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Original Research Article

Pre-operative serum albumin and body mass index as predictors of post-operative morbidity and mortality in perforation peritonitis secondary to peptic ulcer disease

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ABSTRACT

Background: Peptic ulcer disease (PUD) affects 4 million people worldwide annually. Perforated peptic ulcer is a serious complication of PUD and patients often present with acute abdomen that carries high risk for morbidity and mortality. This is worsened in patients who are malnourished. The incidence of malnutrition is around 30% in patients with gastrointestinal disease and is frequently unrecognized. Albumin or prealbumin levels may help identify these patients. Obesity is also another cause for morbidity and has deleterious effects on wound healing. Therefore this study was carried out to assess if preoperative serum albumin and body mass index can be used as predictors of morbidity and mortality in patients with perforated peptic ulcers.
Methods: 70 patients with peptic perforation peritonitis presented to the hospitals attached to Bangalore Medical College and Research Institute from November 2018 to May 2020 and were included in the study. Pre-operative Serum Albumin and BMI was noted and the patients were followed up for 30 days.
Results: Mean albumin level in our study was 3.01. The patients with Serum Albumin <3.5 g/dl have more complications compared to patients with >3.5 g/dl. Morbidity and mortality increases with severity of hypoalbuminemia. This study was statistically significant with a p value <0.05. In our study, we also found that patients with abnormal BMI have more complications than patients with normal BMI but it is statistically insignificant with a p value >0.05.
Conclusions: Serum albumin is a good indicator for predicting postoperative morbidity and mortality in peritonitis secondary to peptic ulcer disease.

Keywords: BMI, Peptic ulcer disease, Serum albumin

INTRODUCTION

Each year peptic ulcer disease (PUD) affects 4 million people around the world. The incidence of PUD has been estimated at around 1.5 to 3%.[1] Complications are encountered in 10%-20% of these patients and 2%-14% of the ulcers will perforate. Perforated peptic ulcer (PPU) is a quite rare, but a life threatening disease and the mortality varies from 10%-40%. Main etiologic factors include use of non-stereoidal anti-inflammatory drugs (NSAIDs), steroids, smoking, Helicobacter pylori infection and a diet high in salt. All these factors have in common that they affect acid secretion in the gastric mucosa.[2]

Wound healing requires energy and is a catabolic process. Patients who are severely malnourished demonstrate impaired wound healing and predisposition

to infection. They also suffer deficient immune mechanisms. The catabolic effects of disease or injury can be reversed by adequate nutritional support. The degree of malnutrition is estimated on the basis of weight loss during the past 6 months, physical findings and plasma protein assessment.[3]

Patient outcome can be predicted by a variety of valuable nutritional indices by means of risk stratification and objective comparison among patients but when used alone there is no consensus on the best method for assessing the nutritional status. Serum Albumin level is the most readily available and clinically useful parameter. A Serum Albumin level greater than 3.5g/dl suggests adequate protein stores. A Serum Albumin level less than 3.5g/dl raises concern for potential surgical complications.

Albumin or prealbumin levels may help identify patients with some degree of malnutrition, and physical findings of temporal wasting, cachexia, poor dentition, ascites or peripheral oedema may be corroborative.[4] Obesity is also another cause for morbidity and has deleterious effects on wound healing.[5] A body mass index of 19kg/m^2 - 25kg/m^2 for an average adult suggests a normal nutritional status. A BMI of less than 18kg/m^2 suggests an abnormal nutritional status and may lead to potential surgical complications.

The aim of nutritional support was to identify those patients at risk of malnutrition and to ensure that their nutritional requirements are met by the most appropriate route and in a way that minimizes complications.[3]

METHODS

This prospective observational study was conducted in hospitals attached to Bangalore Medical College and Research Institute, Bengaluru from November 2018 to December 2020. The patients that were included in the study were patients above the age of 18 years who presented to the hospital with features suggestive of hollow viscus perforation and intraoperative findings suggestive of peptic ulcer perforation. Patients with immunosuppression, severe anemia, chronic liver and renal disease were excluded from the study. Also excluded were patients with proven malignancy post operatively.

