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ANTI-MICROBIAL SENSITIVITY PATTERNS OF BACTERIAL ISOLATES FROM SURGICAL SITE INFECTIONS IN OBSTETRICS AND GYNAECOLOGY

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ABSTRACT

Objective: To find out the most common bacterial pathogens responsible for surgical site infections and their antimicrobial sensitivity profile.

Materials and Methods: This descriptive study was carried out in Obstetrics and Gynaecology Unit "C" Khyber Teaching Hospital, Peshawar, from June 2012 to May 2013. Samples were collected from the patients showing signs of surgical site infection, using sterile swabs and sent to laboratory for identification of micro organisms by Gram-stains and culture growth followed by in vitro antibiotic susceptibility testing.

Results: During the study period, a total of 937 patients underwent major abdominal surgeries, of them 46 patients (4.90%) developed surgical site infections. A total of 36 pathogens were detected. Staphylococcus aureus (30.4%) was the predominant organism followed by Pseudomonas aeruginosa (22.2%), Escherichia Coli (16.7%) and Enterbacter species (8.3%). Staphylococcus aureus exhibited good sensitivities to Vancomycin (100%), Amikacin (91%), Ciprofloxacin (83.3%). Low susceptibility patterns were observed to 2nd and 3rd generation Cephalosporins. Sensitivity pattern of P-aeruginosa showed 100%, 87.5%, 75% sensitivity to Imipenem, Piperacillin-Tazobactum, Amikacin and respectively. However, low susceptibility patterns were observed to Cephalosporins and amoxicillin-clavulonic acid. Escherica Coli had good susceptibility patterns for Amikacin (100%), Imipenem (100%), Piperacillin-Tazobactum (100%), Ciprofloxacin (80%).

Conclusion: Staphylococcus aureus remains the most common pathogen involved in surgical site infections. Since a high proportion of samples had positive cultures, infection control is recommended as a strategy to minimize spread of resistant organisms.

Key Words: Surgical site, infection, pathogens, antimicrobial, sensitivity.

INTRODUCTION

Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSI)[1]. It is estimated that millions of surgical procedures are performed annually worldwide; SSIs continues to be a major source of morbidity after operative procedures. Despite considerable research on best practices and strides in refining surgical techniques, technological advances and environmental improvements in the operating rooms and the use of prophylactic pre-operative antibiotics, SSIs remains the second most common adverse event occurring to hospitalized patients[2].

SSIs are one of the most important causes of health care associated infections with incidence according to Centers for Disease Control and Prevention (CDC) was 15.45% and according to the UK nosocomial infection surveillance was 11.32%[3]. In US, the reported rate of SSI is 2.6% for all operations[4].

SSI has an adverse impact on the patient as well as on the hospital. It is responsible for prolonged hospital stay, which results in social and economic loss to the patient and the family[5]. Other clinical outcomes of SSI include poor scars that are cosmetically unacceptable, persistent pain and a significant impact on emotional well being[6]. It also adds appreciable burden on hospital resources and on health care providers[7].

A complex interplay between host, microbial and surgical factors ultimately determines the prevention or establishment of a wound infection. The most common group of bacteria responsible for SSIs is staphylococcus aureus[8]. Other micro-organisms implicated are Escherica-coli, Pseudomonas and Klebsiella[9].

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The wide spread use of antibiotics, together with the length of time over which they have been available has led to the emergence of resistant strains, which has significantly increased the morbidity and mortality associated with wound infections[10]. Routine surveillance for the hospital acquired wound infections is recommended by both the Centers of Disease Control and Prevention[11] and the Surgical Infection Society[12]. This study is therefore, designed to determine the distribution of bacterial pathogens isolated from septic post operative wounds and their anti-microbial susceptibility patterns.

MATERIAL AND METHODS

This descriptive study was carried out in the Obstetrics and Gynaecology Unit "C" Khyber Teaching Hospital, Peshawar, from June 2012 to May 2013. All the patients who underwent major abdominal surgeries in the selected ward during the study period were included in the study. Patients were enrolled after obtaining informed consent. In all cases pre-operative, intra-operative and post- operative details were studied. Information was collected in case record form for age, date of admission, reason for admission, associated co- morbid condition/s, type of surgery: emergency or planned, the procedure performed, pre-operative antibiotic prophylaxis and the post operative day on which signs of infection were detected. All the patients who underwent major abdominal surgeries, who later on developed wound infection within 30 days, post operatively were included in the study. However, patients who had undergone major abdominal surgeries outside the Obstetrics & Gynaecology Unit "C" Khyber Teaching Hospital and were admitted for the treatment of post operative wound infection, patients with intentional reopening of wound for wound hematomas and patients undergoing diagnostic laparoscopies were excluded from the study.

