the study population (*n*=38)

Complications	Frequency (n)	Percentage (%)
No complications	18	47.4
Post-operative Complications		
Abdominal SSI	7	18.4
Wound Infection	3	7.9
Wound dehiscence	4	10.5
Anastomosis fistula	1	2.6
Reoperation	3	7.9
Mortality	2	5.3
Total	20	52.6

When patients were grouped with serum albumin in the normal and low range and postoperative complications were compared it was noticed that 89.5% (where two is mortality) of the complication was in the group with serum albumin of <3.5gm/dl. There were only 15.8% of complications in the group with serum albumin ≥3.5gm/dl. This showed that patients with low serum albumin had more complications which were statistically significant (p <0.001). [Table V]

Table – V: Relation between serum albumin level and postoperative complications (*n*=38)

S. Albumin level	Postoperative Complications		Total n (%)	p-value*
	Present n (%)	Absent n (%)		
<3.5g/dl	17 (89.5)	2 (10.5)	19 (100)	<0.001
≥3.5 g/dl	3 (15.8)	16 (84.2)	19 (100)	
Total	20 (52.6)	18 (47.4)	38 (100)	-

**A Chi-square test was performed to compare between two groups; Group A: Albumin level <3.5 g/dL; Group B: Albumin level ≥3.5 g/dL*

DISCUSSION

Gastrointestinal surgery patients are at risk of nutritional depletion from inadequate nutritional intake, surgical stress, and the subsequent increase in metabolic rate [7,8]. The mean age of the patient studied was 61(18-87yrs) and 64.6% were men. The present study included a total of 38 patients over six months. The mean age of the patients was 41±13.61 (SD) years with 55.3% of men and 44.7% were women. A study conducted by S Kumar et al. reported that out of 190 patients, 117 (61.5%) patients were male, and 73 (38.5%) patients were female [1]. Decrease in the serum albumin level preoperatively which is a risk factor for surgical complications is associated with increased hospital cost, increased length of hospital stay, increased burden on family, and decreased quality of life. One of the best biochemical parameters to assess nutritional status is estimating the serum albumin level and it is a simple and cost-effective method. Beghetto et al. done on 434 patients who were evaluated for the accuracy of nutritional assessment tools for predicting adverse hospital outcomes, it was concluded that serum albumin level was the strongest predictive parameter for death and hospital infection(<3.5g/dl) [9]. In a retrospective study by Kudsk *et al.* of 526 surgical patients who had preoperative serum albumin levels measured and were undergoing elective oesophageal, gastric, pancreaticoduodenal, and colon surgery, a serum albumin level below 3.25gm/dl correlated immensely with complications [10]. This was similar to what was observed in the present study. In the current study, when patients were grouped with serum albumin in the normal and low range and postoperative complications were compared it was noticed

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that 89.5% (where two is mortality) of the complication was in the group with serum albumin of <3.5gm/dl. There were only 15.8% of complications in the group with serum albumin ≥3.5gm/dl. In a study by Hubner et al, the rate of complication was higher when serum albumin was less than 3g/dl [11]. In the present study, patients with low serum albumin levels (<3.5g/dl) had more complications which were statistically significant (p <0.001). Gould *et al.* studied the effect of hypoalbuminemia (Serum albumin levels< 3g/dl) upon admission of patients to surgical ICU due to vascular insufficiency, hip fractures, gastrointestinal bleeding, cancer, perforated viscus, intra-abdominal infection, or bowel obstruction. Complications were higher in patients with hypoalbuminemia (36.9%) and mortality of 5.8% [12]. In a study by Lohsiriwat V *et al*, 29% of hypoalbumenic patients developed complications where none occurred in nonhypoalbumenic patients.[2] Sonoda *et al*, Montomoli *et al*, and Gohil *et al*, showed that the preoperative serum albumin has an impact on the morbidity following colorectal surgery in their respective studies [13-15]. In the present study, preoperative serum albumin less than 3.5g/dl has the highest complication (89.5%) and death (10.5%) than albumin more than or equal to 3.5g/dl (15.8% and 0%) which was statistically significant with a p-value less than 0.001 and the majority of complications occurred in patients with albumin less than 2.5g/dl to 3g/dl.

Limitations of The Study

This study has some limitations, including its single-center design and a relatively small sample size, which may limit the generalizability of the findings. Additionally, the absence of randomization could introduce selection bias, affecting the internal validity of the results. Furthermore, the study period was limited to six months, which may be insufficient to capture long-term outcomes and conduct a comprehensive quality assessment.

CONCLUSION

In this study, it is observed that following major abdominal surgery, post-operative complications (abdominal SSI, wound dehiscence, wound infection, anastomosis fistula, reoperation, anastomosis fistula, and mortality) were significantly more among pre-operative hypoalbuminemia patients than no-hypoalbuminemia patients.

RECOMMENDATION

A larger randomized controlled trial is recommended to validate these findings. Additionally, preoperative correction of hypoalbuminaemia should be considered in patients undergoing elective major abdominal surgery to potentially improve outcomes.

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