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A STUDY OF POST OPERATIVE WOUND INFECTION IN A TERTIARY CARE HOSPITAL- A CASE CONTROL STUDY.

Surgery

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ABSTRACT

BACKGROUND: Surgical site infection (SSI) is a major cause of morbidity and mortality, increasing both the duration of patient hospitalization and hospital cost.

AIMS AND OBJECTIVE : To identify the possible risk factors related to development of SSIs and the common pathogens encountered in development of SSIs and to Identifying the pathogens and their antimicrobial sensitivity provides help in empirical management of SSIs.

METHODS AND MATERIALS: The present study at was done for a period of one year. During the study period a total of 916 surgeries were conducted and 82 defined cases of SSI as per CDC guidelines.

RESULT: Overall prevalence of SSI in the present study was 8.9%. 33.81% were from the general surgery ward, 29.27% from orthopaedic unit and 35.46% from the obstetrics and gynaecology ward. Major prevalence of SSI was observed in cases of Hernia repair (8.92%) among the intestinal surgeries and least was noted among cases that underwent orthopaedic procedures (8.13%). Majority of the patients were in the age group range from 20-65 years. Of the 916 patients in the study group of one year, 62% were Males and 38% were females. 45% of cases underwent emergency surgery and 55% were elective procedures. The most commonly isolated pathogens in the study were staphylococcus aureus, Escherichia coli, and pseudomonas aeroginosa.

CONCLUSION: Surgical site infections are a major problem in the surgical wards and its incidence is higher than that reported in developed countries. Multi-resistant staphylococcus aureus followed by Escherichia coli and Klebsiella pneumonia are common bacteria causing SSIs.

KEYWORDS

Surgical site infection, wound sepsis, post operative wound infection, staphylococcus aureus

INTRODUCTION

Surgical site infection (SSI) is a major cause of morbidity and mortality, increasing both the duration of patient hospitalization and hospital cost [1-4]. Among the health care associated infection (HAI), surgical site infection (SSI) previously termed as post operative wound infections are one of the most common HAI in developing countries. The prevalence of these infections varies widely ranging from 5-16%. In India, based upon the various studies prevalence of SSI varies between 5% and 24 % [5]. SSI have been responsible for the increasing cost, morbidity and mortality related to surgical operations and continues to be a major problem world -wide [6]. Globally, surgical site infections rates have been reported to range from 2.5 % to 41.9 % [7-13]. In the United States approximately 2% to 5% of 16 million patients undergoing surgical procedures each year have post operative SSI [14]. The ability of the host to resist infection determines the outcome of his contamination with microorganism referred to as his immune status. The resistance of the host, if adequate, prevents him from being infected so that no symptoms and signs may be expressed despite the millions of these microorganisms harboured in the organism. The resistance of the host to the microorganism can be broken either by an increased virulence of the organism or diminished immune status of the host, which may lead to successful invasion, establishment and subsequent multiplication of these organisms. When a patients gets infected after surgery and infection is related to that surgery (usually at the post operative wound site), it is referred to as post-operative wound infection [15, 16]. Staphylococcus aureus is the commonest organism, most documented, to infest surgical wound site. This is because 5% of people carry the organism on all the hair-bearing areas and up to 50 % of people carry it in their nostrils [17, 18]. It is also a transient commensal on the skin of the hand together with pseudomonas, klebsiella and Enterobacter species, which are all found on the hands exposed to moisture, abrasions associated with chronic skin disease and nail bed lesions. The possibility of colonization with multiple antibiotic-resistant hospital bred staphylococcus aureus is a recognized major risk in patient's surgical procedures [15]. Some factors operating in the post-operative period enhance the likelihood of infection in this period [19].

AIMS AND OBJECTIVE

1) To identify the possible risk factors related to development of SSIs and the common pathogens encountered in development of SSIs.
2) Identifying the pathogens and their antimicrobial sensitivity provides help in empirical management of SSIs.

MATERIAL AND METHODS

Study Design

A Prospective cross sectional study among patients undergoing major surgery at IQ City Medical College and Hospital, Durgapur, West Bengal by the department of General Surgery in association with department of microbiology for a period of one year. The duration study was from April 2017 to March 2018 (one year). This study was carried out at General surgery wards, obstetrics and gynaecology wards and orthopaedics ward- a tertiary care hospital with bed capacity of 750. All the cases that were identified as SSI were included in the study. The study was approved by the institutional ethical committee of the college and all the procedures were conducted in accordance to the ethical guidelines.

