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PATTERN OF ANTIBIOTIC PROPHYLAXIS AND INCIDENCE OF SURGICAL SITE INFECTION (SSI) IN POSTOPERATIVE PATIENTS IN THE DEPARTMENT OF GENERAL SURGERY OF A GOVT. TERTIARY CARE TEACHING HOSPITAL- A RETROSPECTIVE STUDY

Pharmacology

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ABSTRACT

Aim- To study the Pattern of Antibiotic Prophylaxis and incidence of SSI in Postoperative patients.

Material and Methods- This retrospective study included all the patients between 15 to 75 yrs of age, who underwent surgical procedures in General Surgery department from July 2016 to January 2018.

Result – Out of total 1650 patients who underwent surgical procedures, SSI were found in 97 cases (5.87%) . Highest number of SSI (34%) were observed in the age group of 46- 60 yrs. Skin grafting was found to be most common procedure prone to develop SSI (21 cases out of 31, i.e 67.74%). Most common organism encountered for SSI was pseudomonas (35 cases) followed by E-Coli (25 cases).

Conclusion-. Study suggested the need of local protocol or institutional antibiotic guideline for judicious and rational use of antibiotics as surgical prophylaxis in hospital for optimal patient care.

KEYWORDS

SSI, Antibiotic Prophylaxis, Rational use

INTRODUCTION-

Surgical site infection (SSI) is the most important post operative complication responsible for increase in the cost , morbidity related to surgical operation and continue to be a major problem even in hospital with most modern facilities and standard protocol . SSI is the third most frequent cause of hospital acquired infection (HAI).[1]

The United States Centers for Disease Control and Prevention (CDC) has developed criteria that define surgical site infection (SSI) as infection related to an operative procedure that occurs at or near the surgical incision (incisional or organ/space) within 30 days of the procedure or within 90 days if prosthetic material is implanted at surgery.[2] The world health organization (WHO) has developed, through an international consensus statement, a surgical safety checklist to improve safety of patient undergoing surgical procedure, since safety measure are often not adequately implemented even in referral centers.[3]

The rate of surgical site infection (SSI) varies extraordinarily worldwide from country to country. Through the years advances have been made for control of SSI including infection control practice, improved operating room ventilation, sterilization procedure, surgical technique and antibiotic prophylaxis; instead SSI stands responsible for morbidity, prolonged hospitalization and death.[4]

AIMS AND OBJECTIVES -

The aims & objectives of this study were as under-

1. To study the different prophylactic Antibiotic regimes
2. To study epidemiology of SSI in tertiary hospital
3. To study distribution of SSI according to age and gender
4. To study the incidence of SSI according to surgical site
5. To study the SSI according to wound class
6. To identifying the common pathogens causing the infection

MATERIAL AND METHODS -

The study was aimed to analyze the post-operative antibiotics trends in surgical practice and included all the patients who underwent surgical procedures over a period of 19 months from July 2016 to January 2018. Both qualitative and quantitative parameters were used to perform the assessment.

INCLUSION CRITERIA: -

1. Age – 15yrs to 75yrs old.
2. The study included Elective contaminated and clean contaminated surgical procedures in general surgery department like Appendectomy, Carcinoma of Colon, Carcinoma of Rectum, Cholecystectomy (open), Hernioplasty (abdominal, inguinal), Abdominal hysterectomy, Ovarian tumor, Haemorrhoidectomy, Varicocelectomy, Modified Radical Mastectomy, Hydrocelectomy (Joubley's procedure).

