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RESEARCH ARTICLE

INVESTIGATION OF RISK FACTORS AND BACTERIAL PATHOGENS OF SURGICAL SITE INFECTIONS IN A TEACHING HOSPITAL IN HYDERABAD

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Abstract

Background: Surgical site infections are one of the most common healthcare associated infections which results in a delay in patient recovery. These infections being the most common HAI in our area, the present study was conducted to know the incidence of SSIs and to detect the risk factors associated with SSIs.

Material and methods: A prospective study on SSIs was conducted over a period of seven months involving 1211 patients. History was taken from these patients regarding the risk factors of SSIs. Pus and wound swabs collected from these patients were subjected to culture. The culture isolates were identified by standard biochemical tests. Antibiotic sensitivity testing was performed using standard protocol. The incidence of SSI's was determined.

Results: SSI rate was 6.6 %.The most common risk factors associated with SSI's were age >60 years, diabetes followed by obesity and prolonged duration of surgery. There was no association with smoking, malnutrition, immunosuppression, skin colonization at the time of surgery, presence of skin diseases at the incision site, peripheral vascular disease and anaemia. Majority of isolates were gram negative isolates. Klebsiella and Escherichia coli were the most common isolates. There was maximum sensitivity of isolates to carbapenems and combination drugs.

Conclusion: Age>60 years, diabetics, obesity, and prolonged duration of therapy were the major risk factors associated with SSI's. Decreased incidence of SSI's & decreased isolation of exogenous pathogens in SSI, high sensitivity of gram negative bacilli in our study suggests good infection control practices in our hospital area.

Introduction:-

Surgical site infection (SSI) is defined as infections that develop at the surgical site within 30 days of surgery or within 90 days for surgeries like breast, cardiac, and joints including implants. These infections are the most common hospital acquired infection in our hospital area. They are one of the most common healthcare associated infections which results in a delay in patient recovery. They are also major cause of post-operative illness resulting in significant morbidity, mortality, prolonged hospital stays and increased economic costs for patients care. Even though every surgical site is contaminated with the bacteria at the end of the surgery, few become clinically infected

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depending on the virulence of pathogens, adjuvants effects of the environment like foreign body and innate and acquired host defenses. There are multiple risk factors which can be associated with SSI like age > 60 years, anemia, diabetes mellitus, smoking, malnutrition, obesity, prolonged duration of surgery, immunosuppression, skin colonization at the time of surgery, presence of skin disease at the incision site, peripheral vascular disease, emergency surgery. Hence, we conducted a study to know the incidence of SSIs and to detect the risk factors associated with SSIs.

Material And Methods:-

A prospective study on SSIs was conducted over a period of seven months in Apollo General Hospital from 15th May 2022 to 15th December 2022. A total of 1211 patients who underwent surgery during the above period were included in the study. Out of these patients ,133 clinically suspected cases of SSI's were studied.

History was taken from these patients regarding the risk factors of SSIs.

Then pus and wound swabs were collected from these patients and were subjected to culture on Blood agar and MacConkey agar.

The culture isolates from these samples were identified by standard biochemical tests. Then the antibiotic sensitivity testing was performed using Kirby Bauer's disc diffusion technique as per standard protocol.

Then the incidence of SSI's was determined by calculating the SSI rate by the formula SSI rate = [Number of SSI cases/Number of surgeries done X 100].

Results:-

In our study, SSI rate was 6.6%. The most common risk factors associated with SSI's in the present study were age >60 years and diabetes followed by obesity and prolonged duration of surgery.

Our study did not show any association with smoking, malnutrition, immunosuppression, skin colonisation at the time of surgery, presence of skin diseases at the incision site, peripheral vascular disease and anaemia.

Among our culture isolates in our study, 90% of isolates were gram negative isolates. Only 10% of the isolates were gram positive isolates. Klebsiella and Escherichia coli and Staphylococci were the organisms isolated in our study.

Discussion:-

Table 1:- SSI rates and percentages.

Present study	Kamran et al study[Tehran 2006]	Farhan et al study[Pakistan 2019]	Prashanta et al study[Karnataka, India 2018]
80 [6.6%]	77 [8.4%]	32 [36.7%]	33 [18.3%]

In our study, SSI rates was less when compared to that in the studies of Kamran [1], Farhan[2] and Prashanta et al[3] and also the SSI rates differed from place to place. This could depend upon various factors like patient population, geographical area, hospital hygiene and method of collection of data.

Table 2:- Risk factors for SSI.

