International Scholars Journals

International Journal of Obstetrics and Gynecology ISSN 2326-7234 Vol. 6 (6), pp. 227-231, June, 2018. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research paper

Bacteriology of automobile accident wounds infection

Idowu Ife, Molayo Olaniyi and Omojola Omojola

[1]Department of Medical Microbiology, Faculty Basic Medical Sciences, Ekiti State University, Ado Ekiti, Ekiti, Nigeria.
[2]Department of Bacteriology, Faculty of Clinical Sciences, Ekiti State University, Ado Ekiti, Ekiti, Nigeria.

Accepted 09 April, 2016

Purulent materials were collected aseptically with the aid of sterile swab sticks from Forty (40) patients with automobile accident wounds at University of Uyo Teaching Hospital (UUTH) and James Accident and Bone Victim Hospital (JABH) in Uyo. These samples were examined microbiologically for the presence of aerobic bacteria and the susceptibility of these organisms to different conventional antibiotics was assessed using Kirby Bauer disc diffusion technique. A total of Seventy-four (74) bacterial isolates were obtained from the wound cultures. A single etiological agent was identified in 13 (32.5%) samples while multiple agents were found in 26 (65%), but no bacterial isolate was obtained in one case. *Staphylococcus aureus* was the predominant microorganism (37.8%) followed by *Pseudomonas aeruginosa* (27.0%), *Escherichia coli* (14.9%), *Streptococcus pyogenes* (12.2%) and *Klebsiella pneumoniae* (8.11%). Automobile accident wound infection was most prevalent in the age group of 21 - 40 and less prevalent in the age group 61 and above. Automobile accident infection was more prevalent (71.6%) in males than in females (28.4%).The results of the antibiotics susceptibility showed that most of the isolates were highly resistant to penicillin (80.4%), streptomycin (67%) and gentamycin (71.6%), and moderately sensitive to augmentin (46.2%), and nalidixic acid (56.8%), but highly sensitive to ofloxacin (81.6%), ciprofloxacin (75.8%) and pefloxacin (81%). The findings of this study showed that ofloxacin, ciprofloxacin and pefloxacin may be drugs of choice for the treatment of automobile accident wound infection, while penicillin, streptomycin and gentamycin may not be used unless culture and sensitivity tests are done.

Key words: Prevalence, susceptibility, automobile, wound, bacteriology, Uyo.

INTRODUCTION

In spite of technological advances that have been made in wound management, wound infection has been regarded as the most common nosocomial infection (Dionigi et al., 2001; Iroha et al., 2008). A wound is a breach in the skin and the 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 (Bowler et al., 2001; Shittu et al., 2002). Automobile accident wound infection simply means wound infection after automobile accident. A wound can be considered infected if purulent material is observed without the confirmation of a positive culture. Infection in a wound delays healing, causes wound breakdown, dehiscence prolongation of hospital stays, increased trauma care and treatment costs (Alexander, 1994; Bowler et al., 2001). The number and range of automobile accidents had increased over the recent decades and the rates of automobile accident wound infection vary from one patient to another. Bacte-riological studies have also shown that wound infection is universal and that the bacteria types present vary with geographical location, bacteria resident on the skin, cloth-ing at the site of wound, time between wound and exami-nation (Trilla, 1994). The virulence and invasiveness capability of the organisms have been reported to influence the risk of infection, but the physiological state of the tissue in the wound and the immunological integrity of the host seem to be of equal importance in determining whether infection occurs (Oguntibeju and Nwobu, 2004). The control of wound infections has become more chal-lenging due to widespread bacterial resistance to anti-biotics and to a greater incidence of infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and polymicrobic flora.The knowledge of the causative agents of automobile accident wound infection will be therefore helpful in the selection of empiric antimicrobial therapy.

*Corresponding author. E-mail: idowu_ife@gmail.com.

Table 1. Occurrence of Bacterial isolates in automobile accident wound infection.

Bacteria	Total number isolated	% of isolates
Streptococcus pyogenes	09	12.2
Escherichia coli	11	14.9
Pseudomonas aeruginosa	20	27.0
Klebsiella pneumoniae	06	8.11
Staphylococcus aureus	28	37.8

Table 2. Clinical source of isolation, age/sex and organisms isolated from University of Uyo Teaching Hospital (UUTH).

