

## Serum Albumin: Useful Predictors Of Surgical Site Infections In Emergency Laparotomy

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### ABSTRACT

**Background and objectives:** Emergency surgeries have been found to be associated with high rates of surgical site infections compared to elective surgeries. This study was conducted to determine serum albumin as predictor of SSI in emergency laparotomy as to throw light on how to minimize SSI. This study was intended to find the association between preoperative albumin and SSI, length of hospital stay and death in emergency laparotomy

**Methodology:** A prospective cohort study was conducted between April 2018 and October 2018. Among 94 patients who underwent emergency laparotomy in Department of General Surgery. Each patient will be monitored from time of admission until the time of discharge and followed postoperatively 30 days for surgical site infection. The predictor variable is pre-op serum albumin. The outcome variables are surgical site infection, length of hospital stay and death. The analysis was done to find association between this variable.

**Results:** During follow up of 94 patients, 29(30.8%) developed SSI and 7(8.5%) patients died. The patients with serum albumin 3.5g/dl(8.7%). The patients with low albumin had increased length of stay in hospital than those with high values. Patients with albumin 3.5g/dl had 2.2% death. Serum albumin emerged significant to SSI after multivariate analysis. Serum albumin had not emerged as significant to length of stay and death. Serum albumin is a good predictor of SSI in emergency laparotomy and patients with serum albumin of < 174mg/dl has a high risk of developing surgical site infection with sensitivity of 87.6% and the specificity of 68.9%.

**Conclusion:** In this study, low albumin is associated with increased risk of SSI. Association of serum albumin with length of stay and death could not be made. Serum albumin is a better predictor of SSI.

**Keywords:** Surgical site infections, pre-op albumin, length of hospital stay, death, emergency laparotomy

## Introduction

Surgical site infection is one of the most common postoperative complications with incidence of 38%<sup>[1, 2]</sup>. SSI increases the morbidity and mortality related to the surgery and continue to be a major problem postoperatively worldwide SSI is defined as infection occurring within 30 days following surgery or up to 1 year following foreign material implantation (vascular graft, mesh, prosthetic joint)

SSI is divided into

1. Superficial incisional (skin and subcutaneous).
2. Deep incisional (fascia and muscle).
3. Organ/space related (anatomical location of procedure itself)-intra-abdominal abscess, empyema, mediastinitis. Incisional infections are more common accounting for 70% of all SSI but better prognosis than organ/space related infection with latter accounting for 90% SSI related mortalities<sup>[2]</sup>. The adverse effects of malnutrition on the morbidity and mortality of patients was first recognized by Hippocrates (460BC-370 BC) many centuries ago. It 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<sup>[3]</sup>. Nutritional assessment is essential to identify patients who are at risk of developing complications related to significant malnutrition<sup>[4]</sup>. A dietary history, physical examination (including anthropometric measurements), and relevant laboratory tests are the appropriate tools needed for an accurate evaluation of a patient's pre-operative nutritional status. The serum albumin level is a readily available and clinically useful parameter. A serum albumin level > 3.5g% suggests adequate protein stores and it confers a protective effect through several biological mechanisms. It predicts peri-operative morbidity and mortality<sup>[5]</sup>. 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 an 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, because of inadequate food intake, or secondary, due to other illness. For most developing nations, primary PEM remains among the most significant health problems. PEM affects every organ system. The most obvious consequences are loss of body weight, adipose stores and skeletal muscle mass. Hepatic synthesis of serum protein decreases and reduced levels of circulating proteins are observed. Because of changes in immunological function, wound healing is poor<sup>[6]</sup>. This study intends to try and find out if serum albumin is associated with infections following emergency surgeries by studying the association between preoperative albumin levels and SSI, length of hospital stay and death in emergency laparotomy so as to modify them and prevent surgical site infections.

## Aims and Objectives

To study the relation between preoperative serum albumin and outcome of surgery, measured as surgical site infections, length of hospital stay and death in patients undergoing emergency laparotomy.

