www.jmscr.igmpublication.org
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v7i3.113

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Bacteriological profile and antibiogram of surgical site infections - A study from a tertiary care teaching hospital of Kashmir Valley, India

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Abstract

Background: *Postoperative wound infections, and now the surgical site infections (SSIs), they usually occur within 30 days following a surgical procedure and may occur up to 1 year if a prosthetic is implanted. In this study we aimed to determine the bacteriological profile and antibiogram of surgical site infections among patients attending a tertiary care teaching hospital.*

Methods: *The study was a cross-sectional study which was carried out at a tertiary care teaching hospital of Kashmir Valley. The study was conducted for a period of 2 months from November 2018-December 2018 among patients with SSIs from various surgical wards of the associated hospital. Patients with cellulitis and suture abscess were excluded. A questionnaire was developed before the study to capture socio-demographic and clinical details.*

Results: *A total of 55 swab samples were collected from different sites of the patients who had SSIs. The majority 29 (52.7) belonging to the age group of 21-40 years followed by 13 (23.6%) belonging to age group of < 20 years. Most of the subjects 30 (54.5%) were having normal body mass Index while 21 (38%) were obese. Most of the subjects 28 (50.9%) belonged to Upper Middle Class. Most of the samples 15 (27.3%) were sterile and were without any growth while 13 (23.6%) and 12 (21.8%) samples had growth of Staphylococcus aureus and E.Coli respectively. Most of the samples were sensitive to Imepenum 33 (60%), linezolid 31(56.4%), Amikacin 29 (52.7%) followed by Gentamycin 27 (49.1%). However, antibiotic resistance was seen for Ceftazidime clavulunate 36 (65.5%), Ceftriaxone 35 (63.6%), Pipercillin Tazobactum 31 (56.4%) followed by Cotrimoxazole 28 (50.9%).*

Conclusion: *Extremes of age and obesity are known risk factors for SSIs. Bacterial resistance is a serious threat for treating infections and exists for more commonly available and used antimicrobials.*

Keywords: *Bacterial Infection, Surgical Site Infections, SSIs, Wound Infection, Antibiotic Ressitance.*

Introduction

Wound Infections are the most commonly reported entity following surgical procedures from the hospitals. Previously termed as postoperative wound infections, and now the surgical site infections (SSIs), they usually occur within 30 days following a surgical procedure and may occur up to 1 year if a prosthetic is implanted[1]. The incidence of SSIs is common in Indian sub-continent ranging from 2-20% following surgical procedures and these may cause serious complications among the patients adding to higher treatment costs, long hospital stays, morbidity and mortality among them[2]. In India, the overall data regarding SSIs is likely to be underestimated because of lack of post discharge data, incomplete reporting and loss to follow-up of patients[3]. SSIs have been reported even from hospitals maintaining higher standards of care and modern facilities. The surgical wound is usually infiltrated by exogenous or endogenous microorganisms that enter the site during operative procedures (primary infection) or even after that (secondary infection). Most of the SSIs involve superficial layers of the skin and subcutaneous tissues while some may progress to necrotizing infections especially among certain high risk groups as evident by previous data[4].

Over the past many years, there has been a huge increase in the number of SSI cases as reported by hospitals and it has been observed that many of the cases which were deemed serious were caused by gram negative organisms. Furthermore, the irrational use of high dose broad spectrum antibiotics and antimicrobial resistance has further accelerated this scenario. In developing countries like India, where hospitals have inadequate infrastructure, poor infection control practices, overcrowded wards and practice of irrational use of antimicrobials, the problem of SSIs gets more convoluted.

In this study we aimed to determine the bacteriological profile and antibiogram of surgical site infections among patients attending a tertiary care teaching hospital. The results and recommendations of the study will help the administrators, policy makers and health care personnel's to improvise appropriate techniques to prevent SSIs among patients during and after the surgical procedures.

Methodology

Study Design & Setting: The study was a cross-sectional study which was carried out at a tertiary care teaching hospital of Kashmir Valley.

Study Period & Study Unit: The study was conducted for a period of 2 months from November 2018-December 2018 among patients with SSIs from various surgical wards of the associated hospital.

