ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

Original Research Article

Preoperative Serum Albumin and BMI as Predictors of Postoperative Morbidity and Mortality in Emergency Exploratory Laparotomy for Hollow Viscus Perforation

Dr. Yaswanth Lakshmi Sainath[1], Dr. Rama Narayan Sahu[2], Dr Sudhanshu Sekhar Mohanty[3], Dr. Soumya Ranjan Jena[4]

[1]Senior Resident, Department of General Surgery, MKCG Medical College & Hospital, Berhampur, Odisha, India.
[2]Assistant Professor, Department of General Surgery, MKCG Medical College & Hospital, Berhampur, Odisha, India.
[3]Associate Professor, Department of General Surgery, MKCG Medical College & Hospital, Berhampur, Odisha, India.
[4]Assistant Professor, Department of General Surgery, MKCG Medical College & Hospital, Berhampur, Odisha, India.

Corresponding Author
Dr. Soumya Ranjan Jena, Assistant Professor, Department of General Surgery, MKCG Medical College & Hospital, Berhampur, Odisha, India.

Received: 08-10-2024 / Revised: 19-11-2024 / Accepted: 24-12-2024

ABSTRACT

Background
In this study, the ability of preoperative albumin and BMI to predict postoperative morbidity and mortality in large emergency exploratory laparotomies for hollow viscus perforation was examined.

Methods
this was a single hospital-based prospective observational study that was carried out among 100 patients who underwent emergency exploratory laparotomy for hollow viscus perforation in the Department of General Surgery, M.K.C.G. Medical College and Hospital, Berhampur, Odisha, over a period of 2 years (August 2020 to July 2022). Approval from the institutional ethics committee and written informed consent from the study participants was obtained.

Results
The serum albumin level was statistically significant at less than 3 g/dl. As blood albumin levels rose to 3.1 g/dl and higher, the frequency of problems decreased. It was statistically significant that patients with a serum albumin level higher than 3.5 g/dl experienced fewer problems. Additionally, post-operative problems were statistically significantly related with BMI in the underweight category. Regarding complication rates, there was no statistically noteworthy sex preponderance.

Conclusion
In order to predict post-operative difficulties, serum albumin and BMI are straightforward, cost-effective, and highly dependable methods. As a result, proper preoperative nutritional supplements can be administered to shorten morbidity and mortality.

Keywords: Serum Albumin, BMI, Predictors, Emergency, Exploratory Laparotomy, Hollow Viscus Perforation, Postoperative, Morbidity, Mortality.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

INTRODUCTION

Wound healing is a catabolic process that uses energy. Patients with severe malnutrition have slowed wound healing and an increased risk of infection. Additionally, they have weak immune systems. With the right nutritional assistance, the catabolic effects of disease or damage can be reversed. The degree of malnutrition is evaluated based on physical observations, plasma protein analysis, and weight loss over the previous six months. Numerous useful nutritional indices can be used to predict patient outcomes through risk stratification and objective patient comparison, but there is no agreement on the most effective way to do it on its own. The most readily obtainable and clinically helpful metric is the serum albumin level. . A serum albumin concentration of more than 3.5 g/dl indicates sufficient protein reserves. Less than 3.5 g/dl of serum albumin increases suspicions of potential surgical complication. An average adult's BMI of 19–25 kg/m2 indicates normal nutritional status.

A probable surgical complication is indicated by a BMI of less than 18 kg/m2. Therefore, the purpose of this study is to determine whether preoperative serum albumin and BMI are reliable indicators of postoperative morbidity and death in complicated emergency procedures. All patients who are hospitalised to the Department of General Surgery at the M.K.C.G Medical College Hospital for a hollow viscus perforation are required to have their serum albumin levels and BMI tested. The effectiveness of nutritional regimens has been assessed by a number of significant biological markers, but advancements in clinical outcome and function restoration should serve as the ultimate justification for nutritional assistance in postoperative patients.

