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BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SUSCEPTIBILITY PROFILE OF WOUND INFECTION IN A TERTIARY CARE HOSPITAL, CHATTISGARH

Md Mustafa Sofiur Rahman Tutor, Department of Microbiology Shri Shankaracharya Institute of Medical Sciences

Surendra Prasad Chauhan* Tutor, Department of Microbiology Shri Shankaracharya Institute of Medical Sciences *Corresponding author

Dr. Smita Bawankar Associate professor Department of Microbiology Shri Shankaracharya Institute of Medical Sciences.

ABSTRACT

Introduction: Wound infection is one of the most common infections caused by different type of gram positive and Gram negative bacteria. The present study aimed to detect common bacteriological and antibiotic susceptibility profile from wound infection.

Material and methods: Total 157 pus samples collected randomly from patients of wound infection, over the period of six months. Samples were collected, transported and processed in the laboratory as per standard protocol. Antibiotic susceptibility test was done by the Kirby Bauer Disc diffusion method.

Result: Out of 157 samples, 131(84%) showed culture positive. A total 110 (83.97%) yielded pure bacterial growth and 18 (13.75%) showed mixed growth. Among GPC, Staphylococcus aureus was most prevalent organism and in GNB, the most predominant was Acinetobacter sp. Teicoplanin and Linezolid were most sensitive to GPC and in GNB most susceptible antibiotics were Imipenem and Meropenem. MRSA was detected in 26.92% of isolates. **Conclusion:** Staphylococcus aureus and Acenitobacter Spp. were the most prevalent organisms isolated. Linezolid, Teicoplanin ,Vancomycin. Imipenem, Meropenem were highly sensitive antibiotics. Higher resistance towards common antibiotics has been observed. Hence it is important to monitor bacterial susceptibility to antibiotics to limit the emergence and spread of these pathogens.

KEYWORDS : Wound infection, Staphylococcus aureus, Acinetobacter sp., Linezolid, Teicoplanin, Imipenem.

INTRODUCTION:

Wound infection is one of the most common hospital acquired infections and important cause of morbidity (Sharma A. et.al.,2017). Infection of a wound may be defined as invasion of organisms through tissues following a breakdown of local and systemic host defenses. It's a type of infections that may contribute to longer hospital stay, increase the cost of medical care and are likely to have an important role in the development of antimicrobial resistance (Srilatha et.al.,2016). Wound infection can be caused by different type of organisms ranging from gram positive organisms like *Staphylococcus aureus,* CoNS, *Enterococcus sp.* to Gram negative organisms like *Pseudomonas aeruginosa, Escherichia coli, Klebsiella sp., proteus sp., acinetobacter sp., enterobacter sp. and Serratia marcescens* depending upon the prevalence of organism in the specific community (Shreeram G. et. al., 2016). For the treatment of infection a large number of antibiotics are used. Both broad spectrum and narrow spectrum antibiotics are available nowadays. It is ideal to give proper antibiotic after culture and sensitivity of the wound swab, pus or infected tissue (Aftab et.al.,2014) The inadvertent use of antibiotics lead to emergence of drug resistant pathogens, which in turns acts as a great challenge to the health services (Sharma A. et.al.,2017). The present study aimed to detect common bacteriological profile and their antibiotic susceptibility profile from wound infection.

MATERIAL AND METHODS

The study was conducted on 157 pus samples collected randomly from OPD and IPD of SSIMS, Bhilai over the period of six months from October 2017 to March 2018. A prospective study was carried out in the Department of Microbiology. Pus samples were collected using sterile cotton swab and syringes. Samples were transported immediately and processed in the laboratory as per standard protocol. Gram staining was done and the samples were inoculated into blood agar, and MacConkey agar. The plates were incubated aerobically overnight at 37^{0}C and growth was observed. On correlating the gram stain and culture report, isolates were confirmed by putting a battery of biochemical tests such as catalase, coagulase, Oxidase, Indole, Methyl red, Voges-proskauer, citrate, urease, triple sugar iron, motility by hanging drop preparation and sugar fermentation test. Antibiotic susceptibility test was done by the Kirby Bauer Disc diffusion method on Muller Hinton agar. Antimicrobial agents tested were according to the CLSI 2017 guidelines. MRSA (Methicillin Resistant *Staphylococcus aureus*) was detected by using Oxacillin and Cefoxitin discs by Kirby Bauer disc diffusion method.

