Risk factors for infection with Multi-Drug Resistant Pseudomonas aeruginosa and its Antibiotic susceptibility pattern among hospitalized patients of a 1,200 bedded hospital in Chengalpet District of Tamilnadu

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Abstract

Pseudomonas aeruginosa is versatile and can be found in warm moist environments like sinks, drains, respirators, humidifiers, and disinfectant solutions available in most hospitals. The human fecal carriage of this organism is around 3% which may increase with the duration of hospital stay because of the selective pressure of antibiotics (1) A wide spectrum of infections are caused by Pseudomonas aeruginosa that are difficult to treat given its ability to acquire resistance to all classes of antimicrobial agents (2). Several mechanisms exist synchronously to bestow resistance to strains of pseudomonas aeruginosa, increasing mortality higher (3) This study was conducted in a tertiary hospital near Chengalpet, Tamilnadu among the in-patients to find prevalence, risk factors, and susceptibility pattern, corresponding to Multidrug-resistant Pseudomonas aeruginosa (MDRPA)

Keywords: Pseudomonas aeruginosa, Antibiotic sensitivity, In-patients, Tertiary care

Antibiotic resistance is of great concern in all hospitals across the world. Pseudomonas aeruginosa is a microorganism responsible for most hospital-acquired infections in the developing world (47-49). The incidence of multi-drug resistant pseudomonas aeruginosa (MDRPA) is on the increase due to the inherent nature of the organism to acquire resistance. Hence it becomes important to study the prevalence and resistance pattern of Pseudomonas aeruginosa by the disc diffusion method (Kirby-Bauer)

METHODS

The study was carried out in a 1200-bedded tertiary hospital with eighty percent bed occupancy throughout the year. There are intensive care units in each specialty that includes paediatric and neonatal intensive care units (ICU) and involved samples derived from all of these representative areas - blood, sputum, tracheal aspirate, bronchial wash, pus, urine, and other body fluids. The antibiotic policy was at the sole discretion of the hospital infection control committee and its attendant member's which included the physicians and the

8426

Eur. Chem. Bull. 2023, 12(Special Issue 4),8426-8433

pharmacists working in tandem. After approval by the institutional ethical committee, the study was performed between April 2012 to March 2013. In total 167 clinically significant isolates of Pseudomonas aeruginosa were obtained during the year-long study. The isolated strains of pseudomonas aeruginosa were identified by cultural characteristics on known culture plates and routine testing for known biochemical tests and further tested for susceptibility to groups of antibiotics for Piperacillin–Tazobactum (100/10)mcg, ceftazidime (30mcg), Ciprofloxacin (5mcg), Ofloxacin (5mcg), Levofloxacin (5mcg), Amikacin (30mcg), Gentamicin (10mcg), Netilmicin (10mcg), Tobramycin (10mcg), Colistin (25mcg) as per CLSI guidelines using the Kirby-Bauer disk diffusion method. Strains that were resistant to more than three groups of antibiotics were considered multi-drug resistant (MDR). The hospital's microbiology laboratory's health-associated information system (HAIs) was of use to obtain and identify all cultures obtained that were multidrug-resistant pseudomonas aeruginosa (MDRPA). Only isolates from in-patients obtained as a pure culture of pseudomonas aeruginosa in association with clinical findings excluding the other causes however all outpatient samples and repeat samples from the same patients were excluded from the study as well as colonizers and contaminant

RESULT

In this study, 167 clinically significant isolates of Pseudomonas aeruginosa from various clinical samples were isolated from inpatients of SRM Medical College Hospital and Research Centre, Kattankulathur. The prevalence of P.aeruginosa in the study was 6.1 %. Strains resistant to 3 or more classes of drugs were considered multi-drug resistant. In the study out of 167 isolates of Pseudomonas aeruginosa 34 were considered Multidrug-resistant (MDRPA) being resistant to 3 or more classes of antibiotics