Samples No.	Age (yrs)/Sex	Culture source	Organisms Isolated
UU-01	18/M	leg	a
UU-02	25/M	face	a
UU-03	35/M	leg	d, e
UU-04	20/F	wrist	b
UU-0 5	23/F	face	a, b
UU-06	15/M	leg	a, b, d
UU-07	22/F	waist	d
UU-08	20/M	abdomen	c, e
UU-09	49/M	leg	a, c
UU-10	62/M	waist	NI
UU-11	64/M	face	a, c
UU -12	18/M	leg	a
UU -13	44/F	back	c, e
UU -14	27/F	leg	a
UU -15	42/M	leg	a, b, c
UU -16	30/F	back	a
UU -17	44/F	face	a
UU -18	44/M	head	b, c
UU -19	35/F	face	d, e
UU -20	24/F	leg	a, b
UU -21	44/M	back	a, c
UU -22	40/F	leg	a, b
UU -23	63/M	leg	b
UU -24	52/M	abdomen	b, c, e
UU -25	30/M	head	a, b, d

a- *Staphylococcus aureus*; b- *Pseudomonas aureginosa;* c- *Escherichia coli;* d-*Streptococcus pyogenes;* e-*Klebsiella pneumonia* , NI- No isolate

Epidemiological data regarding the microbial agents causing automobile wound infections in Nigeria are limited. Thus, this necessitated this research in which the objective was to study the prevalent bacteria in automobile wound infection and their susceptibilities to commonly prescribed antibiotics.

MATERIALS AND METHODS

Collection of samples

Purulent materials were collected aseptically with the aid of sterile swab sticks from Forty (40) patients with automobile accident wounds at University of Uyo Teaching Hospital (UUTH) and James Accident and Bone Victim Hospital (JABH) in Uyo. The samples were properly labelled indicating the source, date, time of collection, sex, age of patients and the samples were transported in cooler boxes to the Microbiology Laboratory, University of Uyo for bacteriological investigations within 4 – 6 h of collection.

Bacterial Isolation and Identification

Culture plates of Eosin Methylene Blue Agar (Oxoid. UK), MacConkey Agar (Oxoid), Nutrient Agar (Oxoid), Blood Agar (Oxoid), and Mannitol Salt Agar (Oxoid) were used. The swab sticks used for the

Table 3. Clinical source of isolation, age/sex and organisms isolated from James Accident and Bone Victim Hospital (JABH).

Samples No	Age (yrs)/Sex	Culture source	Organisms Isolated
JB-01	20/M	leg	a, b, c
JB-02	18/M	leg	a, b
JB-03	40/M	leg	a, b
JB-04	41/M	leg	a
JB-05	58/F	face	a, b, d
JB-06	23/F	leg	b
JB-07	42/F	abdomen	a, d
JB-08	53/M	head	a, b
JB-09	20/M	head	a, b
JB-10	19/M	leg	c
JB-11	52/M	leg	a, c
JB-12	32/M	leg	a, b, d
JB-13	65/M	leg	a, b, d
JB-14	61/M	face	a, b, e
JB-15	36/M	face	a

a- *Staphylococcus aureus*; b- *Pseudomonas aureginosa*;
c- *Escherichia coli*; d-*Streptococcus pyogenes*; e-*Klebsiella pneumonia*

Table 4. Occurrence of bacterial isolates in automobile accident wound infection in relation to age.

Age	No of Samples	No of organisms isolated	Percentage of Isolates
0-20	09	13	17.6
21-40	14	32	43.2
41-60	12	20	27.0
61 and above	05	09	12.2

collection of the samples were streaked directly on the labelled agar plates and incubated at 37°C for 24 h. After incubation, cultures were examined for significant growth. Subcultures were then made into plates of nutrient agar and incubated for another 24 h. The primary identification of the bacterial isolates was made based on colonial appearance and pigmentation. Biochemical tests were performed to identify microbes that could not be characterized by morphology; colour or type of colony after gram's staining. Biochemical tests applied were standard catalase test, citrate utilization, coagulase, oxidase, Voges-Proskauer, Indole production, motility, sucrose, maltose, lactose, nitrate reduction and mannitol. Characterization and identification of the isolates was done using the methods of Cowan (1985), Fawole and Oso's (1988) and Cheesbrough (2004).

