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Bacteriology of Different Wound Infections and Their Antimicrobial Susceptibility Patterns in Owerri

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Abstract

This study was carried out to determine the bacterial aetiologic agents of different wound infections in parts of Imo State their distribution in relation to type of wound and their in vitro antibiotic susceptibility patterns. Samples were collected and processed following standard microbiological techniques as part of the routine clinical management of the patients. The antibiotic sensitivity testing was done on pure culture isolates employing disc-diffusion method for some commonly used antibiotics. A total of 150 patients made of 89 (59.3%) males and 61(40.7%) females were sampled. A total of 175 bacterial isolates were recovered and the predominant bacteria isolated from the infected wounds were staphylococcus aureus (25.1%) pseudomonas aeroginosa (22.3%), Escherichia coli (13.1%) staphylococcus epidermidis (11.4%) Enterobacter species (6.9%), Klebsiella aerogenes(5.1%), proteus vulgaris (5.1%), proteus mirabilis (3.4%), streptococuss specie (1.7%), staphylococcus saprophyticus (1.1%) and Bacillus specie(1.1%). Most of the bacterial isolates were resistant to the microbials used with some species exhibiting 100% resistance to as many as 8 to 10 different antibiotics. This probably indicates that wounds in patients in Owerri were colonized by different bacteria including opportunistic bacteria with staphylococci being predominant. The multiple antibiotic resistant profile of the isolates recommends better clinical evaluation of antimicrobial therapy which would lead to more rational use of drugs.

Keywords: Wounds antimicrobial; susceptibility; Owerri.

Introduction

Wound is a form of injury in which the skin is cut, torn, or punctured. It is referred to as a sharp injury which damages thee dermis of the skin. Also, wound is a breach in the skin and exposure of subcutaneous tissue following loss of skin integrity[1]. It provides a moist, warm and fertile environment conductive to microbial colonization and proliferation. The wound contaminants may not persist but species that grow and divide may become established, causing colonization or infection[2]. Infection in a wound delays healing and may result in wound breakdown or complete wound dehiscence. Most of the bacterial species live on human skin, in the nasopharynx, gastrointestinal tract and other parts of the body with some potential of causing disease. Surgical operation, burns, trauma diseases and nutrition affect the body defenses[3]. The skin barrier is disrupted by every skin incision and microbial contamination is unavoidable inspire of the best skin preparation[4].

Furthermore, irrespective of the technological advances in surgery and wound management, wound infection has been regarded as the most common nosocomial infection particularly among patients undergoing surgery[5]. Wound infection results in prolonged hospital stay and increased trauma care and treatment costs[6]. Generally, wound management practices have become more resource demanding. The severity of complications depends largely on the infecting pathogen and site of infection[7].

The control of wound infections has become more challenging due to widespread bacterial resistance to antibiotics and to a greater incidence of infections caused by Methicillin-Resistant Staphylococcus aurous, Polymicrobic Flora and Fungi[8]. Wound infection has been a source of worry in the field of medicine. Advances in control of infections have not totally eradicated this problem owing to development of drug resistance[9]. The wide spread uses of antibiotics together with the length of time over which they have been available have led to major problems of

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resistant organisms be resulting in morbidity and mortality[10]. Hence, antimicrobial resistance can increase complications and costs associated with procedures and treatment[11]. However, the knowledge of the causative agents of wound infection has proven to be helpful in the selection of antimicrobial therapy[13]. The presence of drug resistant bacteria in the environment is a great threat for public health and up to date information on local pathogens and drug sensitivity pattern are crucial to patients treatment. Therefore, this study is aim at updating the knowledge of bacteria present in wounds and their sensitivity to common antibiotics used in Owerri Imo State, Nigeria.

Materials and Methods Subjects:

The subjects include 150 patients presenting for wound dressing changes in the out-patient department of general Hospital Owerri Imo State. The wound types include boils, postoperative wounds, ulcers, burns, trauma wounds, lymphoma, whitlow, dog bite, cellulotis and abscesses.