DISCUSSION

Nosocomial infections are a direct threat to patients. outcomes in India, Pseudomonas. aeruginosa is the leading nosocomial pathogen isolated from VAP (ventilator-associated pneumonia) cases in ICU (55%) and wound infections (59%) with mortality ranging from 16% to 46% (**32 & 33**). The emergence of MDRPA in many centres throughout the country is of interest. It increases the hospital stay of the patients, thus leading to an increased economic burden. The study aimed at finding out the prevalence and risk factors associated with MDR Pseudomonas aeruginosa strains. This study was carried out for a period of a year from April 2012 to March 2013 at SRM Medical College Hospital & Research Centre, Kattankulatur

In the study, the prevalence of MDRPA strains was found to be 20.35%. Reported MDRPA in 85% of male patients and 15% of female patients. Reported a high prevalence of MDRPA among the age groups between 41-60 years 52.9% followed by 32.35% among the age groups >60years, 8.8% in the age groups between 0-20 years, and 5.8% in the age groups between 21-40 years.

The prevalence of MDRPA among various specimens was 20.58% from tracheal aspirate, sputum, and urine, 26.47% from pus, 8.82% from blood, and 2.94% from other body fluids

The major risk factors for MDRPA infections in the present study were prolonged hospital stay (60%) and diabetes mellitus (44.11%), followed by urinary catheterization (38.23%) and ICU stay (32.35%). About 26.47% of MDRPA were found to have more than 2 risk factors.

Among 44.11% of diabetic patients, the major source of MDRPA were diabetic foot infections and surgical site infections.

Antibiotic susceptibility profiles of MDRPA in the study showed the highest resistance of MDRPA towards Ciprofloxacin 32 (94.11%) and Gentamicin 30 (88.23%). Tobramycin and Ofloxacin resistance was seen in 29 (85.29%) and 27 (79.41%) MDRPA isolates respectively. Twenty-five isolates were resistant to Levofloxacin (73.52%) and Ceftazidime (73.52%). About 23 isolates were resistant to Cefepime (67.64%), 22 towards Piperacillin-Tazobactum (64.70%), 21 isolates were resistant to Netilmicin (61.76%), 18 were resistant to Amikacin(52.94%) and 12 isolates were resistant to Imipenem (35.29%) notably

CONCLUSION

The emergence of Multidrug-resistant Pseudomonas aeruginosa is becoming a major concern among healthcare professionals worldwide. Pseudomonas aeruginosa is a unique pathogen owing to its intrinsic resistance to all commonly available antibiotics. Its ability to acquire resistance and its association with severe infections make treatment expensive and difficult

This study shows that Multidrug-Resistant Pseudomonas aeruginosa (MDRPA) is an existing problem to overcome, early detection of MDRPA isolates by screening tests, identification of risk factors, and isolation of patients infected with MDRPA is to be emphasized besides. Judicial use of antibiotics and periodic surveillance of nosocomial infections. Antibiotic policies and regimens should be formulated in consultation with the information available from the stewardship program in the hospital to prevent the further spread of resistance
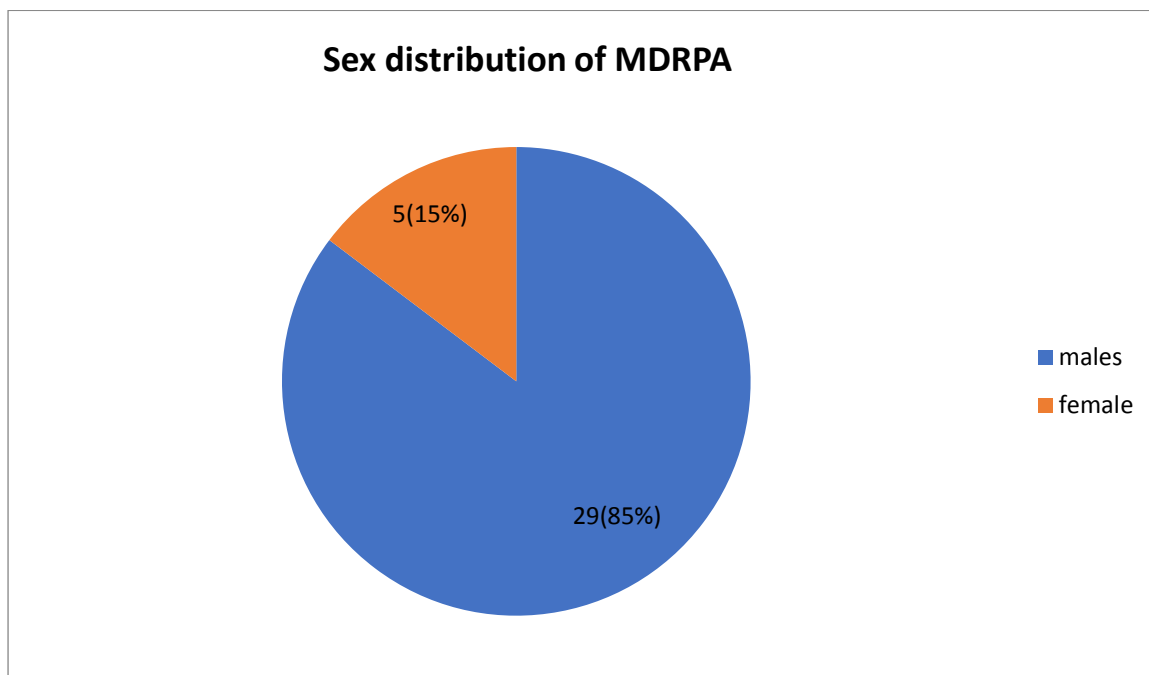
Age-wise distribution of MDRPA isolates

