ROLE OF PREOPERATIVE ASSESSMENT OF SERUM CHOLESTEROL AND ALBUMIN IN SURGICAL SITE INFECTION.

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Abstract

INTRODUCTION: Surgical site infection (SSI) is defined as infection occurring in an incisional wound within 30 days of the procedure or within 1 year if prosthesis is implanted. A few studies have reported a relationship between low serum albumin level and low cholesterol level in surgical site infection, length of hospital stay and death and is reported to be one of the major causes of morbidity and mortality among hospitalized patients.

METHOD: 1 year prospective cohort study was conducted in Tertiary Health care Centre, Indore. A study population of 248 patients from hospital admitted in Department of General Surgery for elective operation.

RESULT: From Total Patients - 172 (69.4%) were male patients and 76 (30.6%) were female patients. The frequency of patients developed SSI in hypoalbuminemia was 25(44.6%) in number compare to n=18(10.7%) in normal and to n=03(12.5%) in hyper albuminemia. The Relative Risk between Hypoalbuminemia and SSI is 4.17 with CI (2.46 to 7) (P = <0.001). There is a significant association between cholesterol levels and the occurrence of SSI, with majority of the people with SSI had Hypocholesterolemia and it was found to be statistically significant with Relative risk (RR=3.98, CI= 2.28 to 6.95) (P = <0.001).

CONCLUSION: Low blood cholesterol and albumin level are the important factors which is usually can lead to significant decrease in this preventable post operative complications especially in a malnourished population presenting in a government setup.

Introduction

Surgical site infection (SSI) is defined as infection occurring in an incisional wound within 30 days of the procedure or within 1 year if a prosthesis is implanted[1]. SSI can be superficial (involving only the skin and subcutaneous tissue of the incision), deep (involving fascial and muscle layers), or organ space[2].

Surgical site infection continues to be one of the major causes of nosocomial infections. It accounts for to about 15-20 percent of all nosocomial infections[3]. SSIs are consistently associated with significant morbidity and mortality, prolonged hospitalization, increased intensive care unit admissions and more frequent readmissions.

A few studies have reported a relationship between low serum albumin level and low cholesterol level in

surgical site infection, length of hospital stay and death and is reported to be one of the major causes of morbidity and mortality among hospitalized patients[4-7].

Hypolipidemia (hypocholesterolemia- total cholesterol <151 mg/dl) is an independent predictor of clinical outcome in critically ill patients. Cholesterol affects gluconeogenesis and immune function; its transport forms, the lipoproteins, also serve as vehicles for fat-soluble vitamins, antioxidants, drugs, and toxins. One that seems especially important is related to the ability of lipids and lipoproteins to bind to and neutralize bacterial endotoxin (lipopolysaccharide [LPS]) [8]. It has been noted that LPS in blood binds to LPS binding protein [9], activating the cell surface CD14 receptor[10]. This stimulates the release of a cascade of pro-inflammatory cytokines, including tumor necrosis

factor- α , IL-1, and IL-6 [11]. If LPS binds to lipoproteins (e.g. cholesterol), then cytokine release is decreased [12].

Apart from various reasons of hypocholesterolemia, Malnutrition is an important secondary cause and is present in majority of patients presenting in a government setup in India. Nutritional depletion has been demonstrated to be a major determinant of the development of postoperative complications. The prevalence of protein-energy malnutrition in surgical patients is high, ranging from 10% to 54%.

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[13]. Serum albumin is a reliable and reproducible predictor of surgical risk and has a close correlation with the degree of malnutrition; it is also a negative acute phase protein[14]. In an acute illness or stress response, there is a reduction in serum albumin due to alterations in hepatic metabolism and loss of albumin into the interstitium. Malnutrition and inflammation suppress albumin synthesis[15].

Our hypothesis was that preoperative levels of albumin and cholesterol are associated with the susceptibility for surgical site infections. We conducted this study to find out the relation between preoperative serum albumin and cholesterol level and risk of surgical site infection.

METHOD:

One year prospective cohort study was conducted in Tertiary Health care Centre - Index Hospital, Indore. A study population of 248 patients from hospital admitted in Department of General Surgery for elective operation –breast surgery, appendectomy, hernia repair (Inguinal/ Umbilical/ Paraumbilical/ Incisional) from January 2017 to December 2017. Excluded criteria of study:

- Diabetic patients and Pregnant Female
- Patient with critically ill & Obstructive hernia.
- Patients with low Immune system: HIV positive, on corticosteroids.
- Patients without follow up.
- Patients admitted with less than one day.

Detailed information was given to the patients and informed consent was collected from them.

Details history and clinical examination and also Necessary pre-operative investigations were performed. Preoperative, operative and Post-operative - Strict aseptic precautions were adopted. Preoperative Blood samples was drawn and analyzed for serum total cholesterol and albumin in the same hospital laboratory. Biochemistry serum tests were done at biochemistry Lab on Erba-300 automated Analyzer. Total cholesterol levels were classified into three categories- Hypocholesterolemia (<151mg/dl), Hypercholesterolemia(>240 mg/dl) and normal. Total serum Albumin were classified in 3 categories- hypoalbuminemia (<3.5 gm/dl) and hyperalbuminemia (>5.5 gm/dl) and normal.

