#### **ORIGINAL PAPER**

# Aerobic bacteriological profile with antibiogram of pus isolates in a tertiary care hospital

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### ABSTRACT

*Introduction*: Being a new institute, antibiotic policy is still not in place. We have made an effort to set the empiric treatment for Gram positive cocci and Gram negative bacilli causing aerobic pyogenic infections. Material and Methods: The total of 134 pus samples received at the bacteriological section were inoculated onto Blood agar and MacConkey agar media and incubated at 37°C for 24 hours and identification of bacteria from positive cultures was done with standard microbiological technique. The antimicrobial susceptibility tests (AST) were done by Kirby-Bauer's disk diffusion method on Mueller-Hinton agar and interpreted as per Clinical Laboratory Standard Institution guidelines. **Observation and Result**: The most common organism was Staphylococcus aureus 53.84%, followed by Escherichia coli 20.87% and Pseudomonas species 5.49%. Conclusion: This study concludes by proposing Gentamycin and Ceftriaxone as empirical treatment for Gram positive cocci and Gram negative bacilli.

Keywords: Pyogenic infection, antibiotic sensitivity pattern

## **INTRODUCTION**

The spread of antimicrobial resistance is now a global problem, which is due to significant changes in microbial genetic ecology, as a result of indiscriminate use of antimicrobials.<sup>1</sup> Pyogenic infection is characterized by several local inflammation, usually with pus formation, generally caused by one of the pyogenic bacteria.<sup>2</sup> A wide variety of aerobic and anaerobic bacteria may be responsible for pyogenic infection either singly or in combination.<sup>3</sup> The current spread of multi drug resistant bacteria from clinical isolates has increased the need for regular updates in the knowledge of the bacteriological review of pus culture reports so as to avoid the unguided empirical treatment which appears to differ in various environment.<sup>4</sup> Being a new institute, antibiotic policy is still not in place. We have made an effort to

set the empiric treatment for Gram positive cocci and Gram negative bacilli causing aerobic pyogenic infections. Therefore, the objectives of the present study were to identify aerobic bacteria in pus isolates and identify the antibiotic susceptibility pattern of the isolated organism.

#### **MATERIAL AND METHODS**

This was a cross sectional study conducted in Department of Microbiology, Jawaharlal Nehru Institute of Medical Sciences, Manipur. Ethical approval from the institutional ethics committee was sought. A total of 134 pus samples received at the bacteriological section were inoculated onto Blood agar and MacConkey agar media and incubated at 37°C for 24 hours. After incubation, identification of bacteria from positive cultures was done with standard microbiological technique.<sup>5</sup> The antimicrobial susceptibility tests (AST) were done by Kirby-Bauer's disk diffusion method on Mueller-Hinton agar and interpreted as per Clinical Laboratory Standard Institution guidelines.<sup>6</sup> Reports issued included the name of the bacteria isolated up to the species level and its AST. Different species of the same genus isolated were clubbed together as our concern is more on the antimicrobial sensitivity pattern. And, the data were analysed for a period of one year from June 2016 to June 2017.

Antibiotics used for Staphylococcus aureus were Penicillin

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(10µg), Erythromycin (15µg), Clindamycin (2µg), Ciprofloxacin (5µg), Cotrimoxazole, Chloramphenicol (30µg), Gentamycin (10µg), Linezolid (30µg), Vancomycin (30µg) and Cefoxitin (30µg).

Antibiotics used for Enterocioccus species were Penicillin (10µg), Linezolid (30µg), Vancomycin (30µg), Daptomycin, High level resistance Gentamycin and High level resistance streptomycin.

Antibiotics used for Gram negative organisms were Ampicillin (10µg), Ciprofloxacin (5µg), Cefotaxime (30µg), Meropenem (10µg), Amikacin (30µg), Amoxyclavulanicacid (20/10µg), Ceftriaxone (30µg) and Chloramphenicol (30µg).

Antibiotics used for Pseudomonias species were Ceftazidime(30µg), Gentamycin(10µg), Ciprofloxacin(5µg), Piperacillin-tazobactam(100/10µg), Amikacin(30µg), Meropenem(10µg), Ceftriaxone (30µg) and Cefepime (30µg).

