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CLINICALLY SIGNIFICANT AEROBIC BACTERIAL ISOLATES FROM SURGICAL SITE INFECTIONS – EXPERIENCE IN A TEACHING INSTITUTION IN DELHI.

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Conflicts of Interest: Nil

ABSTRACT:

Surgical site infections (SSIs) are the third commonest nosocomial infections and account for approximately 10-40% of all health care associated (HAI) infections.[1] the aim of the study was to estimate frequencies of aerobic bacterial isolates in clinically diagnosed Surgical Site Infections (SSIs) in adult patients who have undergone abdominal surgery. The study was carried out in the department of Microbiology, VMMC & Safdarjang Hospital, New Delhi from November, 2015 to January, 2017 after ethical clearance and approval. E. coli was the most common organism isolated followed by Klebsiella pneumoniae. An effective surveillance programme for surgical site infections need be a critical component of any hospital infection control programme to reduce the rate of infection.

Key words: Surgical site infections, HAI, clinical aerobic, Bacteria.

Introduction

SSIs are the third commonest nosocomial infections and account for approximately 10-40% of all health care associated (HAI) infections'[1] These infections increase the patient's risk of death after surgery. Extra bed occupancy is an important factor responsible for increasing financial cost associated with these infections because of additional postoperative hospital stay of about 7-10 days which result in extra expenditure. [2, 3] The problem of SSIs continues to be a problem even after maintaining the standard protocol of pre-operative preparations and antibiotic prophylaxis.[1] The frequencies of aerobic bacteria isolates in clinically diagnosed Surgical Site Infections (SSIs) in adult patients who have undergone abdominal surgery vary geographically - globally as well as regionally.[1,2] The study group included 50 surgical patients who developed SSIs after abdominal surgeries; both superficial and deep

SSIs were included in the study. For wound selection CDC criteria was followed.

OBSERVATIONS

Age distribution: The division of age groups was done arbitrarily with class interval of 10 years (Table1). The age of patients in the study ranged from 11 to 80 years with peak incidence in third decade of life. The mean age observed

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was 28.9 years while gender wise male to female ratio: 3.5:1.

Table I: Age and gender distribution of 50 cases of SSIs following surgery on abdomen. Peak incidence was in third decade of life with mean age as 28.96 years while male to female ratio: 3.5:1.

Age	**Numbers (%)**	
11- 20	9 (18%)	
21- 30	13 (26%)	
31- 40	7 (14%)	
41- 50	10(20%)	
51- 60	7 (14%)	
61- 70	1 (2%)	
71- 80	3 (6%)	
Total	50 (100%)	
Gender	Males	39 (78%)
	Females	11(22%)

Table II: Distribution of SSIs in 50 cases based on depths of wounds and nature of surgery performed. SSI was relatively more in superficial (54%) and more common in cases of emergency abdominal operations (84%) compared to elective operations (16% only).

Type of SSIs	**Nature of Surgery**
Superficial 27(54%)	Emergency 42 (84%)
Deep SSI 23(46%)	08 (16%)
Total	50 (100%)

Bacteriological profile observed in study subjects.

A total of 50 specimens of pus/exudate were collected from the 50 cases of SSI in abdominal surgery cases. Bacteriological diagnosis could be made in 47 cases while in 1 case only fungus was isolated. Two (02) specimens were bacteriologically sterile with no evidence of any growth.

Table III: Distribution of number of organism isolated in the study from 50 clinical specimens.

