Orginal Article

Preoperative Serum Albumin level as a Predictor of Surgical Site Infection in Emergency Laparotomy

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Abstract

Introduction: Serum albumin level is the most readily available and clinically useful parameter used to predict surgical site infection. According to Centres for Disease Control and prevention (CDC), surgical site infection (SSI) is defined as an infection occurs within 30 days of the procedure or within 1 year if prosthesis is implanted, increasing the risk of poor clinical outcome.

Methods: This is a prospective study where 58 patients with estimated preoperative serum albumin level had undergone exploratory laparotomy with acute abdominal conditions in Department of General Surgery, National Medical College and Teaching Hospital over period of January 2021 to July 2021. History and detailed clinical examination were performed as per the working proforma which included patients with record of preoperative serum albumin level. Albumin less than 3.5 g/dL was recognized as hypoalbuminemia. The association between preoperative serum albumin level and surgical site infection was assessed. Data analysis was done using SPSS (Statistical package for social sciences).

Results: Total number of patients in our study was 58, out of which 63.79% were males. The youngest patient included was 20yrs and the eldest one was 85yrs of age. Total 23 patients (39.70%) had hypoalbuminemia at the time of operation. Surgical Site Infection were found in 20 cases with albumin <3.5g/dl and 7 cases with > 3.5g/dl (p=<0.001).

Conclusion: Our study revealed that when serum albumin level was less than 3.5gm/dl, surgical Site Infection were higher which was statistically significant.

Keywords: *Emergency laparotomy, serum albumin, surgical site infection*

Introduction

Hypoalbuminemia has been shown to be associated with increased mortality and morbidity rates in both hospitalized patients and samples of community dwelling elderly persons.[1] Albumin concentration is the most useful biochemical parameters used to evaluate nutritional status of patient.[2] The most common complication faced by surgeons in postoperative cases is surgical site infection (SSI). SSI is an infection that occurs in an incisional wound within 30 days post-surgery.[3] It can be superficial (skin and subcutaneous tissue), deep (fascial and muscle layers), or involving organ space.[4,5]

Serum albumin is a reliable and reproducible predictor of surgical risk and

has a close correlation with the degree of malnutrition.[6,7] transferrin, and prealbumin Hypoalbuminemia is a predictor of death, hospital stay, and outcome and is strongly associated with postoperative complications.[8–11]

This study aims to see the occurrence of SSI in emergency laparotomy in relation to the preoperative serum albumin level.

Methods

A cross-sectional study was done at National Medical College, Department of Surgery, Birgunj from January 2022 to May 2022. Total of 58 cases were included in the study who underwent emergency laparotomy for acute abdomen. Informed consent was obtained from the cases that were included in the study. Ethical clearance (F-NMC/576/078-79) was obtained from institutional review committee of NMC Birgunj. Preoperative investigations were sent. Patient was prepared for surgery. Pre-operative serum albumin was recorded. Patient was observed for postoperative complications. Patients who developed SSI were recorded. Patients who presented with icterus, anemia, and blunt trauma abdomen were excluded from the study.

The sample size was calculated using the formula:

$$n = \frac{Z^2 \times p(1-p)}{e^2}$$

n= required sample size

Z= confidence level at 90 % (standard value of 1.64)

p = proportion of population

m= margin of error at 10% (standard value of 0.1)

From the results of the studies conducted by other researchers can be assume that Patients with preoperative serum albumin less than 3.2 g/dL had complications in 27.5% in emergency abdominal surgery.[7] So, in the present study the value of p = 0.275 and that of q = 1- 0.275 = 0.725. Putting the value in the above equation the calculated sample size was 53. Taking 10% as failure to response the total sample size will be 58.

Cause for surgery was noted, SSI was noted, preoperative, serum albumin was noted and was divided in to normal albumin level and hypoalbuminemia. Presentation of SSI in patients with normal albumin level and hypoalbuminemia

Data collection was done in data collection sheet and later entered in Office Excel version 2016. Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 16. Variables were expressed in mean ± standard deviation, frequency and percentage where applicable. Comparison between groups was done using Chi square test where p value less than 0.05 was considered significant.

Results

The mean age of the patients that underwent emergency laparotomy was 43.64±15.38 years and mean serum albumin level was 3.49±0.789 g/dl (table 1). Among the 58 subjects included in the study, 37 (64%) were male. 39.7% of the subjects had hypoalbuminemia. Out of 23 subjects that had hypoalbuminemia 87% developed SSI post-surgery. Whereas among the 35 subjects with normal albumin only 20% developed SSI post-surgery (table 2). The finding was highly significant (p<0.001) showing that presentation of SSI was more in subjects with preoperative hypoalbuminemia.