Antibiotic sensitivity testing

In vitro susceptibility of the organisms to the antibiotics was determined using Bauer disk-diffusion technique (Bauer et al., 1996) (Commercially available antibiotics discs containing the following (concentration in g): penicillin (Pn, 25), ciprofloxacin (Cf, 10), gentamycin (Gm, 10), nalidixic acid (Na, 30), pefloxacin (Pf, 5), augmentin (Ag, 30), streptomycin (St, 10) and ofloxacin (Of, 5) were used. Zones of inhibition after incubation were observed and the diameters of inhibition zones were measured in millimeters using a caliper. The interpretation of the measurement as sensitive, intermediate and resistant was made according to manufacturer's standard zone size interpretive manual. The intermediate readings were considered as sensitive for the assessment of the data.

Data presentation

Graphs were used for data presentation to illustrate antibiotic susceptibility profile of each of the automobile accident wound pathogens isolated.

RESULTS

A total number of 40 patients with automobile accident wounds during the study period were made up of 27 males and 13 females. The ages ranged from 1 to 60 and above were considered. Only three of the patients were treated as out-patients, all the rest were hospitalized. Wound infection was observed in thirty nine of the patients (97.5%) with 74 isolates comprising *S. aureus* (37.8%), *Pseudomonas aeruginosa* (27%) *Streptococcus pyogenes* (12.2%), *Klebsiella pneumoniae* (9.64%) and *Escherichia coli* (14.9 %) (Table 1). Thirteen patients (32.5%) had a single organism isolated; while the remaining twenty-six patients (65%) had two or more organisms isolated (Tables 2 and 3). There was only one patient (2.5%) who had a sterile culture with no organisms isolated. Automobile accident wound infection was most prevalent in the age group 21 - 40 and less prevalent in the age group 61 and above (Table 4). In relation to sex automobile accident infection was more prevalent in males than in females (Table 5) . The results of the antibiotics susceptibility showed that most of the isolates were highly resistant to the antibiotics penicillin (80.4%), streptomycin (67%) and gentamycin (71.6%), and moderately sensitive to augmentin (46.2%), and nalidixic acid (56.8%), but highly sensitive to ofloxacin

Table 5. Occurrence of bacterial isolates in automobile accident wound infection in relation to sex.

Sex	No of Samples	No of Isolates	% of Isolates
Males	27	53	71.6
Females	13	21	28.4
Total	40	74	100.0

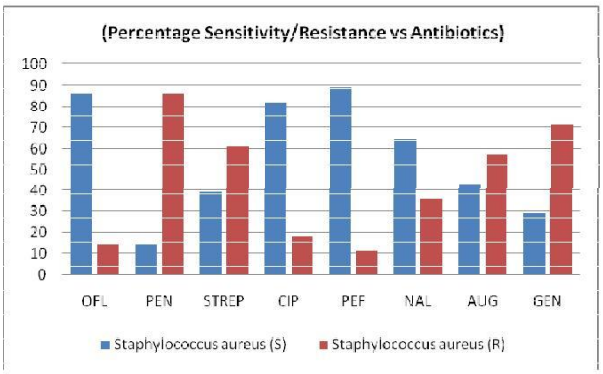

Figure 1. Comparative % of Antibiotic Profiles between *Staphylococcus aureus* (n = 28).
OFL: Ofloxacin; PEN: Penicillin; STREP: Streptomycin; CIP: Ciprofloxacin; PEF: Pefloxacin; NAL: Nalidixic Acid; AUG: Augmentin; GEN: Gentamycin; (S) - Sensitive; (R) – Resistant.

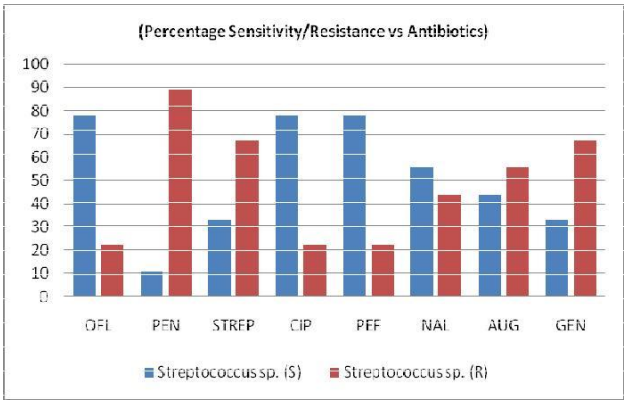

Figure 2. Comparative % of Antibiotic Profiles between Streptococcus pyogenes (n = 09).
OFL: Ofloxacin; PEN: Penicillin; STREP: Streptomycin; CIP: Ciprofloxacin; PEF: Pefloxacin; NAL: Nalidixic Acid; AUG: Augmentin; GEN: Gentamycin; (S) - Sensitive; (R) – Resistant.