Type	**Number (%)**
01 Bacteria	46 (92%)
02 Bacteria	3 (6%)
Fungus only	1 (2%)
Total	50 (100%)

DISCUSSION

SSIs are very common in abdominal emergency care settings.[4] Patients who undergo planned elective surgeries are also not at freedom from the same.[5] SSI s are placed under the broad category of nosocomial infections & are the infections acquired during hospital stay.[6] They are important contributors to morbidity and mortality.[7,8] These infections concern 2 million cases annually worldwide[7.] WHO described Hospital acquired infections as one of the major infectious diseases having huge economic impact[8]. These infections develop where medical and paramedical staff is in close contact with the patient in various stages of treatment and at the same time exact source of infection is difficult to trace[8]. About 25-36% of these infections are preventable through the adherence to strict guidelines by health care workers when caring patients[7]. There are many factors that affect the susceptibility of any wound to infection. These factors include pre-existing illness, length of operation, wound class, and wound contamination. Multi and single centered studies showed that the majority of organisms causing SSI are gram positive cocci e.g. Staphylococcus aureus and gram negative bacilli e.g. E. coli, Klebsiella, Pseudomonas and Enterobacter spp [9, 10].

The principal barrier against microbial invasion is the skin. It constantly interacts with the external environment and is colonized with diverse population of microbes. The vast majority of colonizing flora consists of bacteria whose distribution can be divided into two halves at the waist line. The composition of the flora can vary drastically depending on climate, heat, sex, stress, hygiene, nutrition, and hospitalization including the genetic predisposition. Unfortunately, in the majority of cases undergoing abdominal surgery

that go on to develop SSIs, the precise nature of bacterial etiology remains unknown and the clinicians are forced to prescribe the antibiotics empirically aided by individual experiences. Keeping in view that SSI is major post-operative complication in surgical patients in hospital settings, the present study was conducted with the aim of knowing the profile of bacteria from clinically diagnosed SSIs in adult patients who undergo abdominal surgery - planned as well as emergency. [4.5.6]

For the age factor, in the present study, age of patients ranged from 11 to 80 years with peak incidence in second decade of life with mean age as 28.96 years. It shows most of affected patients are young individuals. Sahu S et al study showed most affected group as 41 to 60 years[11], but our study showed it as 21 to 30years, followed by 41 to 60 years. Demographic data in literature shows wide variation in the age range. In a study by Ashish Pathak et al[12] on incidence and factors associated with SSIs reveals age range from 4 month to 90 years with mean ± SD: 40.10 ± 21.23. [12]

For gender distribution observations, a male preponderance could be observed with 78% males and 22% females affected with male: female ratio as 3.54:1. Literature documents male prevalence for development of SSIs.[4,11,12] Ellis Simons SM[13] et al review on epidemiology of SSIs, states that there is increased prevalence among men to the extent of 60-70% of all cases. Similarly many other studies [14,15] also documents male preponderance – to quote few- an Indian study by Asish Pathak et al[12] showed 76% males and 24% females had SSIs. **In the present study**, based on type of SSIs, superficial SSIs (54%) was found more common than deep SSIs (46%). **In Indian context**, study by **Manisha et al** [16] have shown on average 80% cases as superficial SSIs and 20% as deep SSIs, in another study by **Rajkumari N et a**l,[17] 68 % of cases have been shown to have superficial SSI and 32 % deep SSIs. Both, the planned elective as well as emergency abdominal surgeries were included in our study to arrive at a holistic picture that expectedly would reflect the real world situation in our institution. Among 50 cases, 42 (84%) cases were of emergency abdominal surgery and only 08 (16%) as planned elective surgery. Among these 50 cases, all clinical samples collected after fulfillment of the inclusion criteria. Among these - 27/50 (54%) developed superficial SSIs and rest 23/50 (46%) developed deep SSIs. According to studies documented in Indian literature the findings about percent development of superficial and deep SSIs show wide variations viz. in a study by **Ashihsh Pathak et al** (2014)[12], 44% patients developed superficial SSIs and 56% developed deep SSIs. **Manisha et al** [16] showed 80% cases as superficial SSIs and 20% as deep SSIs, similarly, in **Rajkumari N et al**, 68 % of cases have been shown to have superficial SSI and 32 % deep SSIs.[17]

In the study no death of SSI patient occurred. This can be attributed to advances in surgical techniques and judicious implementation of patient care services. It is a true reflection of dedication of surgeons in our hospital and also dedicated work of clinical microbiologist in our VMMC, microbiology laboratory that tends to support the clinical diagnosis.

