



ROLE OF PREOPERATIVE ASSESSMENT OF SERUM HEMOGLOBIN A1C AND ALBUMIN IN SURGICAL SITE INFECTION IN DIABETIC AND NON-DIABETIC INDIVIDUALS

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ABSTRACT Surgical site infection is defined as infection occurring within 30 days of procedure or within one year if prosthesis is implanted. It continues to be one of the major causes of nosocomial infection. Surgical site infection increases the length of stay in hospital thereby increasing the cost over healthcare system. About 15 - 20 % of nosocomial infections are surgical site infections. The levels of albumin reflect nutritional status and also related to in hospital stay, nosocomial infection, length of stay in hospital. Preoperative blood glucose abnormalities (hypoglycaemia, hyperglycaemia or sugar fluctuation) could increase the rate of morbidity. Incidence of malnutrition is an important secondary cause of hypoalbuminemia in India.

KEYWORDS : Surgical site Infection, albumin, Serum HbA1c

INTRODUCTION

Surgical site infection is defined as infection occurring within 30 days of procedure or within one year if prosthesis is implanted [1]. Serum albumin is the most important biochemical index of malnutrition seen [2]. Significant decrease in levels of serum albumin reflect chronic protein depletion; however, they are poor measures of early protein malnutrition because of the long half-life of serum albumin (20 days) and large total body pool of albumin [3]. Studies have shown that hypoalbuminemia contributes negatively to the process of wound healing, fracture union and severity of disease [4]. Hypoalbuminemia is linked to mortality and postoperative complications such as surgical site infections and reoperations together with longer hospital stay [5,6]

Perioperative levels of serum albumin have been shown to be powerful predictor of morbidity and mortality [7]. Preoperative serum albumin plays a critical role in determining a patient's postoperative outcome after major surgery [8]

HbA1c is considered the gold standard in diabetes control, which does not only reflect the glycaemic adjustment of the last 2-3 months but is also a predictor of the occurrence of complications associated with diabetes. However, the HbA1c value is affected by haemoglobin metabolism and the lifespan of erythrocytes. In clinical situations in which these parameters are changed, i.e. in diabetic patients with advanced stages of nephropathy, the HbA1c value does not any longer correctly reflect glycaemic control [9,10]

In 2011, the World Health Organisation advocated the use of HbA1c in diagnosing diabetes.

Knapik and co-investigators conducted a retrospective review in 782 diabetic patients. For comparison of outcomes with tight post operative glycaemic control, patients had elevated HbA1c levels >7% were significantly associated with increased incidence of perioperative myocardial infarction compared with the HbA1c <7% group and There were no significant differences in all other morbidity and early mortality [11]

On contrast, other studies suggested that there is no strong relationship between elevated HbA1c and surgical site infection after coronary artery bypass grafting such as study carried out by Hudson and associates who examined 1474 patients found no association between elevated HbA1c and infection after cardiac surgery. However they found that Thirty-day mortality and acute kidney injury were significantly higher in patients with HbA1c >6% [12]

Poor nutrition and poor glycemic control may contribute to the vulnerability of patients to surgical site infection and expose them to prolonged hospitalisation [13]. Thus, evaluation of HbA1c and albumin on first contact may provide accurate guidance to the physicians on which patients may run a complicated course and who may be safely treated. If attention is paid to the nutritional care of patients during hospital stay, hypo-nutrition on admission can be ameliorated, which may facilitate recovery from infections. Also, patients with diabetes or hyperglycaemia were to develop more

complicated infections and need early intensive treatments. Such approach will contribute to our understanding of the clinical and laboratory characteristics of infections and help to better treat patients suffering from surgical site infection.

