ORIGINAL RESEARCH

Isolation of bacteria from pus samples and antibiotic sensitivity pattern in a tertiary care hospital, Lucknow

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ABSTRACT

Introduction: In hospitals pyogenic infection is one of the major cause of morbidity. Increasing multidrug resistant strains has made treatment of such infection difficult. For correct antibiotic use, every pus samples should undergo culture and sensitivity.

Aim: To isolate bacteria from pus samples and antibiotic sensitivity pattern in various pus isolates.

Objectives:

i) To study the distribution pattern and prevelance of bacteria causing pyogenic infection.

ii) To study Antibiotic Sensitivity Pattern of organism isolated from pus.

Methods: The study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow, for a duration of 6 months. 256 pus samples from various wards with suspected pyogenic infection were studied. Bacteria were isolated, identified and antibiotic profile was determined from pus samples using standard protocol.

Results: In our study, out of 256 pus samples studied, 159 (62.10%) samples were positive for growth. Gram positive bacteria outnumbered gram negative isolates. Commonest isolate was Staphylococcus aureus, followed by Coagulase Negative Staphylococcus and Pseudomonas aeruginosa. All Staphylococcus aureus were sensitive to Vancomycin and Linezolid. All Pseudomonas aeruginosa were sensitive to Colistin. In Enterobacteriaceae group most effective antibiotic were Colistin and Tigecyclin.

Conclusion: It is important for a clinician to send all the pus samples for microbiological analysis and their antibiogram before putting cases on antibiotic so that emergence of drugresistance can be minimized.

Keywords: Staphylococcus aureus, Coagulase Negative Staphylococcus, Enterococcus faecalis, Pseudomonas aeruginosa, Klebsiella pneumoniae, Escherichia coli, Kirby-Bauer disc diffusion.

INTRODUCTION

Pyogenic infection generally caused by one of the pyogenic bacteria, is characterized by several local inflammation, usually with pus formation. There can be accumulation of dead leukocytes and infectious agent commonly known as pus. Pyogenic infections may be exogenous or endogenous. [**1]**

Breakage in the skin leads to enterance of surface bacteria which then multiplylocally. The defense mechanism of the body includes bringing immune cells into the area to fight against bacteria. The accumulation of these cells producespus which is a thick whitish liquid. [2]
Antibiotics play a key role in prevention & cure of these pyogenic
infections. To select an appropriate antibiotic needs knowledge of the potentialpathogen. So there should be regular analysis of the profile and antibiogram oforganisms isolated and the results need to be communicated to clinician.[3] During the last few decades, multidrug-resistant bacterial strains were increasingly associated with pus infections. Rapid emergence of these multidrug-resistant bacteria poses a serious threat to public health globally.[4]

AIM

To isolate bacteria from pus samples and antibiotic sensitivity pattern invarious pus isolates.

OBJECTIVES

i) To study the distribution pattern and prevelance of bacteria causing pyogenicinfection.
ii) To study Antibiotic Sensitivity Pattern of organism isolated from pus.

MATERIALS AND METHODS

The study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow, for a duration of 6 months.
256 pus samples from various wards with suspected pyogenic infection were studied. Each pus samples for culture were received in sterile swabs and sterile syringe from clinically suspected cases of pyogenic infections. These samples were cultured in culture medias, like blood agar and MacConkey agar . Gram's staining was done from each samples directly. Cultured plates were incubated over-night at 37 degree centigrade. Next day the plates were observed for any growth. Then various tests like Gram's staining, catalase test, coagulase test, oxidase test and biochemical test were performed to identify the organism in pus. After organism were isolated, Antimicrobial susceptibility testing was doneon each isolate by Kirby-Bauer disc diffusion method as per CLSI guidelines.

RESULTS

Total 256 pus samples were studied, among them 159 (62.10%) samples were positive for growth, rest 97(37.89%) samples were negative for growth.
Out of total 159 positive samples, 86(54.08%) were gram positive organismsand 73 (45.91%) were gram negative organisms. **Table 1 & 2**

Table 1

Total samples	Growth positive	Growth absent
256	159 (62.10%)	97 (37.89%)

Table 2

Culture positivesamples	Gram positiveorganisms	Gram negativeorganisms
159	86 (54.08%)	73 (45.91%)

Out of 159 culture positive samples, 44 (27.67%) were *Staphylococcus aureus,* 27(16.98%) were *Coagulase Negative Staphylococcus,* 15(9.43%) were *Enterococcus faecalis,* 27(16.98%) were *Pseudomonas aeruginosa,* 24(15.09%)were *Klebsiella pneumoniae and 22 (13.83%) were Escherichia coli.* **Table 3**