Within 30 days following surgery, operative morbidity comprises predetermined problems. complications following surgery within 30 days. Length of recovery after surgery. Death within 30 days of operation from any reason is included in the term "operative mortality." Surgery-related infections, systemic sepsis, pneumonia, acute kidney injury, ventilator support for longer than three days, hepatic dysfunction, prolonged ileus for longer than five days, wound dehiscence, anastomotic leak, re-laparotomy, urinary tract infection, deep vein thrombosis, myocardial infarction, pulmonary embolism, and cerebrovascular accident are predefined complications that are included in the study.

AIMS & OBJCETIVE

To evaluate the potential utility of preoperative albumin and BMI as indicators of postoperative morbidity and death in severe emergency exploratory laparotomies for hollow viscus perforation.

MATERIALS & METHODS

After receiving approval from the institutional ethics committee and written informed consent from the study participants, a single hospital-based prospective observational study was carried out among 100 patients who underwent emergency exploratory laparotomy for hollow viscus perforation at the Department of General Surgery, M.K.C.G. Medical College and Hospital, Berhampur, Odisha, over a period of 2 years (August 2020 to July 2022).

Inclusion criteria

All patients in excess of 18 years old who underwent an emergency exploratory laparotomy at the MKCG MCH Berhampur, Odisha, during the research period for a perforated hollow viscus.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

Exclusion criteria

- when BMI and serum albumin are unavailable.
- patients with long-term steroid use and chemotherapy, chronic renal illness, and immunosuppressive conditions.

Techniques for Collecting Data

Patients who met the inclusion criteria and underwent major emergency abdominal surgery provided the data. Case specifics, including the history and clinical examination, were documented. We measured our height and weight. Serum albumin and standard lab values were estimated. It was noted the length of postoperative hospital stays, predetermined problems within 30 days of surgery, or death within 30 days after surgery.

Statistical analysis

Student's t test for numerical variables. Chi square test for qualitative variables. SPSS Software (Statistical Software for Social Science) was used to analyse the acquired data, which was placed into a Microsoft Excel spreadsheet. The student t-test was used to compare quantitative data, and frequency and usage were used to compare qualitative data. In order to predict the likelihood of problems in patients postoperatively, the effectiveness of serum albumin and BMI as screening tests was examined. P-values lower than 0.05 were regarded as significant.

RESULTS

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	<20	6	6.0	6.0	6.0
	21 – 39	29	29.0	29.0	35.0
	40-59	49	49.0	49.0	84.0
	>60	16	16.0	16.0	100.0
	Total	**100**	**100.0**	**100.0**	
Age Distribution					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Female	8	8.0	8.0	8.0
	Male	92	92.0	92.0	100.0
	Total	100	100.0	100.0	
Sex Distribution					

Table 1: Demographic Distribution

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Appendicular Perforation	14	14.0	14.0	14.0
Blunt Trauma Abdomen Cecal Perforation	1	1.0	1.0	15.0
Blunt Trauma Abdomen Ileal Perforation	2	2.0	2.0	17.0
Blunt Trauma Abdomen Ileal Transection	2	2.0	2.0	19.0
Blunt Trauma Abdomen Jejunal Perforation	2	2.0	2.0	21.0
BTA Ileal Perforation	7	7.0	7.0	28.0
Cecal Perforation with Cecal Mass	1	1.0	1.0	29.0
Gastric Perforation	20	20.0	20.0	49.0
Hollow Viscus Perforation D1	37	37.0	37.0	86.0

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

Ileal Perforation	11	11.0	11.0	97.0
Penetrating Trauma Jejunal Perforation	3	3.0	3.0	100.0
Total	**100**	**100.0**	**100.0**	

