Identification and antibiotic profile of Pseudomonas aeruginosa from different clinical samples at a tertiary care hospital, Kanpur, Uttar Pradesh.

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Abstract:

Background: Pseudomonas aeruginosa (P. aeruginosa) is an epitome of opportunistic nosocomial pathogen, which causes a wide spectrum of infections and leads to substantial morbidity in immuno-compromised patients. Despite therapy, the mortality due to nosocomial pseudomonal pneumonia is approximately 70%.

Aim and Objective: The aim of this study was to identify and isolate Pseudomonas aeruginosa and to find its antibiotic pattern in different clinical samples.

Material & Methods: This was a retrospective study. A total 1140 samples were asessed during the time period of one year i.e., January to December 2022. All the samples were collected and process in the microbiology laboratory of RMCH&RC.

Results: Out of 1140 different clinical samples 62(5.43%) Pseudomonas aeruginosa isolates were isolated and it is more in males(82.2%) than females(17.7%).maximum numbers of isolates were isolated from the pus samples(64.5%), mostly from the surgery ward(27.4%).it is found that Pseudomonas aeruginosa shows maximum sensitivity towards meropenem, imipenem,amikacin and 100% sensitive against piperacillin-tazobactum, polymyxin B and colistin.

Conclusion: As it was more prominent in the patients from surgery ward it is important to follow bundle care and should monitor the use of antibiotic susceptibility pattern of P.aeruginosa which will help in the treatment and will automatically reduce infections rate in the hospitals.

Keywords: Antibiotic profile, Pseudomonas aeruginosa, broad-spectrum,meropenem**.**

Introduction

Pseudomonas aeruginosa (P. aeruginosa) is an opportunistic bacteria which causes an extensive spectrum of infections ranging from ear infections, bacteremia, urinary tract infections, burn infections, bacteremia and respiratory tract infections.[1,2]. Prevalence rate of P. aeruginosa infection ranges from 10-30% in India.[3]It causes both hospitalized and community acquired infections. P. aeruginosa infection pose a therapeutic challenge as the organism has both intrinsic and acquired resistance to various classes of antibiotics. As antibiotic resistance is increasing drastically among the P. aeruginosa which is a threat to the Public health. Hence monitoring these bacterial populations is necessary to formulate the antibiotic treatment policy. This analysis was done to assess the antibiotic profile of P. aeruginosa isolates from different specimens.

Material and Methods

This retrospective study was done in a RMCH&RC,Mandhana, Kanpur during the period of one year i.e, January-December 2022. Sixty- two P.aeruginosa were recovered from various clinical samples such as urine, sputum, pus, Vaginal swab, ET secretions, Foley's tip from various wards.

The samples then inoculated on Blood Agar, MacConkey agar, Nutrient agar and incubated at 37^0C for 24 -48 hours. The isolated colonies on the culture plates were identified based on the colony morphology, pigment production, aromatic odour, gram staining, oxidase test, Hanging drop and other biochemical test used for the identification of gram-negative bacilli such as indole test, citrate test, urease test, TSI test, oxidative fermentation test(OF test).

Antibiotic susceptibility testing was performed by Kirby-bauer disk diffusion method on Mueller-Hinton agar medium (MHA) and incubated overnight at 370C. Measurement of the inhibition zone was taken and interpreted as Susceptible, intermediate and resistant based on CLSI guidelines 2022. [4]

Results

Sixty-two P. aeruginosa were isolated from 1140 different clinical samples. The prevalence rate of the organisms was found to be 5.43%.

Among sixty two Pseudomonas aeruginosa isolates, 51(82.2%) were males and 11(17.7%) were females. (Figure 1). Pseudomonas aeruginosa was isolated 9(14.5%) from urine samples, 40(64.5%) from pus samples, 4(6.45%) from sputum, 5 (8.06%) from ET Secretions, 1(1.61%) from foley's tip, Vaginal swab,

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and swab throat. 64.5% of the isolates were from Pus and wound swab. (Table 1)

