Current Microbial Isolates From Wound Samples and Their Susceptibility Pattern in A Tertiary Care Hospital, Ahmadabad

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Abstract: Background: Wound infection is one of the major health problems that are caused and aggravated by the invasion of pathogenic organisms where empiric treatment is routine. Objective: To isolate and identify the bacteria causing wound infection and to determine the antimicrobial susceptibility pattern. Method: A total of 2119 wound swab and pus samples were collected during the period of January to June 2016 from a tertiary care hospital VSGH, NHL Medical College, Ahmadabad, Gujarat, India. Swabs from the wound were inoculated on different media and the isolates were identified by standard procedures as needed. Antimicrobial susceptibility testing was performed by disk diffusion method according to 'The Clinical Laboratory Standard Institute' guidelines. Results: In this study 1002 bacterial isolates were recovered from 2119 samples showing an isolation rate of 47.28 %. The predominant bacteria isolated from infected wounds were Staphylococcus aureus 26.04% followed by Klebsiella 23.05%, Pseudomonas aeruginosa 18.346%Escherichia coli 17.76%, Acinetobacter 12.07%, and Proteus 2.59%. In Staphylococcus aureus 37.16% isolates were MRSA. all were sensitive to linezolid (100%), vancomycin (100%), doxycycline 74.60% and gentamicin 65.13%. Among the Gram negative isolates Klebsiella was predominant and showed sensitivity to imipenem 43.29% amikacin 25.10% and cefoperazone- sulbactam 30.73% and pseudomonas showed sensitivity to amikacin 31.35% , imipenem 63.24% and piperacillin-tazobactam 50.27%. Conclusion: Staphylococcus aureus was the most frequently isolated pathogen from wound swab and the antibiotic sensitivity pattern of various isolates help to assist the clinician in appropriate selection of empirical antibiotics against wound infection. [H Sida, Natl J Integr Res Med, 2018; 9(2):17-21]

Key Words: wound infection, bacteria, antimicrobial resistance

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Introduction: A wound is a breakdown in the protective function of the skin; the loss of continuity of epithelium, with or without loss of underlying connective tissue [1.] Wounds can be accidental, pathological or post-operative. An infection of this breach in continuity constitutes wound infection. Wound infection is thus the presence of pus in a lesion as well as the general or local features of sepsis such as pyrexia, pain and induration. Infection is believed to occur .when virulence factors expressed by one or more microorganisms in a wound out-compete the host natural immune system[2.] wound infection is important in the morbidity and mortality of patients irrespective of the cause of the wound. It is also important because it can delay healing and cause wound breakdown [3]. This is also associated with longer hospital stay and increased cost of healthcare [4]. Wound infections are also significant in that they are the most common nosocomial infection [5].

Infection of the wound is the invasion and proliferation by one or more species of microorganisms sometimes resulting in pus formation.[6] Wound can be infected by a variety of microorganisms ranging from bacteria to fungus and parasites.[7] The common organisms that have been associated with wound infection include Staphylococcus aureus which from various studies have been found to account for 20-40%. Infection with Pseudomonas aeruginosa mainly following surgery and burns account for 5-15%. Other pathogens such as, Escherichia coli, Klebsiella species and Proteus species have been implicated especially in immunocompromised patients and following abdominal surgery.[8] The fungal organisms are Candida species also responsible for wound infection.[9] Different microorganisms can exist in polymicrobial communities especially in the margins of wounds and in chronic wounds.[10] The resistance of the hospital strains of S. aureus to methicillin remains a global problem so the control of wound infections has become more challenging.[11] The widespread usesof antibiotics, together with the length of time over which they have been available have led to major problems of resistant organisms, contributing to morbidity and mortality. Antimicrobial resistance can increase complications and costs associated with procedures and treatment. Antimicrobial resistance among pathogens of woundinfections is on theincrease.[12]

The aim of the present study was to find out common bacterial pathogens responsible for wound infection and to determine their antimicrobial susceptibility pattern in our community. It would assist the clinicians in appropriate selection of antibiotics especially against hospital acquired infections.

