



OPEN ACCESS

Key Words

Serum albumin, body mass index (BMI) and peptic perforation

Corresponding Author

Y.L. Prasad,
Department of General Surgery, MS
General Surgery, Agartala
Government Medical College,
Agartala, Tripura, India 799006
ylprasad333@gmail.com

Author Designation

¹Senior Resident
²Professor
^{3,4}Associate Professor

Received: 20 August 2024

Accepted: 11 November 2024

Published: 15 November 2024

Citation: Y.L. Prasad, Damodar Chatterjee, Partha Sarathi Pal and Diptendu Chowdhury, 2024. Serum Albumin and Body Mass Index as Predictors of Outcome in Peptic Perforation Surgeries: A Hospital Based Cross-Sectional Study. Res. J. Med. Sci., 18: 77-81, doi: 10.36478/makrjms.2024.12.77.81

Copy Right: MAK HILL Publications

Serum Albumin and Body Mass Index as Predictors of Outcome in Peptic Perforation Surgeries: A Hospital Based Cross-Sectional Study

¹Y.L. Prasad, ²Damodar Chatterjee, ³Partha Sarathi Pal and ⁴Diptendu Chowdhury

^{1,2,4}Department of General Surgery, Agartala Government Medical College, Agartala, Tripura, India 799006

³Department of Biochemistry, Agartala Government Medical College, Agartala, Tripura, India 799006

ABSTRACT

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. To study association of pre op serum albumin and body mass index with outcome of peptic perforation surgeries. This study is a cross sectional study conducted at the Department of Biochemistry, AGMC and GBP Hospital, Agartala period from December 2019 to June 2021. This graph shows the complication rate in the study. 57 of the 70 patients constituting 81% had postoperative complications including deaths. The most common complication was surgical site wound infection 45(64%), followed by pulmonary complications 31(44%), requirement of ventilator support 23(33%), sepsis 16(22%), Prolonged ileus 13(19%) and cardiac complications 10 (12%). Preoperative serum albumin and BMI serve as valuable predictors for postoperative outcomes in peptic perforation surgeries. Monitoring these parameters could enhance risk stratification and postoperative management, potentially improving patient prognosis.

INTRODUCTION

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. Malnutrition is common. It appears in about 30 per cent of surgical patients with gastrointestinal disease and up to 60 per cent of those in whom hospital stay has been prolonged because of postoperative complications. 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. A body mass index of 19kg/m²-25kg/m² for an average adult suggests a normal nutritional status. A BMI of less than 18kg/m² suggests potential surgical complication. The aim of nutritional support is 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^[1]. Peptic ulcer disease with perforation is a surgical disease, conservative management means emergency surgical intervention. Perforation has highest mortality rate of any complication of ulcer disease, approaching to 15%^[2]. The patients are to be followed up after surgery and watched for complications like wound gaping, seroma formation, wound infection, flap necrosis, fistula formation etc. during the post-operative period. The purpose of this study is because the peptic ulcer perforation is quite high in the population of Tripura and the study has not been done previously. This study aims to explore the relationship between preoperative serum albumin levels, body mass index (BMI) and surgical outcomes in patients with peptic ulcer perforation. It involves assessing serum albumin and BMI levels in these patients and analyzing how these factors influence their postoperative outcomes.

MATERIALS AND METHODS

Source of Data: Patients admitted in AGMC and GBP Hospital, Agartala for any perforation peritonitis secondary to peptic ulcer disease in between December 2019 to June 2021.

Study Design: A cross sectional study.

Study Type: Observational study.

Study Period: December 2019 to June 2021. (One and half years).

Place of Study: The study is planned to be conducted in the department of General surgery with collaboration with Department of Biochemistry, AGMC and GBP Hospital, Agartala.

Inclusion Criteria:

- Patients willing to give written informed consent. (Annexure I).
- Patients of either sex aged between 18 and 60 yrs.
- Patients admitted for any perforation peritonitis secondary to peptic ulcer disease in the department of General Surgery, AGMC&GBP Hospital, Agartala.

Exclusion Criteria:

- Patients under 18 years.
- Patients who do not give consent.
- Patients with chronic liver diseases.
- Patients with severe anemia.
- Patients on immuno-suppressants.
- Patients with chronic renal diseases.

