

BRIEF COMMUNICATION**STAPHYLOCOCCUS AUREUS BURN WOUND INFECTION AMONG PATIENTS ATTENDING YEKATIT 12 HOSPITAL BURN UNIT, ADDIS ABABA, ETHIOPIA****Tigist Alebachew^{1*}, Gizachew Yismaw², Ayelegn Derabe³, Zufan Sisay⁴****ABSTRACT**

BACKGROUND: Burns provide a suitable site for bacterial multiplication and are more persistent richer sources of infection than surgical wounds. *Staphylococcus aureus* is one of the most frequently isolated pathogens in both community and hospital practices. The objective of this study was to address the prevalence and antibiotic susceptibility patterns of *S. aureus* isolated from burn wound infections in Yekatit 12 Hospital, Addis Ababa Ethiopia.

METHODS: This study was Cross-sectional, prospective study conducted from March to May 2011. Burn wound pus sample was collected by using convenient sampling method for culture and drug sensitivity tests were performed according to the WHO standards.

RESULTS: Out of 114 patients, bacterial infection was observed in 95(83.3%) of which, 66 (69.5%) had *S. aureus* infection. Overall prevalence of *S. aureus* isolation was 57.8%. Most of them were sensitive to vancomycin, clindamycin, Kanamycin and Erythromycin, but highly resistant to penicillin G. All isolates were found to be multi drug resistant, and one isolate was resistant to all the tested drugs.

CONCLUSION: The current study is highly important and informative for the high level of multi-drug resistant *S. aureus* isolates in burn patients. Finally, strict consideration for *s. aureus* infection and proper usage of antibiotic policy are recommended in decreasing the incidence and occurrence of multidrug resistant *S. aureus* infections in Yekatit 12 Hospitals.

KEY WORDS: *Staphylococcus aureus*, burn wound infection, drug sensitivity

INTRODUCTION

Burn wounds are a suitable site for multiplication of bacteria and are more persistent richer sources of infection than surgical wounds, mainly because of the larger area involved and longer duration of patient stay in the hospital (1). Infection is a major cause of morbidity and mortality in hospitalized burn patients (2). It is estimated that about 75% of the mortality following burn injuries is related to infections rather than osmotic shock and hypovolemia (3). Microorganisms are still transmitted to the burn wound surfaces of recently admitted patients by the hands of personnel, by fomites, and to some extent by hydrotherapy. The

common pathogens isolated from burn wounds are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes* and various coilform bacilli (4). *Staphylococcus aureus* was frequently isolated pathogen in both community and hospital practices. The pattern of antimicrobial susceptibility of *S. aureus* and other organisms is a worldwide change, especially in developing countries making antimicrobial agents increasingly less effective(5). The frequency of multiple antimicrobial resistances is increasing throughout. Infections with multi drug resistant pathogens whether in hospitals or in the community increase morbidity, decrease treatment success, reduce hospital turn-over rate and

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increase cost of patient care. The presence of drug resistant bacteria in the hospital environment and in patients is a great threat for public health and because of the ever increasing number of resistant strains with time, updated information on prevalence of local major pathogens and their sensitivity patterns is very helpful for health personnel responsible in the management of patients and monitoring the emergence of resistant bacteria in any given region. More than 90% of *S. aureus* produce penicillinase and are resistant to penicillin (6). *S. aureus* is normal flora in nasal vestibule and other skin sites, especially anus and armpits of human population. Burn patients have lost their primary barrier and exposed to microorganism invasion continually and chronically in the pathogens. The dominant flora of burn wounds during hospitalization changes from Gram-positive bacteria such as *Staphylococcus* to Gram-negative bacteria like *Pseudomonas aeruginosa* (7). However, different studies have shown that *Staphylococcus aureus* is one of the greatest causes of nosocomial infection in burn patients. The resistance of the hospital strains of *S. aureus* to methicillin remains a global problem (8). Therefore; the aim of this study was to address the prevalence and antibiotic resistance patterns of *S. aureus* isolated from burn wound infections at Yekatit 12 Hospital, Addis Ababa, Ethiopia

SUBJECTS, MATERIALS AND METHODS

A cross-sectional, prospective study was conducted in burn patients attending in Yekatit 12 Hospital burn unit, Addis Ababa, Ethiopia from March to May 2011. The study was approved by Institute of Pathology ethical review committee and Institutional Review Board (IRB), Addis Ababa University. A total of 114 wound pus swabs specimens were collected by using convenient sampling technique after getting verbal and written consent. Specimens were collected aseptically from all inpatients and outpatients during the study period attending Yekatit 12 hospital burn unit. All swab