Sampling

Sample size was obtained using Kish and Lisle method, using an incidence of 19.4% from a previous study and the infection rate among wound classes and the use of drain were also considered [20]. The sample size obtained was 916. Patients were recruited in the study and all the patients fulfilled the inclusion criteria. All patients of age groups 20 years to 65 years and gender undergoing major surgical procedures with visible incision (laparotomy, excision biopsy, appendicectomy, thyroidectomy, herniotomy, mastectomy, amputations, cholecystectomy, spleenectomy etc.) at I.Q City medical College and Hospital who consented for the study were serially recruited until the sample size was reached.

Data Collection and Laboratory Procedures.

Predictor variables such as patient characteristics, preoperative data, intra operative data, and postoperative data were obtained using a standardized data collection form. A structured questionnaire form consisting of demographic data, risk factors, past medical history, antibiotic usage history, particulars of surgery and antibiotic prophylaxis was noted. All patients who underwent major surgery with visible incisions were eligible to participate in the study and requested to consent for study and HIV testing before being enrolled in to the

study. HIV test was done using national algorithm of rapid test [21]. The patients were assessed preoperatively, intraoperatively and post operatively. Details that were recorded included: Type of surgery, wound class, type and duration of operation, antimicrobial prophylaxis, use of drain, preoperative hospital stay and total hospital stay. Each patient was followed up from the time of admission until the time of discharge and 30 days postoperatively. Surgical wound was inspected at the time of first dressing and weekly thereafter for 30 days. Superficial SSI was diagnosed if any one of the following criteria was fulfilled.

Case definition of SSI

Defined as per CDC Guidelines: SSI was classified as superficial/deep incision or organ / space infection with

- Purulent discharge with or without laboratory confirmation from the superficial or deep incision.
- Organism isolated from an aseptically obtained culture of fluid or tissue from superficial or deep incision or organ/ space.
- Sign or symptoms of infection: pain or tenderness, localized swelling, redness or heat.
- Purulent discharge from the drain that is placed in to the organ/space unless culture is negative.
- Diagnosis of SSI by surgeon or attending physician.
- Fever >38^{0}C, or localized pain or tenderness.

Swabs were collected from the infected site as per standard guidelines and collected before dressing was done. Swabs were transported immediately to the central microbiology laboratory and processed immediately as per standard CLSI guidelines. The pathogens were isolated and identified by a battery of biochemical tests and antimicrobial susceptibility of the pathogen was performed as per CLSI Guidelines [22]. In the laboratory the specimens were registered in the log books and processed as per standard operative procedures. Bacterial identification was done using an in house biochemical panel [23, 24]. Antibacterial susceptibility testing to various antibiotics was performed using disc diffusion methods as previously described [25].

SELECTION CRITERIA

Inclusion Criteria: -

The age group between 20 years to 65 years, confirmed cases of SSI and who consented for the study are included.

Exclusion Criteria:-

Evidence of wound infection at the operative site prior to surgery or pus seen at laparotomy such as drainage of an appendicular mass or pelvic abscess. Oral, anal and urogenital surgeries below the level of bladder with incomplete records were also excluded. Records were rejected if there was any evidence of sepsis at the operative site prior to surgery. The duration of acquisition of the post operative wound infection was determined by subtracting the date of appearance of pus at the operation site. Infections occurring 30 days after surgery, donor sites of SSG (split skin graft) infection of episiotomy and refusal to give consent for participating in the study.

STATISTICAL ANALYSIS

Data were entered in to a computer using SPSS Software version 15 and analyzed using STATA software 10.0 according to the objectives of the study. Chi-square test was used to determine for the significance associations between the predictor and outcome variables to all categorical variables and odds ratio were calculated to test for the strength of association between predictor variables. Fishers Exact test were used to determine the association between independent and dependent variables, p values of < 0.05 were considered significant.

RESULT

The present study at was done for a period of one year. During the study period a total of 916 surgeries were conducted in one year and 82 defined cases of SSI as per CDC guidelines were enrolled in the study. The number of surgeries and the type of surgery in each department and percentage of cases infected are presented in Table-1.

