



### Original Article

## Bacteriological Profile and Antibiotic Susceptibility Pattern of *Pseudomonas aeruginosa* in Blood Samples of Septicemia Patients at PRH, Loni Bk. Bk.

Authors

Dr Rashmi Kharde<sup>1</sup>, Dr Abhay John<sup>2</sup>, Dr Rahul Kunkulol<sup>3</sup>, Sonali Tambe<sup>4</sup>

<sup>1,4</sup>Resident Department of Pharmacology

<sup>2</sup>Assistant Professor Department of Pharmacology PMT-PIMS

<sup>3</sup>Professor Department of Pharmacology PMT-PIMS

Corresponding Author

**Dr Abhay John**

Assistant Professor Department of Pharmacology PMT-PIMS

### Abstract

Hospital acquired infections occurring secondary to hospitalization are often more dangerous because the bacteria may already be resistant to antibiotics. Research findings have reported that inappropriate treatment of BSI and septicemia aggravates to increased mortality of patients and emerging of drug resistance strains. The present study aimed to study the microbiological profile and antibiotic sensitivity pattern of blood samples in patients of septicemia admitted in Pravara Rural Hospital, Loni.

**Aim & Objective:** To study bacteriological profile and antibiotic susceptibility pattern of *Pseudomonas aeruginosa* in Blood Samples of Septicemia Patients at PRH.

**Material and Methods:** This was a descriptive, cross sectional study done in department of pharmacology in collaboration with the Department of Microbiology, at Pravara Rural Hospital, Loni over a period of 1 year. All the blood samples of patients of septicaemia coming to the microbiology department for culture and sensitivity were enrolled for the study. Reports of all the blood samples of diagnosed patients of any age and either gender of Septicemia sent to microbiology laboratory for culture and sensitivity were included in the study. Reports of blood samples of burn patient, previously diagnosed cases of malignancy and immune-compromised states, patients on long term steroids and antibiotics were excluded from the study. The demographic profile, type and sensitivity profile of microorganism were recorded.

**Results:** Out of 300 blood samples 51.56% were monobacterial and 0.67% were polybacterial. The most predominant microorganism found were *pseudomonas* and *staphylococcus aureus* followed by *enterococcus* and *klebsiella*.

**Conclusion:** The study suggests that the common agents for septicaemia were *pseudomonas* and *staphylococcus aureus*. The sensitive antibiotics found for *pseudomonas* were amikacin, linezolid, teicoplanin, ciprofloxacin and for *staphylococcus* were vancomycin, linezolid, teicoplanin.

**Keywords:** Monobacterial, polybacterial, septicemia, *pseudomonas*.

### Introduction

Hospital acquired infections occurring secondary to hospitalization are often more dangerous

because the bacteria may already be resistant to antibiotics. Research findings have reported that inappropriate treatment of BSI and septicemia

aggravates to increased mortality of patients and emerging of drug resistance strains. The present study aimed to study the microbiological profile and antibiotic sensitivity pattern of blood samples in patients of septicemia admitted in Pravara Rural Hospital, Loni.

Due to significant changes in microbial genetic ecology, as a result of indiscriminate use of antimicrobials, the spread of anti-microbial resistance is now a global problem. Every time antibiotics are used whether appropriately or not in human being, the probability of the development & spread of antibiotic resistant bacteria increases. According to CDC, *Pseudomonas aeruginosa* infections are found in 4 per thousand admissions in hospitals. Despite therapy, the mortality due to nosocomial pseudomonal pneumonia is approximately 70%.<sup>[1]</sup> Unfortunately, *P. aeruginosa* demonstrates resistance to multiple antibiotics, thereby jeopardizing the selection of appropriate treatment.<sup>[2]</sup> Therefore, the present study was undertaken to find out the antibiotic susceptibility patterns of pathogenic isolates of *Pseudomonas aeruginosa* at a tertiary care hospital, PRH, Lon.

