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ANTI-BIOTIC RESISTANCE PROFILE OF STRAINS OF PSEUDOMONAS AERUGINOSA EXTRACTED FROM HOSPITAL SPECIMENS IN A TERTIARY CARE FACILITY

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ABSTRACT:

Background: Pseudomonas aeruginosa, often known as Ps. aeruginosa, is a significant bacterial pathogen that has been identified from a variety of specimens. The emergence of a wide range of anti-microbial drugs with anti-pseudomonal activity and advancements in medical and surgical management have not stopped the life-threatening illness caused by Pseudomonas aeruginosa from causing difficulties in hospital acquired contaminations. Anti-biotic resistance in hospital isolates is rising, according to a number of epidemiological studies.

Material and Technique: One year was dedicated to the conduct of this investigation. A total of 1840 specimens were analyzed during this time, and 1162 of those specimens revealed bacterial growth. 200 hospital isolates of Pseudomonas aeruginosa were obtained from 1162 specimens. The specimens were chosen based on how well they grew on standard Mac Conkey medium, where lactose non-fermenting pale colonies with positive oxidase tests were seen, and on Nutrient Agar, where lactose non-fermenting pigmented and non-pigmented colonies also showed positive oxidase tests. The Modified Kirby Baur disc diffusion technique (disc-diffusion) was used to determine the anti-microbial vulnerability of each isolate in accordance with CLSI standards.

Result: The majority of Ps. aeruginosa isolates found in the current investigation are extremely resistant to cefepime (86%) piperacillin (80%), and ceftriaxone (66%). Comparing piperacillin alone to piperacillin-tazobactam combination, low level resistance (50%) was observed.

Conclusion: Strict anti-biotic policies are essential to stop the spread of resistance bacteria, and contamination control measures and multidrug resistant organism surveillance programs must be put in place.

Keywords: Anti-biotic Resistance, Cefepime, Pseudomonas aeruginosa

INTRODUCTION

Isolated from a variety of specimens, Pseudomonas aeruginosa (Ps. aeruginosa) is one of the significant bacterial pathogens[1]. Hospital acquired illnesses are still complicated by potentially fatal Pseudomonal contaminations, even with advancements in medical and surgical management and the emergence of a broad range of anti-microbial medicines with anti-pseudomonal properties[2,3]. Pseudomonas aeruginosa is becoming more widely acknowledged as a newly discovered, medically significant opportunistic bacteria that causes contaminations in hospitalized subjects, especially in those with burns, orthopaedic contaminations, respiratory conditions, immune-compromised individuals, and catheterized subjects[3]. Anti-biotic resistance in hospital isolates is rising, according to a number of epidemiological studies. Since most pseudomonas species are gram-negative bacteria, they naturally resist penicillin and most

related beta-lactam anti-biotics; nevertheless, some of them are susceptible to imipenem, piperacillin, tobramycin, or ciprofloxacin.

These days, Ps. aeruginosa resistance is becoming more and more common in ordinary hospital practice, which is a severe issue that raises management costs as well as morbidity and mortality[4]. There are several reasons that contribute to its general resistance. Its poor cell wall permeability confers inherent resistance to antibacterial drugs. It is genetically capable of expressing a large range of resistance mechanisms. Mutations in the chromosomal genes that control the resistance genes can cause it to become resistant. By using bacteriophages, transposons, and plasmids, it can obtain more resistance genes from other organisms. Pseudomonas aeruginosa has shown a notable rise in the incidence of multidrug resistance (MDR) in recent years, which is associated with elevated morbidity and mortality rates[5]. Different species, such as Pseudomonas aeruginosa, exhibit regional variances in anti-biotic resistance, which could be attributed to disparities in anti-biotic prescribing practices. Physicians can identify patterns of resistance to routinely used anti-biotics in a given organism by conducting periodic testing and analysis of anti-biotic resistance.

Aims & objectives: In the current investigation, our goals were to ascertain the level of multidrug resistance and the state of anti-microbial resistance to certain anti-pseudomonal drugs in these organisms.

MATERIALS AND TECHNIQUES

The Department of Microbiology at a tertiary care hospital in central India was the site of this investigation. It is a teaching, referral, and tertiary care hospital. A year was spent conducting this investigation. 200 Pseudomonas aeruginosa-positive specimens from pus/swab, urine, sputum, and blood specimens that were delivered to the microbiology department for microbiological diagnosis are included in the current study. These specimens were all taken from different hospital wards. The subject's individual units and wards provided the hospital data.

Specimen processing

The specimens were chosen based on how well they grew on regular MacConkey medium, where lactose nonfermenting pale colonies with positive oxidase tests were observed, and on Nutrient Agar, where lactose nonfermenting pigmented and non-pigmented colonies with positive oxidases were observed. Proof positive for pseudomonas sp. Following the acquisition of pure strains, Pseudomonas spp. were identified by means of biochemical identification tests. Specimens were infected in Triple Sugar Iron (TSI), Citrate, Peptone Water, and Urease media for this purpose. They were then incubated for eighteen hours at 37°C. The following day, TSI, Citrate media, and Urease media reported the results. A portion of the growth on Peptone water was tested for motility using the "Hanging drop" technique and a portion was tested for dole using Kovac's Reagent.

In the TSI medium, a strain of pseudomonas had an alkaline slant and no response in the butt. The results of the citrate test were positive, the urease test was negative, and the indole test was negative. Only acid is formed when glucose is utilized oxidatively.