Table-1: surgical procedures and rate of SSI.

Type of surgery	Number done	Number infected	Percentage %
LSCS	70	5	7.14
Orthopaedic procedures	86	7	8.13
External fixation	54	6	11.11
Internal fixation	78	4	5.12
Amputation	46	6	13.04
Intestinal surgeries	46	7	15.21
Small intestine	88	5	5.68
Large intestine	43	2	4.65
Appendicectomy	97	8	8.27
Gynaecological surgery	69	7	10.14
Hysterectomy	44	8	18.18
Uterine surgery	36	6	16.66
Hernia	56	5	8.92
Surgical debridement	68	4	5.88
Others	35	2	5.71
Total	916	82	9

Others: Thyroidectomy, Breast surgery, Lumpectomy, etc.

Overall prevalence of SSI in the present study was 8.9%. 33.81% were from the general surgery ward, 29.27% from orthopaedic unit and 35.46% from the obstetrics and gynaecology ward. Major prevalence of SSI was observed in cases of Hernia repair (8.92%) among the intestinal surgeries and least was noted among cases that underwent orthopaedic procedures (8.13%). Majority of the patients were in the age group range from 20-65 years. Mean SD of 43 years and median 44.5. Of the 916 Patients in the study group, 62% were Males and 38% were females. 45% of cases underwent emergency surgery and 55% were elective procedures. The rate of SSI was more in contaminated operations in category I and II, clean and clean contaminated respectively. The most commonly isolated pathogens in the study were staphylococcus aureus, Escherichia coli, and pseudomonas aeroginosa.

Table-2: Demographic and clinical characteristics of patients with SSI.

Variables	No.	%
AGE (YEARS)		
Median	42	
Mean (SD)	44.5	±14.2
RANGE	20-65	
SEX		
MALE	568	62
FEMALE	348	38
H/O DIABETES		
CONTOLLED	53	5.7
UNCONTROLLED	76	8.2
NON-DIABETIC	66	7.2

DISCUSSION

In the present study conducted in teaching hospital the incidence of SSI was 9 %. SSI in the present study was defined as per CDC guidelines. However, the incidence of SSI is influenced by various operation related factors, immunological status of patients and nutritional status. In our study males were predominant (62%) than females (38%) indicating more number of surgeries was done on males than females. These findings were on par with findings of Tanner J et al. The rate of SSI was more in males than females in our study [26]. The common age group in the study was 20-26 years followed by 45-56 years which is on par with the findings of Khairy GA et al but contrary to findings of Astagneau Leaper et al who reported SSI more in age group >65 years [27,28]. The rate of SSI were higher in emergency surgeries than elective procedures as described by many other studies also (56% versus 44%) [29,30]. This can be due to the reason like emergency surgery lack regular preoperative preparations and involve mostly abdominal and intestinal surgeries which are contaminated surgeries. As reported in many studies, rate of SSI was higher among uncontrolled diabetics than controlled and non-diabetics in our study. This observation was on par with findings of Neumayer et al [31]. As reported from this study, SSI was higher in case of abdominal surgeries (Hernia and Intestinal surgeries) than in other surgeries. Others also observed the same findings in their studies. The rate of SSI was higher in contaminated surgeries followed in order by dirty, clean contaminated and clean surgeries. Similar findings were reported in the findings of Rosenthal et al in his study [32].

CONCLUSION

In spite of modern surgical and sterilization techniques and the use of prophylactic antibiotics, SSIs are still a real risk in surgeries and they represent a substantial burden of disease both for the patients and the

health care services in terms of morbidity, mortality and the economic costs. Surgical site infections are a major problem in the surgical wards and its incidence is higher than that reported in developed countries. Multi-resistant staphylococcus aureus followed by Escherichia coli and Klebsiella pneumonia are common bacteria causing SSIs. Pre-morbidity, use of drain, use of iodine alone in skin preparation, duration of operation of more or equal 3hours and cigarette smoking were significantly found to predict SSI on multivariate analysis. Study clearly explains the various causes and risk factors associated in development of SSI. The study guides in the type of organism isolated and possible antibiotic of choice in treatment and management of SSI. The rate of SSI was more in emergency operations and also in dirty wound than clean wound. A better surveillance system for SSI with feedback of appropriate data to surgeons is highly recommended to reduce the SSI rate in developing countries.

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