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Pre Operative Serum Albumin as Predictors of Post Operative Morbidity and Mortality in Emergency Abdominal Surgeries

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I. Introduction

Wound healing requires energy and is a catabolic process. Patients who are severely malnourished demonstrate impaired wound healing and predisposition to infection.

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. It is frequently unrecognized and therefore patients often do not receive appropriate support. There is a substantial body of evidence to show that patients who suffer from starvation or 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. Long-standing protein-calorie malnutrition is easy to recognize. Short-term under nutrition, although less easily recognized, frequently occurs in association with critical illness, major trauma, burns or surgery, and also impacts on patient recovery. The degree of malnutrition is estimated on the basis of weight loss over the past 6 months, physical findings and plasma protein assessment.

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)]

II. Materials And Methods

Study design: A prospective Cross Sectional Study

Source of data: Patients admitted in Department of General surgery ,Mysore Medical College and Research Institute for any emergency abdominal surgery between 1st November 2017 and 30th June 2019.

.**Sample siz**e : n = 100 . The chi square test was used to calculate 'p-value' which was used as a measure of statistical significance.

Inclusion criteria

- Patients willing to give written informed consent.(annexure1).
- Patients aged >18 years of either sex
- Patients who were admitted for any emergency abdominal surgery under the department of General Surgery in MMC&RI, Mysuru.

Exclusion criteria

- Patients aged < 18 years
- Patients who do not give consent
- Patients with chronic liver diseases
- Patients with severe anemia Hb < 7 g/dl
- Patients with diabetes mellitus
- Patients with chronic renal disease
- patients on immuno-suppressants / immuno- compromised patients.

Procedure

- Details of cases was recorded including history and clinical examination
- Investigation– Serum albumin was estimated (BCG method)
- Follow up was done till patient was discharged from hospital.

III. Results

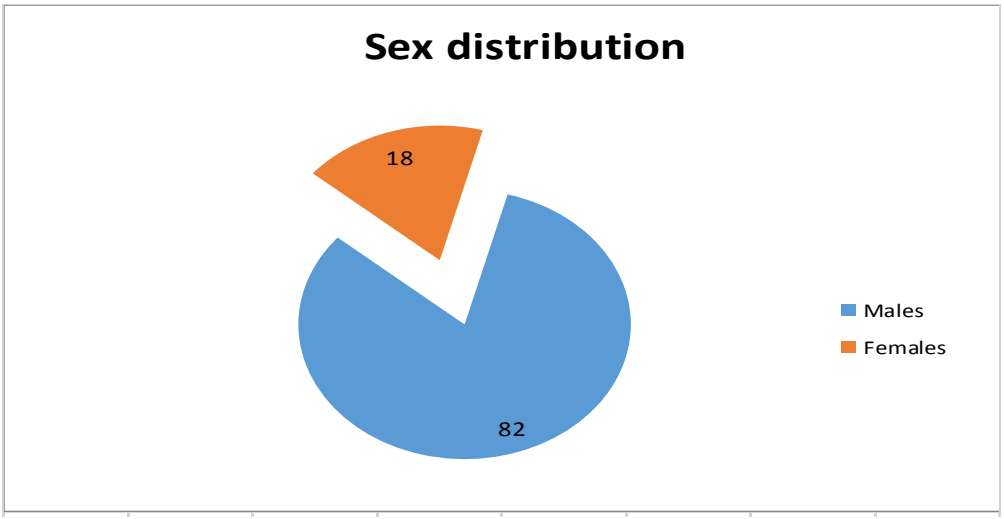
The study was conducted on 100 patients, aged between 18 -75yrs, who underwent any emergency abdominal surgery in MMC&RI .Mysuru from 1st November 2017 to 30th June 2019. Among 100 patients, 82 patients developed complications with 20 deaths and 19 had an uneventful recovery.

Table 1: Sex distribution

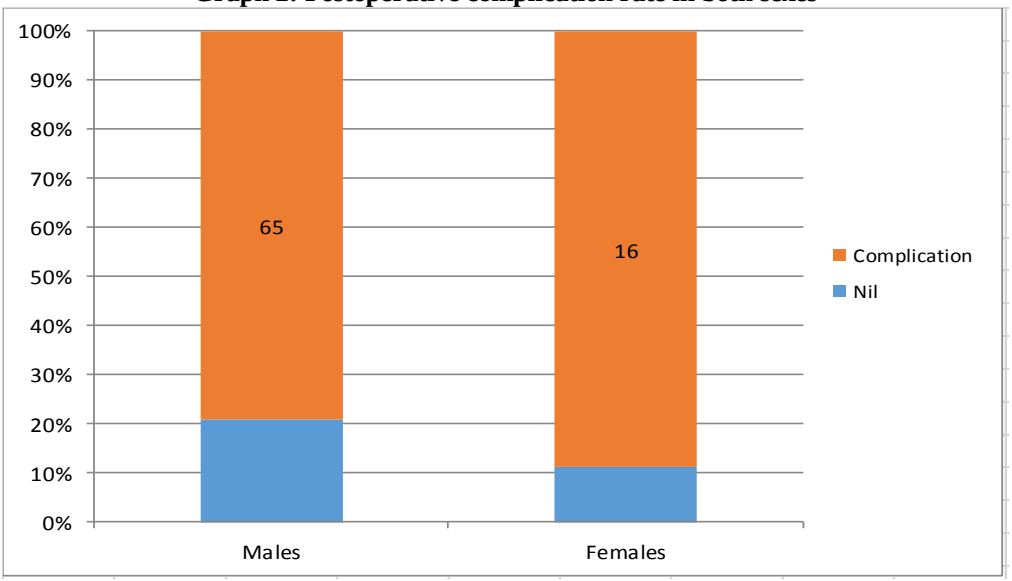
Sex	Number	Percentage (%)	Complication	Percentage (%)
Males	82	82	65	79
Females	18	18	16	89
Total	100		81	

Of the 100 patients studied, 82% were males and 18% were females. 79% of male patients had complications and 89% of female patients had complications.