*P. aeruginosa* is one of the most important causes of morbidity in the general population and is the second most common cause of hospital visits.<sup>[3,4]</sup> The results are in corroboration with the one reported by other workers,<sup>[4]</sup> there is the overall resistance to various generations of cephalosporins. Among the aminoglycosides, amikacin has the highest sensitivity against *P. aeruginosa*.<sup>(5)</sup> Amikacin was designed as a poor substrate for the enzymes that bring about inactivation by phosphorylation, adenylation or acetylation, but some organisms have developed enzymes that inactivate this agent as well. Amikacin seems to be a promising therapy for Pseudomonal infection. Hence, its use should be restricted to severe nosocomial infections, in order to avoid rapid emergence of resistant strains.<sup>(6)</sup> The problem of increasing resistance to *P. aeruginosa* has limited the use of other classes of

antibiotics like the fluoroquinolones, tetracyclines, macrolides and chloramphenicol<sup>(7)</sup>

In fact, the irrational and inappropriate use of antibiotics is responsible for the development of resistance of *Pseudomonas species* to antibiotic monotherapy. There is a need to emphasize the rational use of antimicrobials and the concept of "reserve drugs" susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. Periodic susceptibility testing should be carried out over a period of two to three years, to detect the resistance trends. The study was done to focus on a rational strategy on the limited and prudent use of anti-Pseudomonal agents.

### **Aim & Objective**

To study bacteriological profile and antibiotic susceptibility pattern of *Pseudomonas aeruginosa* in Blood Samples of Septicemia Patients at PRH

### **Material and Methods**

This was a descriptive, cross sectional study done in department of pharmacology in collaboration with the Department of Microbiology, at Pravara Rural Hospital, Loni over a period of 1 year. Blood samples of 300 patients of septicemia coming to the microbiology department for culture and sensitivity were enrolled for the study. Reports of all the blood samples of diagnosed patients of any age and either gender of Septicemia sent to microbiology laboratory for culture and sensitivity were included in the study. Reports of blood samples of burn patient, previously diagnosed cases of malignancy, immune-compromised states, patients on long term steroids and antibiotics were excluded from the study. The demographic profile, type and sensitivity profile of microorganism were recorded.

### **Inclusion Criteria**

- All the blood samples of pseudomonas positive Septicemia sent to microbiology laboratory for culture and sensitivity

