

# Prevalence of Multidrug Resistant *Pseudomonas Aeruginosa* Infection in Burn Patients at a Tertiary Care Centre Jamnagar, Gujarat, India

Mehta Isha<sup>1</sup>, Surani Chandani<sup>1\*</sup>, Mehta Krunal<sup>2</sup>, Mullan Summaiya<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Microbiology, M. P. Shah Govt. Medical College and G.G.G. Hospital Jamnagar, Gujarat, India

<sup>2</sup>Assistant Professor, Department of Microbiology, M. P. Shah Govt. Medical College and G.G.G. Hospital Jamnagar, Gujarat, India

<sup>3</sup>Professor and Head, Department of Microbiology, M. P. Shah Govt. Medical College and G.G.G. Hospital Jamnagar, Gujarat, India

\*Corresponding author: Surani Chandani

| Received: 17.03.2019 | Accepted: 27.03.2019 | Published: 31.03.2019

DOI: [10.21276/sjpm.2019.4.3.13](https://doi.org/10.21276/sjpm.2019.4.3.13)

## Abstract

**Objective:** *Pseudomonas aeruginosa* is an important cause of hospital acquired infection especially in patients admitted in critical care units such as intensive care units and burn care units. In recent times, it has emerged as a widespread Multi Drug Resistant (MDR) pathogen which requires antibiotic susceptibility testing on a regular as well as a periodic basis. This study was carried with an aim to determine the antimicrobial resistance pattern and prevalence of MDR *P. aeruginosa* infection among burns patients at a tertiary care centre. **Material and Methods:** This retrospective study of pus samples of hospitalized patients in burn wards between January 2018 to June 2018 was carried out. The intensity of use of antibacterial agents and resistance of *P. aeruginosa* to common anti-Gram-negative antibiotics were measured. The antibiotic sensitivity testing of all *P. aeruginosa* isolates was done using Kirby-Bauer disc diffusion method and the results were interpreted according to the Clinical and Laboratory Standards Institute guidelines (CLSI) 2017. **Results:** Out of these 130 clinical specimens, *Pseudomonas aeruginosa* was isolated in 38(29.2%) samples. *P. aeruginosa* showed maximum sensitivity to Imipenem (90%), Piperacillin-tazobactam (78%) and Gatifloxacin (52.6%) followed by Tobramycin (28.9%), Ciprofloxacin (23.6%) and Gentamycin (13.1%). **Conclusion:** *Pseudomonas* was the commonest cause of infection in fire burn patients in our setting. About 29.2% of the isolates showed multiple resistances. In light of our findings, regular antibiotic resistance test has to be done for each patient in order to select an appropriate antimicrobial agent.

**Keywords:** Burn, *Pseudomonas aeruginosa*, antibacterial agents, drug resistance, antimicrobial.

**Copyright © 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and sources are credited.

## INTRODUCTION

*Pseudomonas aeruginosa* is a leading cause of healthcare associated infection especially in patients admitted to critical care units such as intensive care units (ICUs) and burn care centers [1]. It is an opportunistic pathogen and can survive in the hospital environment. *P. aeruginosa* infection is associated with increased morbidity and mortality in immunosuppressed patients [2]. Becoming resistant to many anti-pseudomonal agents. Therefore, treatment of burn patients infected with *P. aeruginosa* becomes very difficult and prolonged hospital stay are important factors responsible for infection of burn wound with such opportunistic pathogens especially multi-drug resistant (MDR) *P. aeruginosa* [3]. The presence of dead, denatured tissues and moist environment makes the burn wound vulnerable to infection by *P. aeruginosa*. Patients and their relatives are important sources of *P. aeruginosa* in ICU or other critical care units and have become a potential source of healthcare-associated infections [4]. *P. aeruginosa* is naturally

resistant to many antibiotics and it is increasingly treatment options [4].

This study was conducted with an aim to determine the antimicrobial resistance pattern and prevalence of MDR *P. aeruginosa* infection among burns patients at a tertiary care center.

*P. aeruginosa* is responsible for about 10% - 20% of nosocomial infections as septicemia in the wound and burn infections, cystic fibrosis in intensive-care units (ICUs), etc [5]. In nosocomial environments, strains of *P. aeruginosa* are the cause of several diseases, predominantly bacteremia, pneumonia, meningitis, urinary tract infections, and skin as well as soft-tissue infections [6].

