

## Original Research Article

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## Bacteriological Profile and Antibiogram of Isolates from Pus Samples in a Tertiary Care Centre

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### ABSTRACT

Pus is one of the major samples received in the Microbiology laboratory for culture and sensitivity. Though the bacterial profile from pus samples remain similar in various studies, the inadvertent use of antibiotics has lead to the emergence of various drug resistant pathogens, which in turn acts as a great challenge to the health services. A total number of 233 pus samples obtained for aerobic culture and sensitivity from different IPDs and OPDs of Owaisi Group of Hospitals associated with Deccan College of Medical Sciences, Hyderabad during a period from June 2017 to October 2017 were processed using standard microbiological processed and antibiotic susceptibility testing was done as per CLSI guidelines. Analysis of 233 pus samples showed 65.2% culture positivity (M:F=1.30:1.00) with Surgical wards (33.5%) being the major contributor. *Klebsiella* spp (36.2%) was the most common organism followed by *Staphylococcus aureus* (21.7%). Antibiotic sensitivity profile of Gram negative bacteria showed sensitivity towards imipenem (92.7%), piperacillin (89.1%) and amikacin (87.2%). *Staphylococcus aureus* was susceptible to Linezolid (100%), Vancomycin (100%). The prevalence of MRSA was 12.12%. A continuous inspection should be carried out to monitor the antimicrobial susceptibility of bacterial isolates from pus samples to chose appropriate antibiotics for prophylaxis and treatment of infections.

#### Keywords

Boron, Sowing methods, Sulphur, Mustard.

#### Article Info

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### Introduction

Pyogenic infections are characterized by local and systemic inflammation usually with pus formation (Koneman *et al.*, 2005). These may be endogenous or exogenous. A break in the skin can provide entry to the surface bacteria which thereby start multiplying locally. The body's defense mechanism includes bringing immune cells into the area to fight against bacteria. Eventually, accumulation of these

cells produces pus which is a thick whitish liquid (Chopra *et al.*, 1994).

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 (Rameshkannan *et al.*, 2014).

Though the bacterial profile from pus samples remain similar in various studies, but there is a considerable variation in the antibiotic susceptibility pattern of these isolates highlighting the increasing threat of emergence of resistant bacteria and hence a need for a continuous surveillance of such changing trends. Therefore, a study was conducted in a tertiary care centre at Hyderabad to study the changing trends in antimicrobial resistance in various pus isolates.

### Materials and Methods

This is a prospective study in which a total number of 233 pus samples obtained for aerobic culture and sensitivity from different IPDs and OPDs of Owaisi Group of Hospitals associated with Deccan College of Medical Sciences, Hyderabad during a period from June 2017 to October 2017 were included in the study (Rao *et al.*, 2014).

Pus samples were collected with sterile disposable cotton swabs and aspirates in syringe and were transported and processed in the microbiology laboratory immediately. They were inoculated on to Blood agar (BA), MacConkey agar (MA) and Nutrient agar (NA). Culture plates were incubated at 37°C for 24 hrs to 48 hrs in aerobic condition. After incubation, identification of bacterium from positive cultures was done with a standard microbiological technique which includes motility testing by hanging drop preparation, gram staining and biochemical reactions such as catalase, coagulase, indole, methyl red, Voges-Proskauer, citrate, urease, phenyl pyruvic acid test and oxidase test (Parajuli *et al.*, 2014).

The antibiotic sensitivity testing of all isolates was performed by Kirby Bauer's disc diffusion method (Raza *et al.*, 2013) on Muller Hinton agar and interpreted as per CLSI guidelines (Clinical and Laboratory Standard

Institute, 2012) and classified as sensitive and resistant.

Detection of MRSA isolates were done by using *Cefoxitin* disc (30µg) (Chakraborty *et al.*, 2011) *S. aureus* ATCC 25923 and *E. coli* ATCC 25922 were used as quality control (Chakraborty *et al.*, 2011). All the culture media, biochemical media and antibiotics used were obtained from Hi Media.

### Results and Discussion

Out of 233 pus samples obtained in the Microbiology lab from various departments of Owaisi Hospital, Hyderabad for aerobic culture and sensitivity, 152 (65.2%) samples yielded a positive culture whereas 81 (34.8%) samples yielded no growth (Table 1). Among 152 samples, 86 (56.6%) were male patients and 66 (43.4%) were female patients (Table 2) giving a male: female ratio of 1.30:1.00.

The department-wise distribution showed that Surgery (33.5%) department was the major contributor of pus samples followed by Orthopedics (21.1%), Medicine (19.7%), Burns (9.9%), ENT (7.2%) and others (8.6%). We also tried to find out the microbial flora of individual departments and the various bacterial isolates from different departments are shown in Figure 1 and Table 3.

The most predominant Gram negative bacteria was *Klebsiella spp* (36.2) apart from other isolates such as *Escherichia coli* (16.5%), *Pseudomonas* (9.9%), *Proteus* (5.3%), *Serratia* (0.7%). The most predominant gram positive bacteria isolated was *Staphylococcus aureus* (21.7%) and coagulase negative *Staphylococcus* (7.2%). Two fungal isolates identified as *Candida spp* (0.7%) and *Aspergillus spp* (0.7%) were also isolated (Table 4).