**Exclusion Criteria**

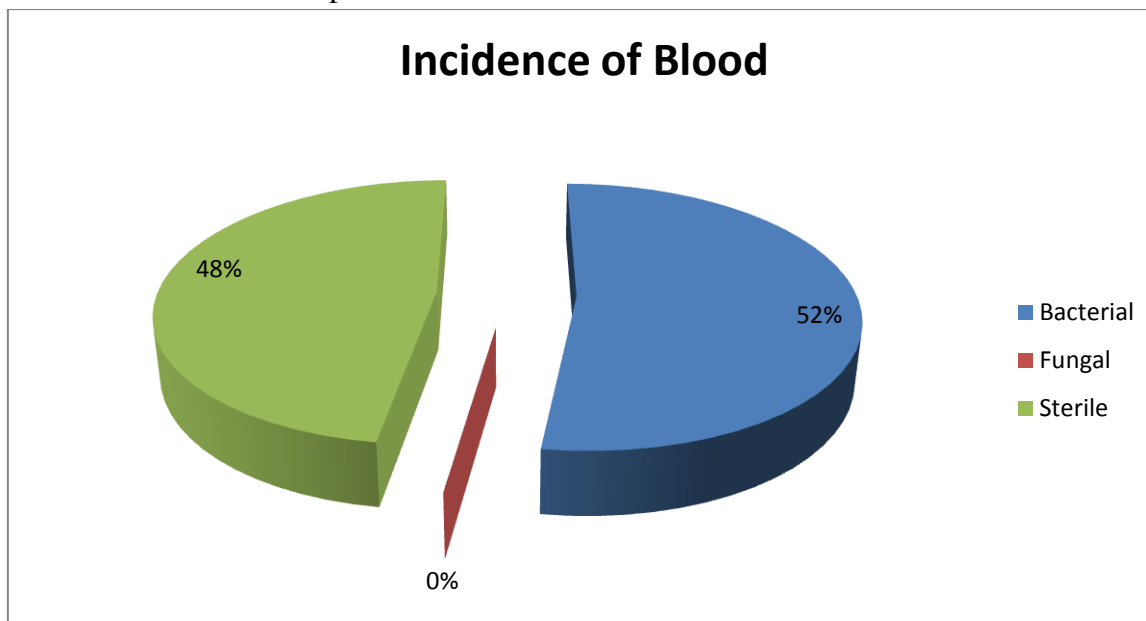
Blood samples of burn patient

- Samples which were negative for pseudomonas
- Samples from neonates

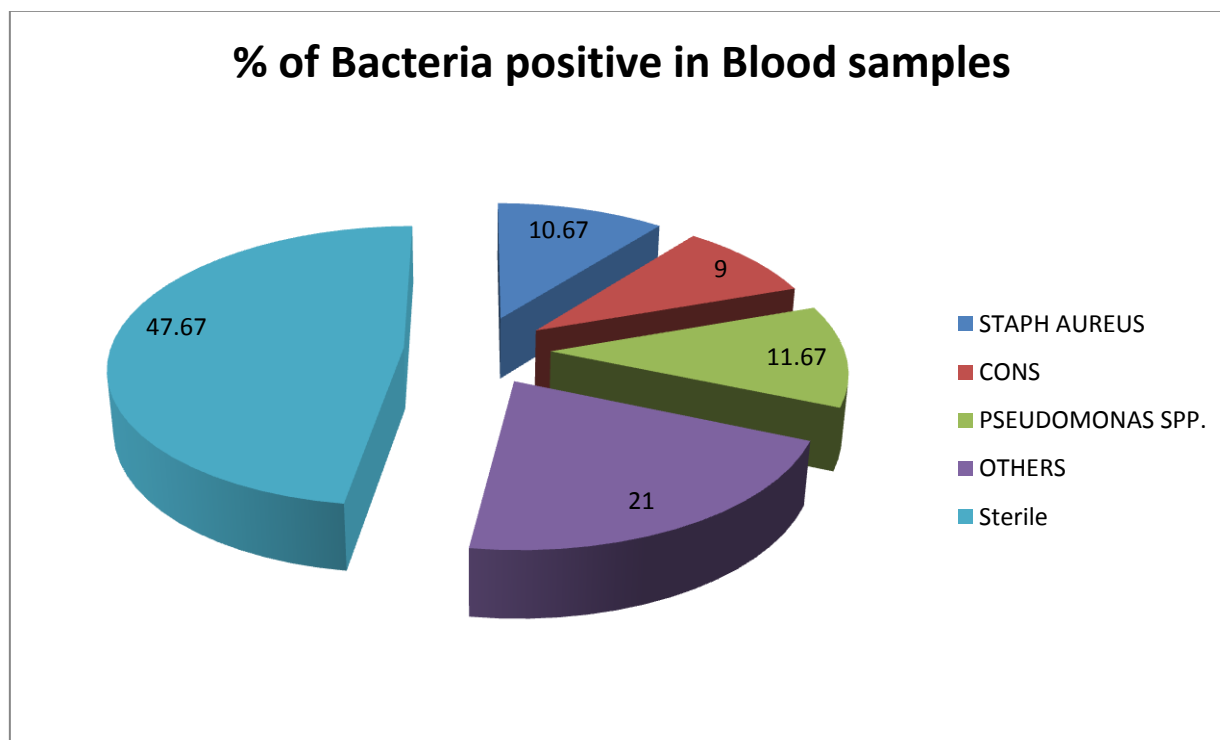
**Observations**

Out of 300 blood samples 51.56% were monobacterial and 0.67% were polybacterial. The most predominant microorganism found were pseudomonas and staphylococcus aureus followed by enterococcus and klebsiella.