Sample Size: All abdominal surgery of perforation peritonitis secondary to peptic ulcer disease cases, aged between 18 and years in one and half years. Average cases taken from last three years, the exploratory laparotomy done for peptic ulcer perforation found to be 48 cases per year.

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analyzed using SPSS (version 27.0., SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests, which compare the means of independent or unpaired samples, were used to assess differences between groups. Paired t-tests, which account for the correlation between paired observations, offer greater power than unpaired tests. Chi-square tests (χ^2 tests) were employed to evaluate hypotheses where the sampling distribution of the test statistic follows a chi-squared distribution under the null hypothesis., Pearson's chi-squared test is often referred to simply as the chi-squared test. For comparisons of unpaired proportions, either the chi-square test or Fisher's exact test was used, depending on the context. To perform t-tests, the relevant formulae for test statistics, which either exactly follow or closely approximate a t-distribution

under the null hypothesis, were applied, with specific degrees of freedom indicated for each test. P-values were determined from Student's t-distribution tables. A p-value ≤ 0.05 was considered statistically significant, leading to the rejection of the null hypothesis in favour of the alternative hypothesis.

RESULTS AND DISCUSSIONS

Table 1: Post-Operative Outcome

	No. of cases	Percentage (%)
Post op complications	43	59
No complications	13	19
Expired	14	22
Total	70	100

Table 2: Prevalence of Hypoalbuminemia

S. albumin	No of patients	Percentage (%)
Normal	22	31%
Hypoalbuminemia	48	69%
Total	70	100

Table 3: Postoperative Complications in Association with Degree of Hypoalbuminemia

Albumin levels (g/dl)	No of patients	Complicated	Uncomplicated	Percentage (%)
>3.5 (normal)	22	15	7	68.2
2.8-3.5 (mild)	24	18	6	75
2.1-2.7 (moderate)	18	18	0	100
< 2.1 (severe)	6	6	0	100

Table 4: Comparison of Complications Between Patients with Hypoalbuminemia and Normal Serum Albumin

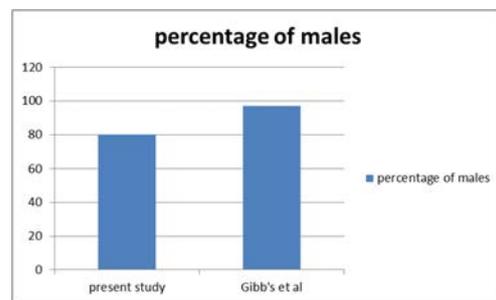
Complications	Hypoalbuminemia	Percentage	Normal	Percentage	P value
Prolonged ileus	8	61.5	5	38.5	0.545
SSI	37	82.5	8	17.3	0.006
Ventilator support	20	87.6	3	13.3	0.02
Sepsis	14	87.5	2	11.8	0.005
Renal complications	28	34.56	2	10.52	0.049
Pulmonary Complications	24	77.4	7	22.6	0.155
Cardiac Complications	9	90	1	10	0.276

This graph shows the complication rate in the study. 57 of the 70 patients constituting 81% had postoperative complications including deaths. The most common complication was surgical site wound infection 45 (64%), followed by pulmonary complications 31(44%), requirement of ventilator support 23(33%), sepsis 16 (22%), Prolonged ileus 13(19%) and cardiac complications 10 (12%). This is a graphic representation of prevalence of hypoalbuminemia of this study population. The prevalence of hypoalbuminemia was 69% in the study population. The average level of albumin in this study is 3.01g/dl. It was observed that the rate of complication was more when serum albumin level was of moderate range and which is statistically significant. The P value is <0.05 ($P=0.034$) for this chart calculated by chi square test and likelihood ratio 0.005. This table 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), prolonged ileus and pulmonary complication and cardioac complications. Nutrition care very important in post-operative outcome of patients. Nutrition assesment is vital part of surgical patient’s management. Different variety Nutritional indices are there predict patients outcome.

In my study preoperative albumin and BMI were used for nutritional assesment for gastric perforation patient. The present study was compared with the study done by James Gibb *et al* ‘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 10 postoperative variables^[3].

Table 5: Comparison of Sex Distribution

	Present study	Gibbs <i>et al</i>
Percentage of males (%)	80	97.1



Graph: Sex Distribution

Males constituted 80% (80) of the study population of the present study in comparison to 97.1% (52,642) of the similar study by Gibbs *et al*.

