AFRICAN JOURNAL OF MEDICINE and medical sciences

Volume 37 Number 3 September 2008

Editor-in-Chief
YETUNDE A. AKEN'OVA

Assistant Editors-in-Chief
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J. O. LAWOYIN

ISSN 1116—4077

Bacteriology of non-surgical wound infections in Ibadan, Nigeria.

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Summary
Previous studies done on wound infections in this environment had been mostly on the surgical variety rather than the non-surgical.However,few studies available on the non-surgical type have indicated that changes do occur in the pattern and antibiogram of the bacterial isolates of these non-surgical wound infections. This study was therefore designed to investigate the bacteriology of non-surgical wound infections in this environment. A retrospective review of seven hundred and fifty four cases of non-surgical wound infections was conducted between September 2002 and February 2005 at the University College Hospital, Ibadan, Nigeria. A total number of 871 bacterial, and seven fungal isolates were obtained from these wound cultures. In 477 (70.3%) cases, cultures were monomicrobial and 202 (29.8%) polymicrobial. *Staphylococcus aureus* (38%) was the predominant pathogen, followed by *Pseudomonas aeruginosa* (18.7%), Klebsiella species (17%),*Escherichia coli* (10.6%), Proteus species(7.4%),*Staphylococcus epidermidis* (4.4%), Streptococcus species (1.6%), *Enterococcus faecalis* (1.4%), and *Candida albicans* (0.8%). High rates of antibiotic resistance were recorded among these isolates. 53.4% of them were sensitive to ceftriaxone, 42.5% to gentamycin and 39.3% to ofloxacin. This high antibiotic resistance gives credence to the value of determining the antibiogram of these pathogens in their management. Continuous interaction between the wound care practitioners and microbiology department is also advocated.

Keywords: *Wound, non-surgical, infections, antibiogram*

Résumé
Cette étude était faite pour investiguer la bactériologie des blessures non chirurgicales dans cet environnement. Une revue rétrospective de sept cent cinquante-quatre cas non chirurgicales des infections conduit entre septembre 2002 et février 2005 au centre hospitalier universitaire d Ibadan, Nigeria. Un total de 871 bactéries et 7 isolats de fungi étaient obtenus des cultures. 477(70,3%) des cas cultivés étaient non microbials et 202(29,8%) polymicrobial. Le *staphylocoque aureus* (38%) était le pathogène le plus prédominant, suivi de 18,7% de pseudomone aerudinose (18,7%), 17% d'espèce Klebsiella, 10,6% d Escherichia Coli,(7,4%) d'espèce proteus, (4,4%) de staphylocoque epidermidis,(1,6%) d'espèces streptocoque,(1,4%) d *enerocoque faecalis*, et (0,8%) des candidas albicans. Des taux élevés de résistances d antibiotiques étaient enregistrée parmi les isolats, 53,4% étaient sensibles au ceftriaxone, 42,5% à la gentamicine et 39,3% a l' ofloxacine. Le taux élevé de résistance donne une crédence à la valeur déterminant l'antibiogramme de ces pathogènes dans leurs soins. Les interactions continues entre les personnels et le département de microbiologie dans les soins effective des blessures sont encouragées.

Introduction

Wounds may be inflicted deliberately on the body as a result of surgical operation, or accidentally, in road traffic accidents, burns, fighting, occupational hazards, or even by action of microorganisms[1-5]. These lesions may now be colonized by endogenous or exogenous microorganisms, and, if these are overwhelming enough to overcome the host's defence mechanisms, wound sepsis results[6]. Wound infections remain important cause of concern in hospitals world over because of the associated morbidity and mortality[7]. Different organisms have been associated with wound infections, and the kind has been found to be dependent on the type and depth of the wound, and on the part of the body involved [6].

Most of the previous studies done on wound infections in this environment had been on surgical rather than on the non-surgical variety. However, in some of the studies done on the non-surgical type, it

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has been recognized that changes do occur in the pattern of wound infections with time, and there is an increasing prevalence of antibiotic resistant strains of the bacterial isolates[8]. It is therefore necessary to carry out a periodic study of the pattern of these isolates and their antibiogram.

This study was therefore designed to investigate the bacteriology of non-surgical wound infections at the University College Hospital, Ibadan, Nigeria, and their susceptibility pattern to locally available antimicrobial agents.