**Figure.1:** Incidence of Blood Sample

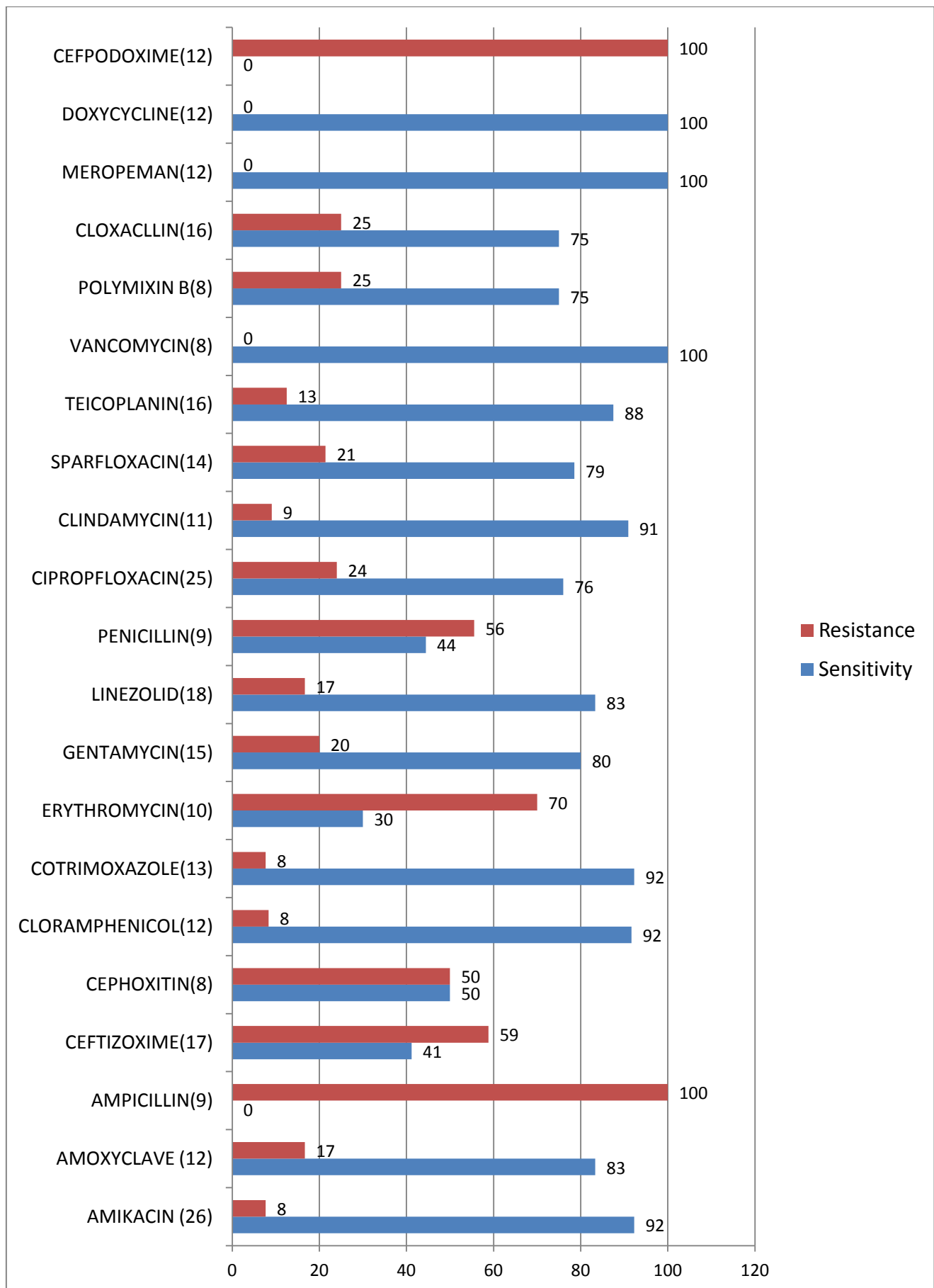


In 52% of the blood samples there was bacterial growth 48% of the blood samples were sterile and there was no fungal growth