Method: This study was carried out by collecting wound swabs and pus samples from patients attending at N.H.L. Medical College and V.S. Hospital, Ahmedabad Gujarat, India from January to June 2016. All the samples were cultured on nutrient agar and Mac Conkey agar media incubated overnight at 37oC. Organisms were identified by standard microbiological procedures including colony characters, Gram staining and biochemical reactions.[13] All the isolates were tested for antimicrobial susceptibility by the disc diffusion technique according to the Clinical Laboratory Standards Institute (CLSI) guidelines.[14,15]

Results: Out of 2119 cases 1303 (61.50%) were male and 816 (38.50%) were female and the age ranged between 4years to 86 years. A total number of 2119 isolates were obtained, among which 1002(47.28%) were culture positive cases. Among the isolated organisms predominant Staphylococcus aureus 261(26.04%) followed by Klebsiella 231 (23.05%) ,Pseudomonas aeruginosa 185 (18.46%) Escherichia coli 178(17.76%),), Acinetobacter 121 (12.07%), and Proteus 26(2.59%).

Table I: Organisms isolated from wound sample (n=1002)

Organism	Number of isolates	Proportion (%)
Staphylococcus aureus	261	26.04
Klebsiella spp.	231	23.05
Pseudomaonas aeruginosa	185	18.46
Escherichia coli	178	17.76
Acinetobacter spp.	121	12.07
Proteus spp.	26	2.59

All the bacterial isolates were tested for antimicrobial susceptibility. Among the all isolates Staphylococcus aureus was the predominant organism. Among them 37.16% isolates were MRSA .All isolates were found sensitive to linezolid 100%, vancomycin 100%, doxicycline 74.60% and gentamicin 65.13%, Cholramphenicol 225(86.20%) Ciprofloxacin 66.96% and cotrimoxazole 34.86%. low sensitivity were found in penicillin 5.76%.

Table II: Antibiotic susceptibility pattern (percent sensitive) of Staphylococcus aureus

Antibiotics	Sensitive isolates (%)
Oxacilin	62.83%
Doxycycline	74.60%
Gentamicin	65.13%
Ciprofloxacin	66.06%
Chloramphenicol	86.20%
Cotrimoxazole	34.86%
Erythromycin	43.15%
Clindamycin	82.98%
penicillin	5.76%
Linezolid	100%
vancomicin	100%

Among the Gram negative isolates Klebsiella was the predominant organism followed by E.coli ,Acinetobacter and Pseudomonas aeruginosa .T he sensitivity of Klebsiella to imipenem was 43.29%, amikacin 25.10%, chloramphenicol 40.59 % and cefoperazone sulbactam 30.73% and low level of sensitivity was found to co-trimoxazole 14.28% and ciprofloxacin 13.41%.Other drugs like ceftriaxone, ceftazidime.

Table III: Antibiotic susceptibility pattern (percent sensitive) of gram negative bacilli

Antibiotics	Klebsiella	E.coli	Acinetobacter
Ceftriaxone	7.35%	11.23%	4.27%
cefepime	12.98%	16.85%	5.12%
Ciprofloxacin	13.41%	7.86%	18.54%
Getifloxacin	36.85%	44.38%	23.93%
Imipenem	43.29%	72.47%	11.11%
Cotrimoxazole	14.28%	17..41%	10.25%
chloramphenicol	40.69%	62.35%	-
Amikacin	25.10%	71.91%	10.25%
Cefopetrazone sulbactam	30.73%	61.23%	56.41%
Doxycycline	13.41%	11.79%	11.96%

Table IV: Antibiotic susceptibility pattern (Percent sensitive) of Pseudomonas

Antibiotics	Pseudomonas
Ceftazidime	31.35%
Cefepime	42.30%
Piperacilin tazobactam	50.27%
Astreonam	43.78%
Imipenam	63.24%
Amikacin	31.35%
Ciprofloxacin	23.78%

Showed lowest sensitivity below 10%.E.coli and Acinetobacter showed sensitivity pattern shown in table III. Pseudomonas showed sensitivity to ceftazidime 31.35%, piperacillin + tazobactum 50.27%, amikacin 31.35%, imipenam 63.24% shown in table IV.