Several different epidemiological studies indicate that antibiotic resistance is increasing in clinical isolates [7]. Being gram-negative bacteria, most *pseudomonas* spp. are naturally resistant to penicillin

and majority of related beta-lactum antibiotics, but a number are sensitive to Piperacillin-Tazobactam and Imipenam, Nowadays more and more resistance of *P.aeruginosa* are encountered in routine clinical practice, a serious problem, increase morbidity and mortality and also cost of treatment.

## MATERIALS AND METHODS

This study was a retrospective study done in Department of Microbiology, Shri M.P. Shah Govt. Medical College and Guru Gobindsingh Government Hospital Jamnagar, Gujarat (India) from January 2018 to June 2018. In this study, antimicrobial susceptibility testing of isolates was done by Kirby-Bauer disc diffusion method and the results were interpreted according to the CLSI guidelines 2017. A total of 130 clinical specimens from different wards were included in the study. Out of these 130 clinical specimens, *Pseudomonas aeruginosa* was isolated in 38(29.2%) samples.

### Sampling

Pus samples were collected from Burns Ward. Pus samples from burn wounds were collected after removal of gauge bandage roll and before regular wound dressing. The tips of the swab cotton sticks were then transferred to sterile buffer peptone water tubes and transported to the laboratory.

### Isolation and identification of *P. aeruginosa*

All the samples were inoculated on MacConkey agar, Blood agar and Nutrient agar plates. The culture plates were incubated aerobically for 24 hrs at 37°C. Growth and cultural characteristics were observed next day. Bacterial pathogens were identified by conventional biochemical methods according to standard microbiological techniques.

### Confirmation of *P. aeruginosa*

After obtaining the pure strains, the strains were subjected to biochemical identification tests to identify *Pseudomonas* spp. For this purpose strains were inoculated in Triple Sugar Iron media (TSI), Citrate media, Peptone water, Urease media and kept in an incubator for 18hrs at 37°C. Next day the results were noted on TSI, Citrate media and Urease media. Part of growth on Peptone water was subjected to Indole test with Kovac's Reagent and part for motility test by 'Hanging drop' method. A strain of *Pseudomonas* in the TSI medium showed alkaline slant,

no reaction in butt. It showed negative reaction for Indole test, negative urease test and positive citrate test. Glucose is utilized oxidatively, forming acid only [8].

### Antibiotic susceptibility test

The organism was identified by its culture characteristics, gram staining and various biochemical reactions performed by standard bacteriological methods. Antimicrobial susceptibility testing of isolates was done by Kirby-Bauer disc diffusion method and each isolate was evaluated for antibiotics susceptibility to different antibiotics i.e. Piperacillin-Tazobactam, Imipenam, Gatifloxacin, Tobramycin, Gentamycin and Ciprofloxacin. The results were interpreted according to Clinical Laboratory Standard Institute guidelines [14].

## RESULTS AND DISCUSSION

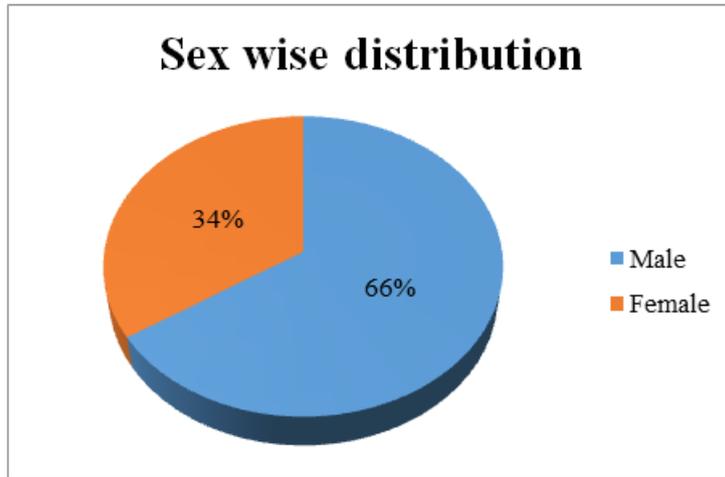
Out of 130 clinical specimens from burns ward, *Pseudomonas aeruginosa* was isolated in 38(29.2%) samples. *P.aeruginosa* infection is more in males as compared to females. Out of them 25 (66%) were males and 13 (34%) were female (Figure-1). Elderly age group were commonly affected in our study (Table-1), associated with comorbidities, and long hospital stay.