Antibiotics used for Acinetobacter species were Ampicillinsulbactam (10/10µg), Gentamycin(10µg), Ceftazidime (30µg), Ciprofloxacin (5µg), Amikacin (30µg), Meropenem (10µg), Ceftriaxone (30µg) and Cefepime (30µg).

Statistical analysis: Quantitative variables, Continuous demographic variables (age, sex, and others) were expressed as number while qualitative variables were expressed as percentages.

#### RESULTS

Out of the 134 pus samples analysed in our study, 92(68.65%) were culture positive and 42(31.34%) were sterile. Only one sample was identified as Caindida species. 6(6.74%) samples had mixed infections of two different aerobic bacteria. 56.17% of the positive culture reports belonged to IPD and 43.83% belonged to OPD. The most common age group was 30-40 years.

Table 1 Showing different isol	ated aerobic	e bacteria

53.84 20.87
20.87
5.49
4.39
3.29
2.19
2.19
1.09
2.19
1.09
1.09
1.09
1.09
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Table 1 shows different aerobic bacteria isolated in our study. The most common organism was Staphylococcus aureus 53.84%, followed by Escherichia coli 20.87% and Pseudomonas species 5.49%. Only two samples showed mixed growth of Staphylococcus aureus and Proteus species otherwise mixed growth of Staphylococcus aureus and Acinetobacter species, Proteus Species and Klebsiella species, Pseudomonas species and Staphylococcus aureus and Proteus species and Pseudomonas species were seen only in one sample each.

Table 2 Antibiotic sensitivity pattern of Gram positive cocci

Antibiotics	Staphylococcus aureusTotal=53	Enterococcus sppTotal=1	CONS Total = 2
Penicillin	10 (18.86%)	1(100%)	1(50%)
Azithromycin	29 (54.71%)	-	1(50%)
Clindamycin	41 (77.35%)	-	2(100%)
Ciprofloxacin	30 (56.60%)	-	-
Cotrimoxazole	30 (56.60%)	-	-
Chloramphenol	18 (33.96%)	-	-
Gentamycin	42 (79.24%)	-	-
Linezolid	53 (100%)	1(100%)	2(100%)
Vancomycin	53 (100%)	1(100%)	2(100%)
Cefoxitin	6 (11.32%)	-	2(100%)
HLR			
Gentamycin	-	1(100%)	-
Daptomycin	-	1(100%)	-
HLR Streptomycin	-	1(100%)	-

Table 2 Shows the antibiotic sensitivity pattern of Gram positive cocci as per the CLSI guidelines. In our study, Staphylococcus aureus was least sensitive to Penicillin (18.86%). Sensitivity of Azithromycin, Clindamycin, Ciprofloxacin, Cotrimoxazole, Chloramphenicol and Gentamycin were 54.71%, 77.35%, 56.60%, 56.60%, 33.96% and 79.24% respectively. 100% sensitivity was seen with Vancomycin and Linezolid. Only 11.32% were sensitive to Cefoxitin. Therefore, MRSA accounted for about 88.68%.

There was only one isolate of Enterococcus species, which was found to be sensitive to all the drugs tested i.e., Penicillin, Linezolid, Vancomycin, HLR Gentamycin, HLR Streptomycin and Daptomycin.

Amongst the CONS, out of the two isolates, both were sensitive to Clindamycin, Linezolid, Vancomycin, Cefoxitin but only one was sensitive to Penicillin and Erythromycin.

Antibiotics	Escherichia coli -19	Klebsiella spp-4	Proteus spp-8	Citrobacter spp-2
Ampicillin	9(47.36%)	3(75%)	5(62.5%)	1(50%)
Ciprofloxacin	11(57.89%)	3(75%)	5(62.5%)	1(50%)
Cefotaxime	9(47.36%)	2(50%)	3(37.5%)	2(100%)
Meropenem	15(78.94%)	3(75%)	7(87.5%)	2(100%)
Amikacin	16(84.21%)	3(75%)	6(75%)	2(100%)
Amoxycla- vulanic acid	7(36.84%)	1(25%)	3(37.5%)	1(50%)
Chloramp- henicol	13(68.42%)	2(50%)	5(62%)	1(50%)
Ceftriaxone	15(78.947%)	3(75%)	6(75%)	1(50%)