(81.6%), ciprofloxacin (75.8%) and pefloxacin (81%) (Figures 1, 2, 3, 4 and 5).

DISCUSSION

It is common for most of the surviving automobile acci-

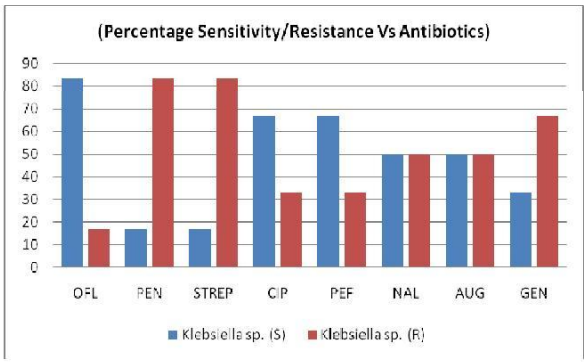

Figure 3. Comparative % of Antibiotic Profiles between Klebsiella pneumoniae (n = 06).
OFL: Ofloxacin; PEN: Penicillin; STREP: Streptomycin; CIP: Ciprofloxacin; PEF: Pefloxacin; NAL: Nalidixic Acid; AUG: Augmentin; GEN: Gentamycin; (S) – Sensitive; (R) – Resistant.

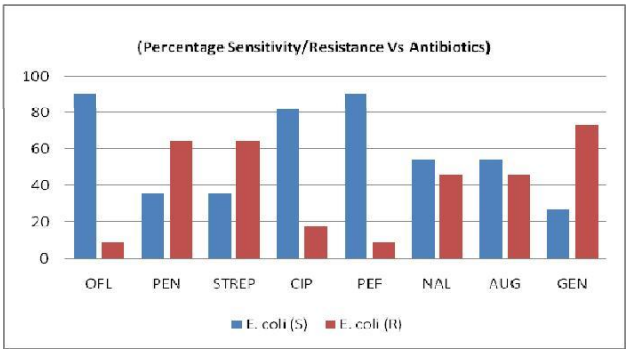

Figure 4. Comparative % of Antibiotic Profiles between *E. coli* (n = 11). OFL: Ofloxacin; PEN: Penicillin; STREP: Streptomycin; CIP: Ciprofloxacin; PEF: Pefloxacin; NAL: Nalidixic Acid; AUG: Augmentin; GEN: Gentamycin; (S) – Sensitive; (R) – Resistant.

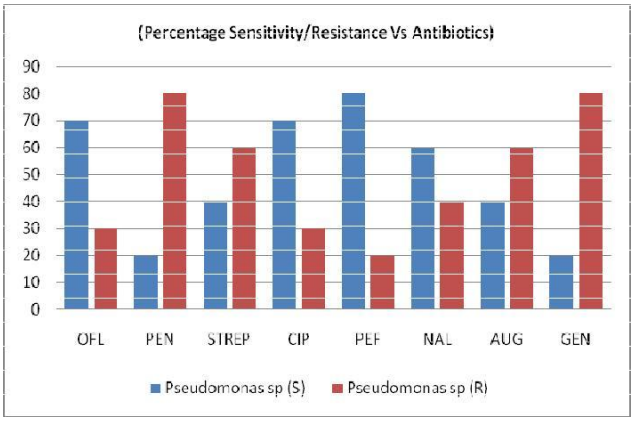

Figure 5. Comparative % of Antibiotic Profiles between Pseudomonas aeruginosa (n = 20).
OFL: Ofloxacin; PEN: Penicillin; STREP: Streptomycin; CIP: Ciprofloxacin; PEF: Pefloxacin; NAL: Nalidixic Acid; AUG: Augmentin; GEN: Gentamycin; (S) - Sensitive; (R) – Resistant.