MDRPA isolates were more frequently seen in the age group between 41-60 years (52.9%) and in the age group of > 60 years (32.35%).
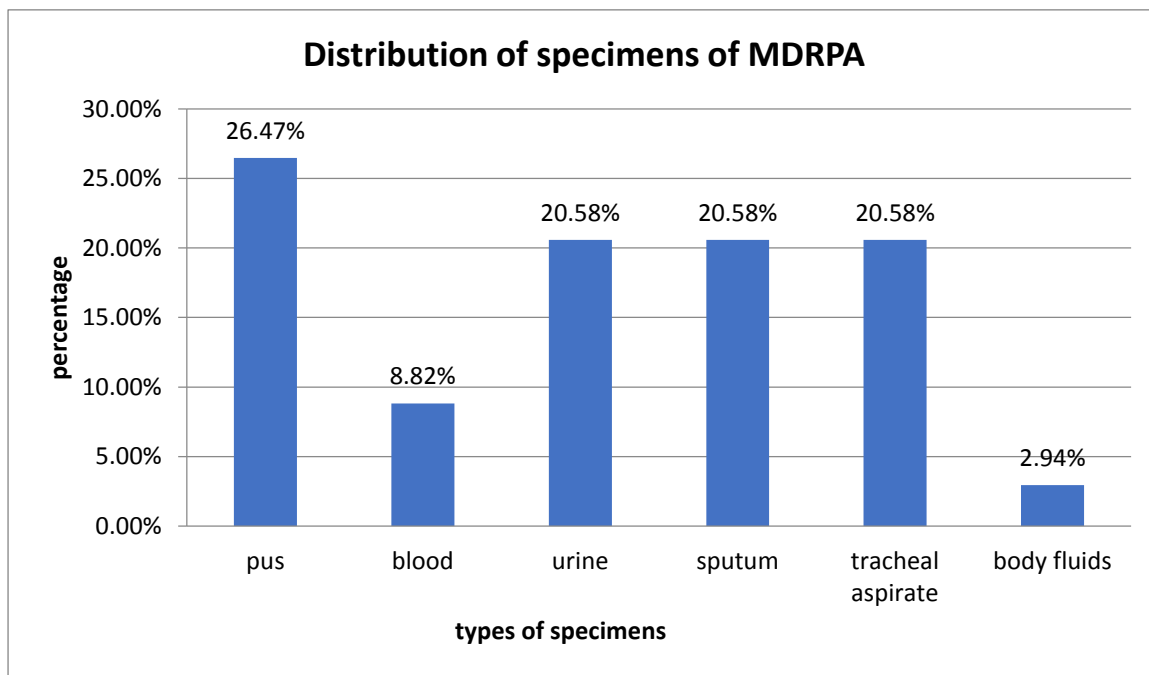

