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Dr. Kadasiddeshwara G Byakhodi
Associate Professor, Department of
General Surgery, Karnataka
Institute of Medical Sciences,
Hubli, Karnataka, India

Dr. Vijay V Kamat
Associate Professor, Department of
General Surgery, Karnataka
Institute of Medical Sciences,
Hubli, Karnataka, India

Dr. CG Sunil
Postgraduate Student, Department
of General Surgery, Karnataka
Institute of Medical Sciences,
Hubli, Karnataka, India

Correspondence

Dr. Vijay V Kamat
Associate Professor, Department of
General Surgery, Karnataka
Institute of Medical Sciences,
Hubli, Karnataka, India

A prospective study to predict post-operative morbidity and mortality in emergency abdominal surgeries using preoperative serum albumin and BMI

Dr. Kadasiddeshwara G Byakhodi, Dr. Vijay V Kamat and Dr. CG Sunil

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Abstract

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 degree of malnutrition is estimated on the basis of weight loss during the past 6 months, physical findings and plasma protein assessment. The purpose of this study was to investigate serum albumin and BMI as predictors of postoperative mortality and morbidity.

Materials and Methodology: Total of 117 patients were included in the study admitted in KIMS Hubli from November 2012 to June 2014.

Results and Conclusion: In this study serum albumin $<3\text{g/dl}$ had more post op complications compared to albumin $>3.5\text{g/dl}$. But BMI did not show any statistically significance in the study.

Keywords: Preoperative, serum albumin, BMI, postoperative, morbidity, mortality

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.

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 $19\text{kg/m}^2 - 25\text{kg/m}^2$ for an average adult suggests a normal nutritional status. A BMI of less than 18kg/m^2 suggests potential surgical complication.

This study therefore aims at correlating preoperative serum albumin and Body Mass Index as predictors of postoperative morbidity and mortality in emergency abdominal surgeries.

The primary aim of providing adequate nutrition in patients undergoing surgery is to prevent or reverse the catabolic effects of disease or injury. The efficacy of nutritional regimens has been determined by several important biological parameters but the ultimate substantiation for nutritional support in surgical patients should be improvement in clinical outcome and restoration of function [1].

Nutrition assessment is the process of identifying patients who are either malnourished or at risk of developing malnourishment. Major trauma and surgical stress alter the intake and absorption of nutrients, as well as their utilization and storage by the body.

Nutritional indices: They provide a means of risk stratification and objective comparison among patients. They assist surgeons in determining the correct timing for intervention and the progress being made towards the goal of adequate nourishment [2].

One such index is Body Mass Index (BMI) also known as Quetelet's index. It was invented between 1830 and 1850 by the Belgian Adolphe Quetelet during the course of developing "Social physics". It is defined as an individual's body weight in kilogram divided by the square of their height in metres.

BMI correlates with morbidity compared to ideal weight tables which are based on mortality alone. Clinical judgement must always be used in the interpretation of BMI on an individual basis³. In our study, 18.5-24.9 was considered normal. Grade I underweight was 17-18.49, grade II was 16-16.99, and grade III was <16 kg/m².

Albumin: it is a major protein of human plasma and makes up approximately 60% of the total plasma proteins. Normal serum value is 3.5-5.5g/dl. 40% is present in the plasma and the other 60% is present in the extracellular space^[4].

Extent of malnutrition: normal- 3.5-5.5g/dl

- Mild- 2.8-3.5
- Moderate- 2.1-2.7
- Severe- <2.1

Moderate and severe albumin levels require nutritional supplement i.e. normal protein required is 0.8g/kg/day, whereas in moderate albumin depletion protein required is 1.2-1.5 g/kg/day and in severe depletion protein required is 1.5-2.0g/kg/day^[5].

Materials and Methodology

Source of data: patients admitted in Karnataka institute of medical sciences Hubli for emergency abdominal surgery between November 2012 to June 2014.

Sample size=117

Inclusion criteria: all the patients admitted in study period

Exclusion criteria

- Children <12 years.
- Patients who have icterus, severe anaemia <7g/dl, diabetes mellitus, chronic renal disease, and patients on steroids.

Method of collection of data

- Details of cases was recorded including history and clinical examination.
- Anthropometry- height and weight recorded.
- Investigation- serum albumin was estimated.

- Follow up was done till patient was discharged from the hospital.

Results

Out of 117 patients, 93 were male patients aged between 16-74 years with mean age of 42.48 years. Highest complications were noted in 41-50 and almost 100% >60 years.

96 of the 117 patients i.e. 82.05% had post-operative complications including deaths. The most common complication was surgical site wound infection 47 (40.17%) followed by pulmonary complications 46(39.31%), requirement of ventilator support in 45 patients, sepsis in 42, renal complications in 35, cardiac complications in 2 and deep vein thrombosis in 2 patients.

94 patients had hypoalbuminemia (80.34%), i.e. average level being 2.93g/dl. It was observed that the rate of complication was more when serum albumin was of moderate to severe range and was statistically significant i.e. p value was <0.05. 90% were morbid with severe hypoalbuminemia. Average hospital stay was 15.47 days in patients with hypoalbuminemia when compared to normal levels where average stay was 10 days. Total 18 patients expired in the study with moderate to severe hypoalbuminemia with statistical significance of p=0.024.

Only 17 patients were classified into grade I & II underweight according to BMI in our study i.e. around 14.53%. out of which 15 got complications. Considering the low BMI, only SSI was the statistically significant complication. Morbidity and mortality were in more favour of normal BMI or overweight individuals.