## Materials and Methods

**Study design:** Prospective Cohort study.

**Study setting:** General surgery Department.

**Study period:** 7 months from April 2018 and October 2018.

**Study population:**

**Inclusion criteria**

Patients undergoing emergency laparotomy in Department of General surgery for non-traumatic disease.

Age >13 years.

**Exclusion criteria**

- Laparotomy in the setting of trauma.
- Foreign body implantation during surgery like prosthetic mesh.
- Not giving consent.

**Predictor variable:** Pre-op serum albumin.

**Outcome variables**

- Mainly Surgical site infection.
- Length of hospital stay.
- Death.

**Method of data collection**

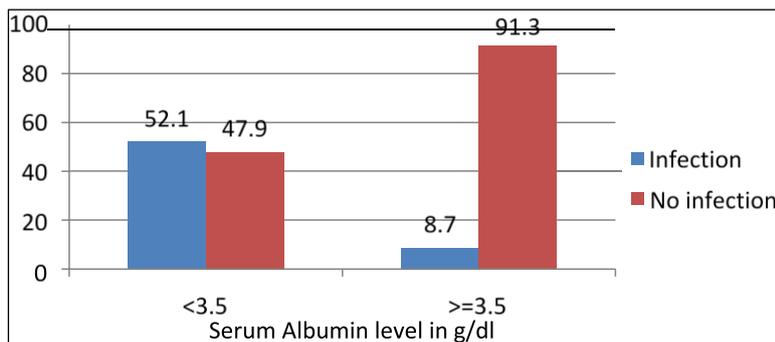
The preoperative serum albumin will be measured. Other data were obtained using a standardized data collection form. Each patient will be monitored from time of admission until the time of discharge and followed postoperatively 30 days for surgical site infection and correlated with the albumin levels. Its correlation with length of stay in hospital and death will also be assessed. Blood was collected preoperatively from all patients for measuring serum albumin. Pus or wound exudates were obtained from incision site and transported for culture to laboratory. Serum albumin less than 3.5g% is considered hypoalbuminemia.

## Results

**Table 1:** Comparison of SSI based on Pre-op Albumin

PREOP Albumin	Infection		No infection	
	%	count	%	count
<3.5	52.1	25	47.9	23
≥3.5	8.7	4	91.3	42

Chi square-20.8; df-1; p value 0.00(<0.05); RR 11.4.



**Fig 1:** Comparison of SSI based on Pre-op Albumin

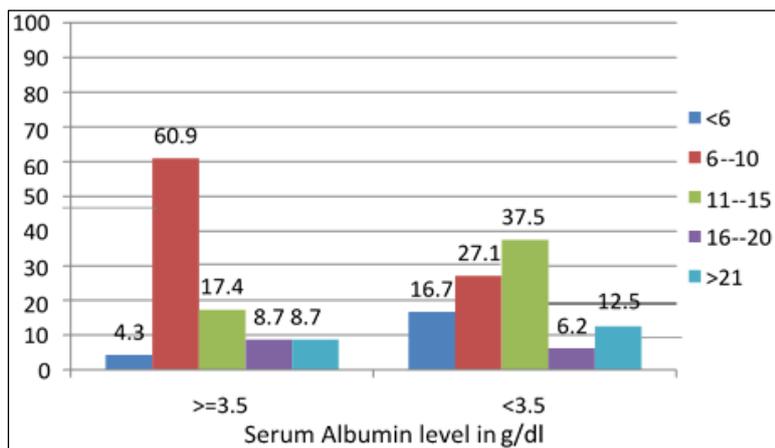
When comparing the sr. albumin to SSI, it was found that patients with alb<3.5g/dl had 52% SSI and those with >3.5g/dl had 8.7% SSI. It was observed that the rate of SSI was more when serum albumin level was less than 3.5 gm/dl which is statistically significant and Sr. albumin level >3.5gm/dl were associated with statistically significant lower SSI.

