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ORIGINAL ARTICLE

Bacteriological Profile and Antibiotics Susceptibility Patterns of Complicated Skin and Skin Structure Infections in Tertiary Care Hospital

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ABSTRACT

Background: Complicated skin and skin structure infections are most prevalent and are mostly caused by gram positive and gram negative bacteria but unfortunately these bacteria are often resistance to the commonly prescribed antibiotics.

Objective: The present study main objective was to find out the Bacteriological profile and antibiotics susceptibility patterns of complicated skin and skin structure infections in tertiary care hospital.

Materials; and method: The current cross-sectional study was carried out PGMIQ/ BMC Hospital Quetta from June 2022 to November 2022 after taking permission from the ethical board of the institute. Individuals of both gender and different age groups with skin infection were included. In accordance with hospital sample collection policy, all pertinent samples were gathered from contaminated places. Every pus/wound swab sample was handled in accordance with accepted microbiological laboratory practices. Using biochemical assays, isolates were frequently identified down to the species level. According to the 2012 CLSI, susceptibility testing was conducted and various antibiotics were used. All the data was analyzed through SPSS version 23 and presented in frequency and percentage.

Results: A total of 440 individuals participated in the current study of which females were 184(41.8%) and male were 256(58.1%). The most prevalent kind of infection was abscesses, which were followed by skin ulcers. Among gram positive bacteria the most prevalent isolated Bactria was S.aureus 26.5% followed by MRSA 9.6% while among gram negative bacteria E.coli was the most common bacteria 17.5% followed by Pseudomonas aeruginosa 14.1% . It was found that all gram-positive isolates were sensitive to vancomycin. It was noted that gram-negative isolates were resistant to the majority of the tested antibiotics. All isolates were found to be sensitive to tigecyline, making it the most effective medication. The majority of the isolates were found to be susceptible to tazobactam+ pipiracillin, gentamicin, amikacin, meropenem,, ticarcillin, chloramphenicol.

Conclusion: The current study concluded that the most prevalent organisms that is likely to be found in skin and soft tissue infections, were S. aureus followed by E. coli and Pseudomonas species. To combat these pathogens, empirical treatment could include aminoglycosides, ciprofloxacin, and vancomycin.

Keywords: Bacteriological profile; Antibiotics; Susceptibility; Complicated skin and skin structure infections

INTRODUCTION

Prompt treatment is required for complicated skin and skin structure infections (CSSSIs), which progress to the hypodermic soft tissue or muscle. Because of the nature of the disease, the response to the treatment is difficult.[1] It may have a variety of causes, including both gram-positive and gram-negative bacteria such S. aureus, β hemolytic streptococci, enterococci, Escherichia coli, & pseudomonas aeruginosa.[2] SSTIs appear in a variety of ways, making it challenging to assess their frequency and prevalence. It is anticipated that there would be 24.6 SSTIs for every 1000 person-years.[3] The rationale for the variation in the projected incidence of SSTI is that the majority of them usually go away after seven to ten days. It is anticipated that 7% to 10% of hospitalized patients would have SSTIs.[4-5] SSTIs typically appear in male patients sixty to seventy percent of the time and in individuals aged 45 to 64.[3] In many cases, CSSSI entails either surgery, intravenous antibiotic therapy, or both.[6] Nowadays, effective antibiotic chemotherapies are especially uncommon because of the emergence of drug-resistant Gram-positive and multidrug Gram-negative bacteria with resistance.[7] The CSSSIs are mostly seen in healthcare settings and are treated with first-generation cephalosporins and penicillinase-resistant penicillins for Methicillin-Sensitive S. aureus (MSSA) and Group A Streptococcus.[8] The rise in Methicillin Resistant S. aureus (MRSA) frequency is correlated with an increase in CSSSIs.[9] Antibiotic resistance profiles and changes in bacterial infections must thus be monitored in order to recommend the best course of action for controlling the infection in a timely manner, halting its spread to other body parts, and enhancing quality of life. This study intends to ascertain the microbiological profile, prevalence, and antibiotic susceptibility patterns of bacteria obtained from CSSSI samples because there is currently insufficient information available in our hospital settings about CSSSI, antibiotic susceptibility patterns of bacteria, and mortality rate.