Wound infection is one of the most common and serious complications among the hospital

acquired infections (Amadi *et al.*, 2009; Gottrup *et al.*, 2005). Wound infection can increase the length of hospital stay and accounts for the mortality rate up to 70–80% (Wilson *et al.*, 2004). The growth positivity reported by Bhatta and Lakhey (60%) was

similar to our finding. The present study revealed that the male: female distribution of pus isolates to be 1.30:1 which closely corroborates with the study by Pappu *et al.*, (Bhatta and Lakhey, 2007).

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

No. of cases studied	No. of positive cases	No. of negative cases
233	152(65.2%)	81(34.8%)

**Table.2** Gender distribution of patients and percentage of positive samples

Gender	No. Of collected samples (%)	Organisms isolates (%)
Male	128 (54.9)	86 (56.6)
Female	105 (45.1)	66 (43.4)
Total	233	152

**Table.3** Ward wise distribution of patients and positive samples

Ward	Total samples (%) n=233	Positive Samples (%) n=152
Surgery	96 (41.2)	51 (33.5)
Orthopedics	46 (19.7)	32 (21.1)
Burns	19 (8.2)	15 (9.9)
ENT	17 (7.3)	11 (7.2)
Medicine	35 (15.0)	30 (19.7)
Others	20 (8.6)	13 (8.6)

**Table.4** Distribution of organisms

Name of species	Number (%) n=152
<i>Klebsiella species</i>	55 (36.2)
<i>Escherichia coli</i>	25 (16.5)
<i>Pseudomonas aeruginosa</i>	15 (9.9)
<i>Proteus species</i>	8 (5.3)
<i>Serratia species</i>	1 (0.7)
<i>Staphylococcus aureus</i>	33 (21.7)
Coagulase Negative Staphylococci (CONS)	11 (7.2)
<i>Streptococcus pyogenes</i>	02 (1.3)
<i>Candida albicans</i>	01 (0.7)
<i>Aspergillus species</i>	01 (0.7)

**Table.5** Antibiotic susceptibility pattern of *Staphylococcus aureus* (n=33)

Antibiotics	Sensitive (%)
Penicillin	7 (21.2)
Erythromycin	19 (57.6)
Clindamycin	24 (72.7)
Doxycycline Hydrochloride	27 (81.8)
Gentamicin	28 (84.8)
Amikacin	31 (93.9)
Ciprofloxacin	14 (42.4)
Cotrimoxazole	26 (78.8)
Vancomycin	33 (100)
Linezolid	33 (100)
Cefoxitin	29 (87.9)

**Table.6** Antibiotic susceptibility pattern of *Pseudomonas* species (n=15)

Antibiotics	Sensitive (%)
Ceftazidime	9 (60)
Tobramycin	6 (40)
Amikacin	13 (86.6)
Piperacillin+Tazobactam	13 (86.6)
Aztreonam	6 (40)
Cefepime	8 (53.3)
Levofloxacin	12 (80)
Imipenem	12 (80)
Meropenem	13 (86.6)
Colistin	15 (100)

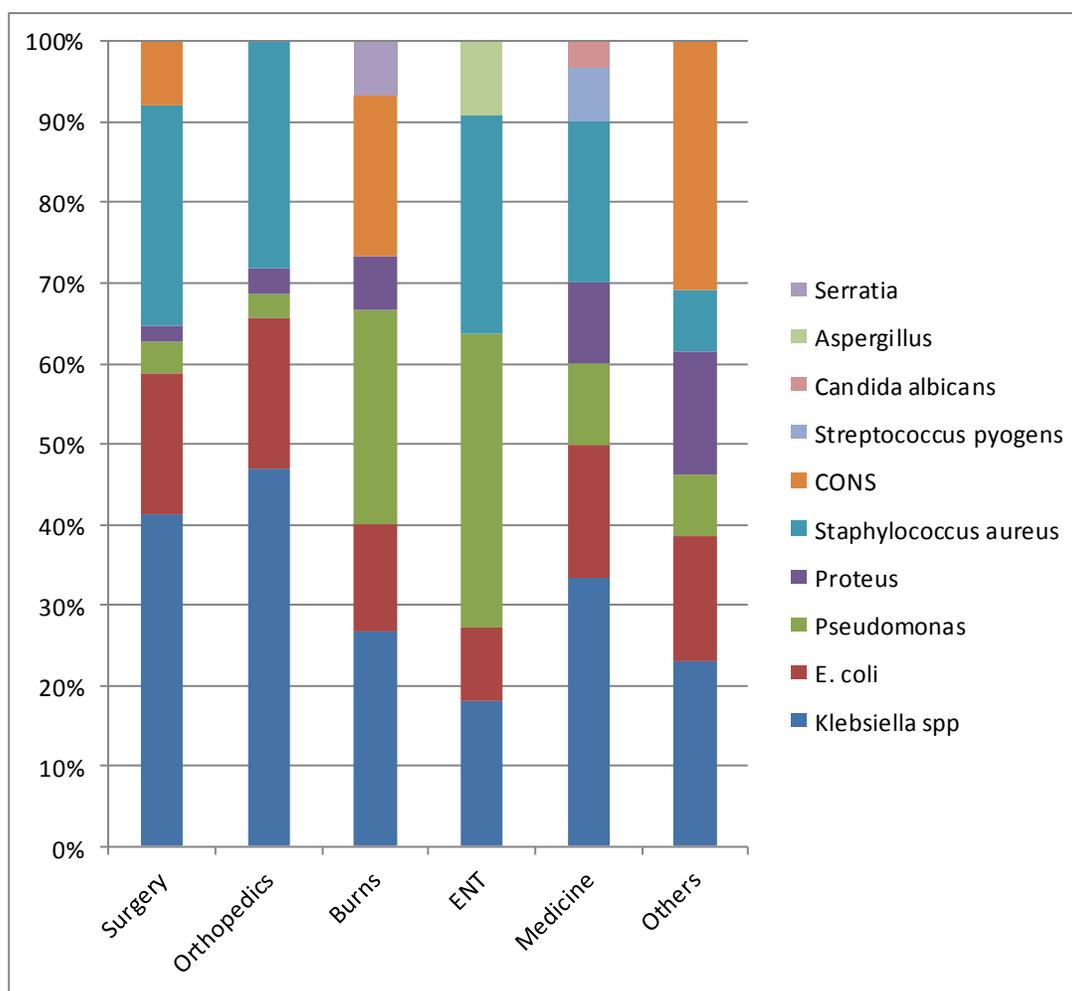
**Table.7** Antibiotic susceptibility pattern of *E. coli* (n=25)

