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SURGICAL SITE INFECTIONS IN ABDOMINAL SURGERIES: A RETROSPECTIVE STUDY FROM KING GEORGE HOSPITAL, VISAKHAPATNAM

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ABSTRACT Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSIs). SSIs are one of the most important causes of healthcare – associated infections (HCAIs), second only to urinary tract infection (UTI) in incidence. SSI develops in at least 5 % of hospitalised patients undergoing an operative procedure in developed countries, raising the costs of healthcare both to the public and the healthcare delivery system. The present study was undertaken on 100 patients who developed SSI following either elective or emergency abdominal surgery in 867 patients, admitted to the IV surgical unit, King George Hospital, Visakhapatnam, over a period of 24 months, from august 2014 to august 2016. Incidence and types of SSI following various procedures, the risk factors for SSI, the causative organisms and their sensitivity patterns and the outcomes of treatment were studied. Surgical site infections are among the most common complications in surgically treated patients and account for serious consequences. 11.53 % of abdominal surgeries developed SSI. 7.05 % of elective and 19.42 % of emergency procedures were infected. Surgery for duodenal ulcer perforation was the most common abdominal procedure to develop SSI. Smoking, anaemia and blood transfusions were the most frequent risk factors. Majority of the cultures yielded *E.coli, Klebsiella* and *Staphylococcus aureus* species. Most were superficial incisional SSIs and resolved after drainage of pus, mostly by the removal of a stitch. Comparison with other similar studies from developing countries showed slightly better results in the present study.

KEYWORDS : Surgical site infections, SSI's, UTI, sensitivity

I. Introduction

Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSIs). SSIs are one of the most important causes of healthcare – associated infections (HCAIs), second only to urinary tract infection (UTI) in incidence (1). SSI develops in at least 5 % of hospitalised patients undergoing an operative procedure in developed countries, raising the costs of healthcare both to the public and the healthcare delivery system (2). According to a report by the International Nosocomial Infection Control Consortium (INICC), overall more than 1.4 million people worldwide were suffering from nosocomial infections, and in India alone, the rate was over 25 per cent, with SSI occupying a significant share (3). The incidence is likely underestimated because of inadequate surveillance and incomplete post-discharge data.

Extensive surveys have shown that SSIs are associated with considerable morbidity and it has been reported that over one - third of postoperative deaths are related, at least in part, to SSIs. SSI can range from a fairly minor wound discharge with no other complications to a life- threatening condition (4). Other outcomes include poor scars that are cosmetically unacceptable and cause psychological stress. SSI is, in most scenarios, a preventable HCAI, that can double the length of hospital stay and thereby increase the costs of healthcare, attributable to re-operation, extra nursing care and interventions, and drug treatment costs (5). There are, in addition, indirect costs due to loss of productivity, patient dissatisfaction and litigation, and reduced quality of life. Abdominal surgical site infections are among the most common infectious complications in hospitalised patients and are associated with serious consequences for outcomes and costs (6,7). They account for up to 14 % of SSIs in studies conducted in developing countries, where there is no organised surveillance system to describe routine nosocomial infections (8).

The present study aims to determine the frequency of surgical site infections in patients undergoing various abdominal surgical procedures and the associated risk factors, the organisms implicated and their sensitivity patterns, and the outcomes observed after treatment among inpatients in the general surgical wards of King George Hospital, Visakhapatnam.

II. Methodology

The present study was undertaken on 100 patients who developed SSI following either elective or emergency abdominal surgery in 867 patients, admitted to the IV surgical unit, King George Hospital, Visakhapatnam, over a period of 24 months, from august 2014 to august 2016. Incidence and types of SSI following various procedures (9), the risk factors for SSI, the causative organisms and their sensitivity patterns and the outcomes of treatment were studied.

III. Results

The most common age group associated with the development of abdominal SSI was 41 – 60 years, the mean age being 43 years. There was male predominance in the study, for both elective and emergency procedures (Table -1 & 2) (Figure -1 & 2).

Table - 1 : Age distribution

Age group	Elective (n = 39)		Emergency (n = 61)		Total (n = 100)	
	No.	%	No.	%	No.	%
15 – 25 years	06	15	08	13	14	14
26 – 40 years	11	28	18	30	29	29
41 – 60 years	16	41	31	51	47	47
> 60 years	06	15	04	06	10	10

Table - 2 : Sex distribution

Sex	Elective (n = 39)		Emergency (n = 61)		Total (n = 100)	
	No.	%	No.	%	No.	%
Male	30	77	50	82	80	80
Female	09	23	11	18	20	20

Figure - 1 : Bar chart showing the age distribution of abdominal SSI

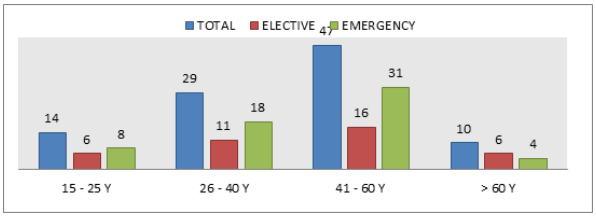
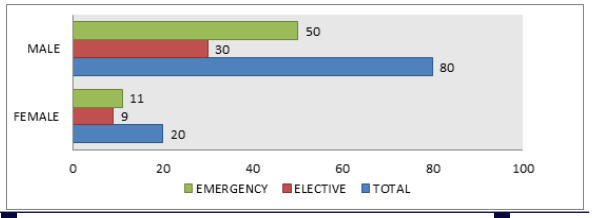


Figure 2: Bar chart showing the sex distribution of abdominal SSI



IV. Discussion

Surgical site infection (SSI) is a common complication following abdominal surgery and is the third most frequent health-care associated infection, accounting for serious consequences in terms of morbidity and increased health-care costs (6-9). Various risk factors have been identified, pertaining to patient characteristics and aspects of perioperative management. Timely recognition of SSI and appropriate management can hasten post-operative recovery and prevent the development of adverse outcomes like burst abdomen and incisional hernia or even death (10).