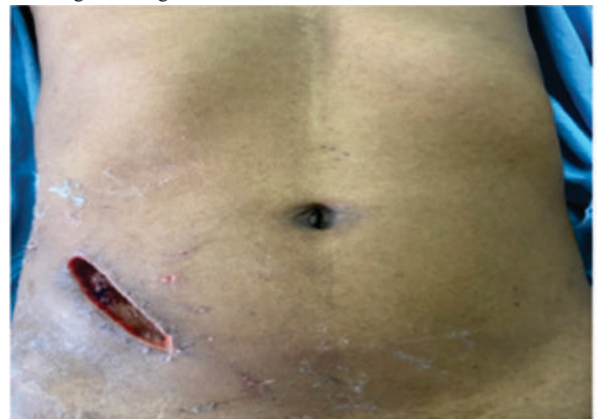


Figure 26: Showing infected Appendicectomy wound



Figure 27: showing laparotomy wound infection

Figure 1: Image Showing Surgical Wounds With Wound Infection

MATERIALS & METHODS

The study was a prospective study of 300 cases, which consisted of 150 patients with surgical site infection and 150 patients without surgical site infection. The study was a two-year, single Centre prospective cohort study conducted at Goa medical College and

Hospital, carried out between January 2021 to September 2022 with prior clearance from Goa medical ethics committee. Inpatients in Department of General surgery admitted for elective and emergency operations such as breast surgery, hernia surgery, appendicectomy, head and neck surgery and colorectal surgeries were the study population selected randomly. After informed consent, HIV testing and patients who met inclusion criteria were consequently enrolled in study. The duration of procedure was assessed from the anaesthesia note and patient was monitored till the date of discharge. preoperative levels and of albumin and hbA1c were assessed. A questionnaire was used to collect patient's demographic information, including age, sex, address. Patient's chief complaints, history of presenting illness, past history of any known comorbidities, details of his/her physical examination and system examination was done. BMI was measured of all patients. A blood sample of at least 5 ml was collected for participants. Serum albumin and serum HbA1c, Hb levels were processed from the blood sample. Participants were followed from the time of Anaesthesia note to the time they were discharged.

RESULTS

Highest chance of surgical site infection is seen in patients with age group of 41-50 years where as the lowest risk of surgical site infection is seen in patients with less than 20 years of age. In the present study with a t value of -2.011 and P value of 0.045 this comparison is considered as statistically significant.

Surgical site infection is more in males (80%) than females (20%). Whereas 89 males (59.3%) and 61 females (40.7%) did not develop Surgical site infection.

Comparison of the BMI between the two groups showed that in patients with higher BMI had more incidence of developing surgical site infection. The incidence of developing surgical site infection in patients with BMI >30 was 18%

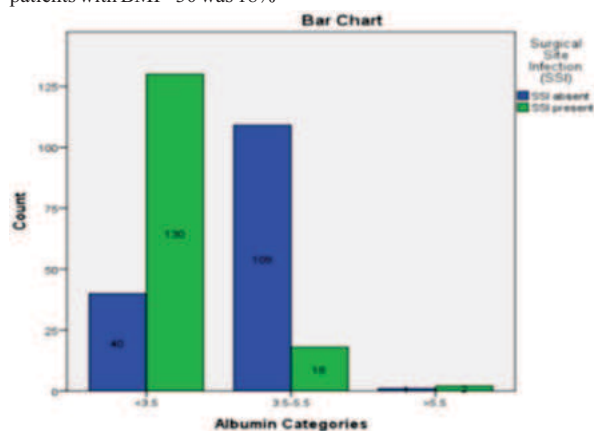


Figure 2: Bar Diagram Showing Comparison To Albumin In Patients With And Without Surgical Site Infection

Comparison of an albumin between the two groups showed that patients with hyperalbuminemia and normal albumin did not develop surgical site infection whereas hypoalbuminemia is seen in patients with surgical site infection, with a t value of 9.642 and is statistically significant with a p value of <0.001. 86.7% developed Surgical site infection with serum albumin of <3.5, whereas only 12% patients developed Surgical site infection and only 1.3% patients developed Surgical site infection with serum albumin >5.5 [figure 2]

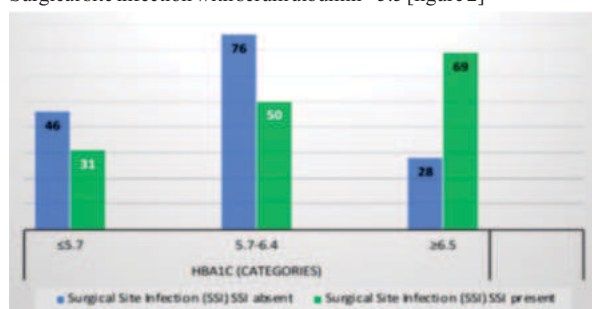


Figure 3: Bar Diagram Showing HbA1c Levels In Patients And Occurrence Of Surgical Site Infection.

