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Original Research Article

Antibiogram of *Pseudomonas aeruginosa* Isolated from Infected wounds

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Abstract

Introduction: The wounds infection remains a medical problem worldwide due to associated morbidity, mortality and economic burden. Wounds can be infected with bacteria or yeast and the source is usually hosts normal flora and/or the hospital environment. Since *Pseudomonas aeroginosa* is the most common gram-negative non fermenter opportunistic bacteria associated with nosocomial infections. The present study was undertaken to know the antibiotic susceptibility patterns of this pathogen.

Materials and Methods: It was a cross-sectional study carried out over a period of one year. Pus samples collected at source were processed as per standard bacteriological techniques for aerobic cultures. They were inoculated on 5% Blood agar and Mac-Conkey's agar and incubated aerobically for 24-48 hours at 37 degree before reporting them as sterile. Anaerobic cultures were not done. Non lactose fermenting colonies on MacConkey agar were subjected to oxidase test. These oxidase positive isolates were further identified by Vitek-2 Compact (Biomerieux) using gram negative identification cards, following manufacturer's guidelines. Antimicrobial sensitivity was also determined by same system using 281 AST cards. Antibiotic sensitivity results were interpreted as per CLSI guidelines.

Results: A total of 1566 wound swab/pus samples from patients with infected wounds were processed for culture and sensitivity testing from January 2018 to November 2018.

The present study comprised of 101 isolates of *Pseudomonas aeroginosa.* Isolation rate was highest in the age group 20-40 years followed by those above 60 years of age. Most of the isolates obtained were multi-drug resistant. Highest sensitivity was seen in Amikacin and Imipenem.

Conclusion: In conclusion, *Pseudomonas aeroginosa* which is a common Gram negative bacteria isolated from wound infections and also highly resistant to different types of antibiotics could be a reason for high morbidity and mortality in hospitalised patients. Therefore a regular surveillance of antibiotic resistance of these organisms is needed to prevent indiscriminate use of antibiotics leading to emergence of drug resistance among these pathogens.

Keywords: Pseudomonas aeroginosa, Nosocomial infections, Multi-drug resistant.

Introduction

The wounds infection remains a medical problem worldwide due to associated morbidity, mortality and economic burden.[1,2] Wounds are generally infected with bacteria or yeast, and the source is usually hosts normal flora and/or the hospital environment.[3]

Since these infections are frequently polymicrobial in nature so bacteriological work up is also demanding hence usually neglected in under-resourced settings. However bacteriological investigation is mandatory to know the bacterial species causing the infection and their resistance profile to enables targeted antimicrobial therapy. Data from previous studies reveals that *Pseudomonas aeroginosa*, *Staphylococcus auerus*, *Escherichia coli* and *Acinetobacter spp*. are among the commonly isolated pathogens from infected wounds.[4,5] Increasing antimicrobial resistance among these bacteria is a major cause of concern worldwide. Thus antimicrobial resistance data is needed so as to guide the clinicians to formulate an empirical treatment for the patients and policy makers to update the treatment guidelines. This can contribute to prevention and control of antimicrobial drug resistance.

Since *Pseudomonas aeroginosa* is the most common gram-negative non fermenter opportunistic bacteria associated with nosocomial infections. The present study was undertaken to know the antibiotic susceptibility patterns of this pathogen.

Materials and Methods

Study design

It was a cross-sectional study from January 2018 to November 2018. Data collection included information about, age & sex of the patients and a brief clinical history of illness like if a wound was not healing well or exuding pus or fluid.

Settings

The study was carried out in Microbiology department, Sri Guru Ram Das Institute of Medical Science and Research, a tertiary care hospital in North India.

Sample size

The study comprised of a total of 101 non-repeat isolates of *Pseudomonas aeroginosa* obtained from wound swab/pus

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received in Microbiology lab for culture & sensitivity testing

Inclusion criteria

All isolates obtained from wound swab/pus which formed non lactose fermenting colonies on MacConkey agar, oxidase test positive and further confirmed as *Pseudomonas aeroginosa* by Vitek-2 Compact (Biomerieux) were included in the study.

Exclusion criteria

Species of *Pseudomonas* other than *Pseudomonas aeroginosa* were exclude from the study.

Ethical clearance for the study was obtained from the institutional ethics committee.

Methods

Pus samples were collected at source (out-patient clinic and in the wards) using sterile cotton swabs, following departmental guideline; two swabs per patient and were send to the Microbiology department for bacteriological work up. All pus samples were processed as per standard bacteriological techniques for aerobic cultures.[6] They were inoculated on 5% Blood agar and Mac-Conkey's agar and incubated aerobically for 24-48 hours at 37 degree before reporting them as sterile. Anaerobic cultures were not done. Non lactose fermenting colonies on MacConkey agar were subjected to oxidase test. These oxidase positive isolates were further identified by Vitek-2 Compact (Biomerieux) using gram negative identification cards, following manufacturer's guidelines. Antimicrobial sensitivity was also determined by same system using 281 AST cards. Antibiotic sensitivity results were interpreted as per CLSI guidelines.[7]

Statistical analysis

SPSS version 17.0 software and MS excel 2007 were used for statistic analysis. p <0.05 was considered significant.

