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Full Length Research Article

Antibiotics Susceptibility Pattern of *Pseudomonas aeruginosa* Isolated from Wounds in Patients Attending Ahmadu Bello University Teaching Hospital, Zaria, Nigeria

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ABSTRACT: This work investigated the prevalence and antibiotics sensitivity of *Pseudomonas aeruginosa* isolated from wounds of patients attending Ahmadu Bello University Teaching Hospital (ABUTH), Zaria-Nigeria. One hundred Isolates were characterized and identified from the specimens using standard microbiological methods. The results of the isolation and identification showed that 55(55%) were Gram-negative organisms and 44 (44%) were Gram-positive. *Klebsiella* species and *Pseudomonas aeruginosa* accounted for 25% of the Gram-negative organisms, followed by *Proteus* species 19%, *Klebsiella* species 14% and *Escherichia coli* accounts for 11%, while *Staphylococcus aureus* 44% was the predominant Gram-positive organism. Antibiotic susceptibility pattern was determined using the disc diffusion method where the susceptibility of *Pseudomonas aeruginosa* isolated in wounds was observed. The highest sensitivity was observed for ofloxacin, moderate susceptibility was observed for ampicillin, cefuroxime and ceftriazone. The results obtained indicated strong resistance to cotrimoxazole, amoxicillin tetracycline and augmentin. There is the need for routine antibiotic sensitivity check.
Keywords: Susceptibility, Pattern, *Pseudomonas aeruginosa*, Wounds, Zaria.

INTRODUCTION

Bacterial contamination of wounds is an important cause of mortality. Rapidly emerging nosocomial pathogens and the problem of multi-drug resistance necessitate periodic review of antibiogram pattern of organisms isolated in wounds (Mehta *et al.,* 2007). The development of wound infection depends on the integrity and protective function of the skin (Anupurba *et al.,* 2010). The widespread use of antibiotics, together with the length of time over which they have been available have led to major problems of resistant pathogens in wound infections contributing to morbidity, and mortality (Nwachukwu *et al.,* 2009). It has been shown that wound infection is universal and the bacterial type varies with geographical location, resident flora of the skin, clothing at the site of wound, time between wound and examination (Anupurba *et al*., 2010).

In general, a wound can be considered infected if purulent materials drain from it, even without confirmation of positive cultures. Also, many wounds are colonized by bacteria, whether infected or not. Infected wounds may not yield pathogens by culture owing to the fastidious nature of some pathogens, or if the patient has received an antimicrobial therapy (Nwachukwu *et al.,* 2009). Many bacterial agents are known to cause wound infections. Initial injury to the skin triggers coagulation and an acute inflammatory response followed by exposure of subcutaneous tissue following loss of skin integrity which provides a moist, warm, and nutritive environment that is conducive to microbial colonization and proliferation (Yah *et al*., 2010).

Despite introduction of a wide variety of antimicrobial agents with anti-pseudomonal activity, life-threatening infections caused by *Pseudomonas aeruginosa* contribute to morbidity and mortality in hospitalized patients (Nwachukwu *et al*., 2009).

The ability of this organism to develop resistance to antimicrobial agents makes it a main culprit in numerous infections especially in nosocomial infections. The capabilities to colonize rapidly in a compromised host make it very difficult to deal with. In such an eventuality antibiotics stand ineffective (Nagoba *et al.,* 2009). Therefore, studies were conducted to determine the antibiotic sensitivity patterns of *Pseudomonas aeruginosa* isolated from wounds obtained from General Outpatients Department of Ahmadu Bello Teaching Hospital, Zaria-Nigeria.

Sample collection and analysis

A total of one hundred wound swabs were collected from male and female patients of all ages with wound attending the General Out Patients Department, Ahmadu Bello Teaching Hospital, Zaria- Nigeria. Swabs were taken from wounds by the use of swabs sticks and scalpel blades. The samples were

collected and transported to the laboratory where they were cultured onto Nutrient and MacConkey agar and incubated aerobically at 37^{0}C for 24hrs. Suspected colonies were identified using colonial morphology, motility testing, Grams reaction and Biochemical test as described by Cheesbrough (2000).