20.7% had HbA1c value of $\leq 5.7\%$ who developed Surgical site infection, 33 % patients with HbA1c value 5.7-6.4 developed surgical site infection and 46 % patients with HbA1c more than 6.5 developed Surgical site infection. The P value in this study was <0.001 and was statistically significant. [figure 3]

74% patients who underwent emergency surgery developed surgical site infection whereas 26% who underwent elective surgery developed Surgical site infection.

Staphylococcus aureus, E. coli and klebsiella are the most common organisms to cause surgical site infection. Most Organisms (15 out of 150(10%)) were sensitive to colistin followed by meropenem, clindamycin and vancomycin.

DISCUSSION

Total 300 patients who underwent major surgeries, 209 were males (69.7%) and 91 were females (30.3%). In this current study majority of population were males (69.7%) Likewise, Dr. Kirankumar B. Sodavadiya, Dr. Sunita Singh observed in their study that majority was male population (69.4%) [1]

Patients with hypoalbuminemia, the incidence of surgical site infection was 86.7% , whereas incidence of surgical site infection in patients with normal albumin was 12% and with hyperalbuminemia it was 0.7%. In this study it was observed that as the incidence of surgical site infection is higher in patients with hypoalbuminemia. Similar results were observed in Dr. Kirankumar B. Sodavadiya, Dr. Sunita Singh in their study the incidence of surgical site infection in patients with hypoalbuminemia was 44.6% [1]

Surgical site infection rate in elective surgeries was found to be 26% whereas there was increase in rate of surgical site infection to 74% in case of patients undergoing emergency surgeries. Similar results were observed in Mahesh CB et al, 2010 for elective surgeries surgical site infection rate was 7.6% and that of emergency surgeries it increased upto 21.05% [14]

The rate of infection is seen more in emergency surgeries, can be attributed to presence of underlying conditions which predispose to emergency surgeries and the more frequency of contaminated or dirty wounds in emergency surgeries.

In this study the incidence of surgical site infection in patients with BMI >30 was 12%. similar results were obtained in Setty NK, Nagaraja MS, 2014 study; in their study patients with BMI >25 had 52.17% incidence of surgical site infection in patients with BMI of <18.5 the incidence was 25% [15]

210 patients out of 300 were anemic out of which 134 patients had surgical site infection. The incidence was 44.66%. Anemia was characterized by Hb < 12 in females and <13 in males [16] Similar results were observed in Jason Pruzansky in his study where 29% patients were Anemic and incidence of developing surgical site infection in them was 72% [17]

In this study, the patients with HbA1c < 5.7 the incidence of surgical site infection 20.7%, whereas HbA1c 5.5-6.4 had an incidence of 33.3% of surgical site infection and patients with HbA1c >6.5 had a incidence of developing surgical site infection was 46%. In this study it was observed that as the levels of HbA1c increased the incidence of surgical site infection also increased. Similar results were observed in Jourdan M, Minton T., 2017 in their study. The incidence of surgical site infection in patients with HbA1c > 7.5 was 11.8% [18]

In this study, surgical site infection was seen highest in contaminated wound > Clean contaminated > Clean wound. 63 patients out of 150 (42%) developed surgical site infection, the wound was contaminated type. Whereas 51 patients out of 150 (34%) had clean contaminated type of wound who developed surgical site infection and 36 patients (24%) with clean wound developed surgical site infection.

Longer the duration of surgery more was the infection rate.

Most of the organisms were isolated from contaminated wounds.

Stap aureus , E.coli and klebsiella were most common organisms to cause surgical site infection.

Overall colistin, meropenem, clindamycin, vancomycin were the most sensitive antibiotics.

Overall ceftriaxone, tetracycline, ciprofloxacin were the most resistant antibiotics.

The culture negative surgical site infection cases responded to broad spectrum antibiotics.

CONCLUSIONS

Patients with hypoalbuminemia, the incidence of surgical site infection was 86.7%. whereas incidence of surgical site infection in patients with normal albumin was 12% and with hyperalbuminemia it was 0.7%.

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In this study it was observed that as the levels of HbA1c increased the incidence of surgical site infection also increased. Most of the cases were prepared preoperatively by shaving within 24 hours for routine cases whereas emergency cases were prepared just before the surgery.

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