GRAPH 1 – SEX DISTRIBUTION



Graph 2: Postoperative complication rate in both sexes

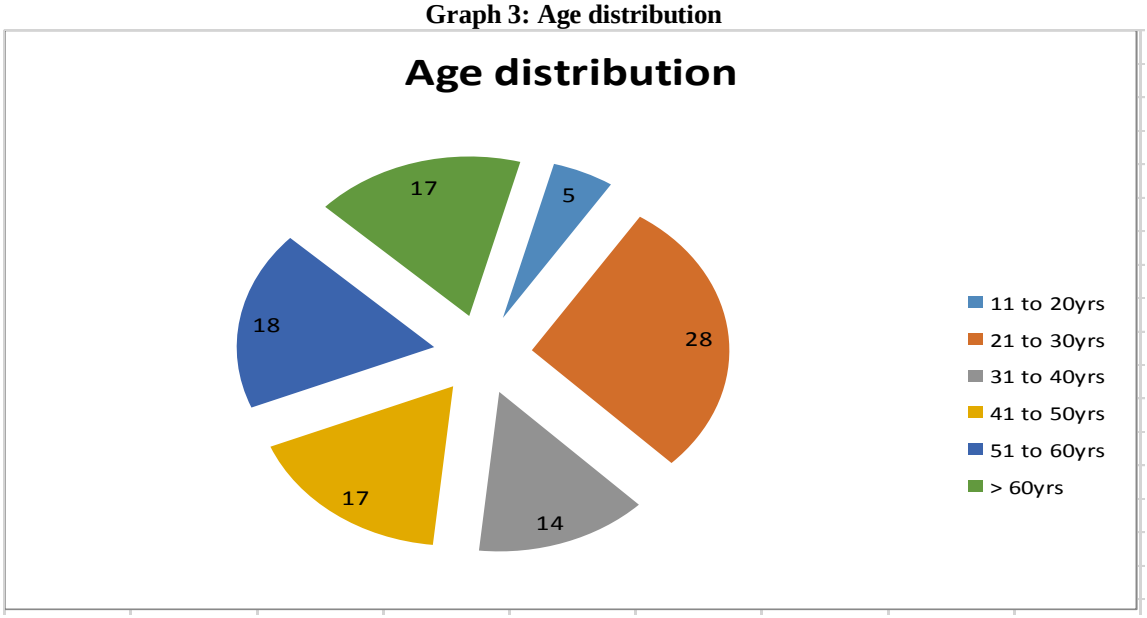


Graph showing complication rate in both sexes. 79% male patients and 89% female patients had complications.

Table 3: Age distribution

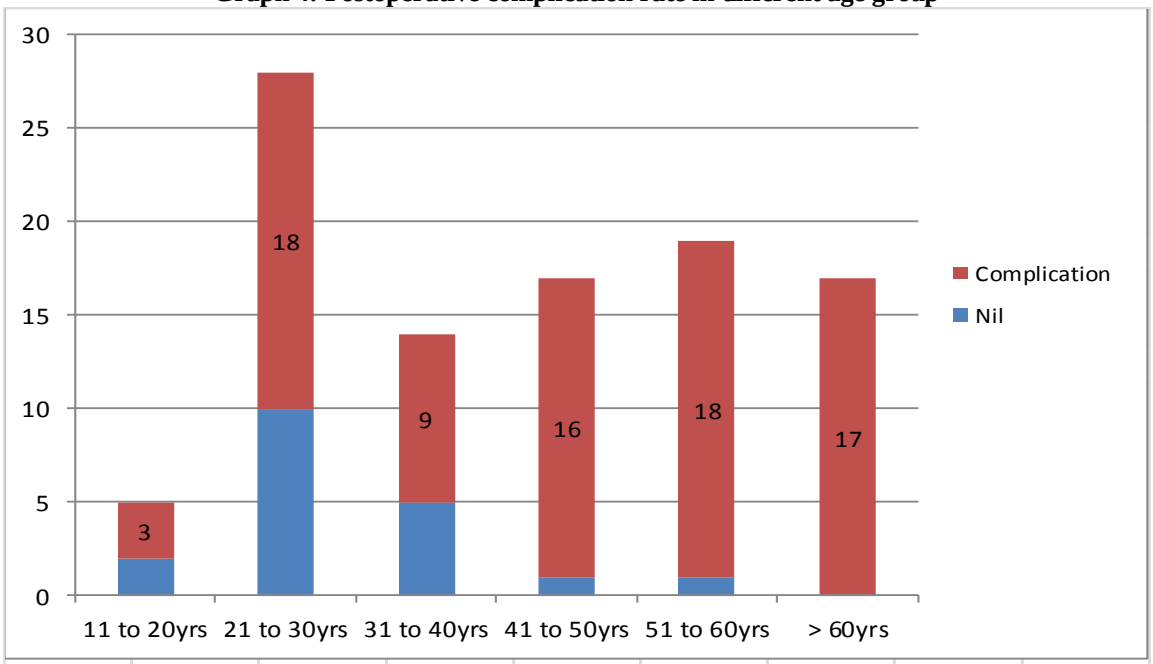
Age (yrs)	11-20	21-30	31-40	41-50	51-60	> 60	Total
Total no	5	28	14	17	19	17	100
Percentage (%)	5	28	14	17	19	17	
Complication	3	18	09	16	18	17	81
Percentage (%)	60.0	64.2	64.2	94.11	94.73	100	

Graph 3: Age distribution



This graph shows age distribution of the study population. Maximum patients belonged to the age group of 21-30years

