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## To study the incidence of nutritional status with two parameters: Serum albumin and BMI in elective major general surgeries

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### Abstract

**Background:** Nutritional assessment is essential for identifying patients who are at risk of developing complications related to significant malnutrition. The main objective was to study the incidence of nutritional status with two parameters- serum albumin and body mass index in elective major general surgeries.

**Method:** Study area was Department of General Surgery, Calcutta National Medical College and Hospital; Kolkata. The study was carried out for a period of one year between Mar 2013 – Feb 2014. Sample size was 50 patients. Permission from Institutional Ethics Committee was obtained.

**Result:** Out of 50 patients studied, 54% were males and 46% were females. The number of patients in the 31 –40 years age group was the highest (34%). The rate of complication was more when serum albumin level was less than 3.0 gm. /dl which is statistically significant.

**Conclusion:** Serum albumin is a good indicator of postoperative complications. The patients with serum albumin < 3.0 g/dl had a higher complications rate which was statistically significant ( $p < 0.05$ ).

**Keywords:** Nutrition, serum albumin, body mass index

### Introduction

Nutritional assessment is essential for identifying patients who are at risk of developing complications related to significant malnutrition<sup>[1]</sup>.

Serum albumin is the most important laboratory test for the diagnosis of protein- calorie malnutrition. 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 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<sup>[2]</sup>.

Malnutrition leads to a significant increase in the operative death rate and threefold increase in the post-operative infection rate. Current indication of nutritional support before elective surgery include a history of weight loss in excess of 10% of body weight or an anticipated prolonged post-operative recovery period during which the patient will not be fed orally. Protein calorie malnutrition produces a reduction in lean muscle mass, alteration in respiratory mechanics, impaired immune function and intestinal atrophy. These changes result in diminished wound healing, predisposition to infection and increased postoperative morbidity. Measurements that can be easily performed in the clinic or at the bedside include determination of height and weight with calculation of BMI, which are the most reliable indicators. These values assess the patient's visceral and somatic protein mass and fat reserve. Nutritional indices 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<sup>[3]</sup>.

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BMI correlates with body fat. It is a better estimate of body fat than body weight and has advantages over the ideal body weight estimation. Unlike the ideal body weight tables that were based on mortality data alone, BMI correlates with morbidity. It is used for both men and women [4].

Hypoalbuminemia is associated with poor tissue healing, decreased collagen synthesis in surgical wounds or at the anastomosis, and impairment of immune response such as macrophage activation and granuloma formation. Therefore in hypoalbuminemic patients wound infection, remote infection such as pneumonia and anastomotic leakage were commonly found [5].

Albumin is a major protein of human plasma and makes up approximately 60% of the total plasma proteins. The normal serum value is between 3.5 -5.5 gm. /dl. Molecular weight is 69kda. 40% of total albumin is present and the other 60% is present in the extracellular space. The liver produces about 12gm of albumin per day, representing about 25% of total hepatic synthesis and half its secreted protein [6].

Mature human albumin consists of one polypeptide chain of 585 amino acids and consists 17 disulfide bonds. It has ellipsoidal shape which means that it does not increase the viscosity of plasma. It is responsible for 75- 80% of the osmotic pressure of the human plasma. To maintain adequate colloidal oncotic pressure serum albumin > 2.5 mg/dl and total protein > 5 gm. /dl is sufficient [7].

## Method

The study was prospective observational study. Study area was Department of General Surgery, Calcutta National Medical College and Hospital; Kolkata. Study population was patients admitted in general surgical wards of Calcutta National Medical College and Hospital, Kolkata for any major elective general surgeries between March 2013 – February 2014. The study was carried out for a period of one year. Sample size was 50 patients are randomly selected by using simple random sampling who was admitted for elective major general surgery.

Parameters to be studied are serum albumin level and Body Mass Index. Under serum albumin level: Normal nutritional status, Mild, Moderate & Severe hypoalbuminemia were studied. Under Body Mass Index: Underweight, Normal, and Overweight & Obesity. A study tool includes history, Clinical examination, investigations, operative note, Anthropometry.

Preoperative clinical examination includes complete blood count, liver function tests, Fasting and post prandial blood sugar, Serum urea, creatinine. Ultrasonography of abdomen, Chest X-ray, Abdominal radiograph. Post-operative clinical examination includes complete blood count, Liver function tests, Fasting and postprandial blood sugar, serum urea, creatinine, Chest x- ray, Histopathological report of resected specimen if any, pus if found for culture and sensitivity.

## Inclusive criteria

- Patients admitted for any major general elective surgery under department of surgery in Calcutta National Medical College and Hospital.
- Both males and females > 12 years age included in the study.

## Exclusive criteria

- Children < 12 years.
- Patients who have icterus, severe anemia< 7gm/dl, diabetes mellitus, chronic renal diseases, chronic liver disease and

patient on steroids, immunosuppressant, chemotherapy and anti-psychotic drugs.

- Road Traffic Accident cases.
- Inguinal and femoral hernia.

**Statistical analysis:** Statistical analysis was done accordingly, p value < 0.05 was considered statistically. Z-test and Fischer exact t- test were used for analysis.

