

Original Research Article

Association of serum albumin with postoperative complication in major surgeries

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Received: 03 May 2021

Accepted: 19 May 2021

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ABSTRACT

Background: Nutritional assessment is essential for identifying patients who are at risk of developing complications related to significant malnutrition. Serum albumin is the most important laboratory test for the diagnosis of protein-calorie under nutrition.

Methods: A COHORT of 100 patients admitted for major elective surgery in the department of general surgery, Government medical college and hospital, Ambikapur, Sarguja, Chattisgarh, India. Patients who were admitted and undergoing any major elective surgeries having age above 12 years were included. Details of cases were recorded including demographic characteristics, history and clinical examination along with BMI and serum albumin.

Results: Complication rate was highest in the age group of 51-60 years (57.9%) followed by the age group of 41-50 years (53.8%). The association was found statistically significant between different level of serum albumin level and their post-operative wound complications. The highest complication rate was seen in patients with renal procedures like nephrectomy and pyelolithotomy (60.0%) but the most common type of procedure observed was bowel resection and anastomosis (38.7%).

Conclusions: The correlation between the serum albumin and complication rate was statistically significant in the malignant diseases when considered separately. Low serum albumin level can be used as a marker for nutritional deficiency and TPN as nutritional supplementation in certain subset of patients may reduce postoperatively septic wound complication.

Keywords: Serum albumin, Nutritional assessment, Wound complication, Renal procedures

INTRODUCTION

The adverse effects of malnutrition on the morbidity and mortality of patients was first recognized by Hippocrates (460 BC-370 BC) many centuries ago. It is common and occurs in about 30% of surgical patients with gastrointestinal diseases and in up to 60% of those in whom hospital stay has been prolonged because of postoperative complications. There is a substantial evidence to show that patients who have signs of malnutrition have a higher risk of complications and an increased risk of death in comparison with patients who

have adequate nutritional reserves.¹ Nutritional assessment is essential for identifying patients who are at risk of developing complications related to significant malnutrition.² A dietary history, physical examination (including anthropometric measurements) and relevant labs are the appropriate tools needed for an accurate evaluation of a patient's preoperative nutritional status.

The serum albumin level is the most readily available and clinically useful parameter. A serum albumin level greater than 3.5 g/dl suggests adequate protein stores and it confers a protective effect through several biological

mechanisms. It predicts perioperative morbidity and mortality.³

Serum albumin is the most important laboratory test for the diagnosis of protein-calorie under nutrition. Most patients with severe protein depletion will have low serum albumin levels. Patients with abnormal parameter have a markedly increased risk of poor clinical outcomes. Protein energy malnutrition (PEM) occurs as a result of relative and absolute deficiency of energy and protein. It may be primary, due to inadequate food intake, or secondary, as a result of other illness. For most developing nations, primary PEM remains among the most significant health problems. PEM affects every organ system. The most obvious results are loss of body weight, adipose stores and skeletal muscle mass. Hepatic synthesis of serum protein decreases and depressed levels of circulating proteins are observed. Due to changes in immunological function, wound healing is poor.⁴ With the above background, the present study was conducted to assess association between serum albumin status and postoperative complication in major surgeries.

METHODS

This study was conducted on a COHORT of 100 patients admitted for major elective surgery in the department of general surgery, Government medical college and hospital, Ambikapur, Sarguja, Chhattisgarh India between March 2020 and October 2020. Patients who

were admitted and undergoing any major elective surgeries having age above 12 years were included in the study and patients who have icterus, severe anemia <7 gm/dl, diabetes mellitus, chronic renal disease and patients on steroids, patients under hernias-inguinal and femoral hernias, undergoing minor surgeries and patients aged less than 12 years were excluded. Ethical consideration was made through institutional ethical committee and informed consent was taken from the subjects prior to study.

Details of cases were recorded including demographic characteristics, history and clinical examination along with BMI and serum albumin were estimated and follow up was done till patient was discharged from hospital. Data was recorded in Microsoft excel and checked for its completeness and correctness then it was analysed by using suitable statistical software and p value <0.05 was considered as a statistically significant.

RESULTS

In our study, the age varied from 13-75 years. Majority of the patients were in the age group of 41-50 years (26%) followed by the age group 31-40 years (21%). But complication rate was highest in the age group of 51-60 years (57.9%) followed by the age group of 41-50 years (53.8%). There was a significant difference found between the age group of patients with complication and patients without complication (Table 1).

Table 1: Distribution of patients according to age and complication rate.

Age (in years)	Number of patients	Patients with complications	Patients without complications	% of complications	Chi square, df, p value
10-20	8	0	8	0.00	11.415, 5, 0.0437, significant
21-30	20	10	10	50.00	
31-40	21	6	15	28.60	
41-50	26	14	12	53.80	
51-60	19	11	8	57.90	
>60	6	2	4	33.30	

Table 2: Distribution of patients according to sex and complication rate.

Sex	Number of patients	Patients with complications	Patients without complications	% of complications	Chi square, df, p value
Male	43	19	24	44.20	0.043, 1, 0.835, insignificant
Female	57	24	33	42.10	

Table 3: Distribution of patients according to serum albumin level and complication rate.