Samples were collected from the wounds showing signs of infection such as erythema, tenderness, discharge and wound gaping by using a sterile swab. For collection of sample wound was washed with normal saline and then swab was collected to avoid the growth of skin commensals. The swabs were labeled with necessary details and were transported to the laboratory, where they were processed by the conventional microbiological methods and antimicrobial susceptibility was done. The data was entered into SPSS version 10 and results were obtained.

RESULTS

During the study 46 (4.90%) developed surgical site infection. Types of surgery done among the wound infected population are shown in figure 1. Prevalence of surgical site infections in relation to different types of obstetrical and gynecological surgeries is shown in Table 1. In 33 (71.7%) of the population, wound infection appeared within 4^{th} to 6^{th} day post operatively. Infection appeared within 7^{th} to 14^{th} day and beyond 14^{th} day post operatively in 10 (21.7%) and 3 (6.5%) cases respectively.

Among the wound infected population, 34 (74%) of patients cultures were positive for micro organism while 12 (26%) had yielded no growth. In 3 (8.8%) cases the growth was polymicrobial while in 31 (91.2%) cases only single microorganism was detected. Frequency of isolates of gram positive organisms was (41.66%) and that of gram negative organisms was (58.33%).

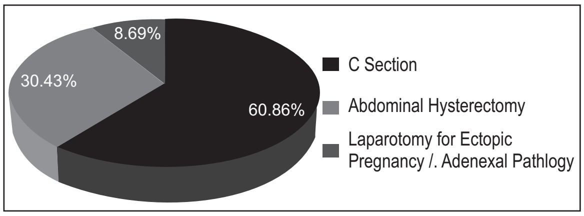

Fig. 1: Types of Surgical procedures presented with Surgical Site infection

Table 1: Prevalence of surgical site infections in relation to different types of surgical procedures

Type of surgical procedures	Frequency and per centage of surgical site infections
Emergency Caesarean sections	24 (4.35%)
Elective Caesarean sections	04 (1.82%)
Abdominal hysterectomies	14 (15.21%)
Laprotomies for ectopic pregnancy	02 (9.52%)
Laprotomies for ovarian cysts	02 (6.0%)
Myomectomies	00 (00%)
Total	46 (4.90%)