Table 6: Comparison of Age distribution

	Present study	Gibbs <i>et al</i>
Median age (years)	44	61

The median age of the present study was 44.48 years and that of the study by Gibbs *et al* was 61years.

Table 7: Comparison of Mean serum albumin

	Present study	Gibbs <i>et al</i>
Mean serum albumin (g/dl)	3.01	3.8

The mean serum albumin level was 3.01g/dl in the present study which was lower than that of Gibbs *et al* ie 3.8g/dl.

Table 8: Comparison of Selected Complications Based on S. Albumin Level

	Hypoalbuminemia Present study	Normal albumin present study	Hypoalbuminemia Gibbs et al	Normal albumin Gibbs et al
Prolonged ileus	16.6	5.4	3.9	1.9
SSI	77.08	36.3	12.30	5.2
Ventilator support	41.66	13.66	11.2	2.3
Sepsis	29.16	9.09	8	1.3
Pulmonary complications	50.02	31.57	10.6	2.9
Cardiac complications	18.75	4.5	1.1	0.6

This table 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, pulmonary complications and cardiac complications showed statistical

significance (P<0.05). This difference could be attributed to the large sample size taken by the Gibbs *et al.*

Table 9: Comparison of Morbidity and Mortality Based on S. Albumin Levels

	Present study	Gibbs <i>et al.</i>
Morbidity (%)	81.4% (57)	19.6
Mortality (%)	20% (14)	3.9

On comparing with the similar study conducted by Gibbs *et al.*, the present study showed a low mean serum albumin level depicting a poor nutritional status of our patients leading to high morbidity rate. Maximum patients were males in both the studies. The morbidity rate of both studies decreased with increase in serum albumin levels as shown in graph. Better the albumin levels better were the postoperative outcome. The mortality rate was highest in severe hypoalbuminemia group in present study due to the maximum patients being present in this group. The present study has also been compared to a study conducted by Paula Ferrada^[4] on ‘**Obesity Does Not Increase Mortality after Emergency Surgery**’. A total of 341 patients were included in their study who underwent emergency surgeries.

Table 10: Comparison of Sample Size of Present Study with Study by Ferrada *et al.* on the Basis of BMI

	Normal + low BMI	Overweight	Total
Present study	32	38	70
Ferrada <i>et al.</i>	139	202	341

This table represents the sample size in both study groups. Ferrada *et al.* and present study have highest patients in overweight group.

Table 11: Comparison of Selected Complications Based on BMI

	Normal BMI (Present study)	Overweight (Present study)	Normal BMI (Ferrada <i>et al.</i>)	Overweight (Ferrada <i>et al.</i>)
SSI	10.5	71.33	4.3	9.95
Pulmonary complications	33.33	52.6	14.4	20.3
Sepsis	16.7	21.1	2.2	4.5
Mortality	18.5	21.1	15.8	13.6

This table 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. The relationship was statistically significant for wound infections in the case of study by Ferrada *et al.* (P<0.05) but not in present study P>0.05 (P=0.179). Present study significant for prolonged ileus. A retrospective study by Kudsk^[5] showed serum albumin levels below 3.25gm/dl correlated immensely with complications, length of stay, postoperative stay and mortality. Palma^[6] published a prospective study of cholesterol and serum albumin as a risk factor for death in patients undergoing general surgery, multivariate analysis revealed significant negative trends for serum albumin, total cholesterol and HDL-C., for each variable a lower level was associated with a higher risk of death up to 2years after general surgery. A meta-analysis of cohort