Discussion: Bacterial contamination of wounds is a serious problem in the hospital especially in surgical practice where the site of a sterile operation can become contaminated and subsequently infected.[16] Inspite of proper application of the basic principles of wound care a number of patients develop infections needing proper identification of the organisms for appropriate management.[17] A changing pattern of isolated organisms and their antimicrobial sensitivity varies from hospital to hospital and region to region is a usual feature.

In our study, Staphylococcus aureus was the most predominant pathogenic bacteria from wound sample which was similar to the other studies done by Shriyan et al.[18], Noroozi et al.[19], Isibor et al.[20], Siguan et al.[17] and Anbumani et al.[21] Predominance of Staphylococcus aureus is however not surprising as it forms the bulk of the normal flora of the skin and nails.[20] Klebsiella was the next common organism followed by Pseudomonas aeruginosa, and E. coli which was similar to other studies done by Shriyan et al.[18] and Albumani et al.[21] This confirms that most wound infections arising from abdominal procedures are acquired from patients own faecal flora.[20]

In our study, Staphylococcus aureus showed 100% sensitive to linezolid and vancomycin,82.15% to clindamicin, 86.20% to chloramphenicol followed by 74.60% to doxycycline and 65.13% ciprofloxacin, and 65.13% to gentamicin and less sensitivity were found in commonly used antibiotic like cotrimoxazole (34.86%), penicillin (5.14%). A study had shown 100% sensitivity to linezolid and vancomycin followed by gentamicin (88.88%).[22-24] Another study showed complete sensitivity to vancomycin, linezolid, fusidic acid and amikacin[24,25] and low activities against co-trimoxazole, ciprofloxacin, tetracycline and erythromycin.[26-29] Above two findings are near about similar to our findings. Remarkable susceptibility of Staphylococcus aureus to vancomycin, linezolid, , amikacin and gentamicin may be due to lesser use of these antibiotics as a result of their less availability, cost and toxic effect.[30] Low activities of commonly used antibiotics such as cotrimoxazole and penicillin may be due to increased consumption of a particular antibiotic which leads to the development of resistance resulting from mutation at drug target sites, or from the disturbance of drug accumulation in cytoplasm due to cell wall or cell membrane rearrangement.[31-34] As a result, they have lost their efficacy in the treatment of wound infection.

Klebsiella showed highest sensitivity to imipenam (43.29%),chloramohenicol (40.26%) , cefoperazone - sulbactam (30.24%) and amikacin (25.21%) and lowest Sensitivity to ceftriaxone (7.26%), cefepime (13.26%) which was similar to the study done by Anbumani et al.[21] and Anderl et al.[36]

E. coli were sensitive to amikacin 71.91%, imipenem 74.62%, cefoperazone sulbactam 61.23% and which was similar to the study done by Mahmood et al.[25] Ranjan et al.[35] reported that Gram negative isolates were found tobe most susceptible to imipenem (90.76%) followed by betalactam+ betalactamase inhibitor combination piperacillin -tazobactam (68.46%) and amikacin (73.84%).

Pseudomonas aeruginosa isolates were susceptible to imipenem (63.24%),piperacilin- tazobactam (50.27%)amikacin (31.35%), levofloxacin (23.18%). But the study done by Anbumani et al.[21, 22] had shown variable susceptibility pattern with imipenem 100%, piperacillin -tazobactum (87.71%), levofloxacin (85.71%), cefotaxime (71.42%) for Pseudomonas aeruginosa.

Conclusion: The findings of our study show that Staphylococcus aureus was found to be the predominant among all of the isolates of wound infections and showed highest sensitivity to vancomycin and linezolid followed by amikacin. Most of the Gram negative isolates were highly sensitive to cefoperazone- sulbzctam followed by imipenem, amikacin, and chloramphenicol. We should use these drugs rationally so that they remain effective for treatment of wound infection. As the commonly used drugs shows less sensitivity, further study is needed for newer drugs to fight against wound infection.

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Conflict of interest: None

Funding: None

Cite this Article as: H Sida, J Pethani, P Dalal, H Shah, N Shaikh. Current Microbial Isolates From Wound Samples And Their Susceptibility Pattern In A Tertiary Care Hospital. Natl J Integr Res Med 2018; 9(2):17-21