Sample Size: Arbitrarily we included all patients with SSIs during the study period

Inclusion Criteria: Patients with SSIs admitted in various surgical wards of the tertiary teaching hospital of either sex and any age, who had surgical wound pus, discharge, or signs of sepsis.

Exclusion Criteria: Patients with cellulitis and suture abscess were excluded.

Questionnaire: A questionnaire was developed before the study to capture socio-demographic[5] and clinical details.

Procedure: Using sterile cotton swabs, two pus swabs/ wound swabs were collected aseptically from each patient suspected of having SSI. Gram stained preparations were made from one swab for provisional diagnosis. The other swab was inoculated on 5% sheep blood agar (BA) and Mac Conkey agar (MA) plates and incubated at 37°C for 48 hours before being reported as sterile. Growth on culture plates was identified by its colony characters and the battery of standard biochemical tests[6,7]. Antimicrobial sensitivity testing (AST) was carried out by modified Kirby Bauer disc diffusion method on Muller Hinton agar and results were interpreted in accordance with Clinical Laboratory Standards Institute guidelines[8]. Methicillin resistance was detected by taking cefoxitin (30µg) as a surrogate marker and was confirmed by using PBP2a latex agglutination test (Oxoid Ltd, Hampshire, UK).

Staphylococcus aureus- ATCC 25923, Escherichia coli- ATCC 25922 and Pseudomonas aeruginosa- ATCC 27853 were used as control strains for AST. All dehydrated media, reagents and antibiotic discs were procured from Hi Media Laboratories Pvt. Ltd., Mumbai, India.

Statistical Analysis: Data was entered in Microsoft excel spreadsheet and analysed using appropriate statistical software application.

Ethical Issues: The study didn't have any ethical issues related to human or animal experiments. The confidentiality of the participants was maintained as per study protocol.

Results

This cross sectional study was carried out at one of the tertiary care teaching hospital of Kashmir valley for a period of two months. A total of 55 swab samples were collected from different sites of the patients who had SSIs. Almost equal number of samples were received from both genders, the majority 29 (52.7) belonging to the age group of 21-40 years followed by 13 (23.6%) belonging to age group of < 20 years. Most of the subjects 30 (54.5%) were having normal body mass Index while 21 (38%) were obese. Most of the subjects 28 (50.9%) belonged to Upper Middle Class while only 3 (5.5%) belonged to lower socioeconomic class. [Table I]

Table II shows the type of organisms cultured from the samples. Most of the samples 15 (27.3%) were sterile and were without any growth while 13 (23.6%) and 12 (21.8%) samples had growth of Staphylococcus aureus and E.Coli respectively. Table III shows the antibiogram of the samples taken from study sample. Most of the samples were sensitive to Imepenum 33 (60%), linezolid 31(56.4%), Amikacin 29 (52.7%) followed by Gentamycin 27 (49.1%).However, antibiotic resistance was seen for Ceftazidime clavulunate 36 (65.5%), Ceftriaxone 35 (63.6%), Pipercillin Tazobactum 31 (56.4%) followed by Cotrimoxazole 28 (50.9%) samples.

Table I: Socio-demographic characteristics of study sample

Variables	Frequency (n=55)	Percentage (%)
Gender		
Male	28	50.9
Female	27	49.1
Age in Years		
< 20	13	23.6
21-40	29	52.7
41-60	6	10.9
>61	7	12.7
BMI		
Lean	4	7.3
Normal	30	54.5
Overweight	14	25.4
Obese	7	12.8
Socioeconomic status		
Upper (I)	8	14.5
Upper Middle (II)	28	50.9
Lower Middle (III)	9	16.4
Upper Lower(IV)	7	12.7
Lower (V)	3	5.5

Table II: Organisms cultured from the samples

Variables	Frequency (n=55)	Percentage (%)
Organism Cultured		
Staph Aureus(MRSA)	13	23.6
E. Coli (ESBL)	12	21.8
Actinobacteria	2	3.6
Enterobacteriaceae	4	7.3
Pseudomonas Aeruginosa	1	1.8
Coagulase Negative Staphylococci (CONS)	3	5.5
Streptococcus species	3	5.5
Citrobacter	2	3.6
Sterile	15	27.3