The present study was undertaken on 100 patients who developed SSI following either elective or emergency abdominal surgery in 867 patients, admitted to the IV surgical unit, King George Hospital, Visakhapatnam, over a period of 24 months, from august 2014 to august 2016. Incidence and types of SSI following various procedures, the risk factors for SSI, the causative organisms and their sensitivity patterns and the outcomes of treatment were studied (11). The overall incidence of SSI for all surgeries performed in the IV surgical unit during the study period was 10.53 %. Different studies from various parts of India have shown rates ranging from 6.09 to 38.7 %, with the majority of studies having a rate of 14 – 17 %, hence the rate of SSI for all surgeries in the present study was slightly lower than that seen in most other hospitals in India. This was probably due to adherence to a uniform protocol for antibiotic prophylaxis and post-operative wound care in our unit. The incidence of SSI in abdominal surgeries in this study was 11.53 %(10-13).

The most common age group developing SSI was 41 – 60 years, with the mean age being 43 years for both males and females (14). Most studies in literature show an increase in the incidence of SSI with increasing age, probably reflecting the deteriorating immune status and development of co-morbidities as age advances (15). Males accounted for 80 % of the cases in this study. Hence, this was a male preponderant study with no specific statistical significance attributed to gender. 61 % of the patients belonged to the low socioeconomic group, who were more likely to be malnourished and practice inadequate or improper health care, predisposing them to infections. Among the patient-related risk factors observed in this study, smoking was seen in 67% and the most common co-morbidity was anaemia, seen in 36 % of the patients. In the study from Iran, the most common co-morbidity encountered was malnutrition.

Of the 100 patients studied, 39 underwent elective abdominal surgeries (39 %) and 61 underwent emergency abdominal surgeries (61 %). The incidence for SSI was 7.05 % for elective abdominal surgeries and 19.42 % for emergency abdominal surgeries, which shows that emergency abdominal surgeries were statistically far more likely to develop SSI than elective procedures (p value < 0.0001). This is in conformity with another study conducted at an Indian teaching hospital by Mahesh C B *et al* (p value < 0.002). The high rates of infection in emergency surgeries can be attributed to delayed presentation, inadequate pre-operative preparation, the underlying conditions which predisposed to the emergency surgery and the greater frequency of contaminated or dirty wounds in emergency surgeries. 61.5 % of elective and 36 % of emergency procedures were classified by the CDC wound classification system as clean-contaminated (6, 9). These cases accounted for 46 % of SSI in this study. This may be due to the fact that a high proportion of elective surgeries is occupied by clean-contaminated cases. Open cholecystectomy (58.3 %) and surgery for duodenal ulcer perforation (41 %) were the most common elective and emergency abdominal surgeries complicated by SSI respectively (13). Incidence of SSI for both these surgeries was far higher than any noted in literature. This was probably due to the associated co-morbidities that rendered patients unfit for laparoscopic cholecystectomy and the late presentation of patients with duodenal ulcer perforation in these parts, which converts a contaminated wound to a dirty wound, thus increasing the risk of SSI. The incidence of SSI was lower following laparoscopic surgery (3 %) compared to open surgery (11.3 %), with the rates slightly higher than those observed in literature (14).

The most common organism implicated in this study was *E.coli*, while the most common organism causing abdominal SSI consistently observed in literature was *Pseudomonas aeroginosa* (15,16). The Gram-negative organisms implicated were found to be most sensitive to the aminoglycosides Amikacin or Gentamicin, followed by third generation cephalosporins and penicillins with or without beta-lactamase inhibitors, macrolides like Roxithromycin, quinolones like ofloxacin and to tetracycline and doxycycline (17).

The mean pre-operative stay for elective surgeries was 8.3 days, which could have contributed to the development of SSI.[32] This prolonged stay was necessary in some cases to improve the nutritional status and general condition of the patient to achieve fitness for anaesthesia and surgery. Post-operative stay was often prolonged once SSI developed for both emergency and elective surgeries, as patients hailing from far-away places preferred to stay at the hospital for dressing of the wound. Infection rate for elective abdominal surgery was only 7.05 % compared to rates of over 10 % elsewhere. The incidence of SSI after an emergency procedure when compared to an elective procedure was statistically more significant in the present study than that observed in the others (p value of < 0.0001 against p value of < 0.001) (18). This shows the need to direct attention towards adherence to infection control strategies by the hospital staff when an emergency abdominal procedure is to be performed, since the patient-related risk factors may not always be adequately controlled in the emergency setting.

Clean-contaminated wounds were the most frequent surgeries infected in the present study. Superficial incisional infections were the most common in all the three studies (19). While most of the risk factors for SSI described in literature have been found to be significant in all these studies, an increased number of patients with SSI were also found to have smoking, anaemia, malignancy and transfusion of blood products as additional risk factors in the present study (12-16).

V. Conclusion

Despite the many technological advances, surgical site infections are still persisting. The old adage, "prevention is better than cure" holds true in this respect. A conscious effort at asepsis, in the form of a proper infection control programme, can take us a long way in the fight against infections.

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