Graph 4: Postoperative complication rate in different age group

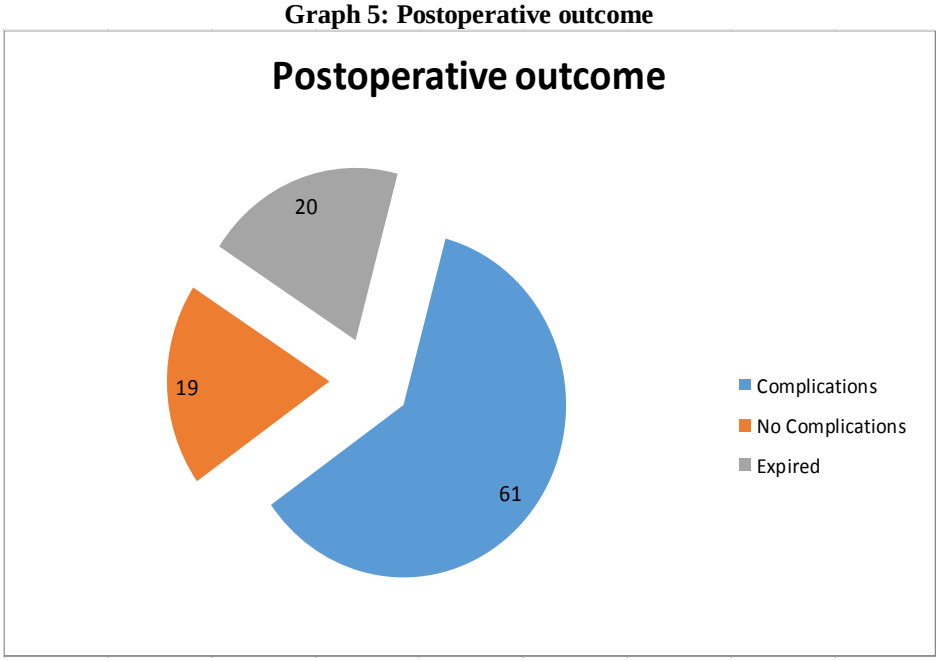


Of the 100 patients studied, the age varied from 18-75 yrs. The number of patients in the 21 – 30 years group was the highest (28%) with mean age being 42.68. This graph represents the complication rate in different age groups. The highest number of complications was noted in the age group of > 60 years (100%).

Table 5: Post operative outcome

	No. of cases	Percentage (%)
Post op complications	61	61
No complications	19	19
Death	20	20
Total	100	100

Graph 5: Postoperative outcome



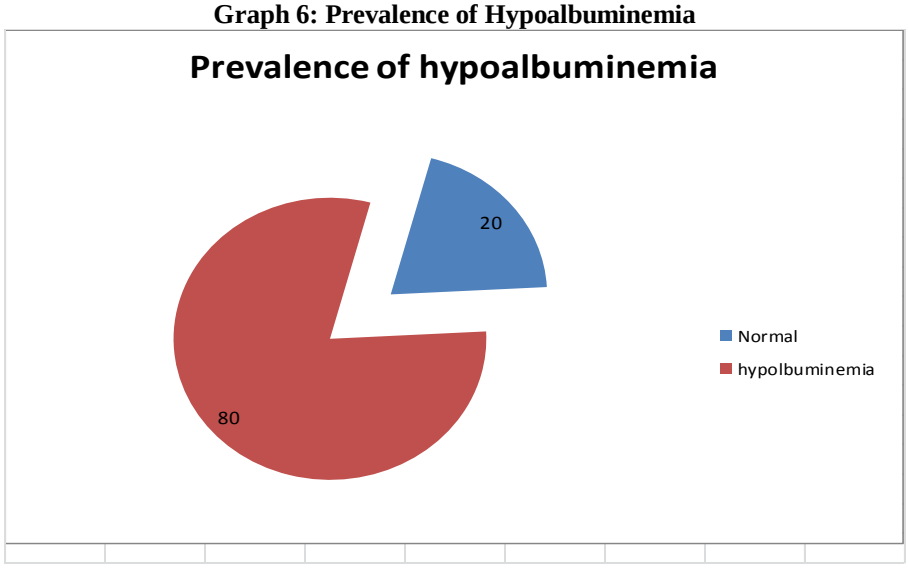
This graph shows the complication rate in the study, 81% of patients had complications including deaths.

81 of the 100 patients, 81% had postoperative complications including deaths. The most common complication was surgical site wound infection 43(43%) followed by sepsis 37 (37%), pulmonary complications 36 (36%), requirement of ventilator support 33 (33%), renal complications 34 (34%), cardiac complications 3 (3%) and DVT 2 (2%).

Table 6: Prevalence of hypoalbuminemia

S. albumin	No of pt	Percentage (%)
Normal	20	20
Hypoalbuminemia	80	80
Total	100	100

Graph 6: Prevalence of Hypoalbuminemia



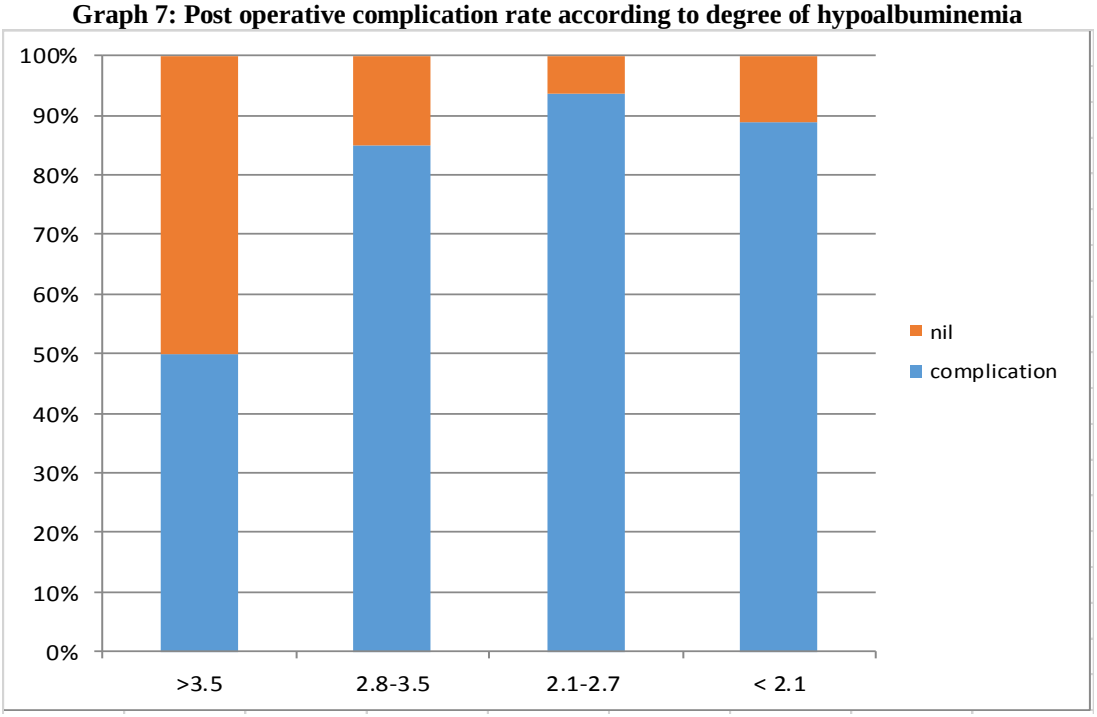
This is a graphic representation of prevalence of hypoalbuminemia of this study population. The prevalence of hypoalbuminemia was 80 % in the study population. The average level of albumin in this study is 2.92 g/dl.

