ORIGINAL ARTICLE

FREQUENCY AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF PSEUDOMONAS AERUGONISA CLINICAL ISOLATES AT A LARGE TEACHING HOSPITAL IN LAHORE, PAKISTAN

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ABSTRACT

Background: Psudomonas is a notorious nosocomial aerobic bacillus mostly involved in causing pneumonia, surgical site infection and urinary tract infection. Resistance of pseudomonas has increased in recent past and has posed a serious health challenge to public health.

Objective: To determine resistance pattern of Pseudomonas aeuroginosa from clicical isolates at Mayo Hospital, Lahore during 2019.

Methods: This was a Single Centre Observational Cross-Sectional Retrospective Study conducted at Mayo hospital Lahore which included clinical isolates of pseudomonas isolated during 2019 obeying inclusion and exclusion criteria. Organism was identified with standard protocols and was tested for susceptibility to various antibiotics as per CSLI guidelines. Data was analyzed with SPSS 23.

Results: Of 1506 isolates, the most sensitive drug was collistin (100%). Relatively higher sensitivity was reported for imipenum (94.48%) followed by amikacin (91.96%). Least sensitive of all the tested drugs was ceftriaxone (12.48%) followed by tazobactum/pipperacillin (33.3%). Ceftazidime (74%), gentamycin (70.1%) and ciprofloxacin (65.6%) showed intermediate level of sensitivity in our study.

Conclusion: Collistin , Imipenum and amikacin are the effective drugs against pseudomonas. However, the resistance of the bug is increasing which warns for judicious use of antibiotics.

Key Words: Pseudomonas, Antibiotics, Sensitivity, Resistance

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INTRODUCTION

Anti-Microbial Drugs are the mainstay of treatment against bacterial Infections. Advancement in the field of antibiotics has resulted in saving millions of lives. However, Emergence of antibiotic Resistance is a global threat and a cause of concern for mankind[1-2]. There are several factors responsible for this much increase in antibiotic resistance. These includes misuse of antibiotics, lack of awareness both by physicians and public, and self medication[3-4].

Pseudomonas Aerugonisa (a member of ESKAPE group that includes Enterococcus faecium, Staphy-lococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa and Enterobacter), a gram-negative aerobic bacillus, is among the one of the emerging pathogen of group and is involved in diverse variety of nosocomial infections especially pneumonia, urinary tract infection, surgical site infections and bacteremia[5-6]. Pseudomonas has contributed greatly in the mortality of hospitalized patients[7].This is surely due to its ability to easily develop resistance against antibiotics through several mechanisms. These includes

production of lactamases, carbapenamases, over expression of efflux pump and Amp C-Lactamases, change in target site and a type of unstable resistance which is acquired by the exposure of broad-spectrum antibiotics i.e due to antibiotic pressure[8-10].

Several antipseudomonal drugs have conventionally been used against pseudomonas which are fluroquinolones (ciprofloxacin), cephalosporin (ceftazidime, cefepime), antipseudomonal pencillins (Tazobactum,Pipperacillin), Aminoglycosides (amikacin & gentamycin) and carbepenam (imepenam and meropenam)[11]. Over the last decades carbepenams has been considered as drug of choice. Since last few years, resisitance to carbepenam has been repoterd[12]. To cope with the problem, colistin is used in multi-drug resistant (MDR) pseudomonas as a last resort[13]. However, Colistin Resistance has also been documented in the recent past [14-15]. Resistance pattern of an organism is very variable. It changes with time and place[16].

So, the need of the hour is such a study describing susceptibility pattern of the bug. In our search of the literature, no study is available showing road map of resistance for pseudomonas in Pakistan for 2019.We have conducted such study elaborating susceptibility of recent isolates of pseudomonas at a large teaching hospital of Lahore.

METHODS

It was an observational cross-sectional retrospective study conducted at Microbiology section, Pathology department of King Edward, Medical University, Mayo Hospital, Lahore after permission of ethical review board of the institution. All the isolates of pseudomonas during year 2019 i.e 1506, which showed positive growth and were tested for susceptibility of antibiotics were included in the study. Whereas all those samples Which were either negative for pseudomonas or were not tested for antibiotics were excluded from the study.

All the samples obtained either from ward or OPD were cultured according to standard guidelines. Further confirmation was done using special biochemical tests and ApI (Biomerieux). After the separation, antibiotics susceptibility analysis was made following CSLI (Clinical and Laboratory Standards Institute) guidelines [17].

Data was analyzed using SPSS version 23.0. Qualitative statistics will be determined as frequency and percentages.