Length of stay and pre-op albumin

**Table 2:** Comparison between length of stay and Pre-op Albumin

Albumin	<6		6-10		11-15		16-20		>21	
	%	count	%	count	%	count	%	count	%	count
>=3.5	4.3	2	60.9	28	17.4	8	8.7	4	8.7	4
<3.5	16.7	8	27.1	13	37.5	18	6.2	3	12.5	6

Chi square-13.4; df-4; P value-0.009.



**Fig 2:** Comparison between Length of stay and Pre-op Albumin

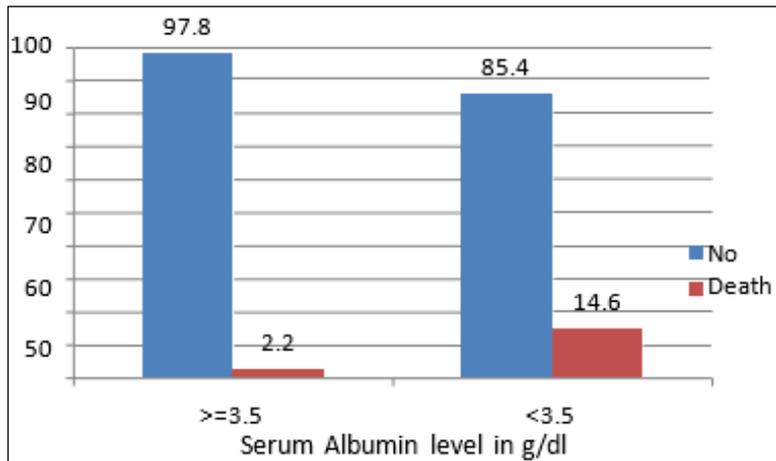
When comparing the sr. albumin to LOS, it was found that patients with low albumin (<3.5) had increased length of stay in hospital than those with high albumin (>=3.5g/dl). Thus, serum albumin is a statistically significant predictor of Length of stay.

**Death and Pre-Op albumin**

**Table 3:**Comparison between Death and Pre-Op Albumin

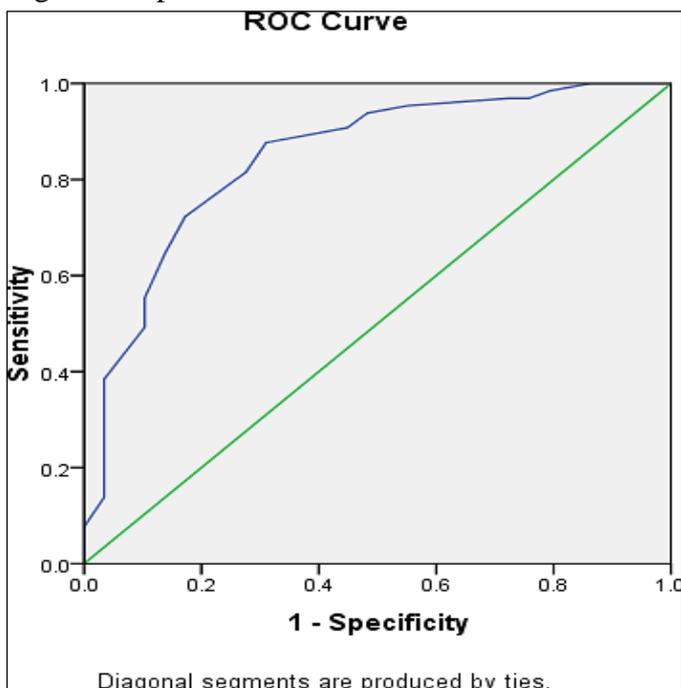
PREOP Albumin	No death		Death	
	%	count	%	count
>=3.5	97.8	45	2.2	1
<3.5	85.4	41	14.6	7

Chi square-4.7; df-1; P value-0.03.



**Fig 3:**Comparison between Death and Pre-Op Albumin

It was found that patients with alb<3.5g/dl had 14.6% death and those with>3.5g/dl had 2.2% death. It was observed that the rate of death was more when serum albumin level was less than 3.5 gm/dl which is statistically significant and Sr. albumin level >3.5gm/dl were associated with statistically significant lower death. Thus,serum albumin is a statistically significant predictor of Death.



