Section: Surgery

Original Research Article

CORRELATION OF PREOPERATIVE SERUM ALBUMIN, TRIGLYCERIDE, TOTAL CHOLESTEROL AND HDL LEVELS WITH RISK OF DEVELOPMENT OF SURGICAL SITE INFECTIONS (SSIS) IN EMERGENCY AND ELECTIVE SURGERIES

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ABSTRACT

Background: Surgical site infection is a serious complication affecting all surgical procedures. Even after so many advancements in surgical techniques and care of the patients, the incidence of SSIs has not reduced to such extent.
Aim: Correlation of preoperative serum albumin, triglyceride, total cholesterol and HDL levels in patients with surgical site infections
Material and Methods: The Prospective observational study was conducted in the Department of General Surgery, Government Medical College Jammu from January 2023 to March 2024. A total of 100 patients were included.
Results: Most of the patients were male about 77percent and 33 percent were female. Maximum patients were in the age group of 45-60 years of age. Surgical site infections were common in patients with low albumin levels. There were 33 patients with albumin levels <3.5 and in all of them, surgical site infection was seen. Similar trend was seen with high triglycerides levels. Patients with hypocholesterolemia were also prone to SSIs (21 patients). Low HDL cholesterol is also associated with higher incidence of surgical site infections (24 patients).
Conclusion: Low albumin and low total cholesterol levels are associated with increased risk of surgical site infection. Low HDL-C is also associated with increased surgical site infections. These are the preventable risk factors to decrease the post-operative complications.
Keywords: Surgical site infections (SSI), Hypocholesterolemia, Hypoalbuminemia.

INTRODUCTION

The infection at or near the surgical incision within thirty days of the procedure if no prosthetic is used and up to one year if a prosthetic is implanted is defined as Surgical site infection (SSI). The Centre for Disease Control and Prevention (CDC) classify surgical site infections into superficial, deep incisional, or organ/space infections. SSIs are the third most common nosocomial infections. Recent studies reported that the SSI rate ranges from 3% to 18% in India, with 17.7% in emergency surgeries and 12.5% in elective surgeries.[1] The likelihood of surgical site infections (SSIs) may be significantly impacted by various patient-related factors such as advanced age, nutritional status, existing infections and other medical conditions, as well as procedure-related factors like the type of suture material used, poor surgical techniques, lengthy surgery duration, inadequate preoperative skin preparation and insufficient sterilization of surgical instruments.[2] Exogenous and/or endogenous microorganisms are typically responsible for causing surgical site infections (SSI) by entering the wound either during

the surgery (primary infection) or post-surgery (secondary infection). Several studies have documented a correlation between decreased serum albumin levels, triglycerides, reduced cholesterol levels and low levels of High-density lipoprotein cholesterol (HDL-C) in the context of surgical site infections. This association has been linked to prolonged hospital stays, increased mortality rates and heightened morbidity among patients admitted to hospitals.[3-7]

Aim: The correlation of preoperative serum albumin, triglyceride, total cholesterol and HDL levels in patients with surgical site infections (SSI) after emergency and elective surgeries.

MATERIAL AND METHODS

The study was conducted in the Department of General Surgery, Government Medical College Jammu, from January 2023 to March 2024. A total of 100 patients were included during the study period.

Study Design: Prospective observational study.

Inclusion criteria: All the patients who developed surgical site infections after elective or emergency surgeries were included in the study.

Exclusion Criteria

1. Immuno-compromised patients.
2. Patients with any malignancy.
3. Patients on chemotherapy, radiotherapy or steroids.
4. Patients with metabolic disorders.
5. Patients admitted for ≤ 2days.

After the approval of the Ethical Committee of the institute, the study was conducted. Detailed information was given to the patients, and proper informed consent was taken. Details of the patients, including history and clinical examination, were recorded. Necessary pre-operative investigations were performed. Variables most likely to have possible relationship with postoperative complications (like albumin, triglycerides, total cholesterol, HDL, etc) were considered and evaluated at the time of admission. All the blood samples were obtained after proper fasting. Albumin levels were classified in three categories <3.5, 3.5-5.5 and >5.5. Total cholesterol divided into three groups <100 mg%, 100-200 mg% and >200 mg%. Triglycerides were divided into two categories, ≤160 mg% and > 160 mg%. HDL divided into two categories, ≤40 mg% and > 40mg%.

Statistical Analysis: Data was collected and tabulated in Microsoft excel sheet. SPSS version 22 was used to perform statistical analysis and student t test was used to compare the data. SSI was the dependent variable and other parameters were independent variables. Significant indicators of SSI after surgery were identified by using univariate analysis ($p< 0.05$).