RESULT:

A total 157 pus samples were processed, in which 73 (46.5%) samples were collected from male and 84(53.5%) were from female. Out of 157 samples, 131(84%) showed culture positive, in which 64 (48.85%) were from male and 67 (51.15%) were from female **(Graph- 1)**. Of the 131 positive culture, 110 (83.97%) yielded pure bacterial growth and 18 (13.75%) showed mixed growth, 2 (1.52%) samples yielded growth of gram positive bacilli which were considered as contaminant. Candida Sp. was detected in 1 (0.76%) sample **(Graph- 2)**. Among monomicrobials, 75(57.25%) isolates were Gram negative Bacilli and 35 (26.71%) gram positive cocci. Among Gram positive cocci, the most prevalent organism was *Staphylococcus aureus* 26 (19.85%) followed by CoNS 6(4.58%) and *Enterococcus Sp.* 3 (2.29%) and in Gram negative bacilli, the most predominant isolate was *Acinetobacter sp*. 24 (18.32%) followed by *Pseudomonas aeruginosa* 19 (14.50%), *Klebsiella sp.* 12 (9.16%), *Escherichia coli* 10 (7.64%), Enterobacter sp. 5 (3.81%), *Citrobacter sp.* 3 (2.29%) and *Proteus sp.* 2 (1.52%) **(Graph-3).** Antibiotic susceptibility profile revealed the most susceptible antibiotic among Gram positive cocci were Teicoplanin and Linezolid with 100% sensitivity, followed by Vancomycin (96.15%), Clindamycin (80.76%), Erythromycin (76.92) **(Table-1).** Gram negative bacilli showed highest rate of susceptibility towards Imipenem (90%), meropenem (80%), Amikacin and Gentamycin **(Table-2).** Antibiotic susceptibility pattern of *Pseudomonas aeruginosa and Acinetobacter sp*. were detected separately and both were found to be most susceptible to Imipenem, meropenem **(Table-3)**. MRSA was detected in 7 out of 26 isolates, which accounts for 26.92%. and methiciline resistant CoNS were found in 4 isolates i.e. 66.67%.

DISCUSSION:

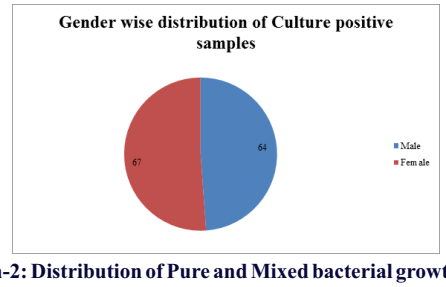
Wound infection being one of the most common and serious complications leads to increase in the length of hospital stay and accounts for the mortality rate up to 70–80% (Rai S. et al., 2017). The growth positivity was observed in our study was 84% which was higher in comparison to the study of Rai S. et.al. (Rai et. al., 2017) and Jain K. et.al. (Jain K. et.al. 2014) that reported 59% and 65% of culture positivity respectively. More number of bacterial isolates were detected from female 67 (51.15%) than male 64 (48.85%). This was correlated with the study conducted by **Madhavi S. et.al (Madhavi**

& Parveen, 2015) that showed almost similar result with 51.1% in female and 48.9% in male of culture positivity. In this study, majority of isolates were monomicrobials 110 (83.97%) and 18 (13.75%) showed mixed growth. Study conducted by **Sharma A. et. al.(Sharma A et.al.,2017)** observed almost similar result with 84.83% mono-microbial isolates and 15.17% poly-microbials that supports our study. Another study by **Mohammed A.(Mohammed et.al., 2013)** had different observations with isolation rate of 74.35% of monomicrobials. Among mono-microbials, the most prevalent organism was *Staphylococcus aureus* 26 (19.85%) and then *Acinetobacter sp*. 24 (18.32%). *Pseudomonas aeruginosa* 19 (14.50%) found to be the third most common isolated bacteria. Study conducted by **Shreeram G. et.al.(Shreeram G. et. al., 2016)** detected 19.7% of *Staphylococcus aureus* which is almost similar with our study but the isolation rate of other organism was much different. Study by **Pokhrel P. et.al.(Pokhrel P.et.al.,2017)** showed similar isolation rate of *Pseudomonas aeruginosa* (12.5%) but percentage of *Acinetobacter sp*. was 4.68% which is less than our study. These variations can be due to demographic changes. Antimicrobial Sensitivity Testing is necessary for appropriate treatment thereby potentiating the prognosis of the disease. In this study gram positive cocci showed highest susceptibility towards Linezolid and Teicoplanin with a susceptibility rate of 100%. Vancomycin was 100% susceptible towards CoNS and *Enterococcus Sp.* and 96.15% for *Staphylococcus aureus.* MRSA was detected in 26.92% of isolates and methiciline resistant CoNS were found in 66.67% isolates. This was correlated with the study of **Mehta M. et. al.(Mehta M., 2007)** that reported 24% of MRSA and also 100% susceptibility to Linezolid. Higher rates of MRSA were reported by **Sharma A. et. al.(Sharma A. et.al.,2017),** (40.25%), **Mohanty S. et. al.(Mohanty et al., 2004)** (38.56%). However study by **Rai S. et. al.(Rai et al., 2017)** reported lower rate of MRSA in comparison to our study. Antibiotic susceptibility of Gram negative isolates showed highest susceptibility towards Imipenem (E.coli 90%, *Klebsiella Sp.* 83.34%), Meropenem (*E.coli* 80%, *Klebsiella Sp.* 50%, *Enterobacter sp.* 80%) and Levofloxacin. *Pseudomonas aeruginosa* showed highest susceptibility towards Imipenem **(68.4%)**, Ciprofloxacin **(68.4%)** and Amikacin (63.1%). This was correlated with the study of **Bhatt C.P. et.al.(Bhatt C.P. and Lakhey M.)** that reported 60% susceptibility to ciprofloxacin. *Acenitobacter Sp.* were equally susceptible to Meropenem and Gentamicin (64%) followed by Amikacin (56%).