**Fig 4:** ROC curve for prediction of SSI using serum albumin

Area under the curve=0.846 the cut off is 3.05.  
With sensitivity =87.6% and specificity =68.9%.

### Discussion

A study conducted in Spain showed that the levels of serum albumin routinely measured at hospital admission, are predictors of inhospital death, nosocomial infection and length of stay [1]. Several community studies [47-50] have found a relationship between a low serum albumin level and an increased risk of death. In the hospital setting, serum albumin level was related to in-hospital mortality [7,8,9] length of stay (LOS), [9,10,11] and nosocomial infection. These reports suggest that measurement of serum albumin level is a risk marker for a bad prognosis for hospital stay. According to a study conducted by Blumetti *et al.* in The University of Texas, the incidence of SSI in patients undergoing emergency surgery was 36% when compared to 23% in patients undergoing elective surgery. In another study [12], it was found that low serum levels of albumin are associated with risk of death. In this study, serum albumin concentration is a better predictor of SSI and associations could not be made with length of stay and death. The main limitation of this study is the low number of some effects. It may imply lack of statistical power to draw significant conclusions on mortality and length of stay. The deaths were very few to draw statistically significant conclusion. Clear and significant trends were observed for serum albumin with SSI. There are many confounding factors which are not accounted for. There is need for more studies to determine if serum albumin is modifiable risk factors that can be influenced to reduce length of study and mortality.

### Conclusion

Low albumin and cholesterol is associated with increased risk of SSI.

### References

1. Cholesterol and Serum Albumin Levels as Predictors of Cross Infection, Death, and Length of Hospital Stay Miguel Delgado-Rodríguez MD, MPH; Marcelino Medina-Cuadros, MD; Antonio Gómez-Ortega, MD; Gabriel Martínez-Gallego, MD; Marcial Mariscal-Ortiz, MD; Miguel Angel Martínez-Gonzalez, MD; María Sillero-Arenas, MD.
2. Townsend, Beauchamp RD, Evers BM, Mattox KL, *et al*, editors. Sabiston Textbook of surgery 19th edition, The Biological Basis of Modern surgical practice, Saunders. Section LL, Chapter 12, 2012, 243-247.
3. John Macfie. Nutrition and fluid therapy. Bailey and love, short practice of surgery 25th edition, 223. N. Engl. J Med. The Washington manual of Surgery; 5th Edition, 1991;352:52.
4. Sacks GS, Dearman K, Replogle WH, Cora VL, Meeks M, Canada T. Use of subjective global assessment to identify nutrition-associated complications and death in geriatric long-term care facility residents. J Am Coll Nutr. 2000;19:570-577.
5. Longo WE, Virgo KS, Johnson FE, *et al*. Risk factors for morbidity and mortality after colectomy for colon cancer. Dis Colon Rectum. 2000;43:83-91.
6. Engelman DT, Adams DH, Byrne JG, *et al*. Impact of body mass index and albumin on morbidity and mortality after cardiac surgery. J Thorac Cardiovasc Surg. 1999;118:866-873.
7. Ryan TA, Rady MY, Bashour CA, Leventhal M, Lytle B, Starr NJ. Predictors of outcome

- in cardiac surgical patients with prolonged intensive care stay. *Chest*. 1997;112:1035-1042.
8. Chima CS, Barco K, Dewitt ML, Maeda M, Teran JC, Mullen KD. Relationship of nutritional status to length of stay, hospital costs and discharge status of patients hospitalized in the medicine service. *J Am Diet Assoc*. 1997;97:975-978.
  9. Palma S, Cosano A, Mariscal M, Martínez-Gallego G, Medina-Cuadros M, Delgado-Rodríguez M. Cholesterol and serum albumin as risk factors for death in patients undergoing general surgery. *Br J Surg*. 2007;94:369-375. Doi: 10.1002/bjs.5626.