RESULTS

A total of 100 patients were studied during the study period. Most of the patients were male about 77percent and 33 percent were female. Maximum number of patients were in the age group of 45-60 years of age (30 percent) followed by age group of 16-30 years (24 percent). [Table 1]

The results of surgical site infections with albumin levels were studied. Surgical site infections were common in patients with low albumin levels. There were 33 patients with albumin levels <3.5 and in all of them, surgical site infection was seen. Similar trend was seen with high triglycerides levels. Out of 38 patients with hypertriglyceridemia, SSIs were reported in 37patients. Patients with hypocholesterolemia (total cholesterol less than 100 mg%) were also prone to SSIs as 21 patients with hypocholesterolemia developed surgical site infections. HDL cholesterol is also one of the risk factors, low levels of which are associated with higher incidence of surgical site infections. Surgical site infections were also common in emergency surgeries (37patients) as compared with elective surgeries (10patients). Surgical site infection also increases with increase in surgical time, with greater than 2 hours of intra-operative time reported to have more infections as compared to less than 2 hours of surgery. [Table 2]

In elective surgeries, SSIs were more commonly seen in patients with open surgeries as compared to laparoscopic surgeries. [Table 3]

Table 1: Age and Gender distribution of the patients

Age Group	Male	Female	Total
≤15	8	1	9
16-30	17	7	24
31-45	11	7	18
46-60	19	11	30
>60	12	7	19
Total	77	33	100

Table 2: Analysis of risk factors associated with surgical site infections

S No.	Parameter		SSI		P value *
			Yes	No	
1	Albumin(mg/dl)	<3.5 (33)	33	0	<.001
		3.5-5.5 (67)	13	54	

		>5.5 (0)				
2	Triglycerides (mg%)	Hypertriglyceridemia-38		37	1	<.001
		Normal (62)		10	52	
3	Total cholesterol (mg%)		<100 (21)	21	0	0.001
			100-200 (77)	26	51	
			>200 (2)	0	2	
4	HDL cholesterol (mg%)		≤ 40 mg% (28)	24	4	<.001
			>40 mg% (72)	22	50	
5	Type of surgery		Emergency surgery (54)	37	17	<.001
			Elective surgery (46)	10	36	
6	Duration of surgery		>2hours(42)	29	13	<.001
			≤2hours(58)	18	40	

***student t test**

Table 3: SSIs in relation to type of elective surgery

Type of elective surgery	SSI		OR
	YES	NO	
Open surgery (22)	7	15	>1
Laparoscopic (24)	3	21	
Total (46)	10	36	

DISCUSSION

Surgical site infections are common after abdominal surgeries and are reported to be one of the common complications. This is associated with increased hospitalization costs, prolonged hospital stay, readmission rates and increased morbidity and mortality.[8] Therefore, SSIs pose a significant burden to the hospitals and the countries. Due to this, various models for surgical site infections were developed to help clinicians to rule out risk factors in the causation of surgical site infections and to prevent such infections. Different preventive measures that can significantly decrease the risk of surgical site infections are appropriate antibiotic prophylaxis, maintenance of peri-operative normothermia and control of hyperglycemia. These components should be implemented reliably to reduce the incidence of SSI to complete minimal.[9] Our study included 100 patients, most of which are male patients. Maximum patients were in the age group of 45-60 years of age (30 percent). Perioperative hypoalbuminemia (less than 3.5mg/dl) is a well-known and significant risk factor for the development of surgical site infections in patients undergoing abdominal surgeries. Serum albumin is considered the objective measure of nutritional status of the patient. Inflammation and malnutrition suppress the albumin synthesis, thus further increasing the risk of SSI.[10,11] In our study, all the patients with albumin levels less than 3.5mg/dl developed surgical site infections with significant values. Similar findings were reported by Delgado-Rodríguez et al. and Manjunath et al.[4,12-14] Hypertriglyceridemia (greater than 160mg%) was also a risk factor for increased incidence of surgical site infections in patients undergoing abdominal surgeries. In our study, about 37 patients developed SSIs with increased triglyceride levels. Total cholesterol has an inverse relation with surgical site infection, with higher incidence of SSIs in patients with hypocholesterolemia (less than 100 mg%). These findings are consistent with studies of Canturk et al. and Manjunath et al.[6,12] HDL cholesterol is considered a risk factor for SSIs. Incidence of SSIs were higher in patients with levels of HDL-C lower than 40 mg%.[4,6] Surgical site infections were also common in patients undergoing operative intervention in emergency setup as reported in our study. In elective surgeries, SSIs are more common in patients undergoing open surgeries. Consistent findings were reported by Jatoliya et al.[15] Duration of surgery is also implicated in the incidence of SSIs, with intra-operative time greater than 2 hours increases the risk for SSIs which is consistent with previous studies.[16]

CONCLUSION

Surgical site infection is a common complication after surgery, so every possible preventive measure should be taken to prevent such complications. Preoperative normalization of parameters like serum albumin, serum cholesterol should be done to decrease the risk of surgical site infections. Hypoalbunemia and hypocholesterolemia are the significant risk factors for postoperative complications. Increase in HDL cholesterol is associated with decrease in the surgical site infections. Hence, routine preoperative measurements of these parameters will help optimise the patients before surgery to decrease the incidence of SSIs.

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