Table 3 Antibiotic sensitivity pattern of Gram negative bacilli

**Table 3** Shows the antibiotics sensitivity pattern of the Gram negative organism isolated in our study.

Escherichia coli was most sensitive to Amikacin (84.21%) followed by Ceftriaxone and Meropenem (78.94%). Escherichia coli were least sensitive to Amoxyclavulanic acid (36.84%). Amongst the Klebsiella species isolates Ampicillin, Ciprofloxacin, Meropenem, Amikacin and Ceftriaxone showed the highest sensitivity (75%). Cefotaxime and Chloramphenicol were 50% sensitive and Amoxyclavulanic acid was the least sensitive (25%). For Proteus species, Meropenem was the most sensitive (87.5%) followed by Amikacin and Ceftriaxone (75%), Ciprofloxacin, Ampicillin and Chloramphenicol (62.5%) respectively. Cefotaxime and Amoxyclavulanic acid showed least sensitivity (37.5%). Both the Citrobacter species isolates were sensitive to Cefotaxime, Meropenem and Amikacin (100%). And, only one showed sensitivity to Ampicillin, Ciprofloxacin, Amoxyclavulanic acid, Chloramphenicol and Ceftriaxone (50%) respectively.

Table 4 Antibiotic sensitivity pattern of Pseudiomonas spp

Antibiotics	Pseudiomonas spp (7) Sensitivity (%)
Ceftazidime	3(42.85%)
Gentami cin	3(42.85%)
Piperacillin-tazobactam	5(71.42%)
Ciprofloxacin	5(71.42%)
Amikacin	4(57.14%)
Meropenem	4(57.14%)
Ceftriaxone	4(57.14%)
Cefepime	2(28.57%)

**Table 4** Shows the antibiotic sensitivity pattern of *Pseudiomonas* species. Highest sensitivity was shown by Ciprofloxacin and Piperacillin-tazobactam with 71.42%

sensitivity each followed by Amikacin, Meropenem and Ceftriaxone with sensitivity of 57.14% each. Cefepime showed the least sensitivity of 28.57%.

In our study, there was only one isolate of *Acinetobacter* species and it was sensitive to Ampicillin-Sulbactam, Gentamycin, Ciprofloxacin, Meropenem, Amikacin, Ceftriaxone and Cefepime but found to be resistant to Ceftazidime.

#### DISCUSSION

In our study, a total of 68.65% showed culture positive for aerobic bacteria out of which 6.74% samples had mixed infections of two different aerobic bacteria. Similar finding was also reported by B Biradar A et al.<sup>7</sup> Majority of our results were mono-microbial (96.73%) and Staphylococcus aureus was found to be the most common pathogen in our study (55.06%), similar reports were also observed by Sharma A et al.<sup>8-10</sup> Biradar A et al observed similar results and P Tiwari et al.<sup>8,11</sup> The second common pathogen in our study was *E.coli* (21.34%) followed by Pseudomonas spp.5.62%. Duggal S et al also found similar result.<sup>12</sup> Though S. aureus was the predominant organism, Gram-positive cocci accounted for only 49% of the total isolates, 51% being Gram negative bacilli. Such GNB dominance in the aerobic growth in pus culture has been highly seconded by studies reported by Mantravadi HB.13

In our study, Gram positive organisms obtained were 100% sensitive to Vancomycin and Linezolid. Staphylococcus aiureus isolates were more from OPD than IPD and difference in the sensitivity pattern was observed between the two though the statistical significance was not found out as the difference were in few numbers and also the sample size was small. Amongst the in-patient Staphylococcus aiureus showed sensitivity to Gentamycin and Clindamycin. Amongst the outpatient, the most sensitive drug was Azithromycin followed by Gentamycin. We found that only18.86% of Staphylococcus aiureus was sensitive to Penicillin and it was comparable with the finding of Jamatia A et al.<sup>14</sup> Ananthi B et al<sup>1,3</sup> also found that Gram positive organisms were 100% sensitive to Vancomycin and Linezolid. In our study, MRSA were 88.67%. Therefore, empirical antibiotic treatment should be primarily directed against this pathogen. Tiwari P et al<sup>8,10</sup> suggested that strict enforcement of hand washing and timely discharge of patients without delay will go a long way towards reducing the spread of this pathogen in this hospital.<sup>15</sup>

Amongst the GNB isolated in our study, *Escherichia coli* (20.87%) was the most common pathogenic isolate though it was the second most common organism isolated. It was found that it was most sensitive to Amikacin, followed by Meropenem which was similar when compared to a study conducted by Mantravadi HB *et al.*<sup>16,17</sup> There was no difference observed in the sensitivity pattern amongst the IPD and OPD isolates.