Table 1: Albumin and age of subjects

Parameters	Albumin <3.5g/dl		Albumin >3.5g/dl		Total	
	Mean	SD	Mean	SD	Mean	SD
Age	52.26	15.330	37.97	12.701	43.64	15.384
Serum albumin	2.68	0.375	4.029	0.462	3.4953	0.789

Table 2: Albumin level and development of SSI among male and female subjects

Albumin (g/dl)	Frequency (%)	SSI present (%)	SSI absent (%)	Gender	
				Male (%)	Female (%)
<3.5	23 (39.7)	20 (87%)	3 (13%)	18 (78.3)	5 (21.7)
>3.5	35 (60.3)	7 (20%)	28 (80%)	19 (54.3)	16 (45.7)
Total	58	27	31	37	21

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Table 3: Albumin and age of subjects

Parameters	Albumin <3.5g/dl		Albumin >3.5g/dl		Total	
	Mean	SD	Mean	SD	Mean	SD
Age	52.26	15.330	37.97	12.701	43.64	15.384
Serum albumin	2.6822	.37494	4.0297	.46199	3.4953	.78976

Out of 58 patients, 22 (37.9%) were diagnosed with acute intestinal obstruction who underwent emergency laparotomy. Among these 22 patients, 14 (48.1%) developed SSI (table 4).

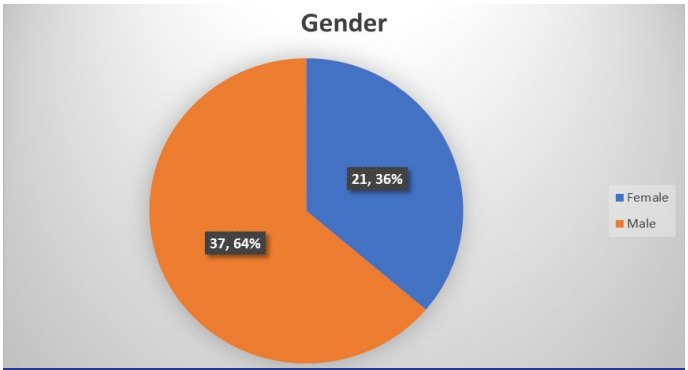

Fig 1: ???

Table 4: Indication for emergency laparotomy

Indication	Frequency (%)	SSI developed (%)
Acute Intestinal Obstruction	22 (37.9)	14 (48.1)
Appendicular Perforation	13 (22.4)	4 (14.8)
Ileal Perforation	2 (3.4)	0
Perforated Duodenal ulcer	21 (36.2)	10 (37)

Discussion

Nutritional assessment is essential for identification of patient who are at increased risk of developing post operative complications. Hypoalbuminemia results due to decrease in albumin production or increase loss. There are many tools to assess the nutrition status of patient but serum albumin is simple and good predicator for assessment of SSI. Preoperatively serum albumin is less than 3.5md/dl have high chance of developing SSI. Correction of the nutritional status of patient is required, as malnutrition increase risk for morbidity and mortality.

The most common indication for emergency abdominal surgery was peptic ulcer perforation, followed by acute intestinal obstruction.

In our study the mean age of patient was 43.64 year with SD 15.384. The maximum age was 85 year and minimum age was 20 years. Most of the SSI was seen in 40-59 year of age group, the incidence of SSI was 52.26 % which was similar to study conducted by Sodavaidya et al,[12] length of hospital stay and death and is reported to be one of the major causes of morbidity and mortality among hospitalized patients. Shows that the incidence of SSI was 35%,61%,56.5% respectively.

In our study out of among 37 male patient 15 (40.54%) patient developed SSI which was similar to study done by Sharma L et al[14] male (47.62)%.

In this study out of 58 patient, hypoalbuminemia (<3.5gm/dl) was seen in 23 cases (39.7%), out of which 20 developed SSI. The incidence of SSI was 87%. An association between low albumin level and development of SSI was found statically significant (P <0.001). This present study comparable with other studies Bhuyan K et al,[15] Sindgikar et al,[16] Warrier V M et al,[17] Hennessey et al,[7] Lalhruaizela et al,[13] shows that the incidence of SSI rate was 36%,72.7%,31.9%, 46.4%, 24.09%respectively.

In present study, incidence of SSI in patients with normal serum albumin level (>3.5gm/dl) found to be 20% only, which was found to be low similar to study done by Bhuyan K et al.[15]

Our study shows the presentation of the patients and development of SSI in when albumin level is low preoperative state. Further study is required to see if correction of preoperative hypoalbuminemia has a better outcome in emergency laparotomy.

Conclusion

Preoperative hypoalbuminemia is an important risk factor for the development of SSI. Our finding was in consistent with other similar articles. Surgeons performing these surgeries have to think ways to reduce SSI. As most of the cases have to undergo emergency surgery perioperative management of hypoalbuminemia might be helpful in reducing the risk of SSI.

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