Antibiotics sensitivity test

Pseudomonas aeruginosa isolates to be inoculated on the surface of Mueller– Hinton agar plates were incubated into nutrient broth overnight until the turbidity is equivalent to 0.5 Mcfarland standards, allowed for few minutes at room temperature. Antimicrobial susceptibility was performed on Mueller-Hinton agar by the standard disk diffusion method recommended by the National committee for clinical laboratory standards (NCCLS 2002).This was done by dipping a sterile swab stick in to overnight nutrient broth and carefully swabbing the entire surface of Mueller– Hinton agar plates. The antibiotics used against the test bacteria were: Amoxicillin (10µg), ofloxacin (5µg), Ampicillin (10µg), ceftriaxone (30µg), cefuroxime (30µg), amikacin (30µg), gentamycin (30µg), tetracycline (30µg), cotrimoxazole (30µg) and augmentin (30µg). The antibiotic multi disc (Oxoid) was then placed on the surface of the inoculated plates and gently pressed. The plates were incubated at 37^{0}C for 18 – 24h. The diameter of zone of inhibition was measured in millimeters and isolates were scored as sensitive or resistant by comparing with values recommended on standard charts.

RESULTS

Table 1 indicates the number of *Pseudomonas aeruginosa* isolated in wounds of patients attending ABUTH, Zaria-Nigeria. Out of the 100 wound swabs analysed following standard microbiological methods, 100 (11%) *Pseudomonas aeruginosa* were recovered. One hundred isolates were recovered from all the specimens, of which 55(55%) were Gram-negative organisms and 44 (44%) were Gram-positive. *Klebsiella* species and *Pseudomonas aeruginosa* accounted for 25% of the Gram-negative organisms followed by Proteus (19%) *Klebsiella* species (14%) *P. aeruginosa* (11%) and *Escherichia coli* (11%), while Gram-positive organism was predominantly *Staphylococcus aureus* (44%).

Table 1: Distribution of Recovered Wounds Isolates

Isolates	Number	%
Klebsiella species	14	14
Pseudomonas aeruginosa	11	11
Staphylococcus aureus	44	44
Proteus species	19	19
Escherichia coli	11	11
Yeast cells	01	01
Total	100	100

Table 2 indicated the susceptibility profile of *P. aeruginosa* isolated from wounds, the highest sensitivity was observed for ofloxacin, moderate susceptibility was observed for ampicillin, cefuroxime and ceftriazone, the resistant pattern of this organism indicated strong resistance to cotrimoxazole, amoxicillin tetracycline and augmentin.

Table 2: Antibiotics Sensitivity Pattern of *P. aeruginosa* Isolated in Wounds

Antibiotics	Disc content (µg)	Number & % Resistant	Number & % Sensitive
Cotrimoxazole	30	[10]90.9	[1]9.1
Tetracycline	30	[9] 81.8	[2]18.2
Amoxycillin	10	[10]90.9	[1]9.1
Ampicillin	10	[5]45.4	[6]54.5
Cefuroxime	30	[5]45.4	[6]54.5
Ceftriazone	30	[5]45.4	[6]54.5
Ofloxacin	05	[3]27.3	[8]72.2
Augmentin	30	[9]81.8	[2]18.2
Gentamycin	30	[5]45.4	[6]54.5
Amikacin	30	[6]54.5	[5]45.5

DISCUSSION

The wound is considered one of the major health problems in the world, and infection is one of the most frequent and severe complications in patients who have sustained wounds (Zogani *et al.*, 2002). The result of this research showed that the prevalence rate of *P. aeruginosa* was 11%, in hospitals, this bacterium is a common cause of wound infections, especially of thermal burns, this is because burns have large exposed areas of dead tissue free of any defences and, therefore, are ideal sites for infection by bacteria from the environment or normal microbiota. This finding is in contrast with the work done by Nwachukwu *et al.*, (2009) in Abia state, Nigeria who reported 32.90% prevalence rate of *P. aeruginosa,* Also, according to work done by AL-Akayleh (1999) in U.A.E, it was reported that out of 67 surgical wound patients examined