Age distribution of MDRPA

8428

Eur. Chem. Bull. 2023, 12(Special Issue 4),8426-8433
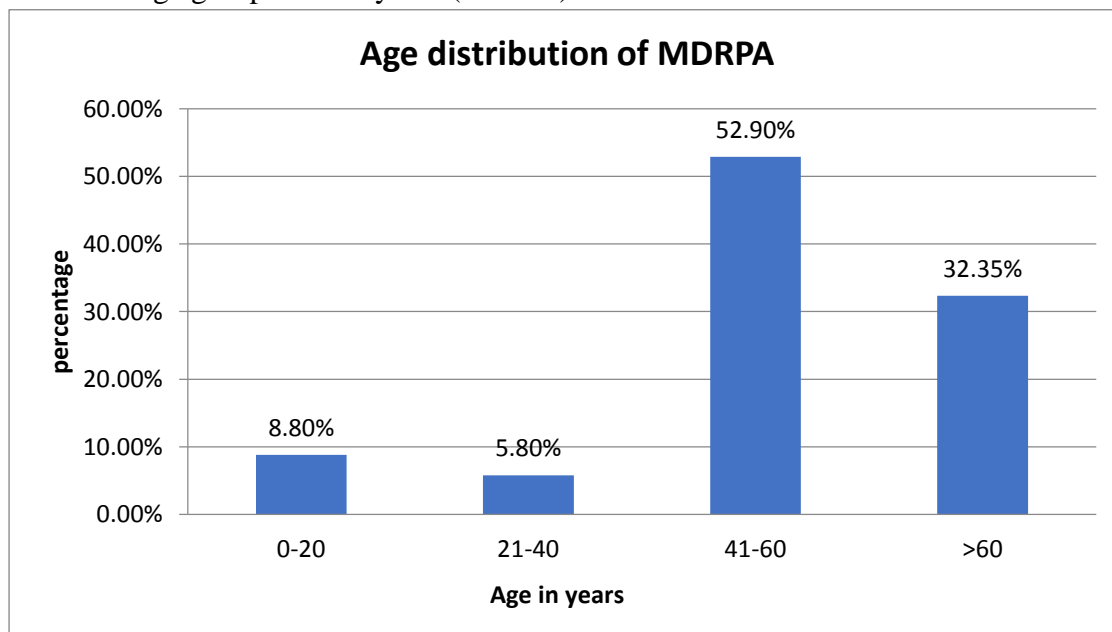
Sex distribution of MDRPA isolates

MDRPA isolates were more commonly isolated from males 29(85.29%) compared to females 5(14.70%)

Sex distribution of MDRPA

Distribution of various specimens of MDRPA isolates

The percentage of various specimens from which MDRPA was isolated were: pus 9 (26.47%), tracheal aspirate 7 (20.58%), sputum 7 (20.58%), urine 7 (20.58%), blood 3 (8.82%) and body fluids 1 (2.94%)