MATERIAL AND METHOD

The current cross-sectional study was carried out PGMIQ/ BMC Hospital Quetta from June 2022 to November 2022 after taking permission from the ethical board of the institute. Individuals of both gender and different age groups with skin infection were included while individuals who were already receiving topical or systemic antibiotics were excluded. In accordance with hospital sample collection policy, all pertinent samples were gathered from contaminated places. Every pus/wound swab sample was handled in accordance with accepted microbiological laboratory practices.[10-11] Using biochemical assays, isolates were frequently identified down to the species level. According to the 2012 standards of the Clinical Laboratory Standards Institute (CLSI, USA), susceptibility testing were conducted and various antibiotics were used .[12] All the data was analyzed through SPSS version 23 and presented in frequency and percentage.

RESULTS

A total of 440 individuals participated in the current study of which females were 184(41.8%) and male were 256(58.1%). There were just 2 individuals in the under 1 year age group. Ninety-one (20%) of the instances were from children aged 1–14, 193 (43.8%) were from individuals aged 15–44, 103 (23.4%) were from individuals aged 45–64, and 51 (11.59%) were from people aged 65 and more. The most prevalent kind of infection was shown to be abscesses, which were followed by skin ulcers as presented in table 1. Out of the total samples collected 354(80.45%) were showed bacterial growth and 86 (19.5%) did not. Among the culture positive 337(76.5%) revealed the growth of single pathogen and 17 (3.86%) produced multiple bacterial growth. Among gram positive bacteria the most prevalent isolated bactria was S.aureus 94 (26.5%) followed by MRSA 34 (9.6%) while among gram negative bacteria E.coli was the most common bacteria 62(17.5%) followed by Pseudomonas aeruginosa 50 (14.1%) and Enterobacter spp as shown in table 2. It was found that all gram-

positive isolates were sensitive to vancomycin. Methicillin-resistant Staphylococcus aureus demonstrated enhanced resistance to most of the tested antibiotics, whereas S. aureus was shown to be sensitive to the most of the antibiotics. While streptococci were found to be susceptible to nearly all antibiotics and Methicillin Resistant Coagulase, Staphylococci were found to be resistant to the majority of the tested antibiotics, while Staphylococci were found to be resistant to the antibiotic ampicillin, amoxicillin, doxycycline, erythromycin, ciprofloxacin, and co-trimoxazole as shown in table 3. It was explored that gram-negative isolates were resistant to the majority of the tested antibiotics. All isolates were found to be sensitive to tigecyline, making it the most effective medication. The majority of the isolates were found to be susceptible to tazobactam+ pipiracillin, gentamicin, amikacin, meropenem,, ticarcillin, chloramphenicol, and clarith, whereas the highest resistance was observed against amoxicillin, ampicillin, cephradine, ciprofloxacin, , cefaclor, ceftazidime, cefotaxime , cefixime, erythromycin and cefepime, as presented in table 4.

Table 1: Age wise distribution of complicated skin and skin structure infection.

Infection type	Age in years less than 1	1 to 14	15 to 45	45 t0 64	Above 65	Total n/%
Abscess	2	19	45	24	20	110(25%)
Ulcer of skin	Zero	23	29	15	7	74(16.8%)
Furunculosis	Zero	2	41	18	9	70(15.9%)
Folliculitis	Zero	11	24	10	3	48(10.9%)
Cellulitis	Zero	4	16	18	8	46(9%)
Impetigo	Zero	30	6	zero	zero	36(8%)
Carbuncles	Zero	1	14	6	2	24(5.4%)
Fournier gangrne	Zero	1	11	8	1	20(4.5%)
Necrotizingfasciitis	Zero	Zero	7	4	1	12(2.7%)
Total	2	91	193	103	51	440(100%)

Table 2: Isolated bacteria

Bacteria	N (%)
Staphylococcus aureus	94(26.5%)
Coagulase Negative Staphylococci	34(9.6%)
Methicillin Resistant Coagulase Negative Staphylococci	22(6.2%)
Streptococci	21(6%)
Methicillin Resistant Staphylococcus aureus, spp.: species	20(5.6%)
E.coli	62(17.5%)
Pseudomonas aeruginosa	50(14.1%)
Enterobacter spp	15(4.2%)
Proteus mirabilis	15(4.2%)
Citrobacter spp.	10(2.8%)