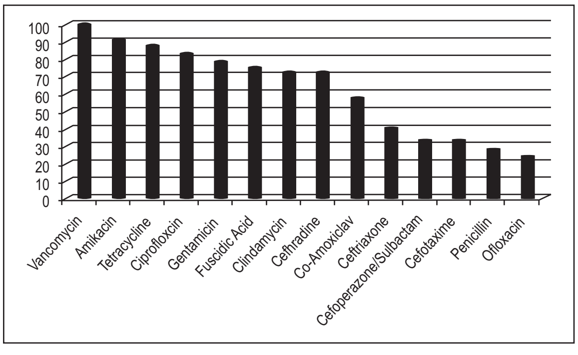

Fig. 2: Sensitivity Patterns of Staphylococcus aureus

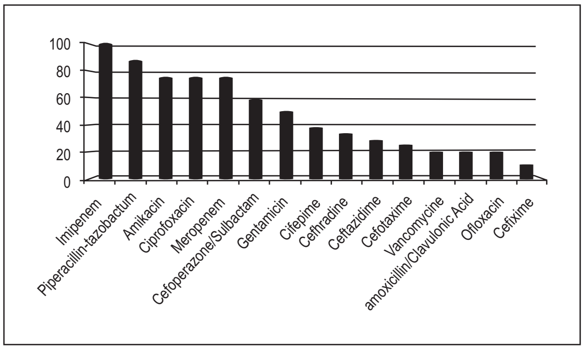

Fig 3: Sensitivity Patterns of Pseudomonas aeruginosa

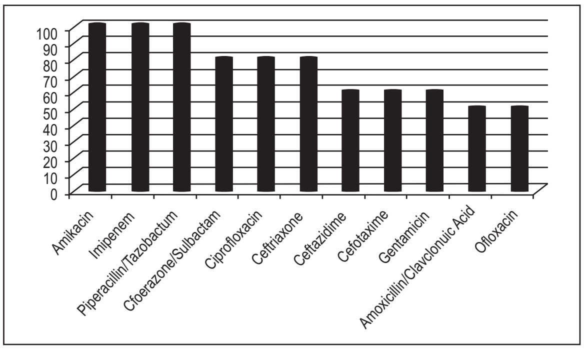

Fig. 4: Sensitivity Patterns of Escherichia Coli

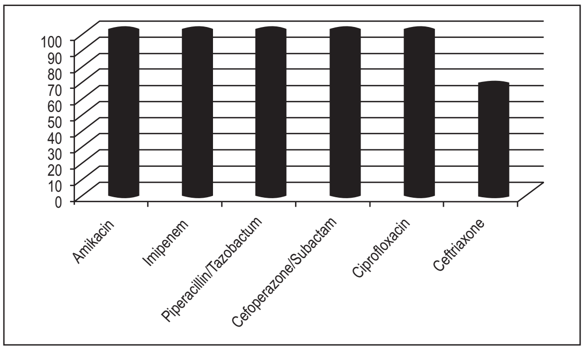

Fig. 5: Sensitivity Patterns of Enterobacter

The micro organisms isolated were Staphylococcus aureus 14 (38.9%), Pseudomonas 8 (22.2%), Escherica coli 6 (16.7%), Enterobacter 3 (8.3 %), Enterococcus 1 (2.7%) , Proteus species 1 (2.7%), klebsiella Pneumoni 1 (2.7%), Citrobacter 1 (2.7%) and Acinetobacter bamunii 1 (2.7%).

Regarding antimicrobial sensitivity patterns, Staphylococcus aureus exhibited highest sensitivities to Vancomycin (100%), Amikacin (91%), Tetracyclines (87.5%) and Ciprofloxacin (83.3%). However, very low susceptibility was seen against Penicillin (28%) and Ofloxacin (14.2%). Antimicrobial sensitivity patterns of Staphylococcus aureus is shown in figure 2. Similarly, sensitivity patterns of Pseudomonas, Escherica coli and enterococcus shown in species are Figures 3, 4 & 5 respectively. One case of Proteus (2.7%) was detected and was sensitive to Amikacin, Cefoperazone-sulbactam, Piperacillin-tazobactum, Gentamicin and Erythromicin. However, resistance was observed to Ceftriaxone and Ceftazidime.

Klebsiella (2.7%) was sensitive to Amikacin, Imepenem, Piperacillin-Tazobactum and Ciprofloxacin, while it was resistant to Ampicillin, Ceftriaxone, Cefuroxime ,Cefixime and Gentamicin. Enterococcus (2.7%) was sensitive to Amoxicillin-clavulonic acid, Ampicillin, Gentamicin, Tetracyclin and Vancomycin. However, it showed resistance to Erythromicin. Acinetobacter bamunii (n=1) was sensitive to Amikacin, Imipenem, Polymicin- B and Meropenem. Resistance was observed to Ampicillin, Amoxicillin-clavulonic acid, Ceftriaxone ,Cefixime, Ciprofloxacin, Gentamicin and Piperacillin-Tazobactum.

The analysis of Performa revealed that the prophylactic antibiotics used pre-operatively as well as post- operatively were Ceftriaxone (in 31 patients) and Amoxicillin-clavulonic acid (in 15 patients), which were available free of cost from hospital's pharmacy. It is evident that majority of the isolates are resistant to the antibiotics used for the prophylaxis and treatment of infected wounds.

DISCUSSION

In the present study incidence of surgical site infection was 4.90% among the patients who underwent major abdominal surgeries in Obstetrics and Gynecology Unit "C" Khyber Teaching Hospital, Shahida Meo[5] from Lahore reported rate of surgical site infection of 1.92% while Nisa[13] from Peshawar showed rate of 6.5% in her study. According to the 2004 survey report by the Centers of Disease Control and Prevention, Noscomial Infection National Surveillance Service (NNIS) incidence of hospital acquired infection, related to surgical wounds is 0.5 -13%[14].

In our study surgical site infections have occurred more in elective surgeries i.e, abdominal hysterectomies (15.21%) than in emergency Caesarean-sections (4.35%). This observation may seem surprising as emergency cases have known to land up more in surgical site infection than the elective ones. However, Varsha[15] has shown increased surgical site infection rate in elective gynecological surgeries as compared to emergency procedures. All of the patients undergoing abdominal hysterectomies were above 45 years of age. The presence of underlying condition such as diabetes mellitus (64.28%) and anemia, requiring blood transfusions (54.54%) were more in patients who underwent elective surgeries. Moreover, prolonged hospital stay pre operatively in elective cases increases the risk of noscomial infections in these patients. The above mentioned factors could have been responsible for this unexpected outcome.

