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STUDY OF BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY & RESISTANCE PATTERN IN PUS CULTURE ISOLATES AT TERTIARY CARE TEACHING HOSPITAL IN BHOPAL

Pharmacology

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ABSTRACT

Objective: To study the bacteriological profile and the pattern of antibiotic sensitivity and resistance in pus culture isolates in a tertiary care teaching hospital in Bhopal.

Materials and Methods: Pus specimens submitted to the microbiology laboratory for routine cultures and sensitivity were analyzed prospectively for the duration of 2 months. Antimicrobial susceptibility testing was performed by Kirby-Bauer Disk Diffusion method.

Results: Among the total 440 samples analyzed, 319 samples (72.5%) were found to be positive for growth. Out of 319 growths, 286 shows single isolate and 33 shows mixed (double) isolates. Out of these positive samples, 269 samples (84.33%) were positive for Gram negative bacteria while 44 samples (13.8%) were positive for Gram positive bacteria, 4 (1.25%)were positive for both and 2 samples (0.63%) were positive for growth other than bacteria i.e. fungal growth. Klebsiella was the most common Gram–negative bacteria isolated & other common Gram-negative bacteria isolated were Pseudomonas and E.coli species while Staphylococcus aureus & CONS were the commonest Gram–positive bacteria. Gram negative bacteria shows >35% sensitivity to Meropenem, Imipenem-cilastatin, Cefoperazone and >20% sensitivity to Piperacillin-Tazobactam and Gatifloxacin. They were most resistant to Cefpodoxime, Cefprozil. Gram positive bacteria were >70% sensitive to Lincomycin and Ampicillin-Sulbactam while most resistant to Clarithromycin, Sparfloxacin, Gatifloxacin.

Conclusion: We must use antibiotics rationally and judiciously as these are precious and limited resources. So in order to combat the menace of resistant microorganisms, we should join hands to formulate safe and effective antibiotic policies at loco-regional as well as national level. Because, if such type of indiscriminate, irrational and widespread use of antibiotics is allowed to continue, the day is not far when the resistance rates among the micro-organisms will become so high that the most innocuous looking infections may prove fatal for life.

KEYWORDS

Bacteriological profile, antibiotic resistance, sensitivity, pus

INTRODUCTION

Infectious diseases have been the leading cause of death all over the world. The discovery of antibiotics opened a new era in the treatment of infectious diseases. But the concurrent development of antibiotic resistance illustrated the ability of the microorganisms to grow and survive under unfavorable conditions.[1] Development of antimicrobial resistance is increasing day by day at faster pace than it can be controlled. Inadequate antibiotic with suboptimal dose and incomplete course has adverse outcome and increases the possibility of development of resistance.[2]

Multi-drug resistant strains have become a matter of serious concern. The bugs producing Extended spectrum betalactamase (ESBL) and carbepenamase are really fatal as they confer resistance to the penicillins, cephalosporins and even to carbapenems.[3] The day is not far when these bacteria will get resistant to the new molecules like tigecyclin, dorepenam and daptomycin owing to their indiscriminate and widespread use.[4] For treating antibiotic resistant infection, many billions of dollars are being spent every year.

Therefore there is a need for regular screening of microorganisms causing various infections and to characterize their antimicrobial sensitivity and resistance pattern to commonly used antibiotics at loco-regional, national and global levels to guide the clinicians to select an adequate antibiotic for empirical treatment of infections.[1]

For selecting an effective antimicrobial agent for an infection, knowledge of the potential microbial pathogen, an understanding of the pathophysiology of the infectious process and pharmacology of the intended therapeutic agents are required.[5] In addition place to place variation has also been found in the antimicrobial susceptibility patterns.[6]

A number of studies have been carried out in the western countries to monitor antimicrobial resistance at national level.[7,8] The academic and educational value of these studies is particularly useful for microbiologists and infectious disease clinicians.

MATERIALS AND METHODS

This cross sectional observational study was conducted at Hamidia Hospital, Gandhi Medical College, Bhopal, a tertiary care teaching hospital. The Pus specimens collected from the various sites of infection routinely submitted for culture and sensitivity during the period of May to June 2014 to the microbiology laboratory of the hospital were analyzed. Processing of samples and the identification of the isolates were performed by conventional methods.

The antibiotic resistance and sensitivity test was performed by Kirby-Bauer's disk diffusion method on Mueller Hinton agar plates. The antibiotics tested for Gram positive cocci (GPC) were cefaclor, sparfloxacin, gatifloxacin, linezolid, lincomycin, clindamycin, vancomycin, ampicillin/sulbactam, roxithromycin, lomefloxacin, clarithromycin, teicoplanin, moxifloxacin. The antibiotics tested for Gram negative bacilli (GNB) were cefoperazone, cefpirome, cefpod oxime, cefprozil, ceftizoxime, gatifloxacin, imipenem/cilastatin, meropenem, moxifloxacin, piperacillin/tazobactam, ticarcillin/clavulanic acid, tobramycin, sparfloxacin, levofloxacin. Data of micro-organisms analysed and its resistance and sensitivity pattern was recorded.