Table 2: Final Diagnosis

		Sex		Total
		Female	**Male**	
Final Diagnosis	Appendicular Perforation	0	14	14
	Blunt Trauma Abdomen Cecal Perforation	0	1	1
	Blunt Trauma Abdomen Ileal Perforation	0	2	2
	Blunt Trauma Abdomen Ileal Transection	0	2	2
	Blunt Trauma Abdomen Jejunal Perforation	0	2	2
	Bta Ileal Perforation	0	7	7
	Cecal Perforation with Cecal Mass	1	0	1
	Gastric Perforation	0	20	20
	Hollow Viscus Perforation D1	3	34	37
	Ileal Perforation	4	7	11
	Penetrating Trauma Jejunal Perforation	0	3	3
Total		8	92	100

Count Final Diagnosis * Sex Cross Tabulation

		Age				Total
		<20	**20-39**	**40-59**	**>60**	
Final Diagnosis	Appendicular Perforation	6	3	3	2	14
	Blunt Trauma Abdomen Cecal Perforation	0	1	0	0	1
	Blunt Trauma Abdomen Ileal Perforation	0	2	0	0	2
	Blunt Trauma Abdomen Ileal Transection	0	0	2	0	2
	Blunt Trauma Abdomen Jejunal Perforation	0	2	0	0	2
	Bta Ileal Perforation	0	4	3	0	7
	Cecal Perforation with Cecal Mass	0	0	1	0	1
	Gastric Perforation	0	2	10	8	20
	Hollow Viscus Perforation D1	0	12	21	4	37
	Ileal Perforation	0	2	7	2	11
	Penetrating Trauma Jejunal Perforation	0	1	2	0	3
Total		6	29	49	16	100

Count Final Diagnosis Age

Table 3

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	No	60	60.0	60.0	60.0
	Yes	40	40.0	40.0	100.0
	Total	100	100.0	100.0	

Complications

			Complications		**Total**
			No	**Yes**	
Sex	Female	Count	5	3	8
		% Within Sex	62.5%	37.5%	100.0%

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

		% Within Complications	8.3%	7.5%	8.0%
		% of Total	5.0%	3.0%	8.0%
	Male	Count	55	37	92
		% Within Sex	59.8%	40.2%	100.0%
		% Within Complications	91.7%	92.5%	92.0%
		% of Total	55.0%	37.0%	92.0%
Total		Count	60	40	100
		% Within Sex	60.0%	40.0%	100.0%
		% Within Complications	100.0%	100.0%	100.0%
		% of Total	60.0%	40.0%	100.0%

Sex Complications Cross Tabulation

			Complications		**Total**
			No	**Yes**	
Age_New	<20	Count	6	0	6
		% Within Age New	100.0%	0.0%	100.0%
		% Within Complications	10.0%	0.0%	6.0%
		% of Total	6.0%	0.0%	6.0%
	21-39	Count	19	10	29
		% Within Age New	65.5%	34.5%	100.0%
		% Within Complications	31.7%	25.0%	29.0%
		% of Total	19.0%	10.0%	29.0%
	40-59	Count	25	24	49
		% Within Age New	51.0%	49.0%	100.0%
		% Within Complications	41.7%	60.0%	49.0%
		% of Total	25.0%	24.0%	49.0%
	>60	Count	10	6	16
		% Within Age New	62.5%	37.5%	100.0%
		% Within Complications	16.7%	15.0%	16.0%
		% of Total	10.0%	6.0%	16.0%
Total		Count	60	40	100
		% Within Age New	60.0%	40.0%	100.0%
		% Within Complications	100.0%	100.0%	100.0%
		% of Total	60.0%	40.0%	100.0%

Age Complications Cross Tabulation

Table 4

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
BMI	<18.5	25	25.0	25.0	25.0
	18.5 – 24.9	72	72.0	72.0	97.0
	25 - 30	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

BMI

		Complications		**Total**
		No	**Yes**	
BMI	**<18.5**	**2**	**23**	**25**
	18.5-24.9	**55**	**17**	**72**
	3.00	**3**	**0**	**3**