Table III: Antibiogram of the swab samples

Antimicrobial	Sensitive	Resistant	Sterile
Vancomycin	26 (47.3)	14 (25.5)	15 (27.3)
Linezolid	31 (56.4)	8 (14.5)	16 (29.1)
Gentamycin	27 (49.1)	13 (23.6)	15 (27.3)
Pipercillin Tazobactum	9 (16.4)	31 (56.4)	15 (27.3)
Teicoplanin	26 (47.3)	14 (25.5)	15 (27.3)
Amikacin	29 (52.7)	11 (20.0)	15 (27.3)
Cotrimoxazole	12 (21.8)	28 (50.9)	15 (27.3)
Ciprofloxacin	18 (32.7)	22 (40.0)	15 (27.3)
Imepenum	33 (60.0)	7 (12.7)	15 (27.3)
Ceftriaxone	5 (9.1)	35 (63.6)	15 (27.3)
Ofloxacin	15 (27.3)	25 (45.5)	15 (27.3)
Erythromycin	19 (34.5)	21 (38.2)	15 (27.3)
Levofloxacin	21 (38.2)	19 (34.5)	15 (27.3)
Clindamycin	24 (43.6)	16 (29.1)	15 (27.3)
Ceftazidime Clavulunate	4 (7.3)	36 (65.5)	15 (27.3)
Tigecycline	40 (72.7)	0 (0.0)	15 (27.3)

Discussion

Wound Infections are the most commonly reported entity following surgical procedures from the hospitals. Regardless of the current advances in surgical procedures, availability of broad spectrum antibiotics, clean and safe wound management practices and modern hospital management systems, SSIs still remain a challenge for practicing surgeons and health care personnel's. Moreover, the patients undergoing surgery have an extra threat of microbial colonies circulating in the hospital environment which may make them susceptible to SSIs. The burden of antimicrobial resistance adds to the burden. Most of the SSIs are hospital acquired and vary from one health care facility to another.

In our study we aimed at determining the bacteriological profile and antibiogram of surgical site infections among patients attending a tertiary care teaching hospital. A total of 55 patients were received during the study period who had SSIs following surgeries for various ailments.Almost equal number of samples were received from both genders, the majority 29 (52.7) belonging to the age group of 21-40 years followed by 13 (23.6%) belonging to age group of < 20 years. In most of the studies conducted earlier[9-11], it has been observed that SSIs are more common among older adults and children due to less immunity and more exposure to bacterial agents. This is not in accordance with our study, we had very less number of older adults in our study who had SSIs but the number of children and adolescents with SSIs were as per other published data [11]. Most of the subjects 30 (54.5%) were having normal body mass Index while 21 (38%) were obese. Other studies [12,13] have reported association of obesity with development of SSIs. That means obese

persons have 1-4 fold increase chance of developing SSIs following surgery[13]. Most of the subjects 28 (50.9%) belonged to Upper Middle Class while only 3 (5.5%) belonged to lower socioeconomic class. Moreover, most of the samples 15 (27.3%) were sterile and were without any growth while 13 (23.6%) and 12 (21.8%) samples had growth of Staphylococcus aureus and E.Coli respectively. This is accordance with the studies conducted earlier[14,15] where the most common organism causing SSIs was Staphylococcus aureus and E.Coli. The antibiogram of the samples taken from surgical sites sensitive to Imepenum 33 (60%), linezolid 31(56.4%), Amikacin 29 (52.7%) followed by Gentamycin 27 (49.1%).However, antibiotic resistance was seen for Ceftazidime clavulunate 36 (65.5%), Ceftriaxone 35 (63.6%), Pipercillin Tazobactum 31 (56.4%) followed by Cotrimoxazole 28 (50.9%). the results of our study were in accordance with the published literature[16-19]. The characteristics of SSIs and antibiotic resistance reported in this paper are comparable to other studies from India. Moreover, the bacteria isolated from the patients in this study showed higher degrees of resistance for commonly available antimicrobials which is worry some for a developing country like India. We recommend to carry out studies with a large sample size to see any statistically relevant association.

Conclusion

We conclude that despite of modern surgical techniques and antimicrobial availability and use, SSIs are common among patients undergoing surgeries. Extremes of age and obesity are known risk factors for SSIs. Bacterial resistance is a serious threat for treating infections and exists for more commonly available and used antimicrobials.

Source of Funding: None
Conflict of Interest: None

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