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Surgical site infection in a tertiary care hospital: A prospective study

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***Abstract*---**Background: Surgical Site Infections (SSI) is the third most commonly conveyed nosocomial infection which has an adverse impact on the hospital as well as on the patient. A continuous surveillance is called for, to keep a check on the incidence of SSI. Objectives: a) to study the incidence of SSI in our hospital; b) To study the risk factors of SSI in our hospital; c) To identify the areas in our hospital, which need to be strengthened and deal with proactive measures to curb the incidence of SSI. Methodology: It was a Prospective study conducted for 6 months in our hospital. 131 cases of Surgery were included in the study. All patients who are operated in general surgery department of VMKVMCH between July 2021 – December 2021. A few host factors, wound factors and surgery related factors that cause SSI were studied. Swabs were collected from the infected surgical wounds and processed by the conventional microbiological methods. Antimicrobial susceptibility was done by Kirby-Bauer disc diffusion method. Results: Prolonged surgery (>2hours) and insertion of drain were found to be significantly associated with occurrence of SSI and the clean surgeries showed minimum risk of infection. Escherichia coli (34.70%) was the

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commonest pathogen, followed by Pseudomonas aeruginosa (26 %) and Staphylococcus aureus 17% .The incidence of SSI in our set up is 6.8%. Conclusions: The outcome of the SSI surveillance in our hospital revealed that in order to decrease the incidence of SSI we would have to: a) decrease the duration of the surgeries performed b) focus on regular and intensive drain care c) identify poor risk patients and ensure their proper management d) conduct periodic surveillance to keep a check on SSI.

***Keywords*---**SSI, incidence, risk factors, clean surgery, pathogen.

Introduction

Surgical site infection (SSI) formerly termed postoperative wound infection is defined as that infection giving up to 30 days after a surgical procedure if no prosthetic is placed and up to 1 year if a prosthetic is implanted in the patient [1]. In India, SSI is found to be a serious complication with an incidence of 2% to 5% in patients undergoing surgery [2]. This is a likely under-estimate because of incomplete post-discharge data [3]. Other data indicate that the incidence is even higher in certain high risk patients4. Based on a survey data there were over 290,000 infections in hospitalized patients in the US in the year 2002 of these, SSI was estimated to be directly responsible for 8205 deaths in surgical patients that year [3]. SSI results in patient discomfort, prolonged length of hospital stay and increased cost. [4, 5]

Surgical site infections (SSI) are the third most commonly reported nosocomial infection and they account for approximately a quarter of all nosocomial infections. It has an adverse impact on the hospital as well as on the patient. It is responsible for increasing length of stay of patient which results in social and economic loss to the patients and family. Host factors, wound factors and surgery related factors are implicated in the causation of SSI.[6,7] SSI is the index of the health care system of any hospital.[6] With the increase in incidence of nosocomial infections and multi drug resistance, a meticulous and periodic surveillance of various hospital acquired infections is called for. With an active Infection Control team operating in the hospital, SSI is naturally one of the topmost priorities on the agenda. Hence the following study was undertaken.

Materials and Methods

It was a Prospective Randomized control study conducted for 6 months in our hospital. All of the 131 patients admitted to the surgical wards and Surgical Intensive Care Unit were included in the study. All patients who are operated in general surgery department of VMKVMCH between July 2021 – December 2021. Certain risk factors like –

Type of surgical wound, elective or emergency surgery, antibiotic prophylaxis, duration of surgery, presence or absence of drain and any underlying or predisposing conditions were noted.

SSIs were diagnosed according to the guidelines of the Centers for Disease Control and Prevention – CDC Atlanta 2014.[8] An operation was defined as any procedure involving skin incision undertaken in an operating theatre under any type of anesthesia. The operations were classified as clean, clean contaminated, contaminated and dirty according to the system employed in the American College of Surgeons, Committee for Centers of Surgical Infection Qualities.[8]

Inclusion criteria

- All patients who are admitted & operated under General Surgery department of VMKVMCH from July 2021 – December 2021

Exclusion criteria

- Patients on pre-operative antibiotics for other ailments.
- Patients who are not willing to participate in the study population.

Methodology

Swabs from deep part of the wound or pus were taken from the infected surgical sites, and routinely from the surface of non– infected ones. The specimens were gram stained and examined for the presence of organisms and pus and cultured aerobically, anaerobically on blood agar as well as in cooked meat broth. Bacterial isolates were identified and tested for antimicrobial susceptibility by the Microscan automated Walkaway system (Dabe Bering, A Siemens Company, Sacramento, California, U.S.A.). Following discharge, two follow-up visits were arranged for the patients at two and four weeks in the surgical outpatient clinic to assess the surgical site. All patients with clean, clean contaminated and contaminated wounds were included.

Statistical Analysis

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Categorical outcomes were compared between study groups using Chi square test /Fisher Exact test. P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

Results

Table 1- Factors associated with the surgical site infections (SSI) (N=131)

Characteristics		SSI/Total	%	*P*value
Gender	Male	6/93	6.4	*0.5
	Female	3/38	7.8	
Age(yrs)	>12-19	2/17	11.76	0.7
	20-29	3/28	10.7	
	30-39	1/23	4.35	
	40-49	2/26	7.69	
	50-59	0/11	0	
	> 60	1/26	3.85	
Operationcategory	Emergency	6/42	14.28	*0.03