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

Total		**60**	**40**	**100**

Count -BMI - New * Complications Cross tabulation

		Complications		**Total**
		No	**Yes**	
Albumin	0 – 2.5	1	7	8
	2.6 - 3	2	14	16
	3.1 -3.5	15	11	26
	>3.6	42	8	50
Total		**60**	**40**	**100**

Count – Albu - New * Complications

Table 5

		Complications		**Total**
		No	**Yes**	
Final Diagnosis	Appendicular Perforation	13	1	14
	Blunt Trauma Abdomen Cecal Perforation	1	0	1
	Blunt Trauma Abdomen Ileal Perforation	2	0	2
	Blunt Trauma Abdomen Ileal Transection	0	2	2
	Blunt Trauma Abdomen Jejunal Perforation	2	0	2
	Bta Ileal Perforation	6	1	7
	Cecal Perforation with Cecal Mass	1	0	1
	Gastric Perforation	6	14	20
	Hollow Viscus Perforation D1	24	13	37
	Ileal Perforation	4	7	11
	Penetrating Trauma Jejunal Perforation	1	2	3
Total		60	40	100

Count–Final diagnosis * Complications

		Complications		**Total**
		No	Yes	
Albu_new1	<3.5	18	32	50
	>3.5	42	8	50
Total		60	40	100

Count-Albumin * Complications

	No	**yes**	**Marginal Row Totals**
<3.5	18(30) [4.8]	32 (20) [7.2]	50
>3.5	42 (30) [4.8]	8 (20) [7.2]	50
Marginal Column Totals	60	40	100 (Grand Total)

Table 6

The chi-square statistic is 24. The p-value is < 0.00001. Significant at p < .05. The chi-square statistic with Yates correction is 22.0417. The p-value is < 0.00001. Significant at p < .05.

DISCUSSION

Malnutrition and a decline in organic defences were identified as potential contributors to greater post-operative morbidity and mortality rates. When compared to well-nourished patients having similar surgery, people who are malnourished are more likely to experience postoperative problems and even die. In order to identify patients who are more likely to

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

experience post-operative problems, nutritional screening is crucial. Serum albumin and body mass index have been used in several research as indicators of post-operative morbidity and death, despite the fact that many studies have investigated many nutritional parameters. According to a study by Mullen et al., Golub et al., and Leite et al.,[1-3] serum albumin levels less than 3 g/dl were linked to higher post-operative morbidity.[3] In accordance with the findings of our study, patients with albumin levels of less than 3 g/dl experience much more problems than those with greater albumin levels, including seroma, wound gaping, lower respiratory tract infections, death, and fistula. The majority of the participants in our study had albumin concentrations between 3.1 and 3.5 g/dl. In their investigation, Gibbs et al. [4] found that a drop in serum albumin levels from 4.6 g/dl to 2.1 g/dl was linked to an exponential rise in morbidity and mortality rates from less than 1% to 29%. Albumin was deemed to be the best indicator of mortality and morbidity in the context of surgery as a whole. The study found that it was a highly helpful prognostic marker and a superior predictor of several types of morbidity, including sepsis and severe infections. In the research mentioned above, women experienced post-operative problems more frequently than men. In addition, our study revealed a modest gender bias in terms of problems after a postoperative hospital stay. According to our study, problems also increased exponentially with age, with age groups older than 59 years showing the greatest increases. In their study, Varut Lohsiriwat et al. [5] discovered that pre-operative hypoalbuminemia is a significant risk factor for problems after rectal surgery. This indicates that pre-operative hypoalbuminemia is a separate risk factor for problems after rectal cancer procedures, as well as for post-operative bowel function and hospital stay. Additionally, our study demonstrates reduced serum albumin levels and a rise in problems.