accident victims to receive a first aid treatment in the field like cleansing of the wounds and early antibiotics administration prior to hospitalization. However, the bacteriology of these automobile accident wounds is limited by the absence of systematic study and the paucity of patients cultured as the cultures are not usually taken prior to, or even after the initiation of antimicrobial therapy. Consequently, there are scant data regarding the bacteriology of automobile accident wounds. The establishment of automobile accident unit will reduce to the barest minimum the mortality rate among the patients as a result of cross-infection. The microbiological analysis revealed that *S. aureus* was the leading etiologic agent of wound infection and the results obtained in this study is similar to reports obtained in, India, Thailand and Japan (Basak et al., 1992; Mashita et al., 2000). The high prevalent of *S. aureus must* have been caused by incision or fluid collection under the skin surface. Microbiological investigations have noted that this organism is the single causative bacterium in approximately 25 to 69% of cutaneous abscess (Brooks and Finegold, 1981; Mahdi et al., 2000). The emergence of resistant organisms in automobile accident wound infections can lead to higher treatment costs and prolongation of hospital stay with serious consequences in infection control especially in developing countries. Most of the wound infections were polymicrobic in nature and in most cases, associated with *S. aureus* and other microorganisms. In conclusion the isolation of both gram positive and gram negative bacteria from the automobile accident wound supports the need to obtain culture specimens from infected automobile accident wounds for microbiological evaluation and antibiotic susceptibility determination, so that adapted chemotherapy can be prescribed and this will facilitate successful wound management but also assist in the control of antibiotic.

ACKNOWLEDGMENTS

We gratefully acknowledge the expertise of staff of Department of Medical Microbiology and Parasitology, University of Uyo Teaching Hospital and James Accident and Bone Victim Hospital (JABH) in Uyo for their immense co-operation and assistance.

REFERENCE

Alexander MF (1994). Wound Infection. In: Nursing Practice Hospital and Home, the Adult. Edited by Margaret F. Alexander, Josephine N. Fawcett, and Phyllis J. Runciman. Churchill Livingstone, New York p. 703.

Bauer, AW, Kirby, WM, Sherris, JC, Jurck, M (1996).Antibiotic susceptibility testing by a standard single disc method. Am J. Clin. Pathol. 451:493-496

Basak S, Dutta SK, Gupta S, Ganguly AC (1992). Bacteriology of wound infections. Evaluation by surface swab and quantitative full thickness of wound biopsy culture. J. Indian Med. Assoc. 90: 33-34.

Bowler PG, Duerden BI, Armstrong DG. (2001). Wound microbiology and associated Approaches to Wound Management. Clin. Microbiol. Rev. 14: 244-269.

Brooks I, Finegold SM (1981). Aerobic and anaerobic bacteriology of cutaneous abscess in children. Paediatrics. 67: 891-895.

Cheesbrough M (2004). Morphology and characterization of E. coli and S. aureus. District Laboratory practice in tropical countries part II. Cambridge University .pp. 157-179.

Cowan ST, Steel KJ (1985). Manual for the Identification of Medical Bacteria. (4th Edition). Cambridge University Press. London, p. 217.

Dionigi R, Rovera F, Dionigi G, Imperatori A, Ferrari A, Dionigi P, Dominion I (2001).Risk factors in Surgery. J. Chemother. 13: 6-11

Fawole, MO, Oso, BA. (1988). Laboratory Manual for Microbiology, Ist Edition, Spectrum Book Ltd, Ibadan. pp. 22-45.

Iroha IR, Amadi ES, Orji JO, Esimone CO (2008). *In vitro* evaluation of the activity of colloidal silver concentrate against *Pseudomonas aeruginosa* isolated from postoperative wound infection. Sci. Res. Essay .3(5): 209-211.

Mahdi SI, Ahmed AA, Boelens H, Ott A, Abugroun ES, van-Belkum A, Zijlstra E, Verbrugh H, Fahal A (2000). An epidemiological study of the occurrence of Staphylococcus aureus in superficial abscesses of patients presenting for surgery in a teaching hospital in Khartoum, Sudan. Immunol. Med. Microbiol. 29: 155-162.

Mashita K, Shinagawa N, Sato T, Hirata K, Katsuramaki T, Mukaiya M, Yura J (2000). Bacteria isolated from surgical infections and their susceptibilities to antimicrobial agents. Special references to bacteria isolated between April 1997 and March 1998. Japanese J. Microbiol. 53 (80): 533-565.

Oguntibeju OO, Nwobu RAU(2004). Occurence of Pseudomonas aeruginosa in post operative wound infection. Pakistan J. Med. Serv. 20(30): 187-191.

Shittu AO, Kolawole DO, Oyedepo ER (2002). A study of wound infections in two health institutions in Ile-Ife, Nigeria. Afr. J. Biomed. Res. 5: 97-10.

Trilla A (1994).Epidemiology of nosocomial infections in adult intensive care units. Intensive Care Med. 20(3): 1- 4.