EXCLUSION CRITERIA: -

1. Age - < 15yrs and > 75yrs old.
2. Dirty or infected wound surgeries and
3. Laparoscopic surgeries.

RESULTS AND OBSERVATION-

Table-1- Age and sex wise distribution of patients

Age	Sex		Total	%
	Male	Female		
15 - 30 Yrs	270	145	415	25.15
31 - 45 Yrs	320	205	525	31.81
46 - 60 Yrs	200	200	400	24.24
61 - 75 Yrs	207	103	310	18.78
TOTAL	997	653	1650	

Table- 2 Distribution of SSI according to age and sex

Age	SSI			(N= 97)
	Male	Female	Total	
15 - 30 Yrs	16	4	20	20.61%
31 - 45 Yrs	15	12	27	27.83%
46 - 60 Yrs	20	13	33	34%
61 - 75 Yrs	8	9	17	17.52%
TOTAL	**59**	**38**	**97**	**100%**

N- Total No. of SSI

Table- 3 Surgical procedure wise distribution of SSI

Procedures	Total No. of Cases	%	No. of Cases with SSI	SSI %
Hernioplasty	498	30.18	12	2.40
Hysterectomy	150	9.09	6	4.0
Fissurectomy	106	6.42	8	7.54
Fistulectomy	94	5.69	12	12.76
Haemorroidectomy	75	4.54	2	2.66
Laparotomy	53	3.21	3	5.66
Varicocelectomy	21	1.27	1	4.76
Mastectomy	97	5.87	2	2.06
Trendelenburge Procedure	34	2.06	1	2.94
Amputation	16	0.96	2	12.5
Excision of Cyst, Lipoma & Lump	230	13.93	9	3.91
Appendisectomy	37	2.24	0	0
Skin Graft	31	1.87	21	67.74
Wound Closer & Sec Suturing	25	1.51	6	24

Orchidopexy	18	1.09	0	0
Joubleysprocedure (Hydrocelectomy)	48	2.90	2	4.16
Circumcission	10	0.60	0	0
Cholecystectomy	63	3.81	8	12.69
Whipples Procedure	4	0.24	0	0
Colostomy Closer	8	0.48	0	0
Hemithyroidectomy	8	0.48	0	0
Ileostomy Closer	24	1.45	2	8.33

Table-4 -Distribution and percentage of pathogens associated with SSI

S. No.	Pathogen	No. of Pathogen	Percentage (%)
1.	PSEUDOMONAS	35	29.41
2.	E-COLI	25	21.00
3.	KLEBSIELLA	15	12.60
4.	ACINETOBACTOR	8	6.72
5.	PROTEUS MIRABILLIS	4	3.36
6.	CITROBACTER	1	0.84
7.	ENTEROBACTOR	1	0.84
8.	COAGULASE NEGATIVE STAPHYLOCOCCUS	20	16.80
9.	COAGULASE POSITIVE STAPHYLOCOCCUS	4	3.36
10.	ENTEROCOCCUS	6	5.04
	Total	**119**	

Table– 5 - Different antimicrobial agents used for prophylaxis

S. NO		ANTIMICROBIALS	PATIENTS(N=1650)		SSI	
			No.	%	No.	%
1.	Single Drug	CEFTRIAXONE	152	9.21	7	4.60
		CEFTAZIDIME	34	2.06	2	5.88
		TOTAL	**186**	**11.27**	**9**	**4.83**
2.	Two Drug Combination	CETRIAXONE + AMIKACIN	434	26.30	9	2.07
		CEFTAZIDIME + AMIKACIN	177	10.72	5	2.82
		TOTAL	**611**	**37**	**14**	**2.29**
3.	Three Drug Combination	CEFTRIAXONE +AMIKACIN + METRONIDAZOLE	490	29.69	35	7.14
		CEFTAZIDIME + AMIKACIN + METRONIDAZOLE	200	12.12	11	5.5
		PIPERACILLIN +TAZOBACTUM+ AMIKACIN	27	1.63	0	0
		TOTAL	**717**	**43.45**	**46**	**6.41**
4.	Four Drug Combination	PIPERACILLIN +TAZOBACTUM + AMIKACIN + METRONIDAZOLE	44	2.66	3	6.81
		PIPERACILLIN TAZOBACTUM + AMIKACIN+ LINEZOLID	23	1.39	16	69.56
		TOTAL	**67**	**4.06**	**19**	**28.35**
5.	Five Drug Combination	MEROPENEM + AMIKACIN+METRONIDAZOLE+ AMOXACILLIN CLAVULENIC ACID	34	2.06	3	8.82
		CEFTAZIDIME +AMIKACIN + METRONIDAZOLE + AMOXACILLIN CLAVULENIC ACID	17	1.03	3	17.64
		PIPERACILLIN +TAZOBACTUM + AMIKACIN + LINEZOLID + METRONIDAZOLE	18	1.09	3	16.66
		TOTAL	**69**	**4.18**	**9**	**13.04**
		GRAND TOTAL	**1650**		**97**	

DISCUSSION –

A total of 1650 patients underwent general surgery with all kind of preoperative precautions and prophylactic antibiotic dosage. The predominance of male patients was seen in this study as male patients (997) were higher than female patients (653) (Table-1).