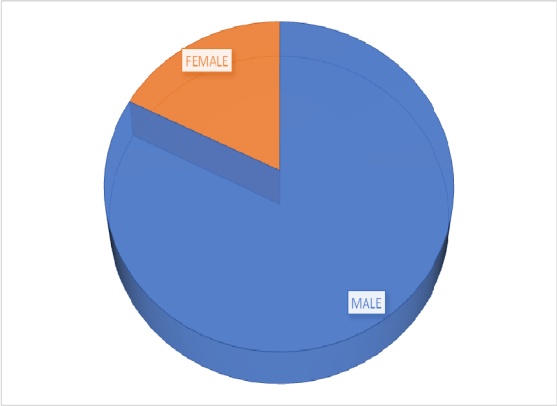


Figure 1: Gender wise distribution

Table 1: Frequency of Pseudomonas aeruginosa from different clinical samples

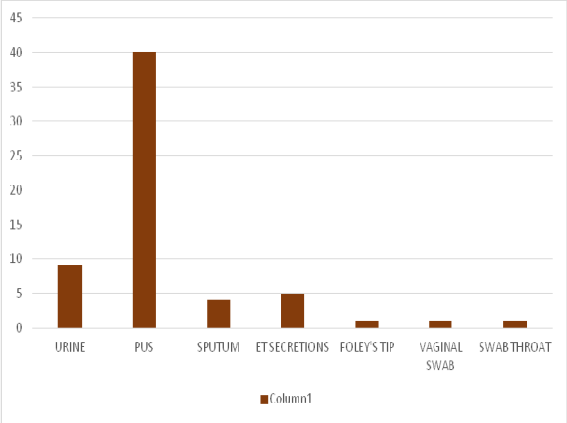


Table 2: Age wise distribution

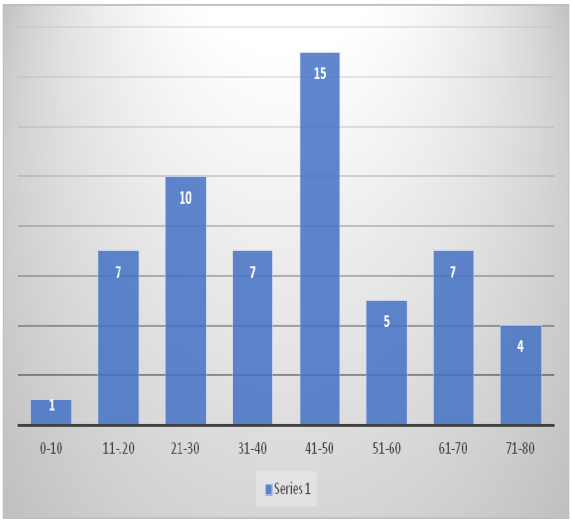


Table 3: Frequency of Pseudomonas aeruginosa from different wards

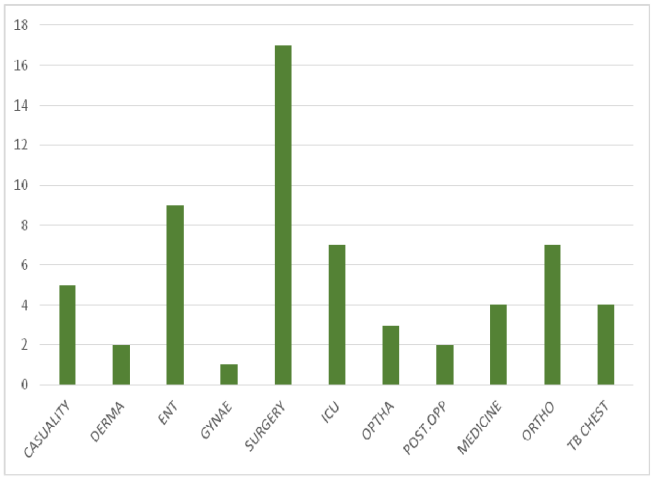
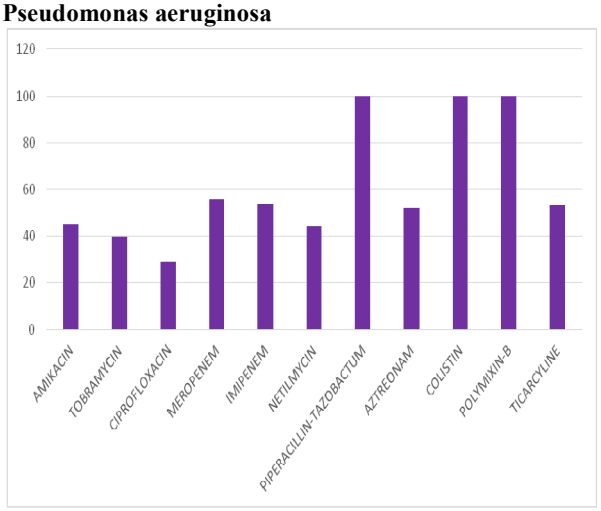


