

Serum albumin as a risk factor for surgical site infection among emergency abdominal surgeries: An observational study

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Abstract:

Background: Some of risk factors for development of SSI are contaminated wound, duration of procedure, body mass index, nutritional status of the patients, blood loss, and frequency of glove changes and use of subcuticular sutures. Serum albumin is an indirect marker of nutritional status of the patients. It is also an acute phase protein which is decreased during stress due to alternations in hepatic metabolism and loss of albumin into the interstitium. With this background we conducted a study the relationship of pre operative serum albumin with SSI.

Materials and methods: We conducted a cross sectional study among the emergency abdominal surgeries attended by the department of surgery of a tertiary care institute of Karnataka. Our study period was for 3 months and all eligible cases were included in the present study. Basic inclusion criteria were to include patients with age more than 18 years, with no prior history of hepatic disease, chronic kidney disease and on artificial supplements of protein. We have included only emergency abdominal surgeries in the present study. Presence of sepsis, severe anaemia, on steroids or chemotherapy, underweight and severely obese, jaundice and significant medical history of albumin loss like cystic fibrosis, nephrotic syndrome, cirrhosis of liver, protein losing enteropathy and ulcerative colitis were excluded from the study.

Results: The prevalence of SSI in the present study was 21%. E Coli (52.38%) was the most common organism isolated in the present study. The serum albumin levels among those patients with SSI was 2.75 ± 0.47 g/dL and among those without SSI was 3.28 ± 0.26 g/dL and this difference was statistically significant ($p < 0.001$).

Conclusions: About ¼ of the patients had SSI in the present study. Among 21 cases, E Coli was the most common organism isolated. This will give us a spectrum of empirical antibiotics to be prescribed after sending culture for future cases. Serum albumin levels of patient with SSI were significantly lower than those without SSI. Correcting serum albumin either pre operatively or post operatively will reduce the risk of SSI or this hypothesis has to be substantiated by more evidence in emergency surgeries.

Key Word: Serum Albumin; Surgical Site infection; Emergency Surgery

Date of Submission: 29-04-2021

Date of Acceptance: 13-05-2021

I. Introduction

Surgically induced stress encompasses derangements of metabolic and physiological processes which induce significant changes in inflammatory, acute phase, hormonal and genomic responses [1]. Emergency surgeries are even more stressful because of the lack of time for preparation, patient's health status and availability of surgeons in time etc. Hence, the risk of morbidities in emergency cases will be expected to increase when compared to elective surgeries [2]. Surgical site infection (SSI) is one of the common morbidities among emergency surgeries and is defined as incisional wound within 30 days of procedure [3]. Some of risk factors for development of SSI are contaminated wound, duration of procedure, body mass index, nutritional status of the patients, blood loss, and frequency of glove changes and use of subcuticular sutures [4, 5]. Serum albumin is an indirect marker of nutritional status of the patients [6]. It is also an acute phase protein which is decreased during stress due to alternations in hepatic metabolism and loss of albumin into the interstitium [7, 8]. With this background we conducted a study the relationship of pre operative serum albumin with SSI.

II. Materials and methods:

This was a prospective study conducted among the emergency abdominal surgeries attended by the department of surgery of a tertiary care institute of Karnataka.

Study Design: Cross sectional study

Study duration: 3 months

Study Setting: Department of Surgery, Shri B M Patil Medical College, Vijayapur, Karnataka

Sample Size: 100 patients

Sample size calculation: After a pilot data analysis of 25 cases, we found that serum albumin levels of patients who were having SSI were 2.8 mg/dl and among those without SSI was 3.21mg/dl. Using this, with 95% confidence interval and 90% power, we found the minimum sample size to be 98. So we included 100 cases in the present study.

Inclusion criteria:

1. Age more than 18 years
2. Emergency abdominal surgeries done under the department

Exclusion criteria:

1. Prior history of hepatic disease
2. Prior history of chronic kidney disease
3. Presence of sepsis
4. Severe anaemia
5. On long term steroids
6. Cancers
7. Underweight or severely obese
8. Cirrhosis of liver
9. Protein losing enteropathy
10. Cystic fibrosis and nephrotic syndrome

Procedure methodology:

Written informed consent was taken and prior permission was taken from the concerned authorities for the conduct of the study. Pre designed questionnaire with demographic details, detailed clinical history and physical examination and relevant investigations was used to collect the data. Serum albumin pre operatively was sent of all the patients along with other basic blood investigations. Appropriate surgical intervention was done and patients were followed up in wards for any infection. Suspected wound dehiscence and site infections were sent for culture and sensitivity for the department of Microbiology and empirical antibiotics were started. The culture report and outcome of SSI was noted in the proforma.

Statistical analysis:

The data was collected, compiled, and analyzed SPSS version 20.00. The qualitative variables were expressed in terms of percentages. The quantitative variables were both categorized and expressed in terms of percentages or in terms of mean and standard deviations. The difference between the two proportions was analyzed using chi-square or Fisher exact test. To test the difference between the two means, we used student t test. All analysis was 2 tailed and the significance level was set at 0.05.