Table 3: Different bacterial isolates from positive pus sample

Bacterial isolate	Number	Percentage(%)
Staphylococcus aureus	44	27.67%
Coagulase NegativeStaphylococcus	27	16.98%

Enterococcus faecalis	15	9.43%
Pseudomonasaeruginosa	27	16.98%
Klebsiella pneumoniae	24	15.09%
Escherichia coli	22	13.83%

Antibiotic sensitivity pattern of Gram positive bacteria, Enterobacteriaceae and Pseudomonas aeruginosa are given in **Table 4, 5, 6** respectively.

Table 4: Antibiotic sensitivity pattern of Gram positive bacteria (n=86)

Antibiotics	***Staphylococcus aureus*(44)**	***Coagulase Negative Staphylococcus*(27)**	***Enterococcusfaecalis*(15)**
Cefoxitin	25 (56.81%)	15 (55.55%)	NT
Ciprofloxacin	27 (61.36%)	18 (66.66%)	14 (93.33%)
Chloramphenicol	26 (59.09%)	13 (48.14%)	10 (66.66%)
Clindamycin	38 (86.36%)	19 (70.37%)	9 (60%)
Cotrimoxazole	23 (52.27%)	15 (55.55%)	10 (66.66%)
Erythromycin	35 (79.54%)	20 (74.07%)	9 (60%)
Gentamicin	40 (90.90%)	22 (81.48%)	11 (73.33%)
Linezolid	44 (100%)	27 (100%)	15 (100%)
Penicillin	10 (22.72%)	6 (22.22%)	4 (26.66%)
Teicoplanin	39 (88.63%)	23 (85.18%)	10 (66.66%)
Tetracyclin	41 (93.18%)	21 (77.77%)	10 (66.66%)
Vancomycin	44 (100%)	27 (100%)	15 (100%)

Table 5:- Antibiotic sensitivity pattern of Enterobacteriaceae

Antibiotics	***Escherichia coli* (22)**	***Klebsiella pnuemoniae* (24)**
Amikacin	16 (72.72%)	20 (83.33%)
Amoxyclavulanic acid	6 (27.27%)	4 (16.66%)
Ampicillin	4 (18.18%)	3 (12.5%)
Aztreonam	3 (13.63%)	5 (20.83%)
Cefepime	5 (22.72%)	5 (20.83%)
Ceftriaxone	2 (9.09%)	2 (8.33%)
Cefoperazone - sulbactam	6 (27.27%)	6 (25%)
Ciprofloxacin	5 (22.72%)	9 (37.5%)
Chloramphenicol	17 (77.27%)	19 (79.16%)
Colistin	22 (100%)	24 (100%)
Cotrimoxazole	9 (40.90%)	11 (45.83%)
Ertapenem	8 (36.36%)	5 (20.83%)
Gentamicin	14 (63.63%)	16 (66.66%)
Imipenem	8 (36.36%)	5 (20.83%)
Meropenem	10 (45.45%)	11 (45.83%)
Piperacillin - tazobactum	6 (27.27%)	7 (29.16%)
Tetracycline	15 (68.18%)	18 (75%)
Tigecycline	22 (100%)	24 (100%)

Table 6:- Antibiotic sensitivity pattern of *Pseudomonas aruginosa*:-

Antibiotics	*Pseudomonas aruginosa* (n=27)
Amikacin	15 (55.55%)
Amoxyclavulanic acid	13 (48.14%)
Ampicillin	2 (7.40%)
Aztreonam	5 (18.51%)
Cefepime	10 (37.03%)
Ceftriaxone	8 (29.62%)
Ceftazidime	9 (33.33%)
Ciprofloxacin	9 (33.33%)
Colistin	27 (100%)
Cotrimoxazole	17 (62.96%)
Ertapenem	15 (55.55%)
Gentamicin	10 (37.03%)
Imipenem	14 (51.85%)
Levofloxacin	9 (33.33%)
Meropenem	16 (59.25%)
Piperacillin - tazobactum	14 (51.85%)