Materials and methods

This retrospective study reviewed cases of non-surgical wound infections seen at the University College Hospital, Ibadan, Nigeria, between September 2002 and February 2005. There were 754 cases of non-surgical wound infections during the period reviewed and these were found in wards and clinics. Specimens taken from these cases included wound swabs, aspirates and biopsies. The results obtained from the bacteriological analysis of these specimens were retrieved from the Medical Microbiology Laboratory records. Patient's name, sex, age, type of specimen taken, ward or clinic, as well as the diagnosis made were also obtained from the records. Standard bacteriological techniques were used in the isolation and identification of the wound pathogens [9].

The antibiotic susceptibility patterns of these isolates were also determined according to the recommendation of the National Committee for Clinical Laboratory Standards (NCCLS) for disc diffusion susceptibility test [10]. The isolates were tested against the following antibiotics: ofloxacin (30µg), gentamycin (10µg), ceftriaxone (30µg), erythromycin (3µg), amoxicillin (25µg), ceftazidime(30µg), amoxicillin/clavulanate(30µg),cefuroxime(30µg),sparfloxacin (5µg), and chloramphenicol (30µg).The samples were processed only aerobically and not anaerobically due to lack of materials for anaerobic cultivation. Control organisms used as standards were, Oxford *S. aureus* NCTC 6571, *E. coli* NCTC 10418, and a local sensitive strain of *P. aeruginosa*.

Results

A total number of 754 cases of wound infections were reviewed. Out of the 754 specimens collected from these cases, 582 (77.2%) were wound swabs,132 (17.5%) wound biopsy, and 40 (5.3%) wound aspirates. 412 (54.6%) of these 754 cases were male while 342 (45.4%) were females, and their ages ranged between 4 days and 90years.Out of these 754 cases, 679 (90%) yielded pathogenic bacterial isolates, while 75(10%) were sterile. Out of these 679 positive cases, 477(70.3%) cultures were monomicrobial while 202 (29.7%) were polymicrobial.

Table1: Frequency of isolation of the different wound pathogens.

Isolates	Number	Percentage
S. aureus	334	38.0
P. aeruginosa	165	18.8
Klebsiella species	149	17.0
E. coli	93	10.6
Proteus species	65	7.4
S. epidermidis	39	4.4
Streptococcus species	14	1.6
E. faecalis	12	1.4
C. albicans	7	0.8
Total	878	100

Table 2: Distribution of different types of wound infections

Type of Wound	Number	Percentage
Chronic Ulcers	240	31.8
Trauma	41	5.4
Burns	40	5.3
Abscess	22	2.9
Others	411	54.5
Total	754	99.9

The total number of organisms isolated were 878, with 871 (99.2%) of them bacteria and the remaining 7(0.8%) fungi. *S. aureus* 334 (38%) was the pre-dominant microorganism, followed by *P. aeruginosa* 165(18.8%),Klebsiella species 149 (17%), *E. coli* 93(10.6%), Proteus species 65(7.4%), *S. epidermidis* 39(4.4%), Streptococcus species 14(1.6%), *E. faecalis* 12(1.4%), and *C.albicans* 7(0.8%) (Table 1).The types of wounds from which these pathogens were isolated included chronic ulcers 240(31.8%), burns 40(5.3%), trauma 41(6.4%), abscesses 22(2.6%) and others 411(54.5%) among which were acute osteomyelitis, bite wounds, dermatitis, impetigo, scalp wound, breast cancer wounds, sacral bed sores etc (Table2).There were high rates of antibiotic resistance among these isolates. 465 (53.4%) of them were sensitive to ceftriaxone, 370 (42.5%) to gentamycin, 342 (39.3%) to ofloxacin, 182 (20.9%) to amoxicillin/clavulanate and 133 (15.3%) to ceftazidime. Only 195 (58.4%) strains

of *S.aureus* , 3 (21.4%) of Streptococcus species and 6 (15.4%) of *S.epidermidis,* were sensitive to erythromycin (Table 3).