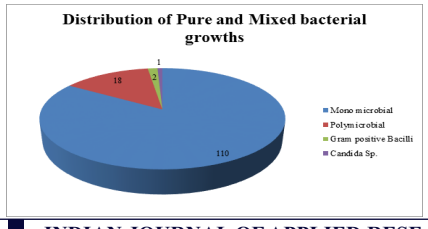
CONCLUSION

The present study concludes that, high prevalence of bacteria associated with wound infection and illustrates the maximum number of organisms from female patients. Isolation rate of *Staphylococcus aureus* was highest and also the emergence of *Acenitobacter Sp.* was observed. The most effective drug for Gram positive bacteria was found to be Linezolid, Teicoplanin and Vancomycin. Imipenem, Meropenem and Levofloxacin are most susceptible to gram negative bacteria. The change in the pattern of bacterial resistance towards common antibiotics occurs time to time which may lead to resistant to broad spectrum antibiotics. Hence it is important to monitor bacterial susceptibility to antibiotics in wound infections to limit the emergence and spread of these pathogens.

Graph- 1: Gender wise distribution of Culture positive samples



Graph-2: Distribution of Pure and Mixed bacterial growths



Graph-3: Distribution of bacterial isolates on culture positive samples.

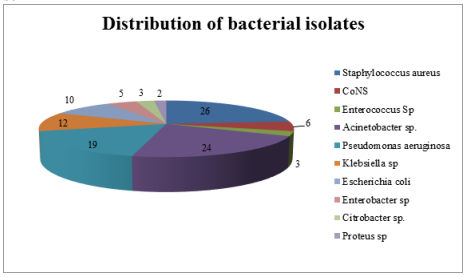


Table-1: Antibiotic susceptibility patterns of Gram Positive cocci

Antibiotic	Staphylococcus aureus (26)/ Percentage	CoNS (6)/ Percentage	Enterococcus 3/Percentage
Erythromycin	20 (76.92%)	6(100%)	-
Clindamycin	21 (80.76%)	3 (50%)	-
Linezolid	26 (100%)	6(100%)	3(100%)
Vancomycin	25 (96.15%)	6 (100%)	3 (100%)
Gentamycin (10 mg)	8 (30.76%)	1 (16.67%)	2 (66.67%) (120 mg)
Ciprofloxacin	10 (38.46%)	1 (16.67%)	3(100%)
Levofloxacin	12 (46.15%)	4 (66.67%)	2(66.67%)
Penicillin	6(23.07%)	2 (33.34%)	-
Tetracycline	13 (50%)	2(33.34%)	2 (66.67%)
Teicoplanin	26 (100%)	6 (100%)	3(100%)
Ampicillin	-	-	2 (66.67%)

Table-2: Antibiotic susceptibility patterns of Gram Negative Bacilli

Antibiotic	E. coli (10)	Klebsiella Sp. (12)	Enterobacter(5)	Citrobacter (3)	Proteus (2)
Ampicillin	2 (20%)	-	-	-	-
Gentamycin	7 (70%)	4 (33.34%)	4 (80%)	0	1 (50%)
Amikacin	8 (80%)	2 (16.67%)	3 (60%)	0	1 (50%)
Piperacillin Tazobactum	2 (20%)	2 (16.67%)	2 (40%)	0	1 (50%)
Cefepime	-	-	2 (40%)	-	1 (50%)
Cefoxitin	-	1 (8.34%)	-	1 (33.34%)	-
Ceftriaxone	-	1 (8.34%)	2 (40%)	-	1 (50%)
Ciprofloxacin	2 (20%)	3 (25%)	2 (40%)	-	-
Levofloxacin	8 (80%)	4 (33.34%)	3 (60%)	1 (33.34%)	1 (50%)
Imipenem	9 (90%)	10 (83.34%)	4 (80%)	2 (66.67%)	1 (50%)
Meropenem	8 (80%)	6 (50%)	4 (80%)	2 (66.67%)	1 (50%)
Ceftazidime	2 (20%)	1 (8.34%)	1(20%)	-	-
Tetracycline	2 (20%)	-	1(20%)	-	-

Table-3: Antibiotic susceptibility patterns of Pseudomonas aeruginosa and Acinetobacter Sp.

Antibiotic	Pseudomonas aeruginosa (19)	Acinetobacter Sp. (24)
Ceftazidime	7(36.8%)	5 (20%)
Gentamycin	6(31.5%)	16(64%)
Piperacillin Tazobactum	10(52.6%)	6(24%)
Amikacin	12(63.1%)	14(56%)
Cefepime	4(21%)	-
Ciprofloxacin	13(68.4%)	6(24%)
Levofloxacin	7(36.8%)	12 (48%)
Meropenem	11(57.8%)	16(64%)
Imipenem	13(68.4%)	11(44%)
Ampicillin Sulbactum	-	9(36%)
Ceftriaxone	-	5(20%)

Cefotaxime	-	5(20%)
Tetracycline	-	3(12%)

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