Distribution of specimens of MDRPA

8429

Eur. Chem. Bull. 2023, 12(Special Issue 4),8426-8433

Distribution of MDRPA in the wards

Among 34 strains of MDRPA, about 12 strains(29.40%) were from medical wards(general medicine & neurology),12 strains(35.20%) from Intensive care units (MICU, SICU, RICU, Neonatal ICU), and 10 strains(35.20%) were from surgical wards(surgery, ortho, urology, and nephrology).
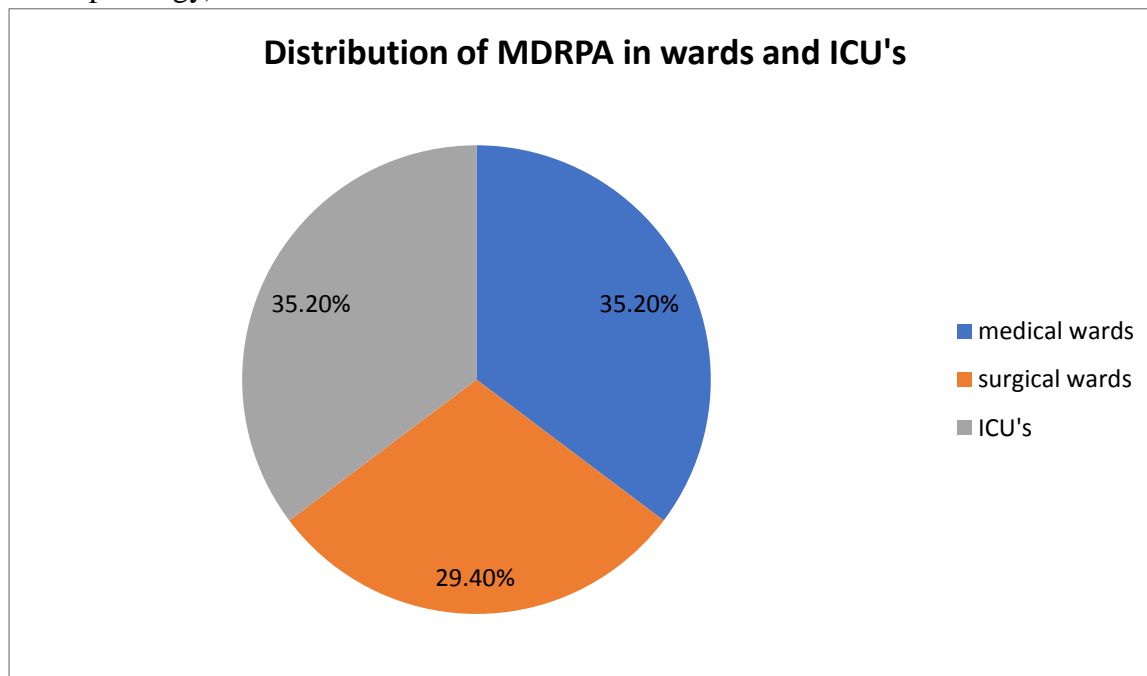

Risk factors for MDRPA infections

The percentage of MDRPA isolates associated with the following risk factors were: prolonged hospitalization 15(44.11%), diabetes mellitus 15(44.11%), Foley's catheterization 13(38.23%), stay in ICU 11(32.35%), steroid therapy 10(29.41%), h/o surgery 8(23.52%), central venous catheterization 6(17.64%), mechanical ventilation 6(17.64%). Isolates with more than two risk factors were 9(26.47%). Among these risk factors, prolonged hospital stay and Diabetes mellitus showed higher rates of prevalence of MDRPA infections.
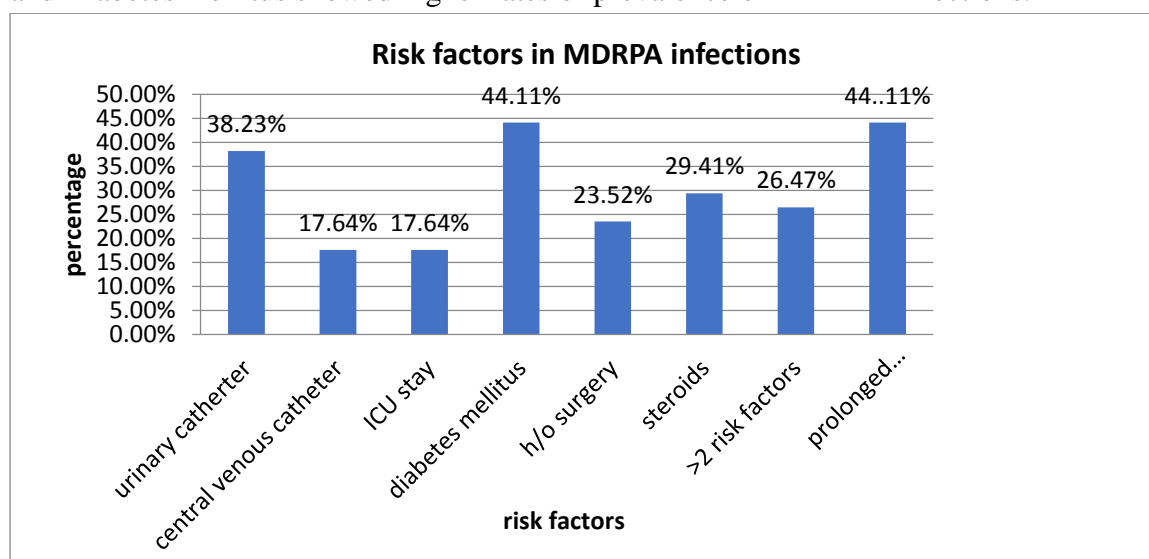
Antibiotic susceptibility test by Kirby-Bauer disc diffusion method