Antibiotics	Sensitive (%)
Gentamicin	18 (72)
Amikacin	22 (88)
Ceftriaxone	13 (52)
Ceftazidime	16 (64)
Cefepime	12 (48)
Ciprofloxacin	11 (44)
Piperacillin+Tazobactam	23 (92)
Ampicillin / Sulbactam	20 (80)
Imipenem	23 (92)
Meropenem	21 (84)
Cotrimoxazole	17 (68)
Doxycycline Hydrochloride	14 (56)

**Table.8** Antibiotic susceptibility pattern of *Klebsiella* species (n=55)

Antibiotics	Sensitive (%)
Gentamicin	41(74.5)
Amikacin	48 (87.2)
Ceftriaxone	19 (34.5)
Ceftazidime	22 (40)
Cefepime	26 (47.2)
Ciprofloxacin	19 (34.5)
Piperacillin+Tazobactam	49 (89.1)
Ampicillin / Sulbactam	36 (65.5)
Imipenem	51 (92.7)
Meropenem	48 (87.2)
Cotrimoxazole	36 (65.5)
Doxycycline Hydrochloride	42 (76.4)

**Fig.1** Ward wise distribution of various organisms



Surgical ward had given maximum number of pus samples followed by Orthopedics department. Department wise antibiogram will help to formulate their antibiotic policy and prevent emergence and proliferation of highly resistant organism.

In our study, a dominance of Gram negative bacteria as the causative agent of pyogenic lesions is seen which is supported by (Zubair *et al.*, 2010). This is in contrast to many studies where *Staphylococcus aureus* is most common pathogen isolated. *Staphylococcus aureus* (22.52%) is the most common Gram positive isolate in our study as shown in studies of (Tiwari *et al.*, 2010; Lee *et al.*, 2009). The prevalence of MRSA reported in our study was in accordance with that reported by (Subedi and Brahmadathan, 2005) (15.4%). However, higher rates were reported by Kshetry *et al.*, (2016) (37.6%), Sanjana *et al.*, (2010) (39.6%), Dibah *et al.*, (2014) (46.3%), and Tiwari *et al.*, (2009) (69.1%). The difference in the rates of isolation of MRSA in different studies might be due to the difference in the level of irrational antibiotic use, level of hygienic condition maintained in different hospitals, and effective implementation of hand hygiene program.

*Staphylococcus aureus* was susceptible to linezolid (100%) and Vancomycin (100%) in correlation to 100% sensitivity in study of (Samra *et al.*, 2005). Antibiotic sensitivity profile of Gram negative bacteria showed sensitivity towards imipenem (92.7%), piperacillin (89.1%) and amikacin (87.2%) as also seen by (Balan *et al.*, 2013) (Table 5).

The study presents a clear understanding to the causative pathogens of wound infections in this hospital and their sensitivity and resistance profiles. It has been concluded that wound infections in this were polymicrobial in nature and, in most cases, associated with *Klebsiella spp*, *E. coli*, *S. aureus* and

*coagulase negative Staphylococcus*. Results also displayed that there is a high rate of antibiotic resistance in all pathogens isolated (Table 6–8). Of all the antibiotics tested, vancomycin and Linezolid was shown to be the one most likely to be effective in treating Gram positive infections as, in contrast to other antimicrobial agents tested in this study, not a single bacterial isolate was found to be resistant to its activity. A continuous inspection should be carried out to monitor the susceptibility of these pathogens and chose appropriate regimens both for prophylaxis and treatment.

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