Sample Collection and Organisms

Isolation:

Prior to wound cleansing and dressing an exudates sample was taken by the physician in charge of the patient using sterile cotton-tipped swab stick. Care was taken to avoid contamination by the normal skin flora. All swabs sticks with samples were transferred to the laboratory and wound swab from each site were immediately applied to freshly prepared blood agar, Nutrient agar, mannitol salt agar, and McConkey agar plates streaked and incubated aerobically at 37^0C for 24 hours. After incubation period, the plates were observed for growth and after careful examination, representative colonies were picked and subcultured onto sterile nutrient agar plates and incubated at37^0C. Overnight for purification, purified cultures were stored on nutrient agar slants and refrigerated.

Identification of Isolates

The initial characterization of the isolates was based on the morphology and cultural characteristics as well as Gram reaction which assisted in ascertaining the purity of each of these colonies. Further characterization of isolates involved various biochemical test such as motility, catalase, coagulase, indole, citrate utilization, voges proskauer, sugar fermentation tests and growth on mannitol salt agar. The tests were performed in replicates of 2 for each isolate with an uninnoculated control in every case.

Antibiotic Sensitivity Testing

The antibiotic susceptibility pattern of isolates was determined using the disc-agar diffusion method described by Ogbulie et al[14].

Results

Table 1: Age Distribution of Subjects with Wound

Age(Years)	No of Subjects (%)	Male	Female
0-10	3(2)	1	2
11-20	21914)	13	8
21-30	43(28.7)	24	19
31-40	21(14)	9	12
41-50	23(15.3)	15	8
51-60	30(20)	20	10
61-70	4(2.7)	4	0
71-80	3(2)	2	1
81-90	1(0.7)	1	0
91-100	1(0.7)	0	1
Total	**150**	**89(59.3)**	**61(40.7)**

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Table 2: Frequency of Wounds on Various Parts of the Body

Body Region	Frequency of wound(%)
Foot	24(15.8)
Hand	39(25.7)
Leg	45 (29.6)
Head and neck	5 (3.3)
Back	4 (2.6)
Abdomen	18 (11.8)
Breast and Chest	7 (4.6)
Armpit	2 (1.3)
Buttocks	7 (4.6)
Genitals	1 (0.7)
Total	**152**

Table 3: Frequency of Types of Wound that Affected the Patients

Types of Wound	Frequency (%)
Ulcer	39(25.7)
Burns	25(16.4)
Abscess	19 912.5)
Cellulitis	2(1.3)
Lymphoma	1 (0.7)
Post operative	18(11.8)
Boil	15 (9.9)
Trauma	21(13.8)
Whitlow	10(6.6)
Dogbite	2(1.3)
Total	**152**

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Table 4: Frequency of Bacterial Isolates Recovered form Patients Wounds

Organisms	Frequency %
Staphylococcus aureus	44(25.1)
Staphylococcus epidermidis	20(11.4)
Staphylococcus Saprophyticus	29(1.1)
Streptococcus species	3(1.7)
Bacillus Species	2(1.1)
Escherichia Coli	23(13.1)
Klebsiella aerogenes	9(5.1)
Klebsiella Oxytoca	6(3.4)
Entrobacter Species	12(6.9)
Proteus Mirabilis	6(3.4)
Proteus Vulgaris	9(5.1)
Pseudomanas aeruginosa	39(22.3)
Total	**175**

Discussion

Wound infection is a major concern among health care practitioners not only in terms of increased trauma to the patient but also in view of its burden on financial resources and the increasing requirement for cost-effective management within the healthcare system[15].

The results showed that the incidence of wound infection is higher in males (59.3%0 than in females (40.7%). This is in line with the work of Ako-nai et al [16].

Also, from the result, it was observed that the frequency of wounds with respect to the location on the body was high at the extremeties. There is a significant difference between the respective frequencies of wounds according to the body regions. The wounds were classified into ulcer (25.7%) burns (16.4%) trauma (13.8%), abscess (12.5%) postoperative wounds (11.8%), boil (9.9%), whitlow (6.6%), Cellulits (1.3%), dog big (1.3%) and lymphoma (0.7%). Majority of the patients with ulcer wounds were diabetic. Many of the wounds manifested as diabetic ulcer. Hence, the foot had the highest number of wounds. This is in agreement to the work of Ozumba[17] who recorded 21.7% as the percentage of ulcer wounds in his evaluation of bacteriology of wound infections.