8430

Eur. Chem. Bull. 2023, 12(Special Issue 4),8426-8433

All the 34 isolates of MDR Pseudomonas aeruginosa were sensitive to colistin.The highest resistance was seen against Ciprofloxacin 32(94.11%) and Gentamicin 30(88.23%). Tobramycin and Ofloxacin resistance was seen in 29 (85.29%) and 27 (79.41%) MDRPA isolates respectively. Twenty-five isolates were resistant to Levofloxacin(73.52%) and Ceftazidime(73.52%). About 23 isolates were resistant to Cefepime(67.64%), 22 towards Piperacillin-Tazobactum(64.70%), 21 isolates resistant to Netilmicin(61.76%), 18 were resistant to Amikacin(52.94%) and only 12 isolates were resistant to Imipenem(35.29%).
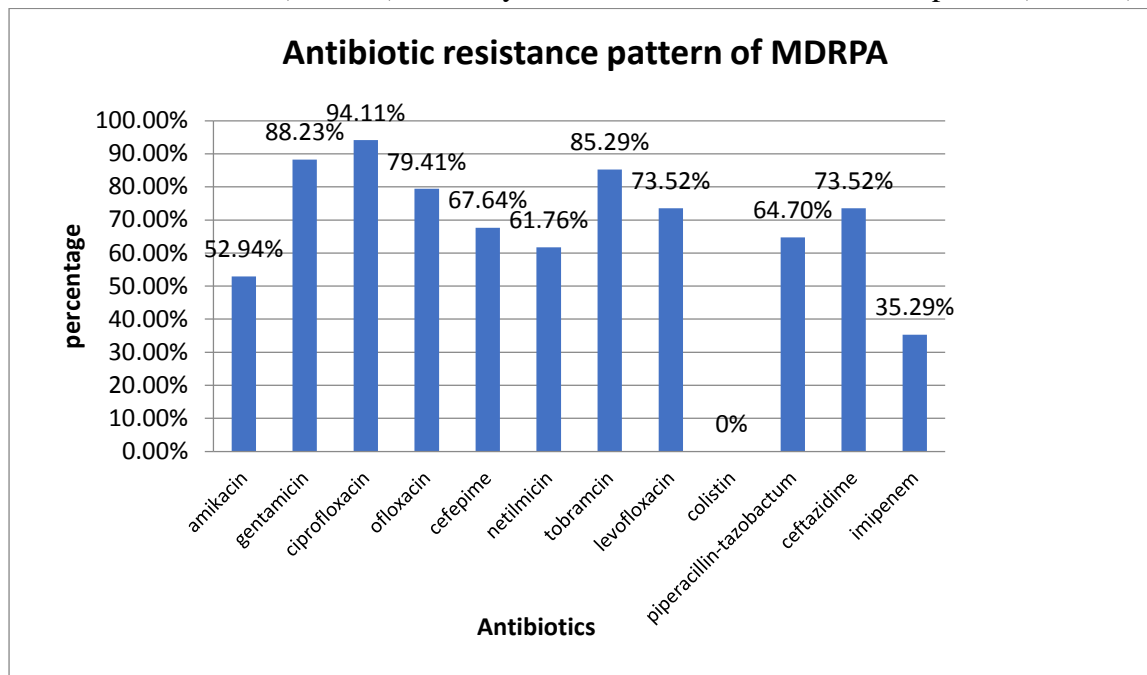
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104

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