## Result

**Table 1: Sex Distribution**

Sex	Number	Percentage (%)	Complications	No complications
Male	27	54	11(55%)	16
Female	23	46	09(45%)	14

Table 1 shows sex distribution of cases. Out of 50 patients studied, 54% were males and 46% were females. 55% of male patients had complications and 45% of females had complications.

**Table 2: Age Distribution**

Age(yrs.)	Total No	Complications	No Complications
11 - 20	02	02	00
21 – 30	08	03	05
31 – 40	17	05	12
41 – 50	06	01	05
51 -60	09	07	02
61 -70	06	01	05
>70	02	01	01

Table 2 shows age wise distribution of cases. Out of 50 patients, the age varied from 15-75 yrs. The number of patients in the 31 - 40 years age group was the highest (34%). And the highest number of complications was noted in the age group of 51 – 60 years (35%).

**Table 3: Post-operative outcomes**

	No of cases	Percentage (%)
Post-operative complications	20	40
No complications	30	60

Table 3 shows post-operative complications. Out of 50 patients, 20 patient's i.e. 40% had postoperative complications and 30 patients i.e. 60% had no complications.

**Table 4: Level of serum Albumin and postoperative outcome**

Sr. Albumin (g/dl)	Total no of patients	Complications	No Complications	P values
<3	16	11	5	<0.05
3.1 - 3.5	16	5	11	>0.05
>3.6	18	4	14	<0.05

Table 4 shows level of serum albumin and post-operative outcome.

It was observed that the rate of complication was more when serum albumin level was less than 3.0 gm. /dl which is statistically significant. There was no significant difference in rate of complication when serum albumin levels were <2, 2.1 - 2.5, 2.6 -3.0 and 3.1 -3.5 gm. /dl. Serum albumin level > 3.5gm/dl were associated with statistically significant lower complications using the Z test and the Chi square test.

**Table 5:** BMI Post-operative outcomes

BMI kg/m <sup>2</sup>	Total no of patients	Complications	No Complications	P values
<16.5	1	1	-	NA
16.5 -18.5	10	6	4	p>0.05
18.6 – 24.9	36	13	23	p>0.05
25 – 29.9	3	0	3	NA

Table 5 shows BMI post-operative outcomes. The complication rate was found to be high with BMI < 18.5 Kg/m but it was not statistically significant.

The complication rate with BMI < 16.5 was 100%, between 16.5 -18.5 was 60%, 18.6 -24.9 was 36% and no complication was found in patients with BMI > 25kg/m<sup>2</sup>.

### Discussion

Beghetto *et al* done on 434 patients who were evaluated for the accuracy of nutritional assessment tools for predicting adverse hospital outcomes, it was concluded that serum albumin level was the strongest predictive parameter for death and hospital infection (<3.5g/dl). A BMI < 18.5 kg/m<sup>2</sup> was also associated with death and infection postoperatively and lengths of hospital stay [8].

Gould *et al* studied the effect of hypoalbuminemia (Serum albumin levels < 3g/dl) upon admission of patients to surgical ICU due to vascular insufficiency, hip fractures, gastrointestinal bleeding, cancer, perforated viscus, intra- abdominal infection or bowel obstruction. Complications were higher in patients with hypoalbuminemia (36.9%) and mortality of 5.8% [9].

Leite *et al* in their article studied the effect of serum albumin and clinical outcome in pediatric patients undergoing cardiac surgery. A low serum albumin (< 3g/dl) was associated with a poor postoperative outcome which included increased postsurgical infection, increased mortality and longer hospital stays [10].

Mullen *et al* 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 [11].

Azodi studied the impact of BMI and tobacco smoking on outcome after open appendectomy. They concluded that tobacco smoking and a BMI of 27.5kg/m<sup>2</sup> or more were associated with more postoperative complications after open appendectomy in patients with non- perforated appendicitis [12].

Detsky *et al* on 202 patients who were planned for gastrointestinal surgery, several techniques of nutritional assessments were adapted to predict major post-operative complications. Subjective global assessment (SGA) and albumin were both of predictive value, and combinations of these variables were useful in differentiating low risk from high risk patients. It was concluded in study that SGA and albumin are useful “nutritional assessment techniques” for patients undergoing major gastrointestinal surgeries if the purpose of such an assessment is to predict postoperative nutrition associated complications [13].

Palma *et al* 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. Total cholesterol and its fraction were similar in patients with a serum albumin levels below 3.4 gm. /dl and in those with a higher level. The result indicate that low levels of serum albumin, total cholesterol and HDL –C are associated with risk of death up to 2 years after general surgery [14].

Kudsk *et al* reported a retrospective study of 526 surgical patients who had preoperative serum albumin levels measured and were undergoing elective esophageal, gastric, pancreatic duodenal, or colon surgery a serum albumin levels below 3.25 gm/dl correlated immensely with complications, length of stay, postoperative stay, and mortality [15].

### 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. Maximum no patients were noted with serum albumin < 2.5g/dl. The patients with serum albumin <3.0 g/dl had a higher complications rate which was statistically significant ( $p<0.05$ ). Patients with serum albumin > 3.5 g/dl had less complication which was statistically significant ( $p<0.05$ ). Thus serum albumin is a good prognostic indicator because of its ability to detect PEM, which is not necessarily accompanied by lower body weight.

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