A total 50 specimens processed - bacteriological diagnosis could be made in 47/50(94%) cases, while in one case fungus Candida albicans was isolated. Two specimens were bacteriologically sterile with no evidence of growth. Literature in Indian context has revealed bacterial diagnosis in > 90% cases - for example a study by **Golia S et al**[18] has documented bacteriological diagnosis in 92.9% cases. However there is wide variation in the bacteriological diagnosis - for example, a study by Praveen et al [19] have recorded 13.5%, **Khyati J et al** [15]in their study on bacteriogical profile of wound infections recovered 65% of bacteria reflecting wide variations in bacteriological diagnosis. This variation is well attributed to differences in the epidemiological factors. A total of 49 bacterial isolates were recovered from 50 cases of SSIs. Specimens yielding more than two bacteria were taken as contamination and not studied further. **In the present study,** a total of 49 bacteria could be isolated along with one

Candida albicans was seen as lone isolate in one case. These 49/50 i.e. 98% bacterial isolates is an important finding in our study reflecting the basic culture techniques employed were appropriate

and justifiable. Wide variations are seen in literature. In a study by **S Mohanty et al** [14] – 114.4% bacterial isolates have been reflected. Such a high preponderance is also shown in studies by other workers like **Golia S et al** [18], 100% bacterial isolates were seen. In both these studies the number of clinical specimens was more running as compared to our study which included only 50 specimens.

About individual isolates – among gram negative E. coli (28.5%) was the most common isolate followed by Klebsiella pneumoniae (26.5%), Acinetobacter spp (14.3%), Pseudomonas aeruginosa (14.3%), and Proteus sp (4%). Gram negatives were seen in nearly 90%. Among gram positive - Staphylococcus aureus (6.1%) & Enterococcus spp (4%) were isolated accounting for nearly 10% of total isolates. It is in accord with many Indian studies viz. in a study by **S. Mohanty et al** [14] - Gram negatives were nearly 55% and Gram positive were 45%; in a study by **Mantravadi HB et al** [20] – nearly 60% were gram negative and 40% were gram positive. However, there cases included other than that of abdominal surgeries also. It is well recorded in literature that typical organism that colonize skin above waist are gram positive species such as Staphylococcus epidermis, Staphylococcus aureus, Streptococcus pyogenes. Later two species are particularly & significantly contribute to majority of SSIs above waist. On the other hand the typical organism that colonize skin below the waist are both gram (+) and gram (-) species. It is speculated the difference are secondary to proximity to the anorectal area where enteric species tend to gravitate and colonize this area of skin. It is specifically true of Enterobacteriaceae member and Enterococcus species. It is also well known observation that specific microbes tend to colonize specific anatomical structure depending upon the local niche, site specific biochemical interactions, and tissue specific biofilm formation. A composition of the flora is an underlying determinant to the type of organism isolated that in turn depends upon climate, gender difference, age factor, stress level (affecting immunity especially CMI), personal hygiene, nutritional status and extent of hospitalization. The bacterial etiology may be normal host flora transferred from instrument of entry or from environment.[4]

CONCLUSION

Aerobic bacteria are significant pathogens in SSI cases. In the present study, 94 % cases of infections had bacteriological etiology. From the clinical specimens - 98% bacterial isolates were recovered with a yield rate of 1.02. Overall - Escherichia coli (28.5%) emerged as most common bacterial isolate among gram negative organisms. It was closely followed by Klebsiella spp (26.5%). Among gram positive organism, Staphylococcus aureus (60%) was most common organism. All Staphylococcus aureus strains were methicillin resistant (MRSA). Source control remains the most important component in the successful prevention and treatment of SSI cases. Patients must be educated about the personal hygiene aspects and hospital staff must observe hospital infection control practices very scrupulously and in a meticulous manner. The hospital guidelines or recommendations on infection control measures need be treated as standing orders as it will help reduce the morbidity in such cases and hence help in early recovery and discharge from hospital.

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