Risk Factors	**Present study**	**Farhan et al's study (Pakistan,2019)**	**Prashanta et al's study (Karnataka,2018)**	**Kamran et al's study (Tehran 2006)**
Age >60 years	60%	44.50%	64.70%	57%
Anaemia	0%	40.9	0%	0%
Diabetes mellitus	50%	67%	75%	16%
Smoking	0%	0%	0%	16 %
Malnutrition	0%	0%	0%	0%
Obesity	30%	37%	0%	13%
Prolonged duration of	30%	33.30%	65.4%	0%

surgery				
Immunosuppression	0%	60%	0%	0%
Skin colonisation at the time of surgery	0%	0%	0%	0%
Presence of skin diseases at the incision site	0%	0%	0%	0%
Peripheral vascular disease	**0%**	**0%**	**0%**	**0%**
Emergency surgery	**0%**	**0%**	**0%**	**39%**

In our study, age above 60 years was the most common risk factor associated with SSI (60%) followed by diabetes (50%). In the study of Farhan et al [2], diabetes mellitus (67%) was the most common risk factor followed by immunosuppression (60%). Prashanta et al study [3] revealed 75% association of diabetes mellitus and followed by 65.4% association of prolonged duration of surgery with SSIs. There was 57% association of age above 60 years and 39% association of emergency surgery with SSI in Kamran et al's[2] study. Hence, it can be concluded that the most common risk factor of SSI varies from place to place and hospital to hospital. Waning age and diabetes remain the common risk factors associated with SSIs. There was no association with malnutrition, skin colonisation at the time of surgery, presence of skin diseases at the incision site, peripheral vascular disease in various studies.

Table 3:- Profiles of organisms in SSI's.

Profiles of organisms	Present study	Marie et al study (2019, Rwanda)	Sangeeta et al study (2020, Northeast India)	Maj et al study (2019, West India)	Farhan et al study (2019, Pakistan)
Klebsiella species	60%	55%	20.6%	8.25%	26.3%
Escherichia coli	30%	15%	22.4%	11.6%	10.5%
Staphylococcus spp.	10%	6%	18.42%	20.5%	31.6%
Pseudomonas	0%	0%	12.3%	8.6%	15.8%
Acinetobacter	0%	9%	0%	6.9%	10.5%
Proteus	0%	12%	0%	3.3%	5.3%
Enterococcus faecalis	0%	0%	6.6%	1.3%	0%
Serratia marcescens	0%	0%	0%	0.6%	0%
Coagulase negative Staphylococcus	0%	3%	0%	2%	0%
Citrobacter	0%	0%	0%	1%	0%

In our study, majority of the isolates (90%) were gram negative bacilli. This finding which correlated with the studies of Marie et al's (91%) [4] and Sangeeta et al (55.3%) [5] whereas in the studies of Maj [6] and Farhan et al's [2] Staphylococcus was the most common isolate. Poor knowledge of personal hygiene of the patients, high environmental burden of Gram negative bacilli could be the reason for the decreased isolation of enteric pathogens in SSI'S in our study and Marie et al's[4] and Sangeeta et al's[5] studies. Decreased isolation of exogenous pathogens in our study (10%) when compared to the studies of Maj et al (23.8%) [6] and Farhan et al (31.6%) [2] suggests that good infection control measures are in place in our hospital.

Klebsiella is the most common isolate in our study which correlated with the studies of Marie et al [4] whereas in the studies of Sangeeta et al [5], Escherichia coli was the most common isolate. Staphylococcus aureus was the most common organism associated with SSI in Farhan et al [2] and Maj et al' studies [6]. This suggest that the isolates of bacteria in SSI vary from place to place.

Table 4:- Antimicrobial susceptibility of bacterial isolates in SSI's.

ANTIBIOTICS	Present Study	Maj etal's study (2019, West India)	Ahmed etal's study (2020, Telangana)
1.Gentamicin	6 (60%)	28%	50%

2. Ceftazidime	6(60%)	16%	61%
3. Ciprofloxacin	5(50%)	19%	65%
4. Ofloxacin	5 (50%)	----	---
5. Tobramycin	5(50%)	38%	---
6. Meropenem	9 (90%	71%	78%
7. Imipenem	9 (90%)	56%	82%
8.Piperacillin-tazobactam	7 (70%)	33%	65%
9.Cefoperazone-sulbactam	7 (70%)	60%	50%
10.Ampicillin	2 (20%)	13%	10%
12.Vancomycin	1 (10%)	98%	8%
13.Erythromycin	37%	35%	45%
14. Cefepime	20%	16%	---
15. Clindamycin	53%	57%	60%
16. Ceftriaxone	34%	11%	---
17. Amikacin	40%	27%	30%
18.Linezolid	57%	97%	---
19. Cotrimoxazole	46%	31%	---

In our study, maximum sensitivity of gram negative bacilli was observed to carbapenems and combination drugs like Piperacillin-tazobactam and cefoperazone-sulbactam which correlated with study of Ahmed [7] and Maj et al [6]. Our study also revealed sensitivity to most of the drugs tested. Sensitivity to most of the antibiotics in our study could be because of appropriate infection control measures and strict adherence to antibiotic policy in our hospital area.

Conclusion:-

1. Incidence of SSIs in our hospital was very less compared to other studies.
2. Age>60 years, diabetics, obesity, and prolonged duration of therapy were the major risk factors associated with SSI's.
3. Poor knowledge of personal hygiene of a patient, high environmental burden of Gram negative bacilli could be the reason for the increased enteric pathogens in SSI's.
4. Decreased incidence of SSI's & decreased isolation of exogenous pathogens in SSI, high sensitivity of gram negative bacilli in our study suggests good infection control practices in our hospital area.

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