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## Bacteriological profile and antibiogram of wound infection in a tertiary care hospital

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### Abstract

**Introduction:** Wound infection is one of the most important cause of morbidity and mortality worldwide and antibiotic resistant bacteria are the great part of complications on treatment of infections.

**Objectives:** The present study was conducted to isolate and identify the bacterial pathogens causing wound infections and their antibiotic susceptibility pattern.

**Materials and Methods:** A total of 168 pus samples were collected from patients with wound infections over a period of six months. Samples were collected, transported and processed in the laboratory as per standard protocol. Antibiotic susceptibility test was done by Kirby Bauer disc diffusion method.

**Results:** Out of 168 samples, 129(76.8%) yielded growth and 39(23.2%) yielded no growth. The most predominant Gram positive cocci isolated was *Staphylococcus aureus* 36(27.91%) and among the gram negative bacteria *E.coli* 23(17.83%) was most commonly isolated. The gram positive cocci were mostly sensitive to Vancomycin (100%) and Linezolid (100%). Among the gram negative isolates, *Pseudomonas aeruginosa* were mostly sensitive to Meropenem (100%), Aztreonam (100%) and Piperacillin-Tazobactam (100%). *E.coli* and *Proteus sp.* were sensitive to Amikacin and Gentamycin.

**Conclusion:** The present study concludes the isolation rate of *Staphylococcus aureus* was the highest. The most effective drugs for Gram positive isolates were found to be Linezolid and Vancomycin. The gram negative isolates were mostly sensitive to Amikacin and Gentamycin. The change in the pattern of bacterial resistance towards the common antibiotics occurs time to time which may lead to resistance 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.

**Keywords:** Wound infections, *staphylococcus aureus*, linezolid

### 1. Introduction

Wound infection is one of the most common hospital acquired infections. Wound infection results in sepsis, limb loss, long hospital stays, higher costs and is responsible for significant human mortality and morbidity worldwide. It remains an ongoing problem which although cannot be completely eradicated, however by taking prompt control measures against the most commonly isolated organism and proper care of the wound may lead to the minimum of wound infections [1]. The prevalent organisms that are associated with wound infection include *Staphylococcus aureus* which from various studies have been found to account for 20 to 40%. Other pathogens such as Enterococci and members of the Enterobacteriaceae have been implicated especially in immune compromised patients and following abdominal surgery [2].

Different studies have been conducted across the globe from time to time to assess the bacterial profile and the antibiotic susceptibility pattern in pus samples. This is particularly relevant for the treating physician who needs to start empirical treatment of patient until the lab culture reports are awaited [3].

Continuous surveillance is therefore mandatory to monitor the bacteriological profile and antibiotic sensitivity pattern to guide antibiotic therapy. This study was conducted to find out the bacteriological profile of wound infections and their antibiotic sensitivity pattern in a tertiary care hospital to guide rational antibiotic therapy.

### 2. Materials and Methods

This is a prospective study in which a total number of 168 pus samples obtained from OPD

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and IPD of Karuna Medical College Hospital, Palakkad over a period of 6 months from January 2017 to June 2017. Pus samples were collected in sterile disposable cotton swabs and aspirates in syringe and were transported and processed in Microbiology Laboratory immediately as per the standard protocols.

Gram staining was done and the samples were inoculated onto Nutrient agar plate, Blood agar plate and Mac conkey agar plate. The plates were incubated aerobically overnight at 37°C<sup>[8]</sup> and the growth was observed.

On correlating the gram stain and culture report, isolates were confirmed by doing biochemical tests such as catalase, oxidase, Indole, Methyl red, Vogues –Proskauer, citrate, urease, Triple sugar iron agar, motility test and sugar fermentation test. The antibiotic sensitivity testing of all the isolates was performed by Kirby bauer disc diffusion method on Muller Hinton Agar as per CLSI 2017 guidelines. All the culture media, biochemical media and antibiotics were obtained from Hi media.

### 3. Results

Out of 168 samples received, 129(76.8%) yielded growth and 39(23.2%) yielded no growth (Table-1). Among 129 samples, 77(59.6%) were male patients and 52(40.4%) were female patients (Table-2). The most predominant gram positive bacteria was Staphylococcus aureus 36(27.91%) followed by CONS 18(13.95%) and Enterococcus sp. 13(10.08%) (Table-3). The most predominant gram negative bacteria was E.coli 23(17.83%) apart from other isolates such as Pseudomonas 19(14.73%), Klebsiella pneumoniae 10(7.75%) and Proteus vulgaris 10(7.75%). The gram positive cocci were mostly sensitive to Vancomycin (100%) and Linezolid (100%) (Table-4).

Among the gram negative isolates, Pseudomonas aeruginosa was mostly sensitive to Meropenem (100%), Aztreonam (100%) and Piperacillin-Tazobactam (100%). E.coli was mostly sensitive to Amikacin (91.3%) followed by Gentamycin (86.9%). Klebsiella pneumoniae was highly sensitive to Ceftriaxone (90%) and Ceftazidime (90%) and Ciprofloxacin (90%). Proteus vulgaris was highly sensitive to Amikacin (60%) and Gentamycin (60%) (Table-5).