Table 7: Postoperative complications in association with degree of hypoalbuminemia

Albumin levels (g/dl)	No of patients	Complicated	Uncomplicated	Percentage (%)
>3.5 (normal)	20	10	10	50.0
2.8-3.5 (mild)	40	34	6	85.00
2.1-2.7 (moderate)	31	29	2	93.54
< 2.1 (severe)	9	8	1	88.89

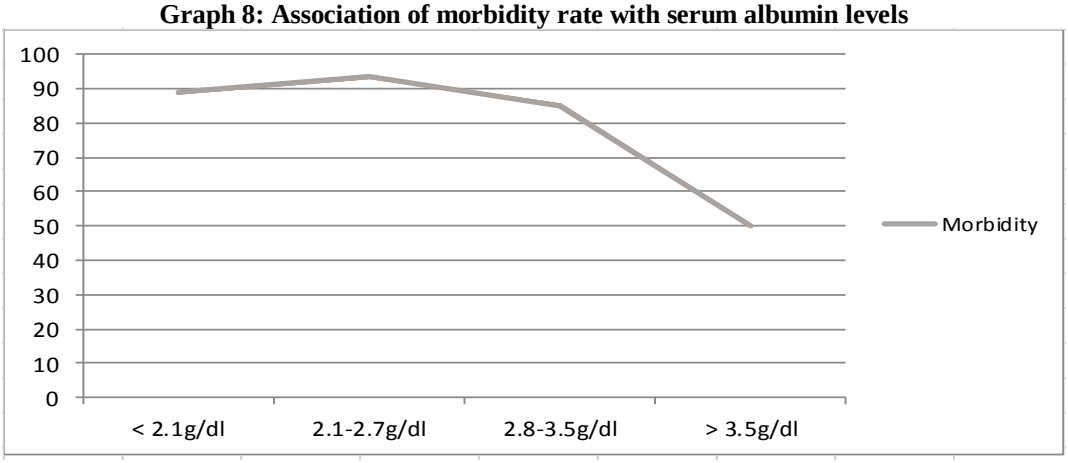
It was observed that the rate of complication was more when serum albumin level was of moderate range and which is statistically significant. The p value is < 0.05 (p= 0.004) for this chart calculated by chi square test.

Graph 7: Post operative complication rate according to degree of hypoalbuminemia



This graph shows the complication rate according to the level of hypoalbuminemia being highest in the moderate group (2.1-2.7g/dl).

Graph 8: Association of morbidity rate with serum albumin levels



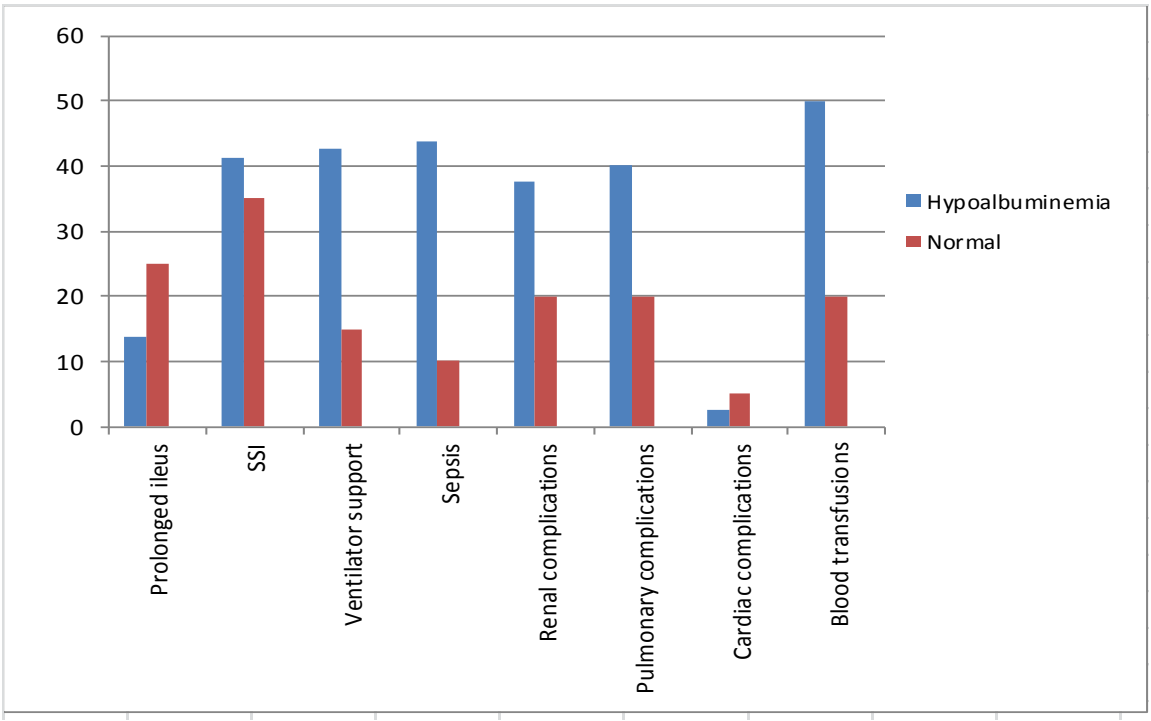
Graph showing the morbidity rate of patients for different albumin levels. It decreases as the albumin level increases.