Testing for anti-biotic vulnerability: The Modified Kirby Baur disc diffusion technique (disc-diffusion) was used to determine the anti-microbial vulnerability of each isolate in accordance with CLSI standards. The anti-biotics Ceftazidime (30 µg), Piperacillin (100 µg), Piperacillin -tazobactam (100/10 µg), Cefipime (30 µg), Imepenam (10 µg), Gentamicin (10 µg), Amikacin (30 µg), Ciprofloxacillin (5
µg), Levofloxacillin (5 µg), and Ceftriaxone (30 µg) were tested using the disc diffusion technique.

RESULTS

A total of 1840 specimens were evaluated over the course of a year; of these, 1162 specimens demonstrated growth on culture, and 200 Ps.aeruginosa specimens were isolated and subjected to anti-biotic sensitivity testing.

Table 1: Sex wise distribution of cases

Sex	Total no	Percentage (%)
Male	122	61
Female	78	39
Total	**200**	**100**

Table 2: Isolation of Pseudomonas aeruginosa from different hospital specimens

Name of Specimen	No. of Specimen in which Pseudomonas aeruginosa Isolated
Pus	116
Blood	44
Urine	24
Sputum	08
Others	08
Total	**200**

Table 3: Anti-biotic resistance of Pseudomonas aeruginosa isolated from different hospital specimens

Anti-biotic Resistance	(%)
Ceftazidime (CAZ)	60%
Piperacillin (PI)	80%
Piperacillin tazobactam (PIT)	50%
Cefepime (CPM)	86%
Cefriaxone (CTR)	66%
Ciprofloxacin (CIP)	60%
Levofloxacin (LE)	20%
Amikacin (AK)	45%
Gentamycin (GM)	63%

The majority of Ps. aeruginosa hospital isolates in the current study were obtained from pus/swab (58%), blood (22%) and urine (12%). The majority of Ps. aeruginosa isolates in this study showed high resistance to cefepime (86%) and piperacillin (80%), with other third-generation cephalosporines coming in second and third. In comparison to piperacillin alone (80%), the combination of piperacillin and tazobactam demonstrated 50% reduced resistance. Gentamycin exhibited higher resistance (63%) among the aminoglycosides than did amikacin (45%). This is consistent with prior research.

DISCUSSION

The second-most common gram-negative bacterium found in hospital environments, Pseudomonas aeruginosa is the main culprit behind nosocomial contaminations that have a high risk of morbidity and mortality. Pseudomonal contaminations are highly prevalent in critically sick subjects admitted to the intensive care unit and in subjects with underlying hospital conditions. Emerging as a significant pathogen, pseudomonas aeruginosa is the cause of nosocomial contaminations. It is among the major factors that contribute to hospital subjects' morbidity. Due to its resistance to standard medicines and antiseptics, as well as its capacity to spread widely in hospitals, pseudomonas aeruginosa is the most common cause of contaminations in hospitals. Because it is such a versatile organism, it can thrive and proliferate even in the absence of most nutrients as long as there is moisture present[6]. This investigation was done to find patterns of anti-biotic sensitivity for the different medications that are currently on the market because Pseudomonas aeruginosa is one of the main

causes of hospital acquired contaminations and can cause serious illnesses. Such research aids physicians in providing subjects with better care. According to the current study, males are more likely than females (39%), with 61% of hospital isolates caused by Pseudomonas aeruginosa contaminations. This is comparable to research conducted by Jamshaid Ali Khan et al. and Javia et al. The majority of Ps. aeruginosa hospital isolates in the current study were obtained from pus/swab (58%), blood (22%) and urine (12%)[7].

The majority of Ps. aeruginosa isolates in this study showed high resistance to cefepime (86%) and piperacillin (80%), with other third-generation cephalosporines coming in second and third. They exhibited similar levels of sensitivity to levofloxacin and imipenem as did Patel H et al. In comparison to piperacillin alone (80%), the combination of piperacillin and tazobactam demonstrated 50% reduced resistance. Gentamycin exhibited higher resistance (63%) among the aminoglycosides than did amikacin (45%). This is consistent with prior research. According to this study, Pseudomonas aeruginosa hospital isolates are growing increasingly resistant to both older and more widely prescribed anti-biotics. Anti-microbial agents are becoming less effective as a result of the emergence of resistance organisms brought on by the careless use of anti-biotics, ignorance, non-compliance from subjects, and unsanitary conditions. Strict anti-biotic policies are essential to stop the spread of resistance bacteria, and contamination control measures and multidrug resistant organism surveillance programs must be put in place. To reduce resistance, it is ideal that the anti-biotic vulnerability pattern of bacterial contaminations, such as Pseudomonas aeruginosa, in specialist hospital units be regularly observed and the findings easily communicated to clinicians.

CONCLUSION

Among the 200 hospital isolates of Pseudomonas aeruginosa, the majority (58%) were obtained from pus/swab specimens, with blood specimens accounting for 22% and urine specimens for 12%, and 4% from the specimens themselves. There were 39% females and 61% males among the 200. The majority of the specimens were taken from the surgical wards, which were followed by the ICU, paediatric, medical, and orthopaedic wards. Pseudomonas aeruginosa maximum resistance isolates were obtained from pus/swab specimens. The majority of Ps. Aeruginosa isolates found in the current study were resistant to cefepime (86%) and piperacillin (80%), with ceftriaxone (66%), following. Anti-biotic policies must be developed and put into place immediately in order to thwart and resolve this growing issue. Every attempt should be made to stop the spread of organisms that are resistant. The community, pharmacists, doctors, and microbiologists can work together to develop the remedy and advance a deeper comprehension of the issue. In order to stop the spread of organisms, frequent hand washing should be promoted. Subjects should receive better surgical and medical care while they are in the hospital.

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