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# BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERNS OF PUS ISOLATES: A STUDY CONDUCTED IN TERTIARY CARE HOSPITAL OF NORTH BIHAR

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**ABSTRACT** **Background:** Pyogenic infections are characterized by local and systemic inflammation usually with pus formation. These may be endogenous or exogenous. A break in the skin can provide entry to the surface bacteria which thereby start multiplying locally. **Materials And Methods:** A cross sectional study was conducted in Department of Microbiology of SKMC, Muzaffarpur. Total of 860 pus samples send for aerobic culture and sensitivity from different departments to Department of Microbiology from January 2024 to July 2024 were included in the study. During this time period all pus/wound swab samples received were analysed for the identification of microorganisms and for the determination of their antibiotic susceptibility. **Results:** Of 860 pus samples collected, 324 (37.68%) were positive cultures for aerobic growth, which included 126(38.88%) Gram negative and 198 (61.11%) Gram positive bacteria. Among 324 culture positive pus samples, male patients had majority that is 201(62.03 %) and 123 (37.96%) were females. Most common organism isolated was followed by Staphylococcus aureus 116(58.58%)followed by Klebsiella spp 79(62.69%), CoNS 70(35.35%), E.Coli 15(11.90%), Pseudomonas Aeruginosa 11(8.37%), Streotococcus spp 4 (2.02%) ,Proteus spp 9(7.14%). **Conclusion:** Pyogenic wound infection is most important cause of morbidity. Emerging antibiotic resistance among pyogenic bacteria has a negative impact in treatment of such cases.

**KEYWORDS :** Pus isolates, Bacteriological profile, Antibiotic sensitivity patterns.

## INTRODUCTION

Pyogenic infections are characterized by local and systemic inflammation usually with pus formation.1 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 defence 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.[1]

Wound injuries are the most common and serious types of trauma and represent a major public health concern. There are many potential factors (age, sex, diabetes, stress, nutrition, oxygenation) involved in the complex wound healing process that can delay healing[2]

The most common causative agent includes Staphylococcus aureus which account for 20-40%. Infection with Pseudomonas aeruginosa occurs mainly following surgery and burns which account for 5-15%. Escherichia coli, Klebsiella sp., Proteus sp. and Enterococci sp. Are commonly associated with pyogenic infections [3,4].

Selection of an effective antimicrobial agent for a microbial infection depends on the causative agent, pathophysiology of the infectious process and on pharmacodynamics and pharmacokinetics of the antimicrobial agents. Also, antibiotic resistance to the commonly used antibiotics is now emerging as a result of misuse and abuse. [5] Bacteria have the ability to acquire resistance and can transfer the resistance from one bacteria to another [6] Earlier, such multidrug resistant organisms were common in immunosuppressed patients but now, reports are showing such infections in normal healthy individuals. The present study aimed to detect common bacteriological bprofile and their antibiotic susceptibility profile from wound infection.

### Objectives

1. To identify and isolate aerobic bacteria from pus samples.
2. To study antibiotic profile of aerobic bacteria.

## MATERIALAND METHODS

A cross sectional study was conducted in Department of Microbiology of SKMC, Muzaffarpur. Total of 860 pus samples send for aerobic culture and sensitivity from different departments to Department of Microbiology from January 2024 to July 2024 were included in the study.

**Characterization of Bacterial Isolates:** All the pus samples were processed aerobically. The pus specimen was inoculated on blood and Mac Conkey agar plates. The streaked plates were incubated at 37°C for 24 hr. Bacterial colonies on blood agar plates were later Gram stained. Characterization of bacterial isolates was based on standard microbiological methods. Identification of isolates were done based on colony morphology, motility, catalase test, oxidase test, coagulase test and biochemical tests like Tripal sugar iron agar, Hydrogen sulfide test, Carbohydrate fermentation test, Phenylalanine deaminase test, Methyl red test, Nitrate reduction test, Urease test, Vogesproskauer , Citrate utilization test, Indole test (Konemanet. al., 2005). The antibiotic sensitivity testing of all isolates will be performed by modified Kirby-Bauer's disc diffusion method on Mueller Hinton agar using antibiotics as per CLSI guidelines. [7]

## RESULTS :-

The present study was conducted at Department of Microbiology of SKMC, Muzaffarpur. Total of 860 pus samples send for aerobic culture and sensitivity from different departments to Department of Microbiology from January 2024 to July 2024 were included in the study. Of 860 pus samples collected, 324 (37.68%) were positive cultures for aerobic growth, which included 126(38.88%) Gram negative and 198 (61.11%) Gram positive bacteria. Among 324 culture positive pus samples, male patients had majority that is 201(62.03 %) and123 (37.96%) were females. Male to female ratio was 1.63:1. Maximum cases were positive for culture were in the age group of 21-30 years 45(26.62%).