In these patients, preoperative Serum albumin and BMI were noted and post operatively these patients were followed up till 30 days. Post operatively, the complications were noted in these patients and correlation was done with preoperative serum albumin and body mass index values.

Statistical analysis

The data was analyzed by descriptive statistical principles and all the data is expressed as Mean, Median, SD, interquartile range, percentages, tables and graphs wherever necessary. Chi square test was used to measure the association between Serum albumin and body mass index with mortality and morbidity and these are expressed as frequency and percentage and it is used to see the significant difference between groups. P-value <0.05 was considered statistically significant.

Estimation of sample size

The sample size calculation is given by the formula:

$$n = \frac{Z\alpha 2 \text{ X } Sn\ (100-Sn)}{L2 \text{ X Prevalence}}$$

Where, Zα = Standard table value for 95% CI = 1.96
Sn = Sensitivity
L = 5% of P = Precision

Based on a previous study by Bhagvat et al, sensitivity is 92.3% when value is <4 for morbidity/mortality.[6] Therefore, sample size calculation is,

$$n = \frac{(1.96)^2 \text{ X } 92.3\ (100-92.3)}{(4.62)^2 \text{ X } 5}$$

n = 70

RESULTS

This study was conducted on 70 patients, with ages ranging between 18-74 years, who underwent any emergency abdominal surgery in Bangalore Medical College and Research Institute, Bengaluru, for peptic ulcer perforation. Among 70 patients, 37 patients developed complications with 9 deaths and 33 had an uneventful recovery.

Table 1: Association of morbidity and mortality with serum albumin levels.

Albumin levels (g/dl)	No. of patients	Complicated	Uncomplicated	Percentage	No. of pts expired	Percentage
>3.5 (normal)	22	7	15	31.8	1	4.5
2.8-3.5 (mild)	24	11	13	45.8	1	4.1
2.1-2.7 (moderate)	18	14	4	77.8	4	22.2
< 2.1 (severe)	6	5	1	83.3	3	50

Table 2: Comparison of complications between patients with hypoalbuminemia and normal serum albumin.

Complications	Hypoalbuminemia	Percentage	Normal	Percentage	P value
Prolonged ileus	3	75	1	25	0.775
SSI	22	84.6	4	15.4	0.026
Ventilator support	17	89.5	2	10.5	0.02
Sepsis	15	88.2	2	11.8	0.04
Renal complications	4	80	1	20	0.56
Pulmonary complications	14	93.3	1	6.7	0.019
Cardiac complications	1	50	1	50	0.56

Table 3: Correlation of BMI with post-operative outcome.

BMI	No. of pts	Complicated	Uncomplicated	Percentage (%)
Underweight	2	2	0	100
Normal	30	9	21	30
Overweight	38	26	12	68.4

It was observed that the rate of complications was more when serum albumin level was <2.7 g/dl and it is statistically significant. The p value is < 0.05 (p=0.011) for this chart calculated by Chi square test and the likelihood ratio is 0.005.

Total of 9 patients expired during this study of 70. Mortality was highest in the group of moderate hypoalbuminemia and severe hypoalbuminemia. This calculation is statistically significant (p <0.05).

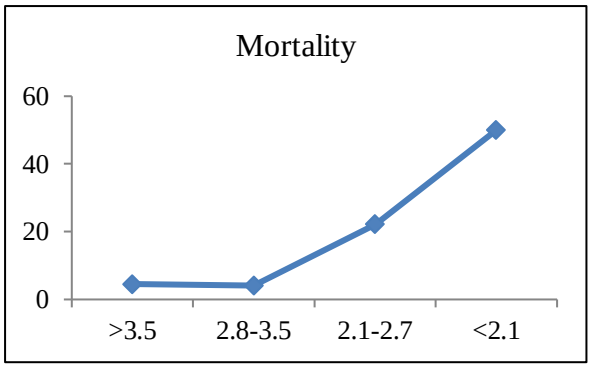

Figure 1: Association of mortality with S. Albumin level.