DISTRIBUTION OF SSI ACORDING TO AGE AND SEX

In our study 97 patients were found to have SSI in which males 59 (60.82%) were higher than females 38 (39.18%%) . Similar observations were found in another study by Velasco et al, and they concluded male sex to be an independent predictive risk factor for SSIs.[5]

Age of the patient is a risk factor to be associated with higher incidence of SSI. The maximum SSI 34% (33 cases) were found in age group 46yrs-60yrs followed by 27.83% (27cases) in age group 31yrs-45 (Table- 2). It could be due to lowered immunity with increasing age leading to impaired wound healing and poor immune response to infections. This observation may seem very surprising, as 46yrs -60 yrs age group cases have known to land up in SSI more than the 61-75 yrs. However, in our study, there have been a greater number of 46yrs-60 yrs age group of cases (34%) over the study duration than 61-75 yrs cases (17.52%).

SURGICAL PROCEDURE WISE DISTRIBUTION OF SSI

Incidence of SSIs varies depending on the type of surgery performed. Most of the SSI incidence in our study 67.74% (21 cases) were found in Skin graft general surgeries, where more than 50% of cases were found to have caused SSI (21 cases out of 31 cases). Surgeries like wound closer and sec suture (24%), fistulectomy (12.76%), Amputation (12.5%) and Cholecystectomy (12.69%) were also found to have higher SSI incidence comparing to other surgeries (Table-3).

In our study Major surgical procedure performed were of Hernioplasty with 498 cases and were found to have total 12 cases (2.40%) of Surgical site infection .Another surgical procedure with low SSI incidence was Mastectomy where out of 97 cases only 2 cases were found to have developed SSI. The surgeries like Hernioplasty and circumcision ,orchidopexy , hemithyroidectomy are clean wound, elective and less duration procedures with usually less duration of hospital stay. This could be the reason of the less SSI incidence rates in these procedures of our study.

Higher rates of SSI in Skin graft surgery have been attributed to fact that they have clean contaminated wounds with long surgical time and usually longer hospital stay. In a similar study by Abbey RK et al. it was observed that the duration of surgery, type of wound (clean - contaminated, elective contaminated) and type of surgery procedures Elective/Emergency are factors responsible for SSI incidence rates.[6] In surgical procedures like Circumcision, Orchidopexy, Colostomy closer, Hemithyroidectomy and Whipple's procedure the SSI incidence were not found.

DISTRIBUTION AND PERCENTAGE OF PATHOGENIC ISLOLATES ASSOCIATED WITH SSI

In our study, the microorganisms causing SSIs were evaluated. A total of 119 etiological microorganisms were identified in 97 SSI cases. Among the various organisms (total 119) isolated on culture ,the number of gram negative organism were more (89) than the gram positive (30). The most common pathogens associated with SSI in the present study was Pseudomonas aeruginosa (35, 29.41%) followed by Escherichia coli (25, 21%) and Coagulase negative Staphylococcus (20, 16.80%).

A study by Masaadeh et al reported Pseudomonas aeruginosa the most important pathogen with increased rate of incidence in post-operative wound infections. Their study observed similar SSI incidence rates of Pseudomonas aeruginosa that is 27.8%. [7] Similarly K Prabhat Ranjan

et al reported an incidence rate of pseudomonas aeruginosa infection to be 29.41% (89 out of 300 isolates).[8] Pseudomonas aeruginosa is a leading cause of health care associated infections, ranking second among gram negative pathogens as reported by the United States national nosocomial infection surveillance system. P.aeruginosa contributes substantially to wound-related morbidity and mortality worldwide.