Most common organism isolated was followed by Staphylococcus aureus 116(58.58%)followed by Klebsiella spp 79(62.69%), CoNS 70(35.35%), E.Coli 15(11.90%), Pseudomonas Aeruginosa 11(8.37%), Streptococcus spp 4 (2.02%) ,Proteus spp 9(7.14%), Enterococcus spp 8(4.04%) Acinetobacter spp 8 (6.34%), Enterobacter spp4 (3.17%). Among gram negative organisms Klebsiella spp was highly sensitive to Amikacin 65.7%, Gentamicin (82.6%), cefepime ( 86.8% ) cefoperazone- sulbactum (88.2%) and least sensitive to Ciprofloxacin (19.9%), Piperacillin-tazobactam (12.2%). Pseudomonas aeruginosa was highly sensitive to Piperacillin-Tazobactam (77.2%), Amikacin (49.8%), Imipenem (56.8%) and least sensitive to ciprofloxacin 38.9%. Among gram positive organisms Staphylococcus aureus was highly sensitive to Linezolid (100%), Vancomycin (100%), and least sensitive to Erythromycin 11.6%.

**Table 1: Culture Positive And Culture Negative Pus Samples**

| S.no | | | Percentage (%) |
|---|---|---|---|
| 1. | Total sample | 860 | |
| 2. | Culture Positive Pus samples | 324 | 37.68% |
| 3. | Culture Negative Pus samples | 536 | 62.32% |

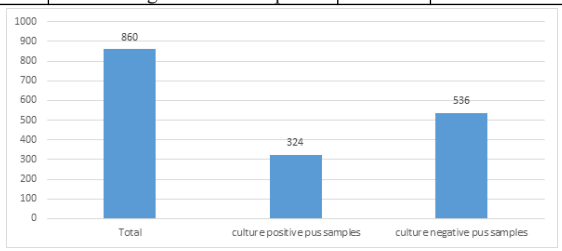


**Figure 1:** Culture positive and Culture negative pus samples

**Table 2: Sex Wise Distribution Of Aerobic Culture Positive Pus/wound Swab Samples (n=324)**

| Sex | Patients with positive cultures |
|---|---|
| Male | 201 (62.03%) |
| Female | 123 (37.96%) |

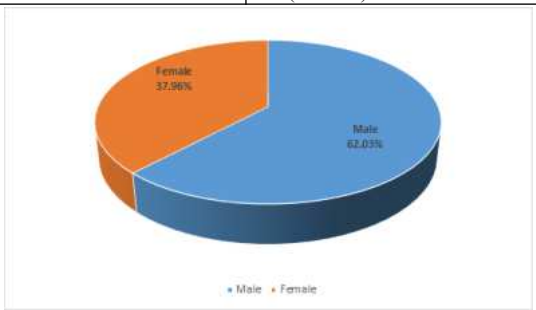


**Fig 2:** Sex wise distribution of aerobic culture positive pus/wound swab samples (n=324)

**Table 3: Age wise distribution of aerobic culture positive pus/wound swab samples (n=324)**

| Patient's age group | Number of positive samples |
|---|---|
| < 20 years | 29 (8.95%) |
| 20-40 years | 156 (48.14%) |
| 40-60 years | 60 (18.51%) |
| > 60 years | 79 (24.38%) |

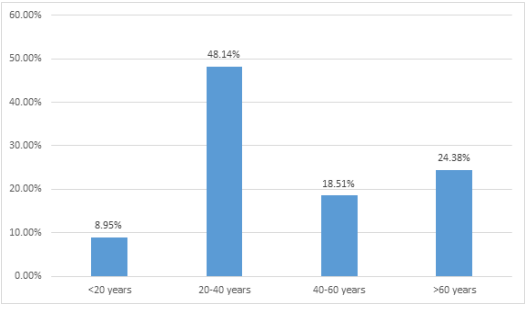


**Fig 3:** Age wise distribution of aerobic culture positive pus/wound swab samples (n=324)

**Table 4: Categorization of aerobic bacterial isolates obtained from positive pus cultures (n=324)**

| Gram positive cocci (GPC) (198) 61.11% | | | Gram negative bacilli (GNB) (126) 38.88% | | |
|---|---|---|---|---|---|
| Isolate | Number | % | Isolate | Number | % |
| Staphylococci aureus | 116 | 58.58% | Klebsiella pneumoniae | 79 | 62.69% |
| CONS | 70 | 35.35% | Escherichia coli | 15 | 11.90% |
| Enterococcus sp | 8 | 4.04% | Acinetobactersp | 8 | 6.34% |
| Streptococcus sp | 4 | 2.02% | Proteus sp | 9 | 7.14% |
| | | | Pseudomonas aeruginosa | 11 | 8.73% |
| | | | Enterobacter sp | 4 | 3.17% |