Table 9: Comparison of complications between patients with hypoalbuminemia and normal serum albumin

Complications	Hypoalbuminemia	Percentage (%)	Normal	Percentage (%)	p value
Prolonged ileus	11	13.75	5	25	0.149
SSI	36	41.25	7	35.0	0.456
Ventilator support	34	42.5	3	15.0	0.02
Sepsis	35	43.75	2	10.0	0.029
Renal complications	30	37.56	4	20.0	0.049
Pulmonary complications	32	40.0	4	20.0	0.331
Cardiac complications	2	2.5	1	5.0	0.276
Blood & blood products transfusion	40	50.0	4	20.0	0.018

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, renal complications and requirement for blood and blood product transfusions

Graph 9: Comparison of complications between patients with hypoalbuminemia and normal serum albumin



This graph represents comparison between patients with normal albumin levels and hypoalbuminemia in relation to all complications

Table 10: Hospital stay

	Average
Normal albumin	9.75
Hypoalbuminemia	15.23

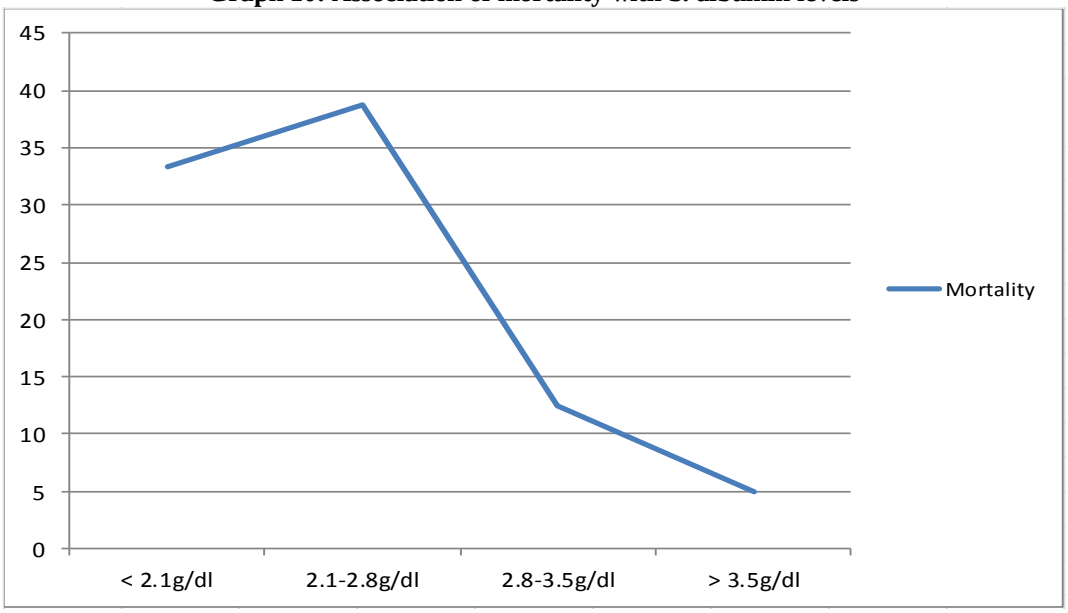
This table shows average hospital stay in patients with normal albumin levels which is lesser than that of patients with hypoalbuminemia.

Table 11: Association of mortality with S. albumin levels

Hypoalbuminemia	No of pts expired	No of patients	Percentage (%)
Severe	3	9	33.33
Moderate	12	31	38.7
Mild	5	40	12.5
Normal levels	1	20	5.0

Total of 20 patients expired during this study of 100. Mortality was highest in the group of moderate hypoalbuminemia. This calculation is statistically significant (p = 0.024).

Graph 10: Association of mortality with S. albumin levels



This graph shows the pattern of mortality in this study according to the albumin levels in the study. Mortality decreases with increase in albumin levels with a peak at moderate hypoalbuminemia.

IV. Discussion

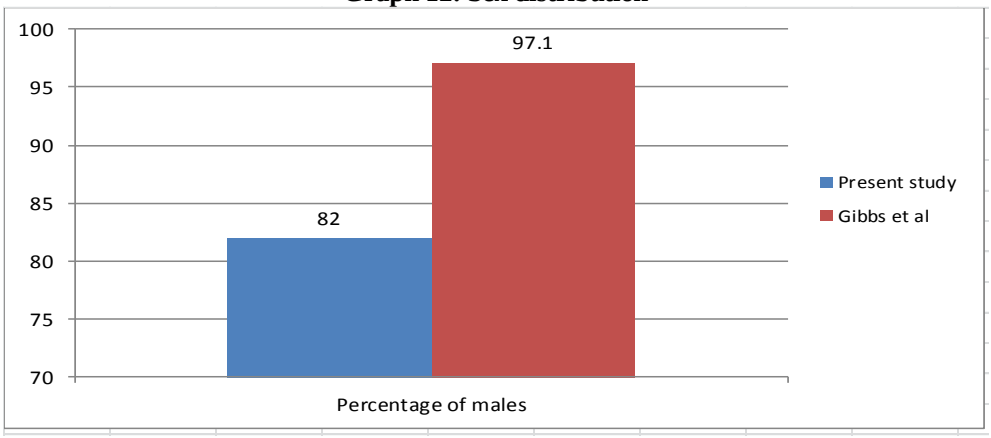
Nutritional assessment is essential for identifying patients who are at an increased risk of developing post operative complications. A variety of nutritional indices have been found to be valuable in predicting patient outcome. In our study preoperative serum albumin level and BMI were used for nutritional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

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'.** [(17)] 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.