RESULTS

A total of 1506 (24%) stains of pseudomonas were isolated from all the culture growths (6280) during 2019. Among these 883(58.63%) were females and 623 (41.37%) were male. Most of the samples were obtained

from wound swab (524) and pus (439) followed by tacheobronchial secretions (268), sputum (97), blood culture (90), catheter tip (78) and chest tube aspirate (10). Relative Distribution of sources with their percentages is shown below in the table:

Table 1: Distribution of the Source of Specimen

Source	Pseudomonas frequency
Wound Swab	524(34.79%)
Pus	439(29.15%)
Trachebronchial Secretions	268(17.8%)
Sputum	97 (6.44%)
Catheter tip (CVP and ETT)	78 (5.18%)
Blood Culture	90(5.98)
Chest Tube aspirate	10 (0.66%)

Pseudomonas was seen to be resistant to almost all the anti-pseudomonal antibiotics. Colistin was the only drug which was 100% sensitive and no resistance was seen. Highest resistance was observed with ceftriaxone (87.52%) The sensitivity of Imipenem, ceftazidime, Amikacin, ciprofloxacin, gentamycin and tazobactum-pipperacillin was 94.48%, 74.1%, 91.96%, 65.6%, 70.18% and 33.33% respectively. The Distribution of resistance and sensitivity pattern of all the isolates of Pseudomonas with their relative percentages is given below:

Table:2 Susceptibility pattern of Pseudomonas Aeruginosa

Antibiotics	Sensitive	Resistance
Ceftazidime	1116(74.1%)	390(25.9%)
Tazobactum-Pipperacillin	502(33.33%)	1004(66.67%)
Imipenam	1423(94.48%)	83(5.52%)
Ceftriaxone	188(12.48%)	1318(87.52%)
Ciprofloxacin	988(65.6%)	518(34.4%)
Amikacin	1385(91.96%)	121(8.04%)
Gentamycin	1057(70.18%)	449(29.82%)
Colistin	1506(100%)	0(0%)

DISCUSSION

Pseudomonas has been implicated in causing many hospitals acquired infections especially in immune-compromised individuals. To treat it, is a big challenge and a major concern for health care providers since its resistance has increased in recent past. This needs to be addressed vigilantly to have a better outcome [18].

The most frequent source of sample was wound and pus with other minor sources being blood, catheter tip, tarachebronchial secreations and chest tube aspirate which is consistent with other studies[19]. Another source

was sputum which was 6.4% of all positive cultures which is in contrast to other studies[20-21].

In the context of resistance and sensitivity pattern, highest resisitant drug was ceftriaxone (87.5%) and tazobactum /pipperacillin (66.67%). This high resistance for tazobactum/pipperacillin is highly alarming and is likely contributed due to its frequent use.This is in accordance with other local studies and was higher in percentage to an international study reported by Micek et al. [22-25]. Ciprofloxacin showed better results and was resistant in 34.4% cases only. Ceftazidime was sensitive in 74.1%. The sensitivity of these two drugs was found to be 41.5% and 22%, and 67.6% and 75.9% respectively in different studies[17,26].

This study showed that aminoglycosides (Gentamycin and Amikacin) are effective against pseudomonas. However, Amikacin (91.96%) was more sensitive than gentamycin (70.18%). Amikacin sensitivity pattern was comparable to a local and an international study[23-24].

We found imipenam to be much effective (94.48%) against pseudomonas. The sensitivity of imipenam has been varyingly reported. It was comparable to our study in some cases and even much better in other studies [6,18,25,27,28]. Highest Sensitive of all the drugs was collistin (100%) which has also been reported in many studies[22,29]. This shows the extensive resistance pattern of pseudomonas in increasing trend for anti-pseudomonal antibiotics.This is probably due to largest gene sequence and greater number of base pairs of bacteria developing multiple mechanisms of resistance[8-10].

Our study has highlighted the recent susceptibility pattern for pseudomonas against antimicrobials and its increasing resistance. This has emphasized the need for judicious use of antibiotics especially in hospitalized and immune-compromised patients. However, our study had few limitations. It was a single centre study in which patients' comorbidities were not studied. The details of the settings either medical or surgical were also not included in the study. So, a multicentre study with the details of the patients and the ward is needed in order to have an actual idea of disease burden and to help improve health care facilities.

CONCLUSION

The Study showed increased resistance and increased frequency of pseudomonas being isolated especially in hospital settings. Amikacin and Imipenam are two effective drugs against pseudomonas. Cautious use of antibiotics and a multicentre study with related details is recommended.

ETHICAL APPROVAL

The study was approved from Institutional Review Board of King Edward Medical University, Lahore, Pakistan, vide reference No. 333/RC/KEMU, dated May 11, 2020.

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AUTHOR'S CONTRIBUTIONS

SZ: Concept and Design, Manuscript writing
HMM: Manuscript writing
HB: Supervision, Data collection, Data analysis
AA: Data collection, Data analysis
HMSJ: Study Design, Critical Review
AS: Data collection, Critical Review