studies and controlled studies of hypoalbuminemia in acute illness., is there a rationale for intervention by Vincent^[7] shows that hypoalbuminemia was a potent dose dependant, independent predictor of poor outcome. Each 10gm/l decline in serum albumin concentration significantly raised the odds of mortality by 137%, morbidity by 89%, prolongs ICU and hospital stay by 28% and 71% respectively. A serum albumin level of <2gm/dl in critically ill patients has been shown to be associated with a mortality of nearly 100%. The association between hypoalbuminemia and poor outcome appeared to be independent of both nutritional status and inflammation. The complication rates may be reduced when serum albumin level attained during albumin administration exceeds 30gm/l. According to the study conducted by Foley^[8], their data suggest that albumin therapy for the treatment of hypoalbuminemia in critically ill patients, despite its demonstrated value in raising the serum albumin concentration, has no beneficial impact on a variety of outcome variables, including mortality, complication rate, hospital stay, ventilator dependence, or tolerance of enteral feeding. In a study by Michael *et al.* on malnutrition, outcome and nutritional support suggest preoperative nutritional risk indications like BMI <18.5kg/m2 and serum albumin < 2.1 g/dl have an impact on surgical outcome. Such patients are evidently malnourished and consequently have longer hospital stays and experience a 40-60% greater frequency of complications in response to medical/surgical treatment. Engelman^[9] studied the importance of BMI and serum albumin on mortality and morbidity after cardiac surgery. Serum albumin levels <2.5g/dl was associated with risk and BMI <20kg/m2 and > 30kg/m2 was associated with increased rates of infection. Mullen^[10] studied the impact of BMI on preoperative outcome in patients undergoing major intra-abdominal surgery. Being underweight was associated with higher mortality and wound infection was more common in the obese. Liop^[11] found that a serum albumin below 3.5g/dl at the onset of treatment was a predictor of liver failure, hospital infection and mortality in 12 patient’s strata. Leite^[12] in their article studied the effect of serum albumin and clinical outcome in pediatric patients undergoing cardiac surgery. A low serum albumin level (<3g/dl) was associated with a poor postoperative outcome which included increased post surgical infection, increased mortality and longer hospital stays. The present study therefore showed that postoperative morbidity and mortality could be predicted by preoperative serum albumin. It showed that patients with serum albumin less than 3g/dl had more postoperative complications than patients with serum albumin >3.5g/dl who had less postoperative complications which was statistically significant. It is an

independent and an important prognostic marker for patient peritonitis secondary to gastric perforation. Present study did not show any statistically significant difference when BMI was considered as a preoperative predictor of morbidity and mortality in peritonitis secondary peptic ulcer disease unlike other studies. This requires in detail study with a larger sample size.

CONCLUSION

This study demonstrates that serum albumin levels and body mass index (BMI) are significant predictors of postoperative outcomes in patients undergoing peptic perforation surgery. Low serum albumin (<3.5g/dL) and abnormal BMI, including both underweight and obesity, are associated with increased postoperative complications, longer hospital stays and higher mortality rates. These findings suggest that routine preoperative assessment of serum albumin and BMI could be a valuable tool in identifying high-risk patients and guiding clinical decisions to optimize postoperative care. Implementing targeted interventions for patients with low serum albumin and abnormal BMI may improve surgical outcomes and enhance recovery in peptic perforation cases.

REFERENCES

1. Gibbs, J., K. Hur and S.F. Khuri, 1999. Preoperative Serum Albumin Level as a Predictor of Operative Mortality and Morbidity. *Arch. Surg.*, 134: 36-42.
2. Ferrada, P., R.J. Anand, A. Malhotra and M. Aboutanos, 2014. Obesity Does Not Increase Mortality after Emergency Surgery. *J. Obesity*, 2014.
3. Kudsk, K., E. Tolley, R. DeWitt, P. Janu, A. Blackwell, S. Yeary and B. King, 2003. Preoperative albumin and surgical site identify surgical risk for major postoperative complications. *J. Parenteral Enteral Nutr.*, 27: 1-9.
4. Foley, E.F., B.C. Borlase, W.H. Dzik, B.R. Bistran and P.N. Benotti., 1990. Albumin Supplementation in the Critically Ill. *Arch. Surg.*, 125:739-742.
5. Palma, S., A. Cosano, M. Mariscal, G. Martínez-Gallego, M. Medina-Cuadros and M. Delgado-Rodríguez, 2007. Cholesterol and serum albumin as risk factors for death in patients undergoing general surgery. *Br. J. Surg.*, 94:369-375.
6. Engelman, D.T., D.H. Adams, J.G. Byrne, S.F. Aranki and J.J. Collins *et al.*, 1999. Impact of body mass index and albumin on morbidity and mortality after cardiac surgery. *J. Thoracic Cardiovasc. Surg.*, 118:866-873.
7. Llop, J.M., C. Munoz, M.B. Badia, N. Virgili and M. Tubau *et al.*, 2001. Serum albumin as indicator of clinical evolution in patients on parenteral nutrition. Multivariate study. *Clin. Nutr.*, 20: 77-81.
8. Leite, H.P., M. Fisberg, W.B. de Carvalho and A.C.D. Carvalho, 2005. Serum albumin and clinical outcome in pediatric cardiac surgery. *Nutrition*, 21:533-8.