III. Results

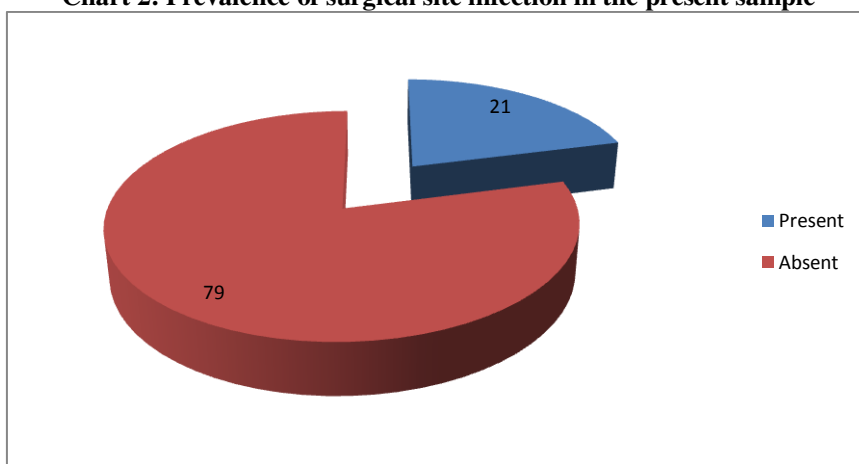
We included 100 emergency abdominal surgeries in the present study.

Table 1: Demographic particulars of the present sample

Demographic particulars	Frequency	Percentage
Age group		
18 to 20	12	12
21 to 30	19	19
31 to 40	22	22
41 to 50	23	23
51 to 60	10	10
>60	14	14
Gender		
Male	56	56
Female	44	44
Diabetes Mellitus	23	23
Hypertension	30	30

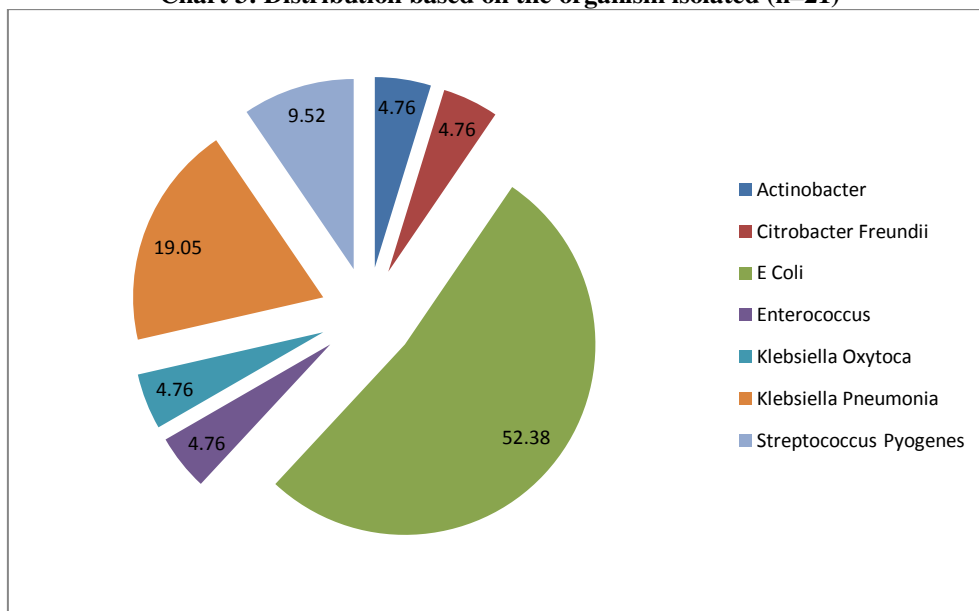
The mean age of the cases was 37.46 ± 17.01 years with male preponderance. About 23% had diabetes and 30% cases had hypertension.

