Study of Colistin Sensitivity Pattern of Pseudomonas Aeruginosa in a Tertiary Care Hospital

K. Ramalakshmi[1], P. Apparao[2], P. Kamala[3], V. Himabindu[4]

ABSTRACT

Introduction: Pseudomonas is an invasive organism that causes severe Hospital Acquired Infections in immune compromised hosts and it exhibits a high degree of resistance to broad spectrum antibiotics. In recent years Colistin is the drug of choice for use against MDR strains. The aim was to study the antibiotic susceptibility and Colistin sensitivity pattern of Pseudomonas isolates from various samples.

Material and methods: 100 Pseudomonas aeruginosa isolates from various samples (exudates, bloods and urines) were included and other isolates were excluded in the study. The samples were collected under aseptic precautions. Isolation and identification of the isolates was done as per the standard guidelines in the lab and AST was done by Kirby Bauer disc diffusion method and interpretation was done as per CLSI guidelines.

Results: Out of 100 isolates, 36 were from the surgical wards;30, 20 and 14 were from medical wards, OBG and GHCCD respectively. 83%of isolates were sensitive to Colistin and 17% were resistant. MDR strains (both ESBL's and MBL's) were detected in 33% and out of these 15.2% were also resistant to Colistin.

Conclusion: Colistin is one of the first antibiotics with significant activity against MDR Gram negative pathogens and its usefulness has been documented that it will be the "last line" therapeutic drug in the 21st century. In the present study it is showing that resistance to Colistin is also increasing, recommending regular monitoring of AST for proper management and to limit its use routinely.

Keywords: Pseudomonas Aeruginosa, Colistin, MDR Strains, AST

INTRODUCTION

Nonfermenting Gram negative bacteria(NFGNB) are primarily opportunistic and account for about 15% of all bacterial isolates from a clinical microbiology laboratory.[1,2] Non fermenting bacilli such as *Pseudomonas aeruginosa and Acinetobater spp* are pathogens emerging as frequent causes of nosocomial infections, especially pneumonia and sepsis, with mortality rates of 27- 47% in especially ill patients.[3,4] Although frequently considered as contaminants in the past but their pathogenic potential has been proved beyond doubt by their frequent isolation from clinical material and their association with disease.[5] They are considered as major contaminants in hospital environment, so major cause of hospital acquired infection.[6] Pseudomonas aeruginosa easily adopts to the environment it inhabits and can also colonize and invade a human host to cause serious infections.[7,8] The general population is refractory against infections caused by Pseudomonas species, but Pseudomonas species are physiologically highly flexible and able to act as opportunistic pathogen in humans with weakened immune systems.[9] Antibiotic resistance among bacteria is becoming more and more serious problem throughout the world and emerges commonly when patients are treated with empiric antimicrobial drugs.[10,11] In recent years due to liberal and empirical use of antibiotic, Non fermenting Gram negative bacilli have emerged as important health care associated pathogens. They have incriminated in infections such as Septicaemia, Pneumonia and Surgical site infections.[12] Non fermentive Gram negative bacilli are innately resistant to many antibiotics and are known to produce extended spectrum beta- lactamases and metallo beta lactamases.[1,12] Of the various mechanisms of carbapenem resistance in P. aeruginosa namely impermeability arising via the loss of outer membrane porins, the upregulation of an active efflux pump (MexAB-OprM system, AdeABC pump) and production of metallo-beta-lactamases that mediated by the MBLs is of great concern.[13,14] The genes responsible for the production of MBLs are typically part of an integron structure carried on transferable plasmid's hence, isolates producing MBLs are often resistant to different groups of antimicrobial agents, which can be transferred to various types of bacteria.[14] The increasing resistance of P. aeruginosa to numerous antibiotics, as a result of excessive antibiotic administration, is now leading to the accumulation of antibiotic resistance and cross-resistance between antibiotics and the appearance of multi drug resistant (MDR) forms of P. aeruginosa.[15] The treatment of MDR P. aeruginosa in critical patients is therefore becoming more of a challenge. These findings stress the importance of microbiologists providing clinicians with accurate information regarding the sensitivity patterns of antibiotics, so that clinicians can

[1]Associate Professor, Department of Microbiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, [2]Professor and HOD, Department of Microbiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, [3]Professor, Department of Microbiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, [4]Post Graduate, Department of Microbiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

Corresponding author: Dr P. Apparao, HOD, Microbiology, AMC, Vizag

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select an appropriate antibiotic for the timely treatment of infectious diseases while still helping to prevent the occurrence of resistance of P. aeruginosa to antibiotics. The present study was conducted to know the sensitivity pattern of P. aeruginosa isolates from various samples to various antibiotics and colistin and to detect ESBLs and MBLs from the isolated strains in a Tertiary care Hospital.