DISCUSSION

This study was conducted in the Department of Microbiology, T.S. Misra Medical College & Hospital, Lucknow. Total 256 pus samples were studied, among them 159 (62.10%) samples were positive for growth, rest 97(37.89%) samples were negative for growth. Out of total 159 positive samples, 86(54.08%) were gram positive organisms and 73 (45.91%) were gram negative organisms. Out of 159 culture positive samples, 44 (27.67%) were *Staphylococcus aureus,* 27(16.98%) were *Coagulase Negative Staphylococcus*, 15(9.43%) were *Enterococcus faecalis*, 27(16.98%) were *Pseudomonas aeruginosa,* 24(15.09%) were *Klebsiella pneumoniae and 22 (13.83%) were Escherichia coli.*

Similar type of study was conducted by Rameshkannan S et al , in which 124 pus samples were studied. Organisms isolated from pus culture reports were Escherichia coli (n= 75, 61%), Klebsiella (n=25, 21%), Staph aureus (n=12, 10%), Pseudomonas (4%), Enterobacter (2%), Proteus (2%), Staphylococcus
epidermidis (1%).[5]

In a study conducted by Mantravadi H B et al, out of 828 clinical samples, 458 showed growth. *Staphylococcus aureus* was the most common organism isolated (37%), followed by *Escherichia coli* (21%), *Klebsiella* (17%), *Pseudomonas* (8%).[6]

In a study by Kansal S et al a total of 63 pus samples were studied. Out of total63 samples, 42 bacterial isolates of 6 species were isolated which included 2 species of gram positive bacteria and 4 species of gram negative. [7]

In our study, Gram positive bacteria showed 100% sensitivity to Linezolid and Vancomycin. Staphylococcus aureus showed 93.18% sensitivity to tetracycline, 90.90% sensitivity to Gentamicin, 88.63% sensitivity to Teicoplanin and 86.36% sensitivity to Clindamycin.

In a study by Khan R A et al, out of (21.7%) *Staphylococcus aureus* found in the study, (100%) were sensitive to Linezolid, (100%) to Vancomycin. [8]

In a study by M. Subha *et al*, *Staphylococcus aureus* showed 100% sensitivityto vancomycin, 82.5% sensitivity to cefoxitin. *S. aureus* showed a high resistance to penicillin (56.25%), ciprofloxacin (36.25%) and erythromycin (31.25%). [9]

In a study by Gomatheswari S N *et al*, *Staphylococcus aureus* isolated were 100% sensitive to Vancomycin and Linezolid, 66% sensitive to amikacin, 66% sensitive to cefoxitin, 60%

sensitive to clindamycin, 50% sensitive to Erythromycin and 41% sensitive amoxicillin-clavulanic acid.[10]

In our study, *Coagulase Negative Staphylococcus* showed 100% sensitivity to Vancomycin and Linezolid, 85.18% sensitivity to Teicoplanin, 81.48% sensitivity to Gentamicin, 77.77% sensitivity to Tetracyclin, 74.07% sensitivity to Erythromycin, 70.37% sensitivity to Clindamycin.

In a study by Kumari P H P *et al*, among the five isolated strains of coagulase- negative Staphylococci, three of them were MDR and the other two showed sensitivity to antibiotics cefaperazone, co-trimoxazole and ticarcillin/clavulanicacid (20%). [11]

In our study, Enterococcus faecalis showed 100% sensitivity to Linezolid and Vancomycin; 93.33% sensitivity to Ciprofloxacin, 73.33% sensitivity to Gentamicin; 66.66% sensitivity to Chloramphenicol, Cotrimoxazole, Teicoplanin and Tetracyclin .

In a study by Soni et al, Enterococcus showed 100% sensitivity to Linezolid,Vancomycin and Teicoplanin. [12]

In our study, *Escherichia coli* showed 100% sensitivity to Tigecycline and Colistin. 77.27% sensitivity to Chloramphenicol, 72.72% sensitivity to Amikacin, 68.18% sensitivity to Tetracycline, 63.63% sensitivity to Gentamicin, 45.45% sensitivity to Meropenem, 40.90% sensitivity to Cotrimoxazole

In our study, *Klebsiella pnuemoniae* showed 100% sensitivity to Tigecycline and Colistin. 83.33% sensitivity to Amikacin, 79.16% sensitivity to Chloramphenicol, 75% sensitivity to Tetracycline, 66.66% sensitivity to Gentamicin, 45.83% sensitivity to Cotrimoxazole, 45.83% sensitivity to Meropenem.

In our study, *Pseudomonas aruginosa* showed100% sensitivity to Colistin.62.96% sensitivity to Cotrimoxazole, 59.25% sensitivity to Meropenem, 55.55% sensitivity to Amikacin and Ertapenem; 51.85% sensitivity to Imipenem and Piperacillin – tazobactum.