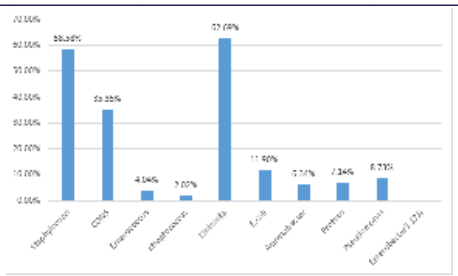


**Fig 4 :-** Positive Pus culture isolates

**Table 5: Antibiogram enterobacteriaeace :-**

| GNB Isolated | *E. coli* | *Klebsiella sp* | *Enterobacter sp* | *Proteus sp* |
|---|---|---|---|---|
| No of isolates | *15* | 79 | 4 | 9 |
| Antibiotic | % Sensitive | % Sensitive | % Sensitive | % Sensitive |
| Ampicillin | 5.1 | 32.1 | 52.7 | 80.7 |
| Gentamicin | 57.2 | 82.6 | 68.9 | 100.0 |
| Amikacin | 72.6 | 65.7 | 87.4 | 79.5 |
| Amoxy-clavulate | 12.5 | 52.7 | 56.7 | 100 |
| Cefoperazone-Sulbactam | 59.8 | 88.2 | 83.2 | 96.8 |
| Piperacillin-Tazobactam | 14.4 | 12.2 | 78.8 | 100 |
| Cefepime | 52.9 | 86.8 | 76.5 | 98.2 |
| Ceftriaxone | 31.6 | 65.3 | 77.8 | 77.9 |
| Imipenem | 74.9 | 77.8 | 88.9 | 92.7 |
| Ciprofloxacin | 68.6 | 19.9 | 54.8 | 82.7 |
| Tigecycline | 94.8 | 75.7 | 88.4 | 79.8 |

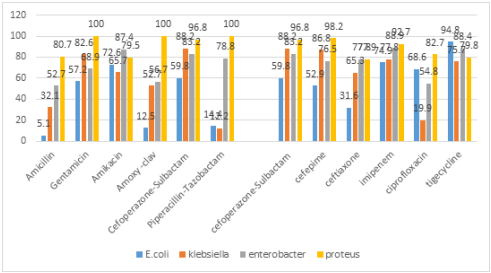


**Fig 5:** Antibiogram enterobacteriaeace :-

**Table 6: Antibiogram Non fermenters**

| GNB Isolated | *Pseudomonas aeruginosa* | *Acinetobacter sp* |
|---|---|---|
| No of isolates | 11 | 8 |
| Antibiotic | % Sensitive | % Sensitive |
| Ceftazidime | 26.5 | 64.8 |
| Gentamicin | 49.6 | 77.8 |
| Piperacillin-Tazobactam | 77.2 | 54.8 |
| Amikacin | 49.8 | 44.89 |
| Aztreonam | 68.7 | 88.6 |
| Cefoperazone-Sulbactam | 52.6 | 66.4 |
| Cefepime | 62.3 | 79.4 |
| Imipenem | 56.8 | 58.6 |
| Ciprofloxacin | 38.9 | 66.9 |
| Levofloxacin | 64.2 | 87.5 |

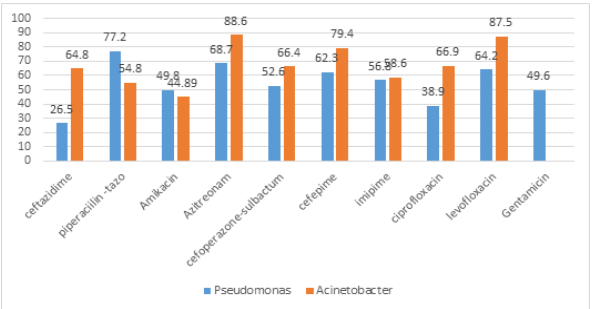


**Fig 6:** Antibiogram Non fermenters

**Table 7: Antibiogram Staphylococcus aureus**

| GPC Isolated | *Staphylococcus aureus* |
|---|---|
| No of isolates | 116 |
| Antibiotic | % Sensitive |
| Cefoxitin | 68.9 |
| Erythromycin | 11.6 |
| Clindamycin | 53.7 |
| Trimethoprim/Sulphamethoxazole | 58.6 |
| Daptomycin | 68.9 |
| Linezolid | 100 |
| Vancomycin | 100 |
| Tetracycline | 65.7 |
| Ciprofloxacin | 45.8 |
| Gentamicin | 54.6 |
| Teicoplanin | 82.5 |

## DISCUSSION

In the present study, out of 860 pus samples collected, 324 (37.68%) were positive cultures for aerobic growth, which included 126(38.88%) Gram negative and 198 (61.11%) Gram positive bacteria. Study done by **Dr. Harsh Vinubhai Singe et al (2024)** [8], Of 125 pus samples collected, 37(29.6%) were positive cultures, which included 16 (43.2%) Gram negative and 21(56.7%) Gram positive bacteria. and no growth in 88(70.4%) samples.