*P.aeruginosa* showed maximum sensitivity to Imipenem (90%), Piperacillin-tazobactam (78%) and Gatifloxacin (52.6%) followed by Tobramycin (28.9%), Ciprofloxacin (23.6%) and Gentamycin (13.1%) (Figure-3).

In present study sex wise prevalence of clinical isolates shows that infections caused by *Pseudomonas aeruginosa* are more common in males (66%) compared to females (34%). This is comparable with study of Solanki Manoj *et al.*, [9] and Rakesh Kumar *et al.*, [10].

Antimicrobial susceptibility testing was carried out for all 38 isolates of *P. aeruginosa* by Kirby-Bauer disk diffusion method. *P. aeruginosa* showed maximum sensitivity to Imipenem (90%), Piperacillin-tazobactam (78%) and Gatifloxacin (52.6%) comparable with study of Romika Dawra *et al.*, [11].

Resistance to Imipenem was seen in 10 % isolates in present study, similar rate were observed in the study of Solanki Manoj *et al.*, 8.82% [9] and Sapana Mundhada *et al.*, 11.76% [12].



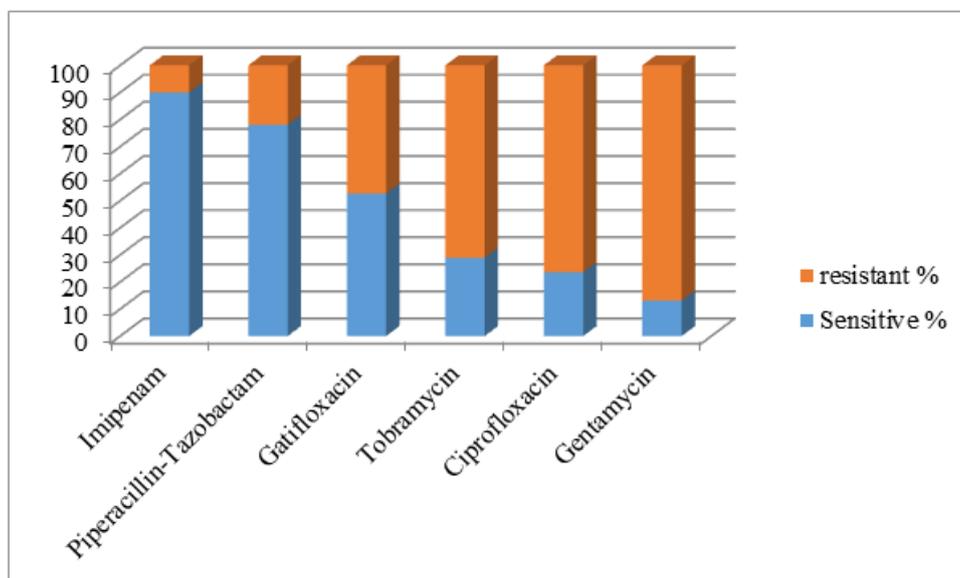
**Fig-1: Sex-wise distribution of the study population**



**Fig-2: Kirby-Bauer disc diffusion method for antimicrobial susceptibility testing of *Pseudomonas aeruginosa* isolates**

**Table-1: Age group wise distribution n= 38**

Age (Year)	Total Positive
0-20	3
20-40	14
>40	21
Total	38



**Fig-3: Antibiogram of *Pseudomonas aeruginosa* isolates**

The absence of new anti-pseudomonal agents against MDR *P. aeruginosa* has amplified the problem. Therefore, polymyxin B becoming the last resort for the treatment of such infections. The lack of any new compounds in the near future indicates that national and local surveillance efforts are essential, to provide clinicians with correct information for choosing right antimicrobial therapy

## CONCLUSION

The prevalence of *P. aeruginosa* infections in burn patients was found to be 29.2%, and the prevalence of multi-drug resistance among these isolates was. Such a high prevalence of MDR *P. aeruginosa* infection in burn patients is a cause for concern because it poses a serious therapeutic challenge due to very limited treatment options. The lack of newer antimicrobial agents with activities against *P. aeruginosa*, makes periodic studies on the antimicrobial resistance patterns very important [11, 13].