Table 3: Antibiogram of gram positive bacteria

Antibiotics	S.aureus N (%) 94 (26.5%)	MRSA N (%) 34(9.6%)	CONS N (%) 34(9.6%)	MRCONS N (%) 22(6.2%)	Streptococci N (%) 17(6%)
Amoxicillin	79 (84)	21 (100)	31 (94)	22 (100)	6 (37)
Cephradine	11 (11)	16 (80)	6 (18.7)	18 (81.8)	zero
Cefaclor	11(13)	15 (75)	8 (25)	14 (64)	1 (6.2)
Ceftazidime	9 (9.78)	14 (70)	7 (21.87)	13 (59)	zero
Cefixime	7 (7.60)	17 (85)	6 (1)	19 (86)	zero
Cefepime	8 (9)	16 (80)	8 (25)	15 (68)	zero
Cefpirome	6 (7)	18 (90)	9 (28.1)	16 (72)	zero
Ciprofloxacin	56 (60.86)	20 (100)	26 (81.2)	21 (94)	2 (12.5)
Erythromycin	6 (6.52)	19 (95)	27 (85)	22 (100)	1 (6.2)
Clarithromycin	2 (2.17)	6 (30)	3 (9.3)	6 (27)	1 (6.2)
Gentamicin	zero	2 (10)	1 (3.12)	3 (13)	zero
Doxycycline	4 (4.3)	14 (70)	25 (78.1)	20 (91.)	7 (43)
Co-trimoxazole	45 (49)	19 (95)	28 (87.)	22 (100)	9 (57)
Amikacin	zero	1 (5)	2 (6.2)	4 (18.1)	zero
Vancomycin	zero	zero	zero	2 (9.0)	zero
Linezolid	zero	zero	1 (3.1)	6 (27)	zero
Fusidic acid	zero	zero	1 (3.1)	8 (36)	zero
Rifampicin	3 (3.2)	4 (20)	4 (12.5)	12 (55)	zero
Chloramphenicol	zero	1 (5)	2 (6.2)	4 (18)	1 (6.2)
Cefoxitin	zero	20 (100)	zero	22 (100)	zero
Novobiocin	zero	5 (25)	3 (9.3)	14 (63)	zero
Aztreonem	zero	8 (40)	1 (3.1)	12 (54)	1 (6.25)
Clindamycin	2 (2.1)	12 (60)	3 (9.3)	19 (86)	2 (12.5)
Cefotaxime	zero	16 (80)	6 (18.7)	16 (73)	zero
Ticarcillin	zero	1 (5)	zero	2 (27.2)	zero
Tigecycline	zero	zero	zero	zero	zero
Pipiracillin+tazobactam	zero	zero	zero	1 (4.5)	zero

Table 4: Antibiogram of gram negative isolates

Antibiotics	E.coli N(%) 62(17.5)	P.aeruginosa N%50(14.1%)	Enterobacter 45(12.71	P.mirabilis 17(4.8%)	Citrobacter 13(3.6%)	M.morganii 11(3.1%)	K.Pneumoniae 9(2.5%)
Ampicillin	59 (97)	46 (96)	43 (97)	14 (87)	9 (75)	8 (80)	6 (87.)
Amoxicillin	59 (97)	47 (98)	43 (97)	15 (93)	10 (83)	9 (90)	7 (87.5)
Cephradine	53(87)	45 (93.7)	38(89)	12 (75)	8 (66)	5 (50)	6 (75)

Cefaclor	51 (85)	44 (91)	38 (89)	13 (81)	7 (58)	6 (60)	5 (62.5)
Ceftazidime	53(87)	46 (96.)	35 (79)	11 ()	6 (50)	2 (20)	7 (87.5)
Cefixime	54 (90)	43 (89)	39 (88)	14 (87.5)	8 (66)	4 (40)	8 (100)
Cefepime	55(92)	45 (93.)	40 (90)	15 (93.75)	9 (75)	3 (30)	8 (100)
Cefpirome	50(82)	42 (85)	37 (84)	10 (62.5)	5 (41)	3 (30)	6 (75)
Ciprofloxacin	56(93.3)	10 (20.)	8 (18)	2 (12.5)	4 (33)	3 (30)	1 (12.5)
Erythromycin	50(82)	14 (29)	9 (20)	9 (56.25)	7 (58)	3 (30)	6 (75)
Clarithromycin	22 (36)	22 (45)	25 (56)	6 (37.5)	2 (17)	3 (30)	3 (37.5)
Meropenem	60 (99)	44 (91)	42 (95)	16 (100)	12 (100)	10 (100)	8 (100)
Gentamicin	50(82)	35 (73)	33 (75)	15 (93.75)	11 (99)	8 (80)	6 (75)
Doxycycline	34(56)	36 (75)	38 (86)	13 (81.25)	8 (66)	6 (60)	4 (50)
Co-trimoxazole	49(81)	41 (85.41)	40 (90)	14 (87.5)	7 (58)	8 (80)	7 (87.5)
Amikacin	48 (80)	32 (66)	34 (77)	8 (50)	6 (50)	3 (30)	2 (25)
Linezolid	19 (31)	13 (27)	10 (22)	5 (31.25)	1 (8)	Zer0	2 (25)
Rifampicin	33 (56)	29 (60)	26 (59)	7 (43.75)	1 (8)	Zer0	3 (37.5)
Chloramphenicol	14(22)	12 (25)	9 (20)	2 (12.5)	Zer0	1 (10)	3 (37.5)
Novobiocin	25(43)	28 (58)	23 (52)	3 (18.75)	2 (16)	Zer0	4 (50)
Aztreonem	22(36)	18 (37)	23 (52.)	4 (25)	1 (8.33)	Zer0	3 (37.5)
Cefotaxime	49(81)	43 (90)	39 (88)	10 (62.5)	8 (6)	4 (40)	7 (87.5)
Ticarcillin	10(17)	9 (18.)	8 (18)	2 (12.5)	zero	Zer0	2 (25)
Tigecycline	zero	zero	zero	zero	zero	zero	zero
Pipiracillin+ Tazobactam	1 (2)	3 (6.2)	4 (9.09)	zero	zero	zero	1 (12.5