RESULTS AND DISCUSSION

Total 444 samples of pus were collected during the study, out of these 319 samples showed significant growth of organisms. Four samples were contaminated so were excluded from the study. The positivity rate was found to be 72.5% which was comparable to those reported by the other similar studies. A study done by Muluye et al reported pus culture positivity rate 70.2%[7], while another study done by Kaup et al, reported it 73.5%.[1] In our study, out of 319 samples, 286 (89.7%) were single isolates & 37 (11.6%) were found to be mixed (double) isolates. Gram negative Bacteria were much more common than Gram Positive organisms. GNB were grown in 269 samples which constituted 84.33% of the total samples while 44 samples were positive for GPC which constituted 13.8%. Four samples (1.25%) were having both types of the growth i.e. GNB & GPC and 2 samples were having fungal growth. Other similar studies also have the consistent results.[1,9]

Klebsiella was the predominant organism isolated from the pus culture which constituted 46.4% (148 samples). Second most common

organism isolated was Pseudomonas (27.3%) followed by E.coli (13.8%). Next common organism isolated was Staphylococcus aureus which was most common Gram Positive bacteria isolated, constituted 11.3% of total growths. In another similar study, the most common GPC isolated was Staphylcoccus aureus and most common GNB was E.coli followed by Pseudomonas[1]. In our study other organisms isolated were non lactose fermenting bacteria (NLF Bacteria), coagulase negative staphylococci (CONS), proteus, acinetobacter, citrobacter, streptococci.

Our study showed that Gram negative bacteria have become highly resistant to cephalosporin group of drugs, of which they were most resistant to Cefpodoxime (96.3%), Cefprozil (94%), Cefpirome (87.4%), and Ceftizoxime (86.2%). Resistance to Ticarcillin/clavulanic acid and Flouroquinolone group of drugs was also quite high. According to our study, most sensitive antibiotics for GNB were found to be Imipenem/cilastatin and Meropenem. But percentage resistance in these newer antibiotics has also found to be 60.6% and 59% for Imipenem/cilastatin and Meropenem respectively. These findings were consistent with the results obtained by previous similar study done by Kaup et al[1],but the resistance to Imipenem/cilastatin and Meropenem was quite higher in our study when compared to the previous study done by Kaup et al in which they were 100% sensitive.[1]

Gram positive bacteria were somewhat less resistant to antibiotics than Gram negative bacteria according to our study. Percentage resistance was highest for Clarithromycin (79.2%), to Sparfloxacin (72.9%) and Gatifloxacin (72.9%). Gram positive bacteria were most sensitive to Lincomycin and Ampicillin/sulbactam with their sensitivity rates approaching 77.1% and 72.9% respectively.

CONCLUSION

We reported our results regarding the trends in the pus culture isolates collected over the period of two months. Most of the infectious sites from where the pus was collected were found to be gram negative bacillary infections. Organisms including Klebsiella, Pseudomonas and E.coli among GNB and Staphylococcus aureus among GPC were the predominant isolates. This is the scenario in most of the hospitals, medical institutes and centers in India, which is in stark contrast with the western countries where the major share of hospital associated infections is constituted by gram positive organisms like Staphylococcus aureus since the 1980's.[10]

Recently, an extensive and indiscriminate use of Cephalosporin group of drugs especially 3rd generation cephalosporins and quinolones in community has contributed to very high resistance rate in GNB. Even the newly introduced 4th generation cephalosporin like Cefpirome has got very high resistance rate as it has been found with other newer antibiotics like Imipenem/cilastatin and Meropenem.

In order to rationalize the administration of empirical therapy before the results of culture are available, knowledge of the most common causative microbial organisms and their antimicrobial sensitivity and resistance pattern is very important. Antimicrobial susceptibility of microorganisms varies from time to time and from place to place. Therefore regular monitoring of bacterial susceptibility to antibiotics is very important and is essential tool to prevent excessive and indiscriminate use of antibiotics, and simultaneously antibiotic resistance.

To summarize, we must use antibiotics rationally and judiciously as these are precious and limited resources. So in order to combat the menace of resistant microorganisms, we should join hands to formulate safe and effective antibiotic policies at loco-regional as well as national level. Because, if such type of indiscriminate, irrational and widespread use of antibiotics is allowed to continue, the day is not far when the resistance rates among the micro-organisms will become so high that the most innocuous looking infections may also prove fatal for life.