## ACKNOWLEDGEMENT

I express my heartfelt thanks and gratitude to my institution, Shri M.P.Shah Govt. medical college and GGG hospital, Jamnagar for allowing me to conduct the study.

## REFERENCES

1. Moazami-Goudarzi, S., & Eftekhari, F. (2013). Assessment of carbapenem susceptibility and multidrug-resistance in *Pseudomonas aeruginosa* burn isolates in Tehran. *Jundishapur Journal of Microbiology*, 6(2), 162-165.
2. Ekrami, A., & Kalantar, E. (2007). Bacterial infections in burn patients at a burn hospital in Iran. *Indian Journal of Medical Research*, 126(6), 541-544.
3. Naqvi, Z. A., Hasmi, K., Rizwan, Q. M., Kaarat, S. A. (2005). Multidrug resistance in *Pseudomonas aeruginosa*: A healthcare associated infectious threat in burn patient. *Pakistan Journal Pharmacol*, 22:9-15.
4. Ikpeme, E. M., Nfongeh, J. F., Enyi-Idoh, K. H., Etim, L. B., & Akubueyi, F. C. (2013). Prevalence, antibiogram profile and cross transmission of *Pseudomonas aeruginosa* in a tertiary burn unit. *Malaysian Journal of Microbiology*, 9(1), 116-119.
5. Carmeli, Y., Troillet, N., Eliopoulos, G. M., & Samore, M. H. (1999). Emergence of antibiotic-resistant *Pseudomonas aeruginosa*: comparison of risks associated with different antipseudomonal agents. *Antimicrobial agents and chemotherapy*, 43(6), 1379-1382.
6. Wróblewska, M. (2006). Novel therapies of multidrug-resistant *Pseudomonas aeruginosa* and *Acinetobacter* spp. infections: the state of the art. *Archivum immunologiae et therapiae experimentalis*, 54(2), 113-120.
7. Koneman, S. (2006). Color Atlas and textbook of diagnostic Microbiology, Sixth Edition, The Nonfermentative Gram-Negative Bacilli, 303-391, Lippincott Williams & Wilkins.
8. Rajat, R. M., Ninama, G. L., Mistry, K., Parmar, R., Patel, K., & Vegad, M. M. (2012). Antibiotic resistance pattern in *Pseudomonas aeruginosa* species isolated at a tertiary care hospital, Ahmadabad. *Natl J Med Res*, 2(2), 156-159.
9. Manoj, S., Krunal, D. M., & Mala, S. (2018). *Pseudomonas aeruginosa* in Nosocomial Infection: Burden in Surgical Site of Tertiary Care Unit. *International Journal Current Microbiology Applied Science*, 7(5): 2746-2750

10. Kumar, R., Srivastava, P., Rishi, S., Dahiya, S., Hemwani, K., & Nirwan, P. S. (2014). Detection and antimicrobial susceptibility pattern of *Pseudomonas aeruginosa* isolates in various clinical samples with special reference to metallo beta lactamase from a tertiary care hospital in Jaipur, India. *National Journal of Medical Research*, 4(2), 128-31.
11. Romika, D., Rajni, S., Rekha, B., & Aruna, V. (2017). High Incidence of Multidrug Resistant *Pseudomonas aeruginosa* Isolated from Infected Burn Wounds in a Tertiary Hospital. *International Journal Current Microbiology Applied Science*, 6(2): 1134-1139.
12. Sapana, M., Anu, S., Kishor, I., & Sadiya, S. (2017). Prevalence of *Pseudomonas aeruginosa* in Surgical Site Infection in a Tertiary Care Centre. *International Journal Current Microbiology Applied Science*. 6(4): 1202-1206.
13. Sharma, B., Sharma, R., Pal, N., & Vyas, L. (2011). Microbiological Profile and Antibiotic Sensitivity Pattern of Burn Wound Infection in an Indian Tertiary Care Hospital. *Journal of Pure and Applied Microbiology*, 5(2), 837-841.
14. Arendrup, M. C., Prakash, A., Meletiadiis, J., Sharma, C., & Chowdhary, A. (2017). Comparison of EUCAST and CLSI reference microdilution MICs of eight antifungal compounds for *Candida auris* and associated tentative epidemiological cutoff values. *Antimicrobial agents and chemotherapy*, 61(6), e00485-17.