Serum albumin	Number of patients	Patients with complications	Patients without complications	% of complications	Chi square, df, p value
<2.5	4	4	0	100.00	16.173, 3, <0.01, significant
2.6-3.0	19	14	5	73.70	
3.1-3.5	35	12	23	34.30	
>3.5	42	13	29	31.00	

Table 4: Distribution of patients according to type of procedure.

Type of procedures	Number of patients	Patients with complications	Patients without complications	% of complications	Chi square, df, p value
Bowel resection, anastomosis	31	12	19	38.70	4.722, 4, 0.317, insignificant
Biliopancreatic	26	13	13	50.00	
Oesophagogastric	19	7	19	36.80	
Nephrectomy, pyelolithotomy	10	6	4	60.00	
Miscellaneous	14	5	9	35.70	
Total	100	43	57	43.00	

Table 5: Distribution of wound complication according to grading system.

Grades	Number of patients	Percentage (%)
Grade I	20	46.00
Grade II	14	32.00
Grade III	7	16.00
Grade IV	2	4.00

Out of total 100 study subjects, 43% were males and 57% were females and developed complications 44.2% and 42.1%, respectively. No significant association was found between gender and post-operative complications (Table 2).

All four patients with serum albumin level <2.5 had wound complications. Whereas out of 19 patients with serum albumin between 2.6 to 3.0, 14 (73.7%) patients had complications. Least complication was seen in the patients with serum albumin more than 3.5 g/dl. The association was found statistically significant between different level of serum albumin level and their post-operative wound complications. So it can be concluded that low serum albumin level is related with higher wound complications (Table 3).

The highest complication rate was seen in patients with renal procedures like nephrectomy and pyelolithotomy (60.0%) but the most common type of procedure observed was bowel resection and anastomosis (38.7%). No significant association was found between type of operative procedure and post-operative complications. (Table 4).

Most common type of complications was seen in grade I type (46.0%) followed by grade II (32.0%) and least complications were seen in grade IV (Table 5).

DISCUSSION

The wound infection rates in our study shows only apparent higher rate of wound complications in the age group 41-50 years whereas in a study done by Banz et al showed an increased incidence of wound infection in elderly patients. Also, overall perioperative morbidity in the age group >75 years are 1.2 to 2 times higher than in younger patients.⁵ In our study complication rate in 41-50

year age groups is approximately five times more than in age group 10-20 years.

Females outnumbered the number of male patients. In our study, 19 out of 43 male patients developed wound complications whereas in female patients 24 out of 57 patients developed wound complications.

Nutritional assessment is essential for identifying patients who are at an increased risk of developing post-operative complications. A variety of nutritional indices have been found to be valuable in predicting patient outcome.

Serum albumin level less than 3 g/dl was associated with increased post-operative morbidity and mortality according to few previous studies.⁶⁻⁹

A retrospective study by Kudsk et al of 526 surgical patients who had preoperative serum albumin levels measured and were undergoing elective esophageal, gastric, pancreatic duodenal or colon surgery had serum albumin levels below 3.25 g/dl, correlated immensely with complications, length of stay, postoperative stay, and mortality.¹⁰

Liop et al found that a serum albumin below 3.5 g/dl at the onset of treatment was a predictor of kidney and liver failure, hospital infection and mortality in 12 patients strata.¹¹

Gibbs et al observed that a decrease in serum albumin from concentration greater than 4.6 g/dl to less than 2.1 g/dl ($p < 0.001$) was associated with exponential increase in morbidity and mortality and that it was a good prognostic indicator, whereas anthropometric markers could not predict postoperative outcome.¹²

According to Foley et al post-operative complication rate was higher when albumin was lower than 2.5 g/dl

($p < 0.001$).¹³ According to Beghetto et al it was concluded that serum albumin level was the strongest predictive parameter for death and hospital infection (< 3.5 g/dl).¹⁴

In the present study patients with serum albumin less than 3 g/dl has more post-operative complications and patients with serum albumin > 3.5 g/dl has less post-operative complications which was statistically significant, that means as the serum albumin level increases, the complication rate decreases.

CONCLUSION

Our study shows that serum albumin is a good indicator of post-operative complications. The patients with serum albumin < 3.0 g/dl had a higher complication rate which was statistically significant ($p < 0.05$). Patients with serum albumin > 3.5 g/dl had less complications which was statistically significant ($p < 0.05$). The correlation between the serum albumin and complication rate was statistically significant in the malignant diseases when considered separately. Thus serum albumin is a good prognostic indicator because of its ability to detect PEM, which is not necessarily accompanied by lower body weight and may not be clinically recognizable but is associated with significant increased risk of morbidity and mortality. Low serum albumin level can be used as a marker for nutritional deficiency and TPN as nutritional supplementation in certain subset of patients may reduce postoperatively septic wound complication.

ACKNOWLEDGEMENTS

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/editors/publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Dhuware MK, Divan AS, Dubey NK, Bharti MK. Association of serum albumin with postoperative complication in major surgeries. Int Surg J 2021;8:1772-5.