In a study by Chauhan M *et al*, Escherichia coli showed 87.80% sensitivity to Imipenem, 53.66% sensitivity to Gentamycin, 43.91% sensitivity to Ceftazidime. Klebsiella showed 100% sensitivity to Imipenem, 72.73% sensitivity to Ciprofloxacin, 60% sensitivity to Cephalothin. Pseudomonas showed 95.83% sensitivity to Imipenem, 56.1% sensitivity to Piperacillin, 51.22% sensitivity to Ceftazidime.[13]

CONCLUSION

Pyogenic wound infection is one of the most important cause of morbidity. Emerging antibiotic resistance among pyogenic bacteria has made treatment difficult in such cases. Appropriate use of antibiotics is very crucial in preventing emergence of multidrug resistant bacteria. So it is important for a clinician to send all the pus samples for microbiological analysis and their antibiogram before putting cases on antibiotic so that emergence of drug resistance can be minimized.

REFERENCES

1. Rao D, Basu R, Biswas D. Aerobic Bacterial Profile and Antimicrobial Susceptibility Pattern of Pus Isolates in a South Indian Tertiary Care Hospital. Journal of Dental and Medical Sciences 2014;**13**(3):59-62
2. Duggal S, Khatri P K, Parihar R S, Arora R. Antibiogram of Various Bacterial Isolates from Pus Samples in a Tertiary Care Centre in Rajasthan. International Journal of Science and Research 2015;**4**(5):1580-1584
3. Hanumanthappa P, Vishalakshi B, Krishna S. A Study on aerobic Bacteriological profile and Drug sensitivity pattern of Pus samples in a tertiary care hospital. Int.J.Curr.Microbiol.App.Sci 2016; **5**(1): 95-102
4. Trojan R, Razdan L, Singh N. Antibiotic Susceptibility Patterns of Bacterial Isolates from

Pus Samples in a Tertiary Care Hospital of Punjab, India. International Journal of Microbiology 2016:1-4

5. Rameshkannan S, Nileshraj G, Rameshprabu S, Mangaiarkkarasi A, MeherAli R. Pattern of pathogens and their sensitivity isolated from pus culture reports in a tertiary care hospital, Puducherry. Indian Journal of Basic and Applied Medical Research 2014;**4**(1):243-248
6. Mantravadi H B, Chinthaparthi M R, Shravani V. Aerobic isolates in pus and their antibiotic sensitivity pattern: a study conducted in a teaching hospital in Andhra Pradesh . International Journal of Medical Science and Public Health 2015;**4**(8):1076-1079
7. Kansal S, Jiloha P K. In–vitro antibiotic susceptibility pattern for gram positive bacterial pathogens isolated from pus sample in India. Journal of Innovative Biology 2015;**2**(2):234-238
8. Khan R A, Jawaid M, Khaleel M. Bacteriological Profile and Antibiogram of Isolates fromPus Samples in a Tertiary Care Centre. Int.J.Curr.Microbiol.App.Sci 2018;**7**(1): 387-394
9. Subha M, Srinivasagam M. Microbial Profile and Antimicrobial Susceptibility Pattern of Pus Culture Isolates from a Teaching Tertiary Care Hospital, South India. Int.J.Curr.Microbiol.App.Sci 2018;**7**(4): 1149-1153
10. Gomatheswari S N, Jeyamurugan T. Bacteriological Profile and the Antibiotic Susceptibility Pattern of Microorganisms Isolated from Pus/Wound Swab Isolates in Patients Attending a Tertiary Care Hospital in South India. Int.J.Curr.Microbiol.App.Sci 2017;**6**(10):1405-1413
11. Kumari P H P, Rani P U, Vijayalakshmi P. Evaluation of microbiological profile and antibiogram of aerobic bacteria isolated from pus samples. J Med Allied Sci 2018;**8**(1): 26 – 35
12. Soni, Pandey A, Chauhan K, Saini D. Spectrum of aerobic bacterial pathogen isolated from pus samples and their antibiotic sensitivity pattern in a tertiary care hospital. International Journal Of Scientific Research 2019; 8 (8): 10-12
13. Chauhan M, Manish S, Mahajan S. Aerobic Bacterial Profile and antibiotic sensitivity pattern of pus isolates in a tertiary care Hospital. Int.J.Curr.Microbiol.App.Sci (2015) 4(5):784-787