	Routine(elective)	3/89	3.37	
Siteofoperation	Abdomen	6/57	10.5	
	Neck	1/14	7.1	
	Back	1/10	10	0.94
	Thorax	0/7	-	
	Perineal	2/14	14.2	
	Breastandaxilla	1/13	7.7	
	Limbs	1/16	6.2	
Typeofoperation	Clean	2/43	4.6	
	Cleancontaminated	4/64	6.2	0.45
	Contaminated	3/24	12.5	
Durationofsurgery	<2hrs	6/96	6.3	*0.45
	>2hrs	3/35	8.6	
Associatedriskfactor	Diabetics	5/25	20	*0.01
	Non-Diabetics	4/106	3.77	

As per table 1 out of one hundred and thirty one patients in the study, 93 were males and 38 were females. Their ages ranged between 11 and 89 years. Twenty three patients had bacteria isolated from their surgical site, and 6.8% of the patients showed frank clinical infection which needed drainage of pus and frequent dressing. The emergency operations showed a significantly higher rate of infection compared to elective operations (P=0.03). The rate of SSI was significantly higher in diabetic patients in comparison to nondiabetics (P=0.01). There was no significant difference in occurrence of postoperative wound infection between patients with prolonged surgery lasting two hours or longer and those who had shorter surgery time. The rate of SSI was higher in females than in males. The rate of SSI, was higher in contaminated operations (12.5%). compared to clean contaminated (6.2%) and clean operations (4.6%).

Table 2 –Bacterial isolates from the patients with positive culture from the surgical site and their multidrug resistance status

Isolates	MDRNo (%)	Non-MDR No(%)	TotalNo(%)
Pseudomonasaureginosa	2(33.3)	4(66.7)	6(26.1)
Staph.aureus	2(50)	2(50)	4(17.4)
Strepmilleri	0 (0.0)	2(100.0)	2(8.7)
Klebsiellapneumonae	0 (0.0)	2(100.0)	2(8.7)
E.coli	1(12.5)	7(87.5)	8(34.7)
Acinetobacterspp.	0 (0.0)	1(100.0)	1(4.4)
Total	5(21.7)	18(78.3)	23(100)

As per table 2. the antimicrobial susceptibility of these 23 bacteria was stated as either a multidrug resistant (MDR) organism resistant to more than three categories of antimicrobials used for treatment of infections usually caused by such bacteria) or a non MDR organism. The most commonly isolated bacteria were E. coli (8/23), Pseudomonas aureginosa (6/23) and Staphylococcus aureus (4/23). Four of the P. aureginosa isolates were MDR susceptible only to carbapenems, (imipenem and meropenem). Two of the S. aureus isolates were methicillin resistant Staphylococcus aureus (MRSA), one of which was a community acquired MRSA which was susceptible beside the glycopeptides to rifampicin, clindamycin, and erythromycin. The second MRSA had a susceptibility of a hospital acquired MRSA, susceptible only to the glycopeptides. Only one of the eight E. coli isolates was MDR, which was an extended spectrum - lactamase producer sensitive only to imipenem and meropenem.

Discussion

Out of the 131 patients included in this study 6.8% had frank surgical sepsis which needed drainage and further management, a rate lower than the 16.7% rate reported in a multicenter study from Tbilisi, republic of Georgia.[9] This is in agreement with the SSI incidences in other studies. However, infection rates varying from 20% to as high as 76.9% have also been reported.[10]. Prolonged duration of operation results I increased exposure of operation site to air, prolonged trauma, stress of prolonged anaesthesia and sometimes blood loss. Our study reveals a clear cut increased number of SSI cases i.e.13.1% cases, where surgery has been prolonged ≥ 2 hours. Studies conducted on SSI in Aurangabad [11], Mumbai,[12] Hyderabad, [13] andOdissa [14] have reported a similar observation.

Out of 131 patients operated upon in the current study, 93 (71%) were males compared to 66% reported by others. But this was lower than the 82% reported in a study on general and vascular surgery. The higher number of males in the latter study may be due to the fact that more males had vascular problems than females.[15] Our study showed a rate of SSI of 6.4% in males compared to 7.8% in females (P=0.5). The rate of infection was highest in contaminated type of wounds 12.3%, followed by clean contaminated wounds 8.0% and least in clean wounds- 4.6%. This is an expected observation. In Aurangabad, [11] similar rates were noted i.e. percentage of infection rate was 10.6 % and 4% in clean contaminated and clean cases respectively, in Mumbai [12] 22.4% and 3.0% respectively. However, in Orissa, [14] the difference between the rate of infection in clean contaminated (25%) and in clean surgeries (30%) was not statistically significant.

Regarding associated risk factors in our series, SSI was significantly higher in diabetic patients when compared to non-diabetics (P=0.01). Neumeyer et al also found a higher incidence of SSI among diabetics [15] regarding the type of infecting bacteria, out of the 23 positive cultures in the current study, the majority (35%) grew E. coli, which reflects the predominance of SSI in abdominal and perineal operations. Mumbai [12] study has also reported 17.6% culture negative SSI cases. The remaining 14 patients' swabs yielded a total of 16 isolates in our laboratory of which Escherichia coli was 31.25%, Pseudomonas aeruginosa 25% and Staphylococcus aureus was 22%. This trend of gram negative bacilli i.e. enterobacteriaceae dominating the gram positive cocci has been observed in Aurangabad [11] Orissa [14].

Conclusion

In this study, the rate of SSI as judged by clinical wound assessment was 6.8% although positive bacterial cultures were more. We can further bring down our

SSI rate by implementing the following measures as efforts to decrease the duration of surgery without compromising the patient's safety and the beneficial outcome. Regular and intensive drain care. Periodic surveillance of SSI will guide the Infection Control Committee in laying down strict guidelines to further decrease the SSI incidence in our setup, which is an indicator of health care in a given system.

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Conflict of Interest- None declared

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