In the present study, majority of the patients were in the age groups 20-40 years. Similar findings were reported by **Manmeet Kaur Gill et al (2019)** [9], Majority of these patients were in the age groups of 20–40 years. In contrast to our study, study done by **G L S Sumanth Kumar et al (2019)** [10], found that age distribution among culture positive samples patients between 51-60 yrs contributed 29.3%.

In the present study, among 324 culture positive pus samples,male patients had majority that is 201(62.03 %) and 123 (37.96%) were females. Male to female ratio was 1.63:1. Our study is similar to the study by **Ferdush Jahan et al (2024)** [11], Out of 220 cases 165(75%) were Male and 55(25%) were female.

Recently, experimental studies have documented hormonal influences on the immune response in animals as well as in humans. Females have been observed to have more prominent hormonal and cell-mediated immune responses compared with males. study done by **Angele et al (1998)** [12], have implicated high testosterone and low estradiol levels in the pathogenesis of immune suppression following trauma and hemorrhage using their well-established rodent model. Male gender is associated with a dramatically increased risk of major infections following trauma. [13,14].

According to our study the most common organisim isolated was Staphylococci 116 (58.58%) followed by, Klebsiella pneumonia 79 (62.69%), CONS 70 (35.35%), e.coli 15 (11.90%), Pseudomonas aeruginosa 11 (8.73%), enterococcus 8 (4.04%), acinetobacter spp 8 (6.34%), streptococcus 4 (2.02%), enterobacter 4 (3.17%). Study done by Chandan Kumar et al (2024) 14. The microorganisms most frequently identified were Staphylococcus aureus (45%), Escherichia coli (25%), Pseudomonas aeruginosa (15%), and Klebsiella pneumoniae (10%).Similar findings was also reported by **Roopashree Set al (2021)** [15], Staphylococcus aureus was identified as the predominant organism (n=40), where 33 among 40 were methicillin sensitive, followed by Escherichia coli (n=30, 23.43%).

In the present study, Gram positive cocci (GPC) (198) 61.11% and Gram positive cocci (GPC) (198) 61.11% is found. In the study done by **M.S.S. Pradeep et al (2019)** [16] Out of 86 isolates, 29(33.7%) isolates are Gram positive organisms and 57(66.3%) isolates are Gram Negative organisms, among Gram positive isolates Staphylococcus aureus (MSSA) (44.8%) is predominant pathogen and in Gram negative isolates Escherichia coli (42.1%) is the predominant pathogen.

## CONCLUSION

Pyogenic wound infection is most important cause of morbidity. Emerging antibiotic resistance among pyogenic bacteria has a negative impact in treatment of such cases. Staphylococcus aureus is still one of the most important bacteria isolated among pyogenic wound infection. Even though gram negative bacteria out number it. Disturbances caused by changes in the normal flora and the contamination of wounds by pathogenic bacteria may lead to pyogenic infections; this may cause pathogenic microflora to multiply and further lead to diseases. The normal flora of every individual is not the same and depends on wound hygiene. The formulation of infection control measures and appropriate use of antibiotics must be considered as compulsory to alleviate wound infection rates.

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8. BACTERIOLOGICAL PROFILE OF PUS SAMPLES AND THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERN 1Dr. Harsh Vinubhai Singel, 2Dr. Binda Pipaliya ,3Dr. Tanuja Javdekar 1Assistant Professor,Microbiology Department,Smt. B. K. Shah Medical Institute & Research Centre,Sumandeep Vidyapeeth Deemed to be university,Piparia, Vadodara, Gujarat. 2Assistant Professor,Microbiology Department,Smt. B. K. Shah Medical Institute & Research Centre,Sumandeep Vidyapeeth Deemed to be university,Piparia, Vadodara, Gujarat. 3Professor & Head, Microbiology Department,Smt. B. K. Shah Medical Institute & Research, Article History Volume 6 Issue 12, 2024 Received: 25 May 2024 Accepted : 30 June 2024 doi: 10.48047/AFJBS.6.12.2024.1742-1745.
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