Table 12: Comparison of Sex Distribution

	Present study	**Gibbs et al**
Percentage of males (%)	82	97.1

Graph 12: Sex distribution

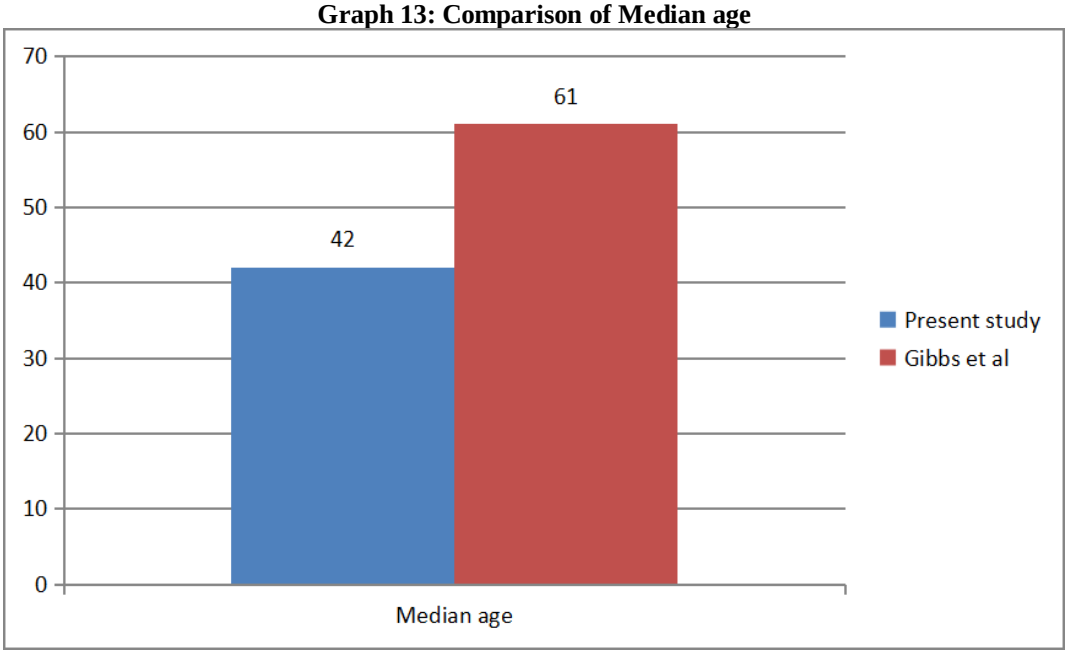


Males constituted 82% (82) of the study population of the present study in comparison to 97.1% (52,642) of the study by Gibbs et al.

Table 13: Comparison of Median age

	Present study	Gibbs et al
Median age (years)	42	61

Graph 13: Comparison of Median age

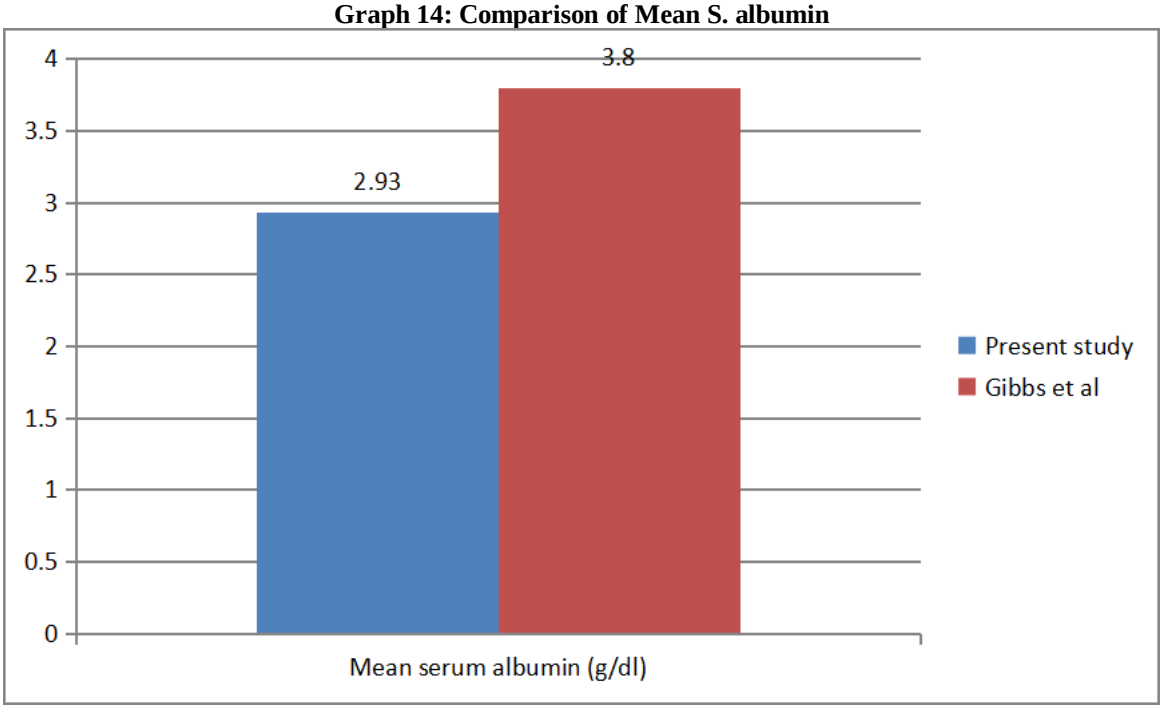


The median age of the present study was 41.48(42) years and that of the study by Gibbs et al was 61years.