In our study, *Pseudomonas species* (5.49%) was the 3<sup>rd</sup> most common pathogenic isolate and were most sensitive to ciprofloxacin and Piperacillin-tazobactam (71.42%);

comparable finding was also seen in other studies.<sup>16,18,19</sup> P. aeruginosa is a prototypical "multidrug resistant (MDR) pathogen" recognized for its ubiquity, its intrinsically advanced antibiotic resistance mechanisms. *P. aeruginosa* is a reason for high fatality rate, as it has arisen as a vital pathogen for nosocomial infection in hospital settings.<sup>20</sup> Therefore, judicial usage of antibiotics becomes a necessity.

In our study, the incidence of Coagulase negative Staphylococcus (CONS), which grew as pure growth was only 2.19%, which may be due to small sample size. And, we have reported CONS as pathogenic as it is now being increasingly recognized as pathogens. CONS have become a common cause of nosocomial infections.<sup>21</sup> But we sent the reports with a note stating to clinically correlate as CONS is an opportunistic bacteria. Mane P et al found that 15.53% CONS isolates were from pus.<sup>21-23</sup>Golia Set aland Asangi Y S *et al* found CONS isolates from pus samples were 47% and 33.3% respectively.<sup>24-26</sup>

The strength of the study was that the laboratory technicians have been consistent with their tests results which increases comparability and reliability and reduces variability.

# CONCLUSION

This study concludes by proposing Gentamicin and Ceftriaxone as empirical treatment for Gram positive cocci and Gram negative bacilli. The antibiotic pattern and the bacterial profile of pus may change from time to time and place to place, as observed by different studies. Therefore, similar studies should be conducted from time to time. And, there is a need for larger scale study for more significant results. There is also a need to include anaerobes in such studies.

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#### REFERENCES

- Ananthi B, Ramakuma M, V Kalpanadevi V, Abigail SR, Karthiga L, Victor KH. Aerobic bacteriological profile and antimicrobial susceptibility pattern in postoperative wound infections at a tertiary care hospital. IJMSCI 2017;4(2):2702-6.
- 2. DVMVSV Rao R, Basu R, Biswas RD. Aerobic bacterial profile and antimicrobial susceptibility pattern of pus isolates in a south Indian tertiary care hospital. JDMS 2014 Mar;13(3):59-62.
- 3. Sujatha R, Tripathi A, Nidhi V. Microbial characterisation of pus isolates and the changing trends in their sensitivity pattern at a tertiary care hospital in Kanpur city. Rama University J of Medical Sciences 2016;2(3):1-7.
- 4. Rameshkannan S, Nileshraj G, Rameshprabu S, Mangaiarkkarasi A, Meher Ali R. Pattern of pathogens and their sensitivity isolated from pus culture reports in a tertiary care hospital, Puducherry. IJBAMR 2014 December;4(1):243-8.
- Procop GW, Church DL. Koneman'scolor atlas and textbook of diagnostic microbiology. 7<sup>th</sup> ed Philadelphia: Wolters Kluwer; 2017. IP-1-119.
- 6. Clinical and Laboratory Standards Institute (2016). Performance standard for antimicrobial susptibility testingtwenty third informational supplements. CLSI document M100-S26. 2016;33(1).
- 7. Biradar A, Faisal Farooqui F, Prakash R, Khaqri YS, Ifran Itagi. Aerobic bacteriological profile with antibiogram of pus isolates.IJMR 2016;3(3):245-9.
- Sharma A, Gupta S. Aerobic bacteriological profile of skin and soft tissue infections (SSTI'S) and its antimicrobial susceptibility pattern at MB Govt. Hospital in Udaipur, rajasthan. IJMSE 2016 April-June;3(2):141-51.
- 9. Sandhu R, Prakash H, Nagdawane RP. Aerobic bacterial isolates in superlative infections and their antibiogram a reflection of infection control. Int J Pharm Biol Sci 2011April-June;4(2):186-92.
- Kumar A, Agrawal AK, Kumar M, Sharma AK, Kumari P. Aerobic bacterial profile of diabetic foot and its antibiogram in RIMS, Ranchi - a tertiary care hospital. IJCMR 2017January;4(1):251-3.
- 11. Tiwari P, Kaur S. Profile and sensitivity pattern of bacteria isolated from various cultures in a tertiary care hospital in Delhi. Indian J of Public Health 2010 Oct-Dec;54(4):213-5.
- 12. Duggal S, Khatri PK, Parihar RS, Rajat Arora R. Antibiogram of various bacterial isolates from pus samples in a tertiary care centre in Rajasthan. IJSR 2013:6-14.
- 13. Mantravadi HB, Chinthaparthi RM, Shravani V. Aerobic isolates in pus and their antibiotic sensitivity pattern: a study conducted in a teaching hospital in Andhra Pradesh.