Table 4: Antibiotic sensitivity pattern of Pseudomonas aeruginosa



It is most common in the age group of 41-50(24.1%), followed by 21-30(16.1%) and least from the age group of 0-10(1.61%). (Table 2) 27.4% of P.aeruginosa strains were isolated from the samples from surgery ward followed by 14.5% from ENT ward and only 3.22% were isolated from Derma ward. (Table 3)

Antibiotic sensitivity rates of the Pseudomonas aeruginosa isolates were 72.5% to Gentamycin and amikacin, 64.5% to tobramycin, 46.7% to ciprofloxacin, 90.3% to meropenem, and 87% to imipenem. All the isolates were sensitive to polymyxin B, colistin followed by piperacillin-tazobactum.(Table 4)

Discussion

P. aeruginosa is the prime cause of healthcare associated infections among the Gram negative bacterial pathogens. Wider use of the antibiotics has resulted in the emergence of the multidrug resistant isolates among these organisms. Multiple drug resistance (MDR) is the resistance exhibited by an

microgranism to alteast one antibiotic in three or more antibiotic categories. It has been found to cause infections in wider clinical settings especially in surgical wards and ICUs and the resistance patterns in different geographical regions. Hence antibiotic surveillance is important to the policy makers to frame the empirical treatment regime for these bacterial infections.

Our study shows that infections from P. aeruginosa infections was more in males than females with 51(82.2%) in males and 11 (17.7%) in females. This study was similar to the study performed by the other author Anupurba et al., where the ratio of males was more.[5].

The isolation of Pseudomonas aeruginosa was higher from surgery ward samples. This might be due to prolonged hospital stay after surgery which results in colonization and infection. [5] P. aeruginosa occurrence was predominant in males (82.2%) in our study similar to other studies. [6, 7].

In our study, the P. aeruginosa isolates were mostly isolated from pus or wound swab than other clinical samples which were similar to studies done by Siguan SS et al., Masaadeh HA et al and Ranjan et al. [6, 8, and 9].

In this study, most of the isolates were from surgical wards similar to a study by Ramakrishnan.[10]

In this study, Prevalence rate of P. aeruginosa was 5.43% which is similar to the reports in India by Ramakrishnan et al. [10] and Sorabh Singh Sambyal14 were 6.8 and 4.8%.

In our study, all the isolates were sensitive to colistin and piperacillin-tazobactumlike the study by Mastoraki et al. [11]

Pseudomonas is an ultimate example of the opportunistic nosocomial pathogen, which in immuno-compromised patients causes a broad range of infections and contributes to severe morbidity. The mortality due to nosocomial pseudomonal pneumonia is around 70 percent, despite therapy [12]. Bacterial resistance to antibiotics is a global health problem that limits the therapeutic options. P. aeruginosa develops resistance against almost all antibiotics by several mechanisms like, multi-drug resistance efflux pumps, resistance genes, biofilm formation, aminoglycoside modifying enzymes and mutations in different chromosomal genes. Further more exposure to broad spectrum antibiotics and patient to patient spread has added the rapid increase in the isolation of rapid strains [13].

Conclusion

From our study we concluded that meropenem, imipenem, piperacillin-tazobactum, polymyxin B and colistin, has been the promising antibiotic agents against the infections caused by P. Aeruginosa. As it was more prominent in the patients from surgery ward it is important to follow bundle care and should monitor the use of antibiotic susceptibility pattern of P.aeruginosa which will help in the treatment and will automatically reduce infections rate in the hospitals.

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