

ORIGINAL PAPER

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

Mayengbam Sonita¹, Laifangbam Supriya², Singh Huidrom Lakhendro³

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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 Gentamicin 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.¹ Pyogenic infection is characterized by several local inflammation, usually with pus formation, generally caused by one of the pyogenic bacteria.² A wide variety of aerobic and anaerobic bacteria may be responsible for pyogenic infection either singly or in combination.³ 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.⁴ 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, and 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.⁵ 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.⁶ 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

Address for correspondence:

¹Post graduate trainee

Mobile: +918729935682

Email: sonitadevi@yahoo.co.uk

²Associate Professor (**Corresponding author**)

Mobile: +919402882477

Email: slafangbam@gmail.com

³Professor and Head

Department of Microbiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS),
Porompat-795005, Imphal–East, Manipur.

(10µg), Erythromycin (15µg), Clindamycin (2µg), Ciprofloxacin (5µg), Cotrimoxazole, Chloramphenicol (30µg), Gentamycin (10µg), Linezolid (30µg), Vancomycin (30µg) and Cefoxitin (30µg). Antibiotics used for Enterococcus 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 Pseudomonas 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 Ampicillin-sulbactam (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 Candida 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 isolated aerobic bacteria

Organism	Number	Percentage
Staphylococcus aureus	49	53.84
Escherichia coli	19	20.87
Pseudomonas spp	5	5.49
Proteus spp	4	4.39
Klebsiella spp	3	3.29
Citrobacter spp	2	2.19
Coagulase negative staphylococcus aureus	2	2.19
Enterococcus spp	1	1.09
Staphylococcus aureus & Proteus spp	2	2.19
Staphylococcus aureus & Acinetobacter spp	1	1.09
Proteus spp & Klebsiella spp	1	1.09
Pseudomonas &Staphylococcus aureus	1	1.09
Proteus spp & Pseudomonas	1	1.09

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 aureus Total=53	Enterococcus spp Total=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.

Table 3 Antibiotic sensitivity pattern of Gram negative bacilli

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%)
Amoxycyclavulanic acid	7(36.84%)	1(25%)	3(37.5%)	1(50%)
Chloramphenicol	13(68.42%)	2(50%)	5(62%)	1(50%)
Ceftriaxone	15(78.947%)	3(75%)	6(75%)	1(50%)

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 Amoxycyclavulanic 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 Amoxycyclavulanic 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 Amoxycyclavulanic 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, Amoxycyclavulanic acid, Chloramphenicol and Ceftriaxone (50%) respectively.

Table 4 Antibiotic sensitivity pattern of Pseudomonas spp

Antibiotics	Pseudomonas spp (7) Sensitivity (%)
Ceftazidime	3(42.85%)
Gentamicin	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 Pseudomonas 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.⁷ 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.⁸⁻¹⁰ Biradar A et al observed similar results and P Tiwari et al.^{8,11} 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.¹² 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 in our study were 100% sensitive to Vancomycin and Linezolid. *Staphylococcus aureus* 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 aureus* showed sensitivity to Gentamycin and Clindamycin. Amongst the out-patient, the most sensitive drug was Azithromycin followed by Gentamycin. We found that only 18.86% of *Staphylococcus aureus* was sensitive to Penicillin and it was comparable with the finding of Jamatia A et al.¹⁴ Ananthi B et al¹³ 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^{8,10} 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.¹⁵

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.^{16,17} There was no difference observed in the sensitivity pattern amongst the IPD and OPD isolates.

In our study, *Pseudomonas* species (5.49%) was the 3rd most common pathogenic isolate and were most sensitive to

ciprofloxacin and Piperacillin-tazobactam (71.42%); comparable finding was also seen in other studies.^{16,18,19} *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.²⁰ 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.²¹ 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.²¹⁻²³ Golia Set al and Asangi Y S et al found CONS isolates from pus samples were 47% and 33.3% respectively.²⁴⁻²⁶

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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