IJMSPH 2015;4(8):1076-9.

- 14. Jamatia A, Roy D, Shil R, Prabhakar PK. Bacteriological profile and antimicrobial resistance patterns isolates in pus samples at agartala government medical college. Asian J Pharm Clin Res 2017;10(1):335-7.
- 15. Tiwari P, Kaur S. Profile and sensitivity pattern of bacteria isolated from various cultures in a tertiary care hospital in Delhi. Indian J Public Health 2010 Oct-Dec;54(4):213-5.
- 16. Hosimin K and Prabakaran G. Studies on isolation and characterization of some wound infection causing bacteria. IJCAR 2012October;1(2):26–31.
- 17. Girish M Bengalorkar, TN Kumar. Culture and sensitivity pattern of micro-organism isolated from diabetic foot infections in a tertiary care hospital. Int J Cur Biomed Phar Res 201;1(2):34–40.
- Kumar H, Singh RP. Incidence and antimicrobial resistance among potential nosocomial bacteria isolated from indoor environment of hospital. Int J Cur Microbiol App Sci 2015;4(3):134-42.
- Rai S, Yadav NU, Pant DN, Yakha JK, Tripathi PP, Poudel A et al. Bacteriological profile and antimicrobial susceptibility patterns of bacteria isolated from pus/ wound swab samples from children attending a tertiary care hospital in Kathmandu, Nepal. I J Microb 2017;5:1-5.
- 20. Namita A Raytekar, Meghna R Choudhari, Sonali Das. Antibiotic profiling of pseudomonas aeruginosa isolates from pus sample of rural tertiary care hospital of western

Maharashtra, Loni, India. Int J Res Med Sci 2017 Jul;5(7):3076-81.

- 21. Mane P, Mane M, Mohite ST, Patil RS. Study of coagulase negative staphylococci isolated from clinical specimens in tertiary care hospital from western Maharashtra. IJSR 2013;6(14):1437-40.
- 22. Mane MP, Mane BM, Mohite ST, Patil SR, Pawar SK, GS Karande GS. Biofilm production and antibiotic susceptibility pattern of coagulase negative staphylococci from various clinical specimens in a tertiary care hospital. Intl J of Scientific Study March 2016;3(12): 184-6.
- 23. Neelima, Praveen Kumar D, Suresh P, Nandeeshwar. Bacteriological profile of wound infection in rural hospital in Ranga Reddy district, Andhra Pradesh. IJMRHS 2013;2(3):469-73.
- 24. Golia S, Bhimacharya Telsang DB, Asha S Kamath B, Tiwari D. Speciation of clinically significant coagulase negative staphylococci and their antibiotic resistant patterns in a tertiary care hospital. Int J Res Med Sci 2015 May;3(5):1242-6.
- 25. Asangi YS, Mariraj J, Sathyanarayan MS, Nagabhushan, Rashmi. Speciation of clinically significant coagulase negative staphylococci and their antibiotic resistant patterns in a tertiary care hospital. Int J Biol Med Res 2011;2(3):735-9.
- 26. Badampudil VSS, Kirani KRL1S, Gunti R.Speciation and biofilm production of coagulase negative staphylococcal isolates from clinically significant specimens and their antibiogram. JKIMSU 2016 April-June;5(2):69-78.