Table 14: Comparison of Mean serum albumin

	Present study	Gibbs et al
Mean serum albumin (g/dl)	2.93	3.8

Graph 14: Comparison of Mean S. albumin

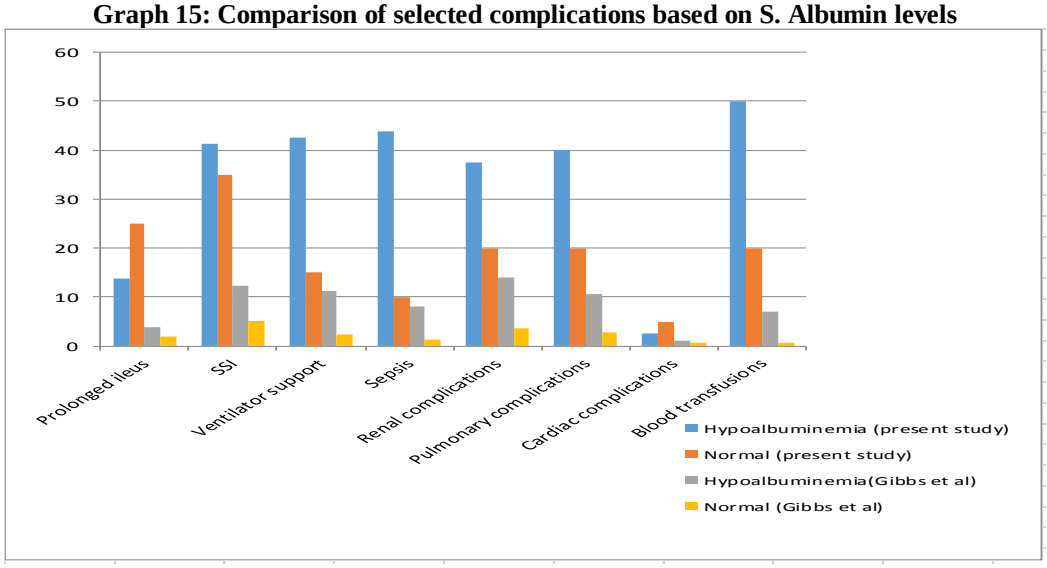


The mean serum albumin level was 2.93g/dl in the present study which was lower than that of Gibbs et al ie 3.8g/dl.

Table 15: Comparison of selected complications based on S. Albumin level

	Hypo-albuminemia – Present study	**Normal albumin – present study**	**Hypo-albuminemia – Gibbs et al**	**Normal albumin- Gibbs et al**
Prolonged ileus	13.75	25.0	3.9	1.9
SSI	41.25	35.0	12.30	5.2
Ventilator support	42.5	15.0	11.2	2.3
Sepsis	43.75	10.0	8	1.3
Renal complications	37.56	20.0	14	3.6
Pulmonary complications	40.0	20,0	10.6	2.9
Cardiac complications	2.5	5.0	1.1	0.6
Blood transfusion	50.0	50.0	7.1	0.6

Graph 15: Comparison of selected complications based on S. Albumin levels

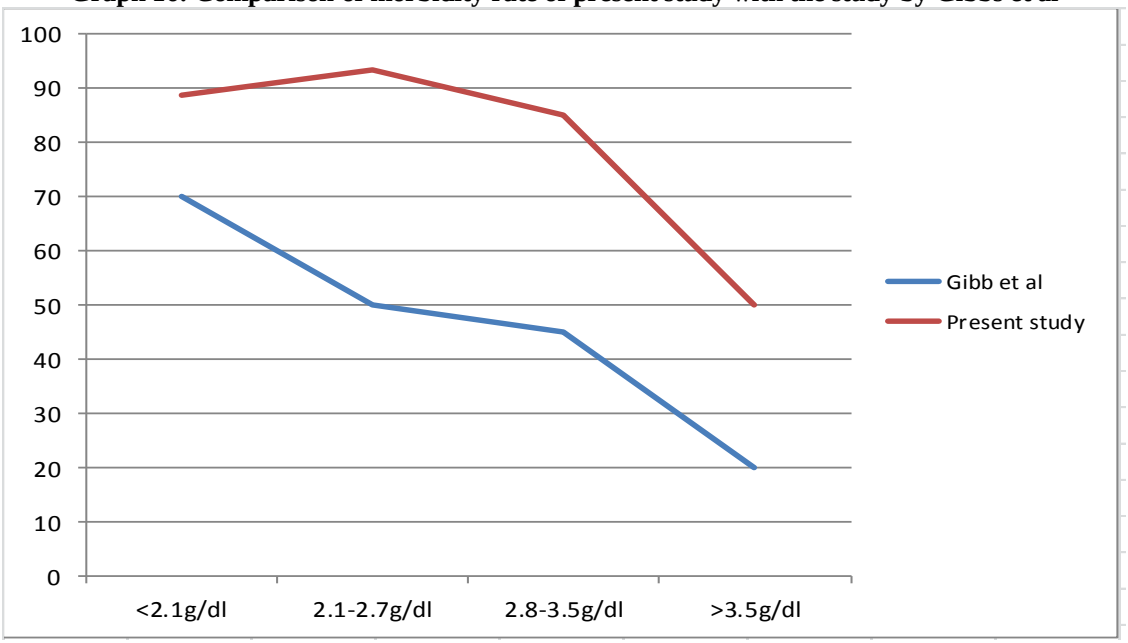


This graph compares selected complications between the two studies. All relationships were statistically significant ($p < 0.001$) in the study by Gibbs et al. In the present study only variables like requirement of ventilator support, sepsis, renal complications and requirement for blood and blood product transfusions showed statistical significance ($p<0.05$). This difference could be attributed to the large sample size taken by the Gibbs et al.