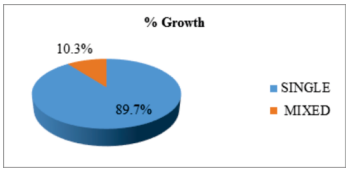

Figure1: Percentage Growth among Pus Specimens

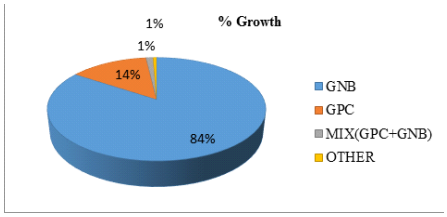

Figure 2: Percentage Growth among Pus Specimens

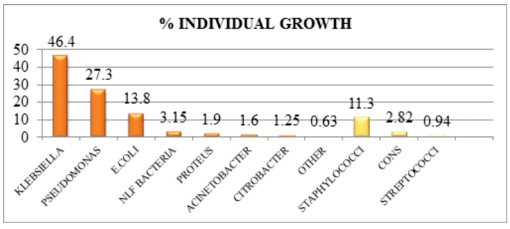

Figure 3: Percentage Individual Growth

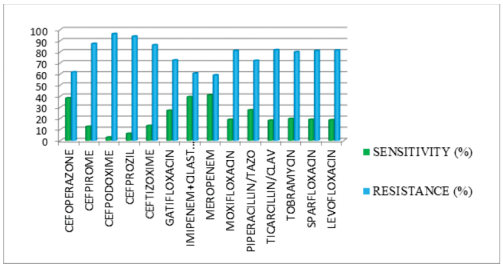

Figure 4: Antimicrobial sensitivity and resistance pattern among GNB

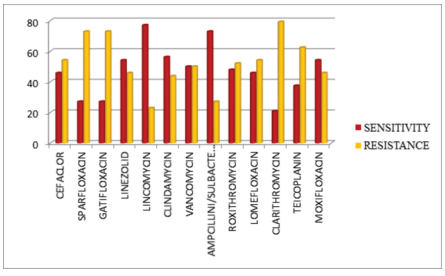

Figure 5: Antimicrobial sensitivity and resistance pattern among GPC

Table 1: Antimicrobial sensitivity and resistance percentage among gram-negative bacilli (GNB)

Antimicrobials	Resistance (%)	Sensitivity (%)
Cefoperazone	61.7	38.3
Cefpirome	87.4	12.6
Cefpodoxime	96.3	3.7
Cefprozil	94	6
Ceftizoxime	86.3	13.7
Gatifloxacin	72.5	27.5
Imipenem/Cilastatin	60.6	39.4
Meropenem	59	41
Moxifloxacin	81.04	18.96
Piperacillin/Tazobactam	72.5	27.5
Ticarcillin/Clavulanic Acid	81.8	18.2
Tobramycin	80	20
Sparfloxacin	81	19
Levofloxacin	81.4	18.6

Table 2: Antimicrobial sensitivity and resistance percentage among gram-positive cocci (GPC)

Antimcrobial Agent	Resistance (%)	Sensitivity (%)
Cefaclor	54.2	45.8
Sparfloxacin	72.9	27.1
Gatifloxacin	72.9	27.1
Linezolid	45.8	54.2
Lincomycin	22.9	77.1
Clindamycin	43.7	56.3

Vancomycin	50	50
Ampicillin/Sulbactam	27.1	72.9
Roxithromycin	52.1	47.9
Lomefloxacin	54.2	45.8
Clarithromycin	79.2	20.8
Teicoplanin	62.5	37.5
Moxifloxacin	45.8	54.2

REFERENCES

1. Kaup S, Sankarankutty J. Prevalence and antimicrobial susceptibility patterns of bacteria isolated from skin and wound infections. J. Microbial. Biotech. Res., 2014; 4(2):39-45.
2. Herbert S, Ferrière K, Hugonnet S, Ricou B, Suter P, Pittet D: Epidemiology and prognostic determinants of bloodstream infections in surgical intensive care. Arch Surg 2002; 137:1353-1359.
3. Chandel DS, Johnson JA, Chaudhry R, Sharma N, Shinkre N, Parida S, Misra PR, Panigrahi P. Extended-spectrum β-lactamase-producing Gram-negative bacteria causing neonatal sepsis in India in rural and urban settings. J Med Microbiol. 2011 April; 60(4):500–507.
4. Gupta A, Sharma S, Arora A, Gupta A. Changing trends of in vitro antimicrobial resistance patterns in blood isolates in a tertiary care hospital over a period of 4 years. 2010; 64(11):485-492.
5. Rajalakshmi V, Amsaveni V. Int. J. Microbiol. Res. 2012; 3(1):30-32.
6. Raghunath D, J. Biosci, 2008; 33:593-603.
7. Muluye D, Wondimeneh Y, Ferede G, Nega T, Adane K, Biadgo B, Tesfa H, Moges F. Bacterial isolates and their antibiotic susceptibility patterns among patients with pus and/or wound discharge. Gondar university hospital. BMC Research Notes 2014; 7:61.
8. Wright GD. Antibiotic resistance in the environment:a link to the clinic? Current opinion in microbiology. 2013; 13(5):589–594.
9. Tiwari VB, Kuril BM, Doibale MK. Study of Microbiological Surveillance Data and Antibiotic Sensitivity Patterns for Isolates Collected at a Single Tertiary Care Hospital. International Journal of Recent Trends in Science and Technology. 2013; 7(3):91-99.
10. Gaynes R, Edwards JR. Overview of nosocomial infections caused by gram negative bacilli. Clin Infect Dis 2005; 41:848-54.