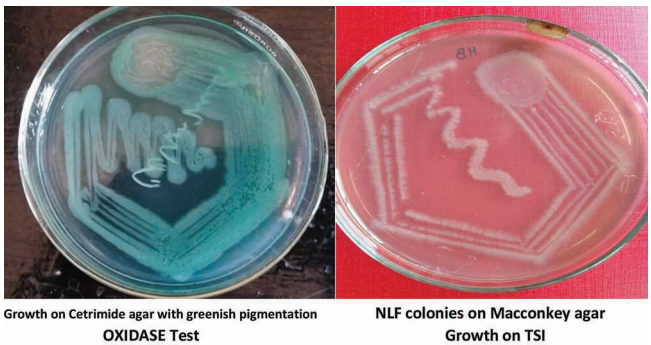
MATERIAL AND METHODS

The present study was conducted in the department of microbiology, Andhra Medical College and King George Hospital, a tertiary care, referral and teaching hospital in South India for a period of 6 months from July to December 2017. A total of 100 Pseudomonas aeruginosa isolates from 1450 samples were included. Exudates, bloods and urine specimens were included. Isolates other than Pseudomonas aeruginosa were excluded. All the samples were processed in the lab. Isolation and identification of the organisms was done as per the standard protocols in the laboratory (figure-1,2,3,4).

Antibiotic sensitivity test was done by Kirby-Bauer Disc diffusion method and MDR strains (both ESBL's and MBL's) were detected by double disc diffusion method and interpretation of the zones were done as per the CLSI guidelines (figure 5).

RESULTS

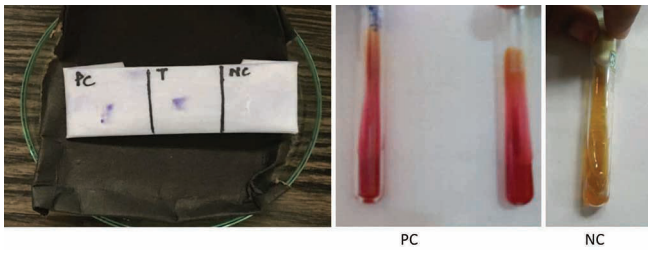
In the present study a total of 100 Pseudomonas aeruginosa isolates from 1450 samples were included. Out of 100 Pseudomonas isolates 55% were from males and 45% were from females. Out of 100 isolates 25% were from the age group of 21 to 30 years. Most of the isolates 72% were from Exudates followed by urines 19% and from Bloods 9%. In the present study most of the isolates were from the surgical wards 36% followed by Medical wards 30%, OBG wards 20% and Government hospital for chest and communicable diseases 14%. Out of 100 Pseudomonas aeruginosa isolates 83% were sensitive to colistin and 67% were sensitive to meropenem. Most of the strains were resistant to broad spectrum antibiotics. MDR strains were isolated in 33%, both ESBL (Extended spectrum Beta Lactamase) and MBL (Metallo beta lactamase) producers. Out of 17% colistin



Growth on Cetrimide agar with greenish pigmentation
OXIDASE Test

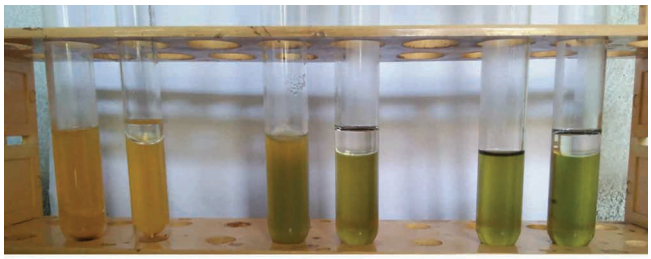
NLF colonies on Macconkey agar
Growth on TSI

Figure-1:



PC NC

Figure-2:



PC Test NC
PC-Escherichia coli ATCC , NC-Uninoculated medium

Figure-3:

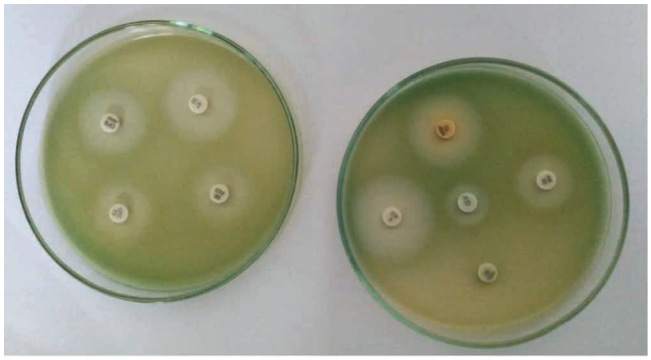
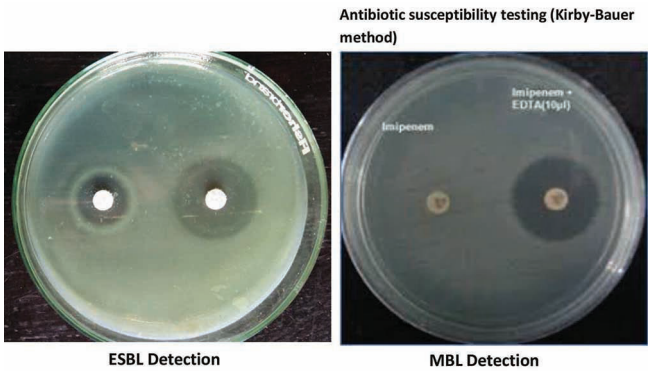


Figure-4:



ESBL Detection MBL Detection

Figure-5:

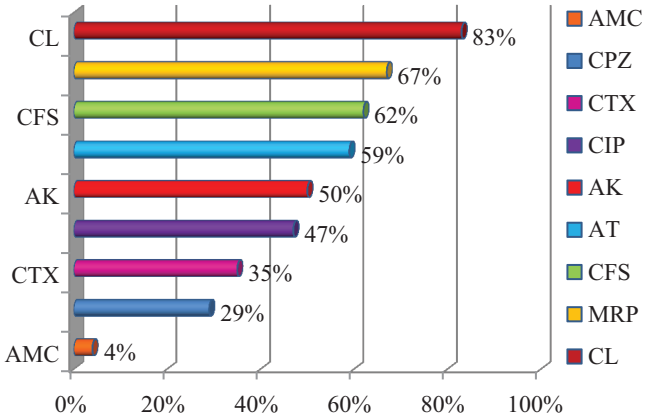


Figure-6: Antibiotic susceptibility pattern (%) (n=100)

resistant strains,5 were sensitive and 12 were resistant to carbapenems (figure-6).

DISCUSSION

Non fermenting gram negative aerobic bacilli consider to be contaminants in the past have now emerged as important major pathogenic organisms.

The emergence of multi drug resistant (MDR) gram negative bacteria in parallel with the lack of new antibacterial agents led scientists to understand the importance of polymyxins.[16,17] There has recently been a tremendous in the infections caused by MDR gram negative bacteria especially P.Aeruginosa, Acinetobacter Baumannii and Klebsiella Pneumoniae and for these species polymyxins are often the only available active antibiotics.[17,18-24] Colistin became available for clinical use in the 1960s, but was replaced in the 1970s with other antibiotics due to its toxicity.[17,19,25] In recent years colistin has attracted considerable interest as an antibiotic for use against MDR strains.

In the present study out of 1450 samples Pseudomonas aeruginosa were isolated in 100 (6.8%) samples which correlates with Sorabh Singh Sambyal et al[26] who reported 4.8%

In this study males were more infected than females and age group 21 to 30 were mostly affected which correlates with Sorabh Singh Sambyal et al.[26] 72% of isolates were obtained from exudates and 9% from blood samples in the present study which correlates with Sorabh Singh Sambyal et al.[26]

Out of 100 isolates, 17 were Colistin resistant of which 5 (%) were from Carbapenem sensitive isolates and 12 (%) were from Carbapenem resistant isolates which correlates with Srujana Mohanty et al[27] who reported 1.7% and 18.4% respectively and Brink A. et al.[28]

CONCLUSION

Colistin was one of the first antibiotic with significant activity against multidrug resistant (MDR) Gram negative pathogens such as Pseudomonas aeruginosa.

As Colistin resistance is increasing, susceptibility testing should be performed whenever clinical use of Colistin is considered.

Identification of NFGNB (non fermenter Gram negative bacilli) and monitoring their susceptibility pattern are important for proper management and to control drug resistant strains in the hospitals.

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