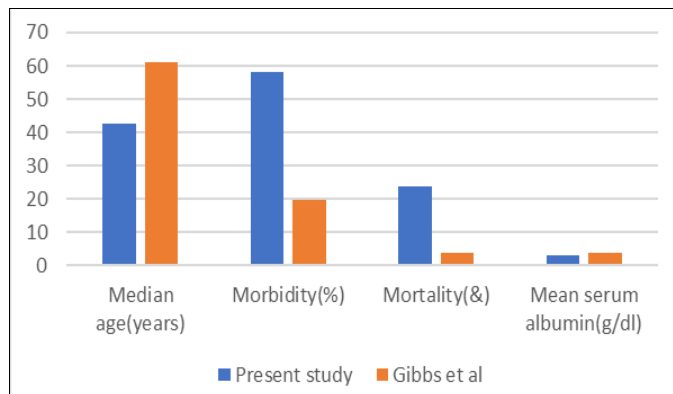
Discussion

Nutritional assessment is essential for identifying patients who are at an increased risk of developing postoperative complications. A variety of nutritional indices have been found to be valuable in predicting patient outcome. In our study preoperative serum albumin level and BMI were used for nutritional assessment.

Our study was compared to study conducted by Gibbs *et al.*^[6] on-serum albumin levels in October 1991 to December 1993.

Table 1: Shows the comparison between present study and Gibbs *et al.* study in relation to Median age (years), morbidity (%), Mortality (%) and Mean serum albumin (g/dl)

	Present study	Gibbs <i>et al.</i>
Median age (years)	42.48	61
Morbidity (%)	58.12	19.6
Mortality (%)	23.93	3.9
Mean serum albumin(g/dl)	2.93	3.8



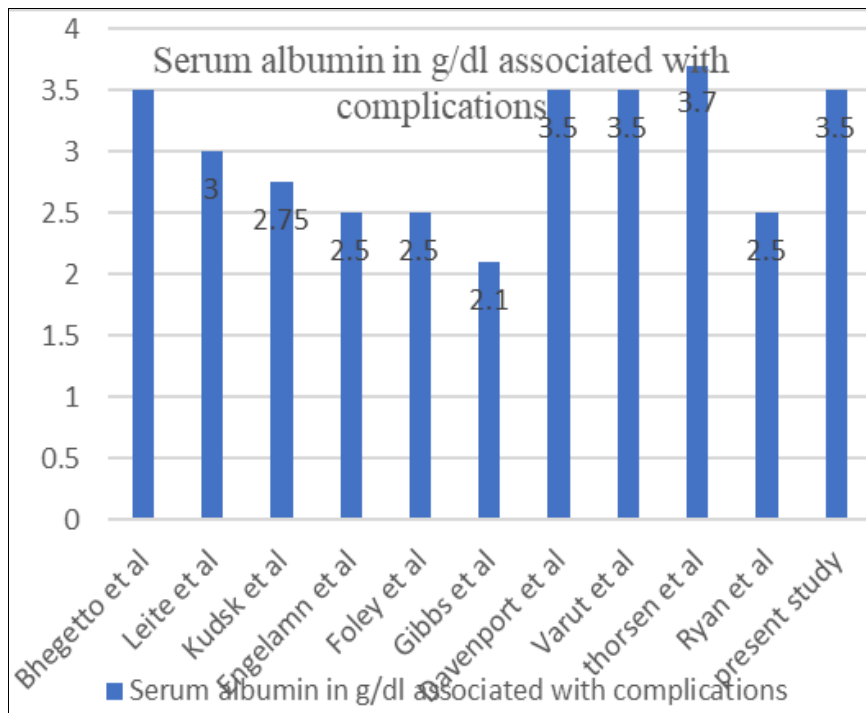
Graph 1: Shows the comparison between present study and Gibbs *et al.* study in relation to Median age (years), morbidity (%), Mortality (%) and Mean serum albumin (g/dl).

Our study was compared to a study conducted by John T Mullen *et al.* [7] on impact of BMI in outcomes of surgery. SSI was

statistically significant in both studies. Both studies didn't show statistical significance in morbidity rate.

Table 2: Shows the comparison between present study and various studies in relation to serum albumin in g/dl associated with complications

Study name	Serum albumin in g/dl associated with complications	P value
Beghetto <i>et al.</i> [8]	<3.5	<0.05
Leite <i>et al.</i> [9]	<3	<0.05
Kudsk <i>et al.</i> [10]	<2.75	<0.005
Engelman <i>et al.</i> [11]	<2.5	<0.001
Foley <i>et al.</i> [12]	<2.5	<0.001
Gibbs <i>et al.</i>	<2.1	<0.001
Davenport <i>et al.</i> [13]	<3.5	<0.0001
Varut <i>et al.</i> [14]	<3.5	<0.05
Thorsen <i>et al.</i> [15]	<3.7	<0.01
Ryan <i>et al.</i> [16]	<2.5	<0.001
Present study	<3.5	<0.05



Graph 2: Shows the comparison between present study and various studies in relation to serum albumin in g/dl associated with complications

However, BMI in our study was not statistically significant when compared to other studies in predicting outcome because of small sample size and also other studies were more based on elective surgeries where as our study was on emergency abdominal surgeries.

Conclusion

Our study shows that serum albumin is a good indicator of postoperative complications. An abnormal BMI was associated with more complications but was not statistically significant. 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. Early detection of hypoalbuminemia and prompt treatment can improve postoperative outcome.

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