microbiologically for surgical wound infection, 51.1% had Staphylococcal surgical wound infection, while 35.6% had *P. aeruginosa* infection. This research was in contrast with similar studies carried out by Anupurba *et al.,* (2010), which showed that *P. aeruginosa* was isolated in 32% of isolates. A similar study from India showed that *P. aeruginosa* was the most frequent pathogen isolated, accounting for 36% of the total number of the organisms (Kehinde *et al.,* 2004). The susceptibility profile of *P. aeruginosa* isolates to the ten antimicrobials tested *in vitro* were relatively low compared to the sensitivity pattern to different anti pseudomonal drugs reported worldwide. Such high antimicrobial resistance is probably promoted due to selective pressure exerted on bacteria due to numerous reasons like non adherence to hospital antibiotic policy, and excessive and indiscriminate use of broad-spectrum antibiotics. In our study, *S. aureus* was the most frequent pathogen isolated, accounting for 44 % of cases because it is the most common group of bacteria responsible for wound infection, and the emergence of resistant strains has considerably increased the morbidity and mortality associated wound infections (Al-Akayley, 1999). It has emerge as one of the most important human pathogens and has over the past several decades, been a leading cause of hospital and community-acquired infections including septicemia, wounds sepsis, and post-surgical toxic shock syndrome with substantial rates of morbidity and mortality (Boyce, *et al*.,1990). However, a similar study from India showed that *P. aeruginosa* was the most frequent pathogen isolated, accounting for 36% of the total number of the organisms. Forty four percent (44%) of the Gram-negative isolates were *K.* species, *E. coli* and *P. aeruginosa*, six strains (54.5%) of *P. aeruginosa* were sensitive to gentamicin, an antibiotic commonly prescribed for Gram-negative infections. Thus, routine microbiological surveillance and careful *in vitro* testing prior to antibiotic use and strict adherence to hospital antibiotic policy may help in the prevention and treatment of multi-drug resistant pathogens in wound infection.

CONCLUSION

Pseudomonas aeruginosa was isolated from wounds and has a frequency of occurrence of 11%. Other bacteria isolated are *S. aureus* (44%), *Proteus* spp. (19%), *Klebsiella* spp. (14%). The sensitivity pattern of *Pseudomonas aeruginosa* showed that it is sensitive to ofloxacin (72%), ceftriazone (54%), cefuroxime (54%) and gentamycin (54%). There is the need for antimicrobial surveillance programs in Nigeria. This will provide valuable insight on resistance trends and encourage the prudent use of antibiotics, which is a major factor in controlling the emergence and spread of microbial resistance to antimicrobial drugs.

REFERENCE

Al-Akayley, M., (1999). Surgical wound infections in United Arab Emirates. *Journal of Clinical Medecine*, **20:** 861-870.

Anupurba, S., Bhattacharjee, A., Garg, A. and Sen, M.R. (2010).Antimicrobial susceptibility of *Pseudomonas aeruginosa* isolated from wound infections. *Indian Journal of Dermatology* **51:** 286-288.

Boyce, J.M. (1990). Increasing prevalence of methcillin–resistant *Staphylococcus aureus* in US hospitals infection control, Hospital *Epidemology* , **11:** 639-642.

Cheesbrough, M. (2000). *District Laboratory Practice for Tropical Countries*. Macmillan Publishing Company. U.S.A. Pp. 67 – 68, 137,141,180.

Kehinde, A.I.O., Ademola, S.A., Okesola, A.O., Oluwatosin, O.M. and Bakare, R.A. (2004). Pattern of bacterial pathogens in burn wound infections in Ibadan, *Nigeria annals of Burns and Fire Disasters,* **18:** 12-15.

Mehta, M., Dutta, P. and Gupta, V. (2007). Bacterial isolates from burn wound infections and their antibiograms: An eight-year study. *Indian Journal of Plastic Surgery* **40:**:25-28.

Nagoba, B., Kolhe, S. and Wadher, B. (2009). Antibiotic Treatment Failure in Chronic Nosocomial Wound Infections *European Journal of General Medecine* **6(1):** 60

National Committee for clinical laboratory standards (2002). Performance standards for antimicrobial disc susceptibility test. 7th edition approved standards M2-A8, National Committee for Clinical Laboratory Standards.

Nwachukwu, N.C., Orji, F.A. and Okike, U.M. (2009). Antibiotic Susceptibility Patterns of Bacterial Isolates from Surgical Wounds in Abia State University Teaching Hospital (ABSUTH), Aba - Nigeria, *Research Journal of Medicine and Medical Sciences,* **4(2):** 575-579.

Yah, S.C., Haruna, T., Enabulele, I.O. and Jacob, J. (2010). Bacterial Adherence: The Role of Serum and Wound Fluid *Sudanese Journal of Public Health* **5(1):** 15-21.

Zogani, A., Zaidi, M., Ranka, R. and Shahen, A. (2002).The pattern and outcome of septicaemia in a burns intensive care unit. Ann. *Burns and Fire Disasters,* **15:** 179-82.