DISCUSSION

The treatment of complicated skin and skin structure infections is very difficult due to the involment of multiple factors so early management and prevention is crucial.In our study over all 440 samples were examined out of which females were 184(41.8%) and male were 256(58.1%) and 193 (43.8%) individuals age was 15 to 44 years. This is similar to the previous investigations.[13-14] In the current study the most prevalent kind of infection was shown to be abscesses, which were followed by skin ulcers which is comparable with the study of Barie and wison .[1] Among the culture positive 76.5% revealed the growth of single pathogen and 3.86% produced multiple bacterial growth .These findings are similar to the Najotra.[15] Among gram positive bacteria the most prevalent isolated bacteria was S.aureus 26.5% in our study and previous studies also reported that S. aureus is the most prevalent causal agent.[16-18] Gram-negative bacteria predominate over gram-positive bacteria, as reported by Ghosh et al[19] and Zubair et al[20] which is comparable to our findings. One of the most significant obstacles to manage skin infections is antibiotic resistance. Since penicillin have been administered for many years in modern hospital settings, there was a significant prevalence of penicillin resistance in our research. Staphylococci were found to be resistant to the antibiotic ampicillin, amoxicillin**.** These findings are comparable with other study**.**[21] S. aureus was highly resistant co-trimoxazole similar results were obtain from previous study.[15] Erythromycin resistance in S. aureus has dropped to 6.52% in our research compared to the Tiwari et al. study, while the prevalence of Methicillin-resistant S. aureus (MRSA) was high in our hospital.[21] For gram-negative bacteria, amoxicillin had the highest resistance (<90%). There was also significant resistance to cefepime (<90%) and cefotaxime (<80%), two third-generation cephalosporin. This might be as a result of gram-negative bacteria expressing more extended spectrum beta-lactamases (ESBLs). All gram-negative bacteria were susceptible to ciprofloxacin, with the exception of E. coli, which had a 93.33% resistance rate. Higher levels of ciprofloxacin resistance in E. coli have also been found by Najotra et al. additionally, aminoglycosides shown resistance to these isolates.[15] Gram negative isolates showed a high level of resistance to beta lactam antibiotics and fourth-generation cephalosporins, but a lower level of resistance to carbapenems, such as meropenem. Amikacin and gentamicin demonstrated good sensitivity among aminoglycosides. The majority of isolates were discovered to be quinolone resistant. The combination of pipiracillin and tazobactam shown the least amount of resistance. The results of our investigation on antibiotic susceptibility were consistent with those of Taiwo et al. and Basu et al.[22-23] Physicians can choose the right medicines to treat infections and improve care by using information on the bacterial isolates that cause infections and their antibiotics susceptibility patterns. It is possible that the increased rates of resistance were caused by the tertiary care hospital's extensive use of broad spectrum antibiotics, which aid in pathogen survival, and the absence of a clear antibiotic policy, which is quite concerning.

CONCLUSION

The current study concluded that the most prevalent organisms that is likely to be found in skin and soft tissue infections, were S. aureus followed by E. coli and Pseudomonas species. To combat these pathogens, empirical treatment could include aminoglycosides, ciprofloxacin, and vancomycin.

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