46.77 % blood samples contained STAPH AUREUS 11.67 were PSEUDOMONAS SPECIES 9% were CONS others were 21% and 10.67% were sterile

Antibiotic Sensitive Pattern of Pseudomon



## Discussion

Hospital acquired infections occurring secondary to hospitalization are often more dangerous because the bacteria may already be resistant to antibiotics. *P. aeruginosa* is one of the most important causes of morbidity in the general population and is resistant to most of the commonly used antibiotics.<sup>(2)</sup> *P. aeruginosa* is the second most common cause of hospital on admissions as a result of bacterial infection.<sup>[3,4]</sup>

The present study was done to study bacteriological profile and antibiotic susceptibility pattern of *Pseudomonas aeruginosa* in Blood Samples of Septicemia Patients at PRH Loni. All the blood samples of patients of septicemia coming to the microbiology department for culture and sensitivity were enrolled for the study.

In our study out of the total 300 blood samples 48% were sterile and in 52% of the blood samples there was bacterial growth and there was no fungal growth in the blood samples. Out of blood samples with bacterial growth 51.56% were monobacterial and 0.67% were polybacterial. The most predominant microorganism found were *Pseudomonas* and *Staphylococcus aureus* followed by *Enterococcus* and *Klebsiella*. Our study is very similar to the study done by Obritshe et al .

The study done by Sonali and Rahul et al<sup>(9)</sup> suggests that the common bacterial isolates in pus samples of burn patients were *Pseudomonas Aeruginosa* and *Staphylococcus Aureus*, similar to our study but the study was done in the pus samples obtained from burn patients and in the current study burn patients were excluded

The results in our study are in agreement with the one reported by Navaneet BV et al and Obritshe et al, in their study also there is the overall resistance to various generations of cephalosporins, ampicillin and erythromycin<sup>(2,3)</sup>. Among the aminoglycosides, amikacin has the highest sensitivity against *P. aeruginosa* which is in agreement with the study done by Smitha et al.<sup>(5)</sup> Amikacin was designed as a poor substrate for the enzymes that bring about inactivation by phosphorylation, adenylation or acetylation, but

some organisms have developed enzymes that inactivate this agent as well. Amikacin seems to be a promising therapy for *Pseudomonas* infection. Hence, its use should be restricted to severe nosocomial infections, in order to avoid rapid emergence of resistant strains.<sup>(6)</sup> The problem of increasing resistance to *P. aeruginosa* has limited the use of other classes of antibiotics like the fluoroquinolones, tetracyclines, macrolides and chloramphenicol<sup>(7)</sup> In study done by Mehta and Rahul et al *Pseudomonas aeruginosa* was found to be the most common bacterial isolate in the ear swab of the patients with COM<sup>(8)</sup> The antibiogram pattern revealed that the most common gram negative isolate *Pseudomonas aeruginosa* was found highly sensitive to following antibiotics PB- Polymixin B (98.4%) , CL- Colistin, (98%), MRP-Meropenam (82.68%) IPM- Imipenem/ Cilastin (82.6%), PIT- Piperacillin-Tazobactam (84.25%), for all these antibiotics sensitivity was more than 80%, same were the findings in the study done by Mehta and Rahul et al<sup>(8)</sup> in his study also meropenam was very sensitive against *Pseudomonas aeruginosa*

In our study *Pseudomonas aeruginosa* displayed high resistance against TCC- Ticarcillin/ Clavulanic acid (85.83%), PI- Piperacillin (80.31%), LOM-Lomifloxacin.