**Table 1:** Distribution of culture positive cases

S. No.	Growth	No. of samples	% of Samples
1.	Culture positive	129	76.8
2.	Culture Negative	39	23.2
3.	Total	168	100

**Table 2:** Gender wise distribution of Culture Positive cases

Gender	No. of collected samples (%)	Organisms isolated
Male	97 (57.7%)	77 (59.6%)
Female	71 (42.3%)	52 (40.4%)
Total	168 (100%)	129 (100%)

**Table 3:** Frequency of Different pathogens isolated from wound Infections

Organism	Frequency	Percentage
Staph.aureus	36	27.91
CONS	18	13.95
Enterococcus sp.	13	10.08
E.coli	23	17.83
Pseudomonas sp.	19	14.73
Klebsiella pneumoniae	10	7.75
Proteus vulgaris	10	7.75
Total	129	100

**Table 4:** Antibiotic sensitivity pattern of Gram positive isolates

Antibiotic	Staph.aureus (n=36)		Cons (n=18)		Enterococcus sp. (n=13)	
Erythromycin	69.4%	30.6%	44.4%	55.6%	0	100%
Doxycycline	80.5%	19.5%	27.7%	72.3%	76.9%	23.1%
Cotrimoxazole	83.3%	16.7%	83.3%	16.7%	23.07%	76.93%
Vancomycin	100%	0	100%	0	100%	0
Amoxycillin	88.9%	11.1%	55.5%	44.5%	61.5%	38.5%
Linezolid	100%	0	100%	0	100%	0
Ofloxacin	52.7%	47.3%	55.5%	44.5%	38.4%	61.6%
Ciprofloxacin	69.4%	30.5%	83.3%	16.7%	100%	0
Amikacin	91.6%	8.4%	100%	0	61.5%	38.5%

**Table 5:** Antibiotic sensitivity pattern of Gram Negative isolates

Antibiotic	E.coli (n=23)		Pseudomonas sp. (n=19)		Klebsiella pneumoniae(n=10)		Proteus vulgaris (n=10)	
Amikacin	91.3%	8.7%	68%	32%	50%	50%	60%	40%
Gentamicin	86.9%	13.1%	53%	47%	50%	50%	60%	40%
Ceftriaxone	78.2%	21.8%	26%	74%	90%	10%	50%	50%
Ceftazidime	73.9%	26.1%	89%	11%	90%	10%	50%	50%
Ciprofloxacin	52.1%	47.9%	68%	32%	90%	10%	40%	60%
Cotrimoxazole	21.7%	78.3%	26%	74%	40%	60%	20%	80%
Piperacillin-Tazobactam	21.7%	78.3%	100%	0	40%	60%	20%	80%
Aztreonam	86.9%	13.1%	100%	0	40%	60%	50%	50%
Tobramycin	47.8%	52.2%	95%	5%	30%	70%	40%	60%
Meropenem	86.9%	13.1%	100%	0	30%	70%	40%	60%

### 4. 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%<sup>[8]</sup>. In our study, out of 168 pus samples, 129 (76.8%) showed positive growth and 39 (23.2%) yielded no growth. This was similar

to a study done by Md Mustafa Safiur *et al.* where the growth positivity was 84%<sup>[8]</sup>.

In our study, the incidence of wound infection was more common in males (59.6%) than in females (40.4%). This is in agreement with a study done by Mahat P *et al.*<sup>[1]</sup>. This might be explained by the fact that traditionally in this

country mainly males are involved in occupation such as farming, construction work, transportation and industry works where the likely exposure to trauma is common. In our study, *Staphylococcus aureus* (27.91%) was most commonly isolated followed by *E.coli* (17.83%). This was well correlated in a study done by Neelima *et al.* [4]. The high prevalence of *Staphylococcus aureus* may be because it is an endogenous source of infection. With the disruption of natural skin barrier, *Staphylococcus aureus* which is a common bacterium on surfaces easily find their way into wounds. Antibiotic sensitivity testing is necessary for appropriate treatment thereby potentiating the prognosis of the disease.

In this study, gram positive cocci were mostly sensitive to Vancomycin (100%) and Linezolid (100%). This is similar to a study done by Rozina *et al.* [3]. In our study, *Pseudomonas aeruginosa* was mostly sensitive to Meropenem (100%), Aztreonam (100%) and Piperacillin-Tazobactam (100%). This was similar to a study done by Md Mustafa Sofiur *et al.* [8] where *Pseudomonas aeruginosa* was highly sensitive to Meropenem. *E.coli* and *Proteus vulgaris* were highly sensitive to Amikacin and Gentamycin.

This is similar to a study done by S.Madavi *et al.* [9]. *Klebsiella pneumoniae* was highly sensitive to Ceftriaxone (90%) and Ceftazidime (90%). This was in contrast to a study done by Md Mustafa *et al.* [8] where the *Klebsiella sp.* were highly sensitive to Imipenem and Meropenem.

## 5. Conclusion

In conclusion, wound infections are one of the most common hospital acquired infections and are an important cause of morbidity and mortality. Depending on the site of wound infection, the role of the microbiology laboratory is to determine the clinically significant isolates, perform antimicrobial susceptibility testing and subsequently provide guidance on the most appropriate. The present study concludes the isolation rate of *Staphylococcus aureus* was highest. The most effective drug for gram positive bacteria was found to be Linezolid and Vancomycin. *Pseudomonas aeruginosa* was sensitive to Meropenem, Aztreonam and Piperacillin-Tazobactam.

The change in the pattern of bacterial resistance towards the common antibiotics occurs time to time which may lead to resistance 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.

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