Presence of enteric organisms like E. coli could be attributed to the patient's normal endogenous microbial fecal flora.[9] In our study a total of 25 isolates (21.32%) were Escherichia coli which was similar to (61 isolates, 20.3%) in a study done by K Prabhat Ranjan in referral hospital Haryana in 2011.[8] E. coli invasion of the wound could be a clear case of poor hygiene.

DIFFERENT COMBINATION OF ANTIBIOTIC AGENTS

All cases in our study received prophylactic antimicrobials prior to the surgery. In our study we found that 3rd generation Cephalosporins (Ceftriaxone) in combination with Metronidazole and Amikacin were commonly used antimicrobials combinations for antibiotic prophylaxis.

This combination was found to be given in clean and clean-contaminated surgeries like Appendectomy, cholecystectomy (open), haemorrhoidectomy, orchidoplexy , Circumcision , where no signs of infection were present and this was found to be irrational as per different standard guidelines like ASHP[10] and SIGN (Scottish Intercollegiate Guidelines Networks) because of the emergence of drug resistant organisms.[11]

Limited – choice of antimicrobials available as Govt. hospital supply at the point of time of surgery may be a factor which have contribute to inappropriate selection of AMA .

3rd generation Cephalosporins were used along with Amikacin & Metronidazole to cover gram negative and anaerobes bacteria respectively , however some studies shows that there is no significant difference in efficacy by additional benefits .[12,13,14,15]

Single antibiotic prophylaxis given to cases of clean surgery like excision of lipoma , circumcision , orchidoplexy , where no signs of inflammation were there. Out of 186 cases 9 cases develop surgical site infection i.e. 4.83% .

Two drug combination of 3rd generation Cephalosporins with Amikacin was used in 611 cases in clean –contaminated surgery like henioplasty , mastectomy hemithyroidectomy , some cases of vericocelectomy , orchidoplexy out of which 14 cases(2.29%) develop surgical site infection.

Three drug combination was used in 717 cases. Among the Three drug combinations used, combination of that Ceftriaxone + Amikacin + Metronidazole used in 490 patients , Ceftazidime + Amikacin + Metronidazole used for 200 patients out of these SSI was developed in 35(7.14%) and 11(5.5%) patients respectively , whereas Piperacillin + Tazobactam + Amikacin was used only in 27 patients and none of the patients developed SSI in this group .

Four drug combination was used for prophylaxis in total 67 cases which were highly contaminated. Out of these, 44 cases were given Piperacillin with a Beta lactamase inhibitor, Amikacin and Metronidazole and among these, SSI was reported in 3 patients. Other four drug combination of Piperacillin- Tazobactam with Amikacin + Linezolid was used in 23 cases of skin graft (18) and Amputation(5), out of which 15 and 1 develop SSI respectively .

Five drug combinations were used for highly contaminated cases in which combination of Meropenem + Amikacin + Metronidazole + Amoxacilllin + Clavulenic acid was used in 34 patients whereas combination of Ceftazidime + Amikacin+ Metronidazole + Amoxacilllin + Clavulenic acid was used in 17 patients & combination of Piperacillin + Tazobactum + Amikacin + Linezolid + Metronidazole was used in 18 patients and out of these 3 (8.82%) patients , 5 (29.41%) patients , and 9 (16.69%) patients developed SSI respectively.

Inspite of the modern surgical and sterilization techniques and the use of prophylactic antimicrobials, SSIs still continue to pose an important clinical challenge . Although SSIs cannot be completely eliminated, but can be reduced with proper infection control measures and a sound antibiotic policy which will surely result in better patient care, safety and healthcare outcomes.

CONCLUSION -

The SSIs represents a substantial burden of disease both for the patients and the healthcare services in terms of the morbidity, mortality and economic costs. Assessment of current antimicrobial prescribing patterns is an important step towards promoting appropriate use of antimicrobial agents.

The study suggested the need for a local protocol or institutional antibiotic guideline for the use of antibiotics as surgical prophylaxis in hospital so as to make the use of antibiotics appropriate and rational and for optimal patient care.

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