P. aeruginosa was found to have a rather low susceptibility to ceftazidime (34.6%) in this study. This is in contrast to the report of a study conducted in India, where *P.aeruginosa* had a much higher

Table 3: Antibiotic sensitivity pattern of isolates

	Klebsiella species	*P.aerugi-nosa*	*S.aureus*	*E.coli*	Streptococcus species	Proteus species	*S.epider-midis*	*E. faecalis*	Total
Antimicrob. Agent	(149) No (%)	(165) No (%)	(334) No (%)	(93) No (%)	(14) No (%)	(65) No (%)	(39) No (%)	(12) No (%)	(871) No (%)
Ofloxacin	87(58.4)	84(50.9)	76(22.8)	41(44.1)	3(21.4)	44(67.7)	9(23.1)	4(33.3)	342(39.3)
Gentamycin	47(31.5)	64(38.8)	178(53.3)	32(34.4)	3(21.4)	33(50.8)	9(23.1)	4(33.3)	370(42.5)
Ceftriaxone	68(45.6)	71(43.0)	203(60.8)	55(59.1)	3(21.4)	46(70.8)	12(30.8)	7(58.3)	465(53.4)
Erythromycin	0(0.0)	0(0.0)	195(58.4)	0(0.0)	3(21.4)	0(0.0)	6(15.4)	5(41.7)	209(24.0)
Amoxycillin	1(0.7)	0(0.0)	69(20.7)	4(4.3)	6(42.9)	9(13.8)	10(25.6)	6(50.0)	105(12.1)
Ceftazidime	21(14.1)	57(34.5)	11(3.3)	27(29.0)	0(0.0)	12(18.5)	5(12.8)	0(0.0)	133(15.3)
Amoxicillin/ Clavulanate	13(8.7)	0(0.0)	124(37.1)	9(9.7)	6(42.9)	15(23.1)	9(23.1)	6(50.0)	182(20.9)
Cefuroxime	7(4.7)	2(1.2)	16(4.8)	8(8.6)	1(7.1)	8(12.3)	0(0.0)	0(0.0)	42(4.8)
Sparfloxacin	22(14.8)	29(17.6)	41(12.3)	13(14.0)	1(7.1)	8(12.3)	3(7.7)	0(0.0)	117(13.4)
Chloram-phenicol	2(1.3)	0(0.0)	96(28.7)	0(0.0)	11(78.6)	1(1.5)	4(10.3)	2(16.7)	116(13.3)

Discussion

The microbiological analysis in this study revealed that *S.aureus* is the leading actiological agent of non-surgical wound infections in this environment. This is similar to reports obtained from India and some other countries [11]. Investigations have also revealed that this organism is the single causative bacterium in approximately 60-69% of cutaneous abscesses[12]. *E.faecalis* (1.4%) and *C.albicans* (0.8%), however, were the least in terms of frequency of isolation in the present study, and other studies have also given similar reports. In Ekpoma, Nigeria, the two organisms *E. faecalis* and *C. albicans* were found to be the least occurring in wound infections in that environment [13].

In this study, there is also diversity of microorganisms and high incidence of polymicrobic flora. This observation is also similar to what obtained in another study conducted in Ilorin , Nigeria, where, there were both monomicrobial and polymicrobial flora[14]. This gives credence to the value of identifying one or more bacterial pathogens from wound cultures and the determination of their antibiotic susceptibility pattern, so that appropriate antibiotic can be prescribed.

Wound infections have been a major concern among healthcare practitioners because of its increased trauma to patients, its burden on financial resources, and the increasing requirement for cost-effective management within the health care system.

susceptibility to ceftazidime (54%) [15]. It is also the most prevalent (18.8%) in this study among the Gram-negative organisms followed by Klebsiella species (17%). This is in keeping with another study where the prevalence rate of *P.aeruginosa* was 36%[16].

Generally, high rates of antibiotic resistance were demonstrated among the isolates as only 53.4% of them were sensitive to ceftriaxone, 42.5% to gentamycin and 39.3% to ofloxacin.

Conclusion

This review has further confirmed the importance of *S.aureus* and other pathogens in wound infections. It has also revealed that regular surveillance of pattern of wound pathogens and their susceptibility to locally available antimicrobial agents is of utmost importance.

Acknowledgements

The authors thank Mrs Abosede Agboola for her assistance in data collection , Mr Odebunmi for his technical assistance ,and Mrs Popoola for her secretarial support.

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Received: 24/01/08
Accepted: 11/08/08