The antibiotic sensitivity pattern revealed that *S. aureus* was found highly sensitive to as many as 10 antibiotics with 100% sensitivity for LZ- Linzolid followed by TEI-Teicoplanin (99.06%), TOB- Tobramycin (98.11%), VA-Vancomycin (98.11%), LE-Levofloxacin (97.17%), AK- Amikacin (97.17%), PIT-Piperacillin-Tazobactam (97.17%), IP- Imipenem (97.17%), G- Gentamicin (96.23%), Doxycyclin (95.28%), CFS- Cefoperazone/Tazobactam (92.45%), CPT- Cefepime /Tazobactam (92.45%), MRP-Meropenam (80%) same were the findings in the study done by Ali reza Ekrami et al<sup>(10)</sup>

*S. aureus* displayed high resistance against A- Ampicillin 91.51% and LOM-Lomifloxacin (76.42%) here our study closely resembles with the study done by Mehta and Rahul et al<sup>(9)</sup>

Finally we came to a conclusion that the irrational and inappropriate use of antibiotics is responsible for the development of resistance of *Pseudomonas species* to antibiotic monotherapy. Hence, there is a need to emphasize the rational use of antimicrobials and strictly adhere to the concept of “reserve drugs” susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. Periodic susceptibility testing should be carried out over a period of two to three years, to detect the resistance trends. Also, a rational strategy on the limited and prudent use of anti-Pseudomonal agents is urgently required.

### Conclusion

The study suggest the common agents required for the treatment of septicaemia is pseudomonas infecton The sensitive antibiotics found for pseudomonas were amikiacin, linezolid, teicoplanin ciprofloxacin.. The aminoglycoside group of antibiotics - amikiacin – demonstrated maximum sensitivity against pseudomonas species. Therefore, use of amikacin should be restricted to severe nosocomial infections, in order to avoid rapid emergence of resistant strains.

### References

1. Chastre J, Trouillet JL. Problem pathogens (*Pseudomonas aeruginosa* and *Acinetobacter*) Semin Respir Infect. 2000;15:287–98.
2. Obritsch MD, Fish DN, McLaren R, Jung R. National Surveillance of Antimicrobial Resistance in *Pseudomonas aeruginosa* isolates obtained from Intensive Care Unit Patients from 1993 to 2002. Antimicrob Agents Chem. 2004;48:4606–10.
3. Navaneeth BV, Belwadi S, Suganthi N. Urinary pathogens resistant to common antibiotics: A retrospective analysis. Trop Doct. 2002;32:20–2
4. Chitnis SV, Chitnis V, Sharma N, Chitnis DS. Current status of drug resistance among gram negative bacilli isolated from admitted cases in a tertiary care centre. J Assoc Physicians India. 2003;51:28–32.
5. Smitha S, Lalitha P, Prajna VN, Srinivasan M. Susceptibility trends of *Pseudomonas species* from corneal ulcers. Indian J Med Microbiol. 2005;23:168–171
6. Poole K. Aminoglycosides resistance in *Pseudomonas aeruginosa*. Antimicrob Agents Chem. 2005;49:479–
7. Chambers HF. General Principles of antimicrobial therapy. In: Brunton LL, Lazo JS, Parker KL, editors. Goodman and Gilman's The Pharmacological Basis of Therapeutics. 11th ed. Mc-Graw Hill: Medical Publishing Division; 2006. pp. 1095–110.
8. Mehta M, Saha P, Kunkulol R, Simar H, Mehta N. Microbiological Profile and Antibiotic Sensitivity Pattern of Active Mucosal Chronic Otitis Media and Active Squamous Chronic Otitis Media (with Cholesteatoma) in a Tertiary Care Hospital of Hisar, (Haryana) India. Ann Clin Otolaryngol. 2017; 2(3): 1019.
9. Mrs. Sonali Tambe, Dr Rahul Kunkulol\*, Dr Rashmi Kharde, Mrs Vandana Pulate Bacteriological Profile in Pus Sample of Burn Patients Admitted in PravaraRural Hospital Loni JMSCR Volume 06 Issue 05 May 2018 1.0,
10. Alireza Ekrami, Enayat Kalantar, Bacteria linfection in burn patients at a burn hospital in Iran. Indian J Med Res 126, December 2007, PP- 541-544.