Furthermore, 175 bacterial agents were cultured from 152 samples. Gram positive organisms constituted 40.6% of which 97.2% were coci and 2.8% were rods. The gram negative organisms accounted for 59.4% of the organisms isolated. There is a significant difference between the respective. Frequencies of organisms isolated from the wound ($P<0.05$)

The staphylococcus aureus strains accounted for 25.1% of the total bacterial isolates recovered from the wounds. This result is similar to the 25.3% value reported by Adebayor et al[18].

Also, the staphylococcus epidermis accounted for 11.4% of the organisms isolated from wounds in this study. This is not unexpected since the organisms is a commensal or normal flora on the skin[19]. Bacillus species accounted for only 1.1% of the isolates in this study. This is low compared to 8% recorded by Adebayor et al[18]. This may be associated with aerial contamination because Bacillus Species have been reported as frequent contaminants in air and water[2O]

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Enteric organism accounted for 37% of the organisms cultured from different wounds. Coliforms accounted for 81% of the organism isolated form post operative wounds. The lactose fermenters –Escherichia coli, Klebshiella Oxytoca, Kaeroginosa and Enterobacter species accounted for 28.5% of the isolates encountered. This is in line with the work of Mahmood[21] who reported 26.13% enteric bacteria.

The antibiotic susceptibility pattern of the 175 bacteria recovered from the wound infections was evaluated. The resistance to the selected antimicrobials was very high. The average resistance of the isolates to all the antibiotics was 82.4%. This si similar the work of Andargachew et al[22].

Owing to poverty and corruption in this country, many people are practicing self medication, hence practicing self medication, hence leading to inappropriate use of antibiotics. This would encourage resistance of the microbes to the drugs. This resistance might probably be a reflection of inappropriate use of antimicrobials, lack of diagnostic laboratory services or unavailability of guideline regarding the selection of drugs.

It was observed from the study that 100% of staphy aureus isolates were resistant to cotrimoxazole, nitrofurantoin, nalidixic acid and augmentin. There was 97.7% resistance to amoxicillin 95.5% cloxacillin, 90.9% to ofloxacin, 84.1% to tetracycline and 75% to chloramphenicol. Also, 68.2% and 56.8% were resistant to erythromycin and gentamycin. Only 4.5% were resistant to levofloxacin. These results suggest that S aureus are less susceptible to traditionally employed antimicrobials. Such as tetracycline, erythromycin and chloramphemicol which may be epidemiologically important in treating infections caused by this organism.

The gram negative organism displayed high resistance to different antimicrobial agents used in the study. Pseudomonas aeruginosa isolates were the most predominant gram negative isolates and 100% of these were resistant to amoxicillin, augmentin, erythromycin, cloxacillin and chloramphenicol.

Similarly, 97.4% showed resistance to cotrimoxazole, 94.9% each to nalidixic acid and nitrofurantoin and 51.3% to gentamycin. Only 5.1% resistance was demonstrated to levofloxacin. The mechanism of resistance of P aeruginosa to aminoglycosides and B-Lactancs may be antibiotic inactivation by certain enzymes. The outer membrane of this organism may also act as a barrier limiting the entry of antimicrobial agents.

In conclusion, it is implied that levofloxacin is the most effective of the antibiotics used in this study, against both grain positive and gram negative isolates cultured from different wounds in Owerri Nigeria.

References

[1] Vimalin JH, Growther L. Studies on bacterial infections of diabetic foot ulcers. Afr J Clin Experimental Microbiol 2010; 11(93): 146-149.

[2] Weigelt JA, Lipsky BA, Tabak YP, Derby KG, Kim M, Gupta V. Surgical site infections: Causative pathogens and associated outcomes. Am J Infect Control 2010;38:112-20.

[3] Mawalla B, Mshana SE, Chalya PL, Imirzalioglu C, Mahalu W. Predictors of surgical site infections among patients undergoing major surgery at Bugando Medical Centre in Northwestern Tanzania. BMC Surgery 2011;11:21.