Study Name	S. Albumin Associated with Increased Complications	P-Value
Beghetto et al.[6]	<3.5	<0.05
Leite et al.[3]	<3	<0.05
Drown et al.	<3	<0.05
Engelman et al.[7]	<2.5	<0.001
Foley et al.[8]	<2.5	<0.001
Present Study	<3	<0.00001

A BMI of less than 20 kg/m2 and low albumin levels were linked to an increased risk of post-operative complications, according to Engelman et al.'s [7] observations. According to our research, post-operative complications increased as albumin levels dropped from 3 g/dl to lower levels, and patients with underweight BMIs of less than 18.5 kg/m2 had a higher incidence of complications. Similar results were also put forward by a prospective cohort study done by Mullen et al. [1] on the impact of body mass index on perioperative outcomes in patients undergoing major intra-abdominal surgeries, where they concluded that patients who were underweight had a fivefold increase in post-operative mortality, perhaps as a consequence of their underlying nutritional status. In a study on malnutrition by Michael et al., the results and nutritional support the idea that pre-operative nutritional risk indicators like BMI 18.5 kg/m2 and serum albumin 2.1 g/dl affect the outcome of surgery. Such individuals are visibly malnourished and thus have longer hospital stays and experience a 40-60% increased frequency of problems in response to medical/surgical therapy.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 12, 2024

CONCLUSION

Thus, serum albumin is confirmed as one key marker for post-operative complications that also shows the person's nutritional status and is highly predictive of post-operative morbidity and mortality. In our investigation of 100 patients, the complication rate was increased when the blood albumin level was less than 3 g/dl, which was statistically significant. The rate of problems decreased as serum albumin levels increased from 3.1 g/dl and higher. Patients with serum albumin levels more than 3.5 g/dl had fewer problems, which was statistically significant irrespective of malignant or non-malignant disease pathology. In comparison to many other preoperative patient characteristics, serum albumin is a better predictor of surgical outcomes. It is a commonly used test that is reasonably inexpensive, and because of its highly regarded value, it ought to be used more frequently as a prognostic tool to identify malnutrition and the possibility of unfavourable surgical outcomes. Additionally, statistically significant post-operative complications are related to BMI in the underweight category. There was no statistically significant sex preponderance with relation to complication rates.

In order to anticipate post-operative difficulties, serum albumin and BMI can be utilised as simple, affordable, and highly dependable methods. Additionally, proper preoperative nutritional supplements can be administered to ultimately lower morbidity and death rates.

REFERENCES

[1] Mullen JJ, Davenport DL, Hutter MM, Hosokawa PW, Henderson WG, Khuri Sf, et al. Impact of BMI on perioperative outcome in patients undergoing major interabdominal cancer surgery. Ann Surg Onco 2008;15:2164-72.

[2] Golub R, Sorrento JJ, Cantu R. Efficacy of albumin supplementation in the surgical intensive care unit: A prospective, randomized study. Crit Care Med 1997;25:249-52.

[3] Leite HP, Fisberg M, De Carvallio WB. Serum albumin and clinical outcomes in paediatric cardiac surgery. Nutrition 2005;21(5):553-8.

[4] Gibbs J, Cull W, Henderson W. Daley J, Hur K, Khuri SF. Preoperative serum albumin level as a predictor of operative mortality and morbidity. Arch Surg 1999;134(1):36-42.

[5] Lohsiriwat V, Lohsiriwat D, Boonnuch W, Chinswangwatanakul V, Akaraviputh T, Lert-Akayamanee N. Pre-operative hypoalbuminemia is a major risk factor for postoperative complications following rectal cancer surgery. World journal of gastroenterology: WJG 2008;14(8):1248-51

[6] Beghetto MG, Luft VC, Mello ED, Polanczyk CA. Accuracy of nutritional assessment tools for predicting adverse hospital outcomes. Nutricion Hospitalaria 2009;24(1):56-62.

[7] Engelman DT, Adams DH, Byrne JG, Avanki SF, Collins JJ, Coupee GS, et al. Impact of BMI and serum albumin on morbidity and mortality after cardiac surgery. J Thorac Cardiovas Surg 1999;118:866-73.

[8] Foley EF, Borlase BL, Dzik WH. Albumin supplementation in the critically ill: a prospective, randomized trial. Arch Surg 1990;125(6):739-42.