In the above graph, mortality is seen to increase with hypoalbuminemia. Table 2 compares all complications between patients with normal albumin levels and patients with hypoalbuminemia. The comparison was statistically significant (p<0.05) for requirement of ventilator support, sepsis, surgical site infection (SSI) and pulmonary complications.

Table 3 shows BMI levels and its association with complications. Patients with low/high BMI had more complications (70%) when compared to patients with normal BMI levels (30%).

Table 4: Association of mortality with BMI.

BMI	No. of pts expired	Percentage
Underweight	1	50
Normal	2	22.2
Overweight	6	23.1

Out of the 9 patients who expired during this study of 70 patients with peptic ulcer perforation, mortality was highest in the group of overweight patients but this calculation was not statistically significant (p=0.246).

DISCUSSION

The present study was compared with the study done by Gibb et al titled 'Preoperative Serum Albumin Level as a Predictor of Operative Mortality and Morbidity'. They collected 46 preoperative, 12 operative and 24 postoperative variables for 87,078 major surgery cases between October 1, 1991, and December 31, 1993. The present study used 2 preoperative variables and 6 postoperative variables.[7]

Table 5 compares selected complications between the two studies. All relationships were statistically significant (p<0.001) in the study by Gibbs et al. In the present study only variables like requirement of ventilator support, sepsis, SSI and pulmonary complications showed statistical significance (p<0.05). This difference can be attributed to the large sample size taken by Gibbs et al in their study.

The present study has also been compared to a study conducted by Ferrada et al on 'Obesity Does Not Increase Mortality after Emergency Surgery'. A total of 341 patients were included in their study who underwent emergency surgeries.[8]

Table 5: Comparison of selected complications based on S. Albumin level.

Complications	Hypo-albuminemia – Present study	Normal albumin – present study	Hypo-albuminemia – Gibbs et al	Normal albumin-Gibbs et al
Prolonged ileus	4.2	1.4	3.9	1.9
SSI	31.4	5.7	12.30	5.2
Ventilator support	24.3	2.8	11.2	2.3
Sepsis	21.4	2.8	8	1.3
Pulmonary complications	20	1.4	10.6	2.9
Cardiac complications	1.4	1.4	1.1	0.6

Table 7 depicts the comparison of selected complications between the present study and the study conducted by Ferrada et al.

The complication rates were noted to be higher in the present study but it was statistically insignificant.

Table 6: Comparison of morbidity and mortality based on S. Albumin levels.

Comparison	Present study	Gibbs et al.
Morbidity (%)	52.85	19.6
Mortality (%)	12.86	3.9

Table 7: Comparison of selected complications based on BMI.

Complications	Normal BMI (present study)	Overweight (present study)	Normal BMI (Ferrada et al.)	Overweight (Ferrada et al.)
SSI	15.71	21.43	4.3	9.95
Sepsis	14.3	10	2.2	4.5
Mortality	2.86	8.57	15.8	13.6

Limitations

The major limitation of the study is the sample size of 70 patients due to time constraints. Also, post operative complications are influenced by a wide variety of factors like age, other comorbid conditions, duration of perforation and presence of shock.

CONCLUSION

In our study serum albumin is a good predictor for post-operative complications in perforation peritonitis secondary to peptic ulcer disease. We also noted that an abnormal BMI was associated with more complications but was not statistically significant. Maximum number of patients were noted with Serum Albumin <2.8-3.5 g/dl. The patients with Serum Albumin <2.7 g/dl have higher percentage of complications as compared to patients with Serum Albumin 2.8-3.5 g/dl. Serum albumin <3.5 g/dl showed higher complication rate with statistical significance with $p<0.05$. Patients with Serum Albumin >3.5 g/dl had less complications with statistically significant p value <0.05.

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