Of the 46 SSIs cases 26% had yielded no growth of microorganisms, varsha[15] and Rehman[9] have also reported negative cultures in 22% and 35% cases, respectively in their studies. This may be due to the normal healing process where the bacteria have been overpowered by body's defense mechanism. Another possible explanation is anti microbial activity in patients' circulation, since all of them had been on antibiotic therapy postoperatively at time of collecting the specimen. It may be possible that the culprit microorganisms were anaerobic bacteria that were missed as cultures were incubated aerobically[16].

In the present study and some other recent studies[10,15], predominance of gram negative organisms in surgical site infection (58.33% vs. 41.66%) is reported. However, a study done in Turkey[17] showed gram positive organisms as predominant. This difference may be due to variation in common noscomial pathogens in different hospital set ups. Though, the percentage of gram negative bacilli from SSIs was high, however, Staphyloccocus aureus was the predominant micro-organism isolated (38.88%), followed by Pseudomonas (22.22%) and E-coli (16.66%). Similar findings have been observed in the studies done previously[18,19,20]. However, other studies have shown the predominance of Pseudomonas[21], E-Colli[15] and Klebsiella[7]. The high prevalence of Staphyloccocus aureus in the present study is may be due to the fact that it forms a part of the normal skin flora and can be isolated from noses of up to 60% of the healthy individuals. It is readily transmitted from person to person, onto the hands and clothes of the health care staff, on objects and into the air[22].

In present study, prevalence of Methicillin Resistant Staphylococcus Aureus (MRSA) was low (7.1%), same result has been found in another study[23]. However, the prevalence of MRSA in our study is remarkably low as compared to the study by Safia[24] which showed 100% prevalence of MRSA. Our study revealed that Staphyloccocus aureus showed highest sensitivity (100%) to Vancomycin. Same result has been observed by Safia et al[24]. Good sensitivity patterns were shown to amikacin (91%), Tetracyclines (87.5%), Ciprofloxacin (83.3%) and Gentamicin (78.5%). These findings are in agreement with the previous studies[7,16,21].

In our study moderate sensitivity of Staphyloccocus aures (57%) has been observed against Amoxicillin/clavulonic acid while a study done in Agha Khan University hospital indicated good sensitivity (69.76%) to it[21]. In present study, S-aureus showed low susceptibility patterns to 2nd and 3rd generation cephalosporines as compared to some studies[21,25]. This could be due to the overuse of these drugs and the high prevalence of extended spectrum beta lactamases among these organisms. Our study indicated low susceptibility of S-aureus to Penicillin and Ofloxacin. Same results have been observed in recent studies[21,24,26].

In one case, MRSA was detected which was sensitive to Vancomycin, Chloramphenicol and Linezolide, while it was resistant to Ciprofloxacin, Gentamicin, Clindamycin, Fusidicacid, Oxacillin and Penicillin. Same sensitivity pattern of MRSA have been observed in other studies carried out in different hospitals in Pakistan[27,28,29]. In our study, Pseudomonas aeruginosa strains showed good sensitivity patterns to Imepenem (100%), Piperacillin-Tazobactum (87.5%), Amikacin (75%) and Ciprofloxacin (75%). These findings are in agreement with studies done by varsha[15] and Shekih[21]. However, in our study low sensitivity patterns to 2nd and 3rd generation Cephalosporines have been seen. This result is in conformity with the studies in the literature[21,24,26,30].

The increased resistance against Cephalosporines might be the result of increased used of these antibiotics, as these are extensively used in the selected ward for prophylaxis as well as post operatively to prevent infections and as empirical treatment for infected cases. Literature also suggests that antibiotic use is proportional to the antibiotic resistance[24].

Sensitivity patterns of Escherichia coli in our study as compared to others were Amikacin (100% vs. 88.9%)[21], Imipenem (100% vs. 78%)[24], Gentamicin (60% vs 51.8%)[21] and Ciprofloxacin (80% vs. 70.4%).[21] Good sensitivity patterns were observed to Cephalosporins i.e. Ceftriaxone (80%), Ceftazidime (60%) and Cefotaxime (60%). However, in contrary to our findings Safia and Ali[31] have shown high resistance patterns to cephalosporins in their reports.

CONCLUSION

Infection control can be achieved by proper sterilization of the instruments, surfaces and theatres. Proper scrubbing techniques should be observed. Furthermore, Periodic surveillance is recommended to determine the susceptibility patterns of the common pathogens and tailoring the antimicrobials use accordingly.

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