Chart 2: Prevalence of surgical site infection in the present sample



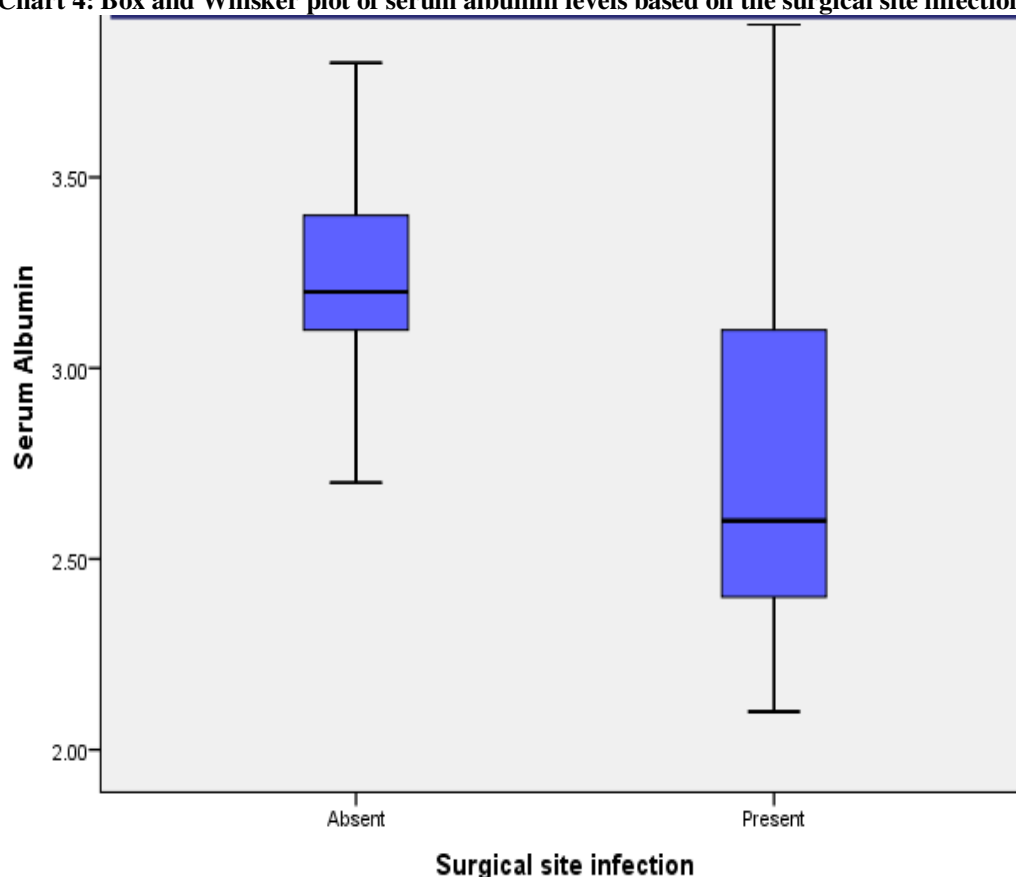
The prevalence of SSI in the present study was 21%.

Chart 3: Distribution based on the organism isolated (n=21)



E Coli (52.38%) was the most common organism isolated in the present study.

Chart 4: Box and Whisker plot of serum albumin levels based on the surgical site infection



The serum albumin levels among those patients with SSI was 2.75 ± 0.47 g/dL and among those without SSI was 3.28 ± 0.26 g/dL and this difference was statistically significant ($p < 0.001$).

IV. Discussion

Patient's nutritional status is of utmost importance when it comes to surgeries pre operatively. Elective surgeries have this advantage to improve the health and then do a planned surgery. But, emergency surgeries will not have such patient's preparations due to the urgency of the surgery to be performed. The main goal of the present study was to find any association of serum albumin and SSI so that we can incorporate it in our guidelines to reduce the SSI in our hospital.

We found that 21% of the cases were having positive culture report from the suspected SSI swabs sent. The proportion of SSI range from 4.56 to 23.34% in various studies conducted [9-13]. E Coli was the most common organism in the present study. Similar inferences were drawn by Negi V et al[14], Kasukurthy LR et al[15], Mahat P et al[16], Akhter MSJ et al[17],Mundhada AS et al[18]and Njoku CO et al[19] in their studies.

There was a significant difference between the serum albumin levels of the patients with and without SSI in the present study ($p < 0.001$). Lalthruaizela S et al [20] inferred that pre operative Hypoalbuminemia was an independent predictor for SSI in their study. In a meta analysis and systemic review conducted by Yuwem P et al [21] among the patients with orthopaedic emergency surgeries inferred that serum albumin < 3.5 g/dL in their patients had 2.5 fold increase in the risk of SSI. Another study conducted by Alfargieny R et al [22] also inferred similar inferences. In another study conducted by Rungsakulkij N et al [23] pre operative serum albumin and operative time were two independent predictors for SSI. So, serum albumin serves as a potential marker for prediction of SSI in the emergency surgeries. Routine practice is to investigate serum albumin pre operatively, correct it either pre operatively or post operatively in cases of emergency surgery which will help to reduce the SSI.

Our study of course had some limitations. It was a single center study and an observational study. Randomised controlled trials on replacing serum albumin in reducing the SSI with a multi centeric approach will be a robust evidence generation on the present hypothesis. Other confounding factors associated with SSI are not addressed in the present study. Nonetheless, this study is one of pioneer studies in studying the serum albumin levels among the emergency abdominal surgeries and will add to the research pool to develop evidence.

V. Conclusion

About ¼ of the patients had SSI in the present study. Among 21 cases, E Coli was the most common organism isolated. This will give us a spectrum of empirical antibiotics to be prescribed after sending culture for future cases. Serum albumin levels of patient with SSI were significantly lower than those without SSI. Correcting serum albumin either pre operatively or post operatively will reduce the risk of SSI or this hypothesis has to be substantiated by more evidence in emergency surgeries.

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Dr Shailesh S Kannur, et. al. “Serum albumin as a risk factor for surgical site infection among emergency abdominal surgeries: An observational study.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(05), 2021, pp. 07-11.