Results

A total of 1566 wound swab/pus samples from patients with infected wounds were processed for culture and sensitivity testing from January 2018 to November 2018.

The present study comprised of 101 isolates of *Pseudomonas aeroginosa*. Of these 101 isolates, 58(57.42%) were obtained from pus samples of male patients and 43(42.57%) from female patients (Table.1). Isolation rate was highest in the age group 20-40 years followed by those above 60 years of age (Table 2).

Table 1: Gender wise distribution of the positive samples n=101

Sex	Patients with positive cultures
Males	57.42%
Females	42.57%

Odds Ratio: 2.073, p <0.001: highly significant

Table 2: Age wise distribution n=101

Patient's age group	Culture positive N (%)
Less than 1 year	None
1-20 years	2
21-40 years	47
41-60 years	13
>60 years	39

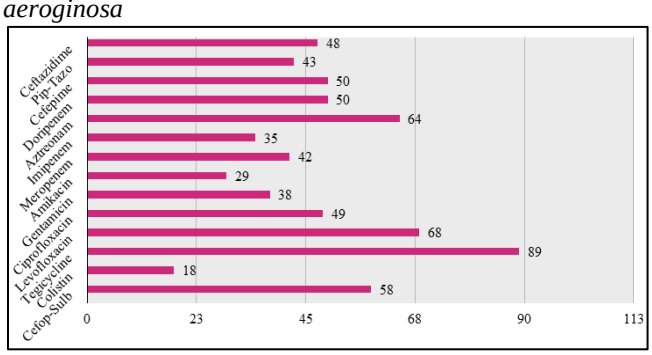
Odds Ratio: 1.607, p <0.001: highly significant

Table 3: Antibiogram of *Pseudomonas aeruginosa* n=101

Antibiotic	Number of Isolates Sensitive	% isolate sensitive
Ceftazidime	53	52.5%
Piperacillin-Tazobactum	58	57.4%
Cefipime	51	50.5%
Doripenem	51	50.5%
Aztreonam	36	35.6%
Imipenem	66	65.3%
Meropenem	59	58.4%
Amikacin	72	71.3%
Gentamicin	63	62.4%
Ciprofloxacin	52	51.2%
Levofloxacin	32	31.7%
Minocyclin	16	15.8%
Tigecyclin	11	10.9%
Colistin	83	82.2
Cefoperazone-Sulbactam	42	41.5%

Table 3 showing that Most of the isolates obtained were multi-drug resistant. Highest sensitivity was seen in Amikacin and Imipenem.

Graph 1: showing resistance patterns of *Pseudomonas aeroginosa*



Discussion

Pseudomonas aeroginosa is worldwide one of the most frequently isolated nosocomial gram negative bacteria from clinical specimens of hospitalized patients. Not only there has been an increase in the incidence of infections with this bacteria during the past decade but also a trend towards greater antibiotic resistance is seen. This could probably be due to an increase in the number of hospitalized or immune-compromised individuals.[8,9] *Pseudomonas aeruginosa* is

intrinsically resistant to several antibiotics because of the low permeability of its outer-membrane to the antibiotics and also the constitutive expression of various efflux pumps, and beside this they also produce antibiotic-inactivating enzymes (e.g., cephalosporinases).[10]

The study showed that more than 50% of isolates of *Pseudomonas aeroginosa* were cephalosporin resistant. Resistant to fluoroquinolones was also high which is in concordance with a study by *Parajuli NP et al* which showed almost 92% of *Pseudomonas* spp. were cephalosporin resistant and even higher resistant to fluoroquinolones (95.8%).[11] However sensitivity to Imipenem was comparatively high (65.3%). These findings were in agreement with those published by *AL Kassi et al*.[12] They isolated different types of bacteria from burn's patient and other units of hospital in Baghdad, which had shown that 86% of *Pseudomonas aeroginosa* isolates were sensitive to Imipenem and which was higher than the results obtained in our study. The results of our study also matched with the study by *AL-Kadhmi et al*, which showed good sensitivity of the isolates of *Pseudomonas aeroginosa* to Ciprofloxacin (61.1%,) and high sensitivity to Imipenem which reached to (77.8%).[13]

Conclusion

In conclusion, *Pseudomonas aeroginosa* which is a common Gram negative bacteria isolated from wound infections and also highly resistant to different types of antibiotics could be a reason for high morbidity and mortality in hospitalised patients. Therefore a regular surveillance of antibiotic resistance of these organisms is needed to prevent indiscriminate use of antibiotics leading to emergence of drug resistance among these pathogens.

Limitations

We were not able to evaluate the risk factors and the outcomes of nosocomial infections caused by this nosocomial pathogen because of unavailability of sufficient data from the patients whose infections were not of nosocomial origin.

Source of Funding

None.

Conflict of Interest

None.

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