The patients were monitored till the discharge. Operative wounds were examined everyday for signs of surgical site infection for both superficial and deep (according to CDC criteria). Any surgical site infection seen was recognized. Such patient's preoperative S.Albumin & S.cholesterol are considered for this study and its relation to surgical site infection were obtained. All related statistical analysis was done in statistical software.

RESULT:

Total of 248 patients who underwent abdominal and other surgery. Out of which 172 (69.4%) were male patients and 76 (30.6%) were female patients.

Table 1: sex distribution of the study

Sex	Number	Percentage
Male	172	69.4
Female	76	30.6

In the present study, Majority of the patients' population include of males 69.4%.

Table 2: Age distribution of the study

Age Group	Number	Percentage
00-20	05	2.0
21-40	140	56.5
41-60	88	35.5
61-80	15	6.0

Majority of the patients were consisting to the age group of 21-40 years and it was 56.5%. Mean age of study participants was 43.21 ± 12.35 years.

Figure 1: Distribution of study participants according to the albumin levels.

Most of patients were having a normal range of serum albumin (N =168, 67.7%), rest of patients having Low albumin level (hypoalbuminemia) (N = 56, 22.58%, Mean=2.8, SD=0.4) and hyperalbuminemia (N= 24, 9.6%).

Table 3: Distribution of study participants according to the total cholesterol levels.

Cholesterol	Frequency	Percentage
Hypocholesterolemia	67	27.02
Normal	143	57.66
Hypercholesterolemia	38	15.32

Hypocholesterolemia (S.cholesterol <160 mg/dl) was present in 67(27.02%) of the patients (Mean=129.5, SD=19) and normal cholesterol was reported in 143(57.66%) of the participants. High cholesterol levels were found in 38 patients with 15.32%.

Figure 2: Distribution of study participants according to SSI present or not.

The total incidence of postoperative SSI(surgical site infection) was 18.55% with n = 46. Remaining patients had normal surgical site with number 202(81.45%).

Table 4: Association between albumin levels and occurrence of SSI.

Albumin Level	SSI(Surgical Infection) Site		Total
	Present(%)	Absent(%)	
Hypo-albuminemia	25 (44.6)	31 (55.4)	56
Normal	18 (10.7)	150 (89.3)	168
Hyper-albuminemia	03 (12.5)	21 (87.5)	24

Table 5: Association between Total cholesterol levels and occurrence of SSI.

Cholesterol Level	SSI (Surgical Infection) Site		Total
	Present(%)	Absent(%)	
Hypo-cholesterolemia	28 (41.8)	39 (58.2)	67
Normal	15 (10.5)	128 (89.5)	143
Hyper-cholesterolemia	03 (7.9)	35 (92.1)	38

The frequency of patients developed SSI in hypoalbuminemia was 25(44.6%) in number compare to n=18(10.7%) in normal and to n= 03(12.5%) in hyper albuminemia. The Relative Risk between Hypoalbuminemia and SSI is 4.17 with CI (2.46 to 7) (P = <0.001).

There is a significant association between cholesterol levels and the occurrence of SSI, with majority of the people with SSI had Hypocholesterolemia and it was found to be statistically significant with Relative risk(RR=3.98, CI= 2.28 to 6.95) (P = <0.001).

20 patients with SSI had both hypoalbuminemia and hypocholesterolemia, and 05 patients with SSI had only hypoalbuminemia and 08 patients with SSI had only hypocholesterolemia.

DISCUSSION:

Surgical site infections are a frequent cause of morbidity following surgical procedures[16]. Surgical site infections have also been shown to increase mortality, readmission rates, length of stay, and costs for patients who incur them[17]. While nationally the rate of surgical site infection averages between two and three percent for clean cases (Class I/Clean as defined by CDC), an estimated 40 to 60% of these infections are preventable.

A review of the medical literature shows that the following care components reduce the incidence of surgical site infection: appropriate use of prophylactic antibiotics; appropriate hair removal; controlled

postoperative serum glucose for cardiac surgery patients; and immediate postoperative normothermia for colorectal surgery patients. These components, if implemented reliably, can drastically reduce the incidence of surgical site infection, resulting in the nearly complete elimination of preventable surgical site infection in many cases[18].

In our study, the aim is to find whether preoperative serum cholesterol and albumin parameter affect the chances of the surgical site infections or not. The present study has shown that Preoperative hypoalbuminemia and low cholesterol are significantly associated with the development of and is an independent risk factor for the development of postoperative SSI. Analysis of the correlation between serum albumin, serum cholesterol and the development of superficial and deep SSIs showed that preoperative serum albumin <3.0 mg/dl and cholesterol <150mg/dl - increased the risk of SSI in this study. In this study the relative risk for hypoalbuminemia and SSI was 4.1. This is in consistent with studies in the literature like

Neumayer et al [19] and also same as Dr Nowshad.M[20].

According to present study data the preoperative measurement of serum albumin and cholesterol at hospital admission is recommended. An additional advantage of albumin and cholesterol measurements in the hospital routine is potential improvement in control of cardiovascular and renal diseases by early detection.

CONCLUSION:

Low blood cholesterol and albumin level are the important factors which is usually can lead to significant decrease in this preventable post operative complications especially in a malnourished population presenting in a government setup.

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