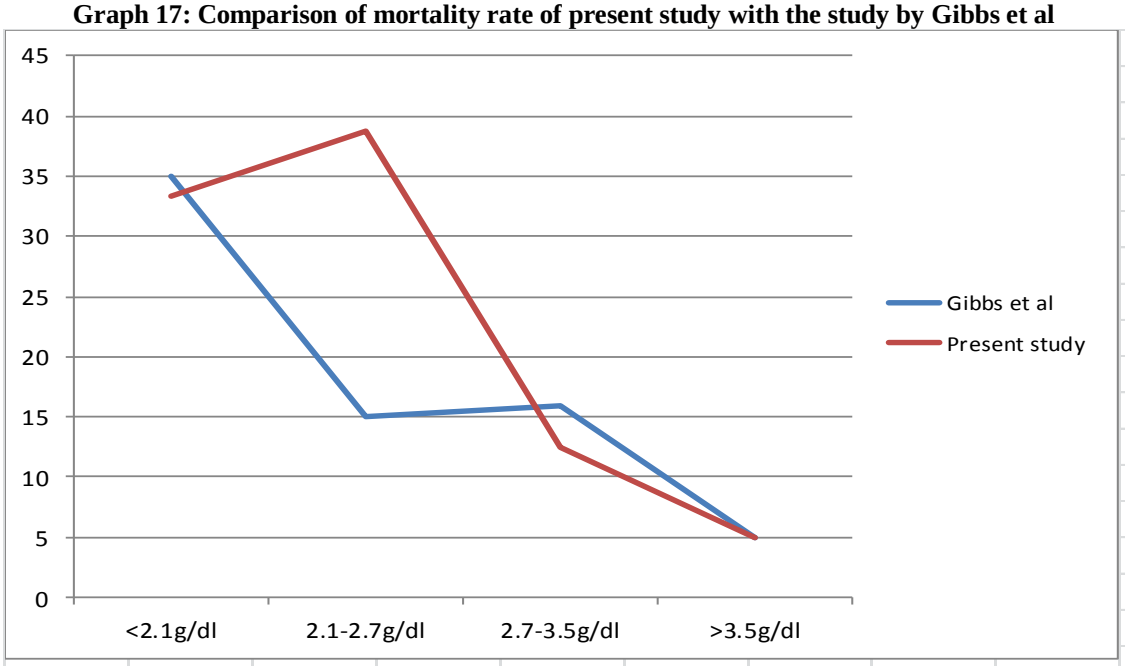
Table 16: Comparison of Morbidity & Mortality based on S. Albumin levels

	Present study	Gibbs et al
Morbidity (%)	61	19.6
Mortality (%)	20	3.9

Graph 16: Comparison of morbidity rate of present study with the study by Gibbs et al



Graph 17: Comparison of mortality rate of present study with the study by Gibbs et al



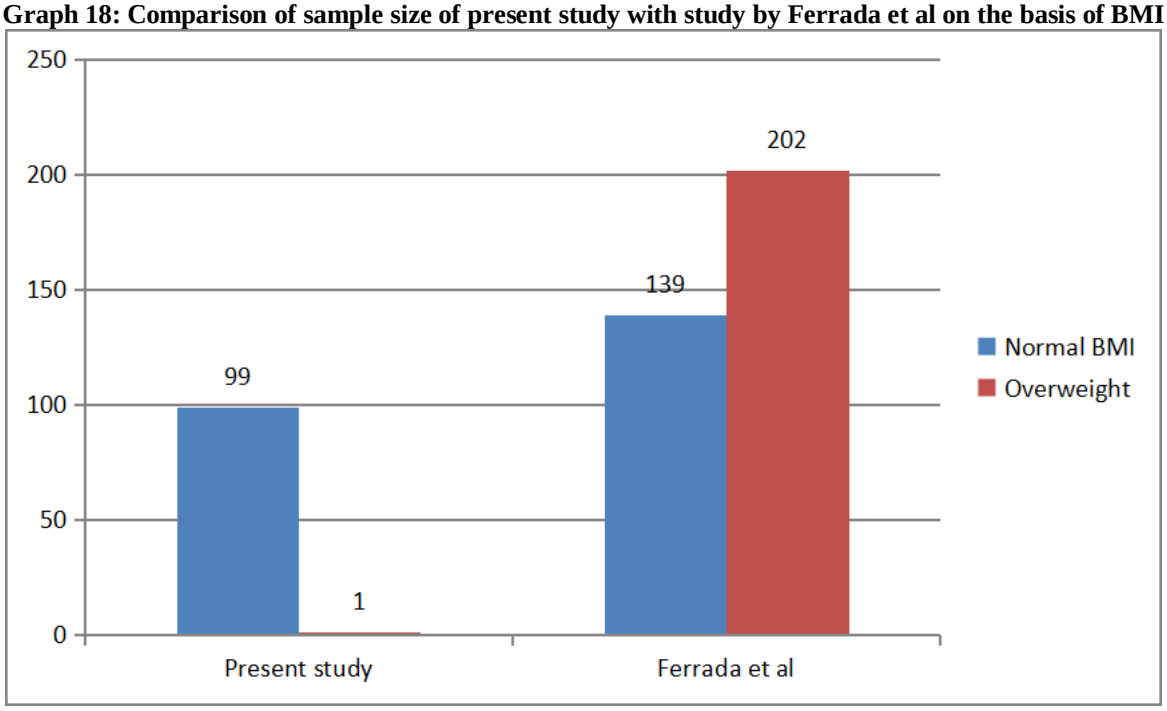
On comparing with the study conducted by Gibbs et al, the present study showed a low mean serum albumin level depicting a poor nutritional status of our patients leading to high morbidity rate. Maximum patients were males in both the studies. The morbidity rate of both studies decreased with increase in serum albumin levels as shown in graph . Better the albumin levels better was the postoperative outcome. The mortality rate was highest in moderate 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 et al[36] on **'Obesity Does Not Increase Mortality after Emergency Surgery'**. A total of 341 patients were included in their study who underwent emergency surgeries.

Table 18: 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	99	1	100
Ferrada et al	139	202	341

Graph 18: Comparison of sample size of present study with study by Ferrada et al on the basis of BMI



This graph represents the sample size in both study groups. Ferrada et al had highest patients in overweight group whereas present study had more patients in normal BMI group.

V. 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 sr. albumin 2.1-2.7g/dl. The patients with sr. albumin <3.5g/dl had a higher complication rate which was statistically significant ($p < 0.05$). Patients with serum albumin >3.5g/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. Early detection of hypoalbuminemia and prompt treatment can improve postoperative outcome.

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