[4] Adegoke AA, Tom M, Okoh AI, Jacob S. Studies on multiple antibiotic resistant bacterial isolated from surgical site infection. Scientific Research and Essays 2010;5:3876-81.

[5] Moyo S, Aboud S, Kasubi M, Maselle S. Y. Bacteria isolated from bloodstream infections at a tertiary hospital in Dar es Salaam, Tanzania – antimicrobial resistance of isolates. S Afr Med J 2010;100:835-8.

[6] Lyamuya EF, Moyo SJ, Komba EV, Haule M. Prevalence, antimicrobial resistance and associated risk factors for bacteriuria in diabetic women in Dar es Salaam, Tanzania. African Journal of Microbiology Research 2011;5:683-9.

[7] Uçkay I, Harbarth S, Peter R, Lew D, Hoffmeyer P, Pittet D, Preventing surgical site infections, Expert Rev Anti Infect Ther 2010;8(6):657-70.

[8] Moyo SJ, Aboud S, Kasubi M, Lyamuya EF, Maselle SY. Antimicrobial resistance among producers and non-producers of extended spectrum beta-lactamases in urinary isolates at a tertiary Hospital in Tanzania. BMC Res Notes 2010;3:348.

[9] Kamat U, Ferreira A, Savio R, Motghare D, Antimicrobial resistance among nosocomial isolates in a teaching hospital in Goa , Indian J Community Med. 2008 ;33(2):89-92.

[10] Sani RA, Garba SA, Oyewole OA. Antibiotic resistance profile of Gram negative bacteria isolated from surgical wounds in Minna, Bida, Kontagora and Suleja Areas of Niger State. Am J Med Med Sci 2012; 2(1): 20-24.

ISSN 2454-1672

[11] Nwachukwu NC, Orji FA, Okike UM. Antibiotic susceptibility patterns of bacterial isolates from surgical wounds in Abia State University Teaching Hospital (ABSUTH), Aba – Nigeria. Res J Med Med Sci 2009; 4(2): 575-579.

[12] Reichman DE, Greenberg JA. Reducing surgical site infections: A review. Rev Obstetrics and Gynecol 2009; 2(4): 212-221.

[13] Emine A, Hakan L, Mehmet D, Andreas V. Infection control practice in countries with limited resources. Ann Clin Microbiol Antimicrobials 2011; 10: 36-38.

[14] Ogbulie JN, Uwaezuoke JC and Ogiehor SI. Introduction to Microbiology Practicals. First edition spring field Publications Owerri pp. 1998 62-62.

[15] Choi WS, Song JY, Hwang JH, Kim NS, Cheong HJ, Appropriateness of antibiotic prophylaxis for major surgery in Korea, Infect Control Hosp Epidemiol 2007; 28:997–1002.

[16] AKo-Nai Ak, Lamikanra AB and Onipede AO. Incidence of pathogenic microorganisms in Clinical Specimens from Hospitals in South Western Nigeria. East Afr. Med. J1995 72(7): 436-441.

[17] Ozumba UC. Bacteriology of wound infections in the surgical wards of a Teaching Hospital in Enugu Nigeria. Afr. J. med Science2007 36(4): 341- 344.

[18] Adebayor OS, Deboye OK and Emiola AR. Wound infections in tow Helath Institution in Ileife Nigeria. Result of a Cohort Study Osto Wound Manag. 2003 49.52-57.

[19] Fadeyi A, Ismaila AA, Ganiyu AR. Bacteriological patternof wound swab isolates in patients with chronic leg ulcer. Int J Health Res 2008; 1(4): 183-188.

[20] Erol S, Altoparlak U, Akcay MN, Celebi F, Parlak M. Changes of microbial flora and wound colonization in burned patients. Burns 2004; 30(4): 357-361.

[21] Mahmood A. Bacteriology of Surgical Site infectious and antibiotic susceptibility pattern of isolates at a tertiary Care Hospital in Karachi. J Pak Med. Ass. 2000, 50(8): 256-259.

[22] Andargachew, M Feleke M, Belay T and Afework K . Pattern and Multiple drug resistance of bacterial pathogens isolated form wound infectious at University of Gondar Teaching Hospital North West Ethiopia. Ethiopian Medical Journal2006 44 (2): 125-131.

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