specimens were transported to Yekatit 12 hospital microbiology laboratory for culture and sensitivity tests. The sample collection, culturing, staining and sensitivity tests were performed according to the WHO standard microbiological diagnosis for *S. aureus* (9). The specimens were collected by the attending physician and health officer using sterile applicator stick with cotton swabs moistened with normal saline and test tubes. The socio-demographic variables (age and sex) were taken from patient's card. The swabs were then inoculated on blood agar and mannitol salt agar (MSA) plate and incubated at 37°C for 24 hrs. After the plate had been left at room temperature for pigment formation, colonies were selected and checked for gram stain and coagulase test was done to differentiate *S. aureus* from other staphylococci spp. Those colonies that were golden or cream and coagulase positive were considered as *S. aureus*. All *S. aureus* isolates were taken and inoculated on Muller Hinton agar for sensitivity testing according to modified Kirby- Bauer disk-diffusion technique (10), by using penicillin (10 units), erythromycin (15 µg), chloramphenicol (30 µg), clindamycin (2 µg), vancomycin (30 µg) Augmentin (30 µg) Polymyxin-B (300 µg) Amikacin (30 µg) Cephalothin (30 µg) Methicillin (10 µg) and Kanamycin (30 µg). A control *S. aureus* (ATCC 25923) reference strain was used for quality control of culture media and drug disks for susceptibility testing for every batch. Final data was analyzed by using SPSS for Windows (version 16.0, USA). Percentage for a proportion was used wherever appropriate. A p-value < 0.05 were considered as statistically significant.

RESULTS

In the presents study, 114 patients were enrolled from Yekatit 12 Hospitals in the burn unit. The age of the study participants ranged from 1-65 years with a mean age of 22.78± five years and majority, 59 (51.8%) were in the age range between 20-45years (Table 1).

Table-1 Socio-demographic characteristic features of burn patients attending in Yekatit 12 Hospital from March to May 2011

| Age | Sex | | Total |
|-------|-----------|-----------|-------------|
| | Male | Female | |
| <20 | 22(19.3%) | 24(21.1%) | 46(40.4%) |
| 20-45 | 31(27.2%) | 28(24.6%) | 59(51.8%) |
| >45 | 5(4.4%) | 4(3.5%) | 9(7.9%) |
| Total | 58(50.9%) | 56(49.1%) | 114(100.0%) |

Out of 114 burn wound pus swab specimens processed, 95(83.3%) grew organism on culture. From the 95 isolates, 66 (69.5%) were *S. aureus* and 29(30.5%) other organisms. The overall prevalence of *S. aureus* was 57.8%. The

positivity rate in females was slightly higher than in males (table 2). However, there was no significant association with age and sex (P-value= 0.457 and 0.823, respectively).

Table 2: Distribution of *S. aureus* by age and sex in burn patients attending Yekatit 12 Hospital from March to May 2011

| Age of patients | <i>S. aureus</i> Group (n=66) | | |
|-----------------|------------------------------------|----------|-----------|
| | Sex of patients N ^o (%) | | |
| | Male | Female | Total |
| <20 | 14(45.2) | 15(42.8) | 29(43.9%) |
| 20-45 | 15(48.4) | 17(48.6) | 32(48.4%) |
| >45 | 2(6.4) | 3(8.6) | 5(7.6%) |
| Total | 31(47.0) | 35(53.0) | 66(100%) |

All isolates the 66 (100%) *S. aureus* isolates were multidrug resistant and one isolate 1 (1.5%) was pane-resistant for all the tested drugs. Rates of susceptibility pattern of *S. aureus* ranged from 4.5 - 93.9%. Sensitivity of *S. aureus* isolates to vancomycin, clindamycin, Kanamycin and Erythromycin 93.9%, 90.9%, 86.4 and 86.4%, respectively. In another way the resistance of *S. aureus* isolates above 50% rates was observed to penicillin, methicillin, polymyxin-B and chloramphenicol 95.5%, 77.3%, 68.2% and 51.5%, respectively (Table 3).

DISCUSSION

The burn wound is considered as one of the major health problems in the world (11). In the present study, *S. aureus* was the most common isolate which is similar to other findings (12, 13). In contrast other studies reported that *P. aeruginosa* as a predominant organism (1, 14). This could be

attributed to differences in geographical location and hygienic measures. At present, the overall prevalence of *S. aureus* infection was high compared to other bacterial isolates in this study. Similar reports were done by Bhat and Vasaikar (15). This may be due to cross infection by the hand of the medical personnel, air and other materials but there was no significant association with age and sex.

Infection is the most important problem in the treatment of burn patients. The bacteriology of burn wounds is often poly-microbial in nature, and the presence of multidrug-resistant organisms is often associated with more severe clinical manifestations and poor response to antimicrobial therapy. Antibiotic sensitivity patterns served as a useful guideline for choosing an appropriate antibiotic. In the present study, drug resistant rate of *S. aureus* isolates were extremely high for penicillin and moderately for methicillin and polymyxin-B. Eke and Rotimi also reported

Table-3: Antimicrobial susceptibility pattern of isolated *S.aureus* in burn patients attending Yekatit 12 Hospital from March to May 2011.

| Total isolated | N ^o . | S/R | Antimicrobial agents tested. | | | | | | | | | | |
|----------------|------------------|-----|------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|
| | | | AUG N ^o . (%) | CEP N ^o . (%) | CHF N ^o . (%) | MET N ^o . (%) | PEN N ^o . (%) | AMI N ^o . (%) | VAN N ^o . (%) | CLI N ^o . (%) | KAN N ^o . (%) | ERY N ^o . (%) | POLM N ^o . (%) |
| 66 | | S | 44(66.7) | 43(65.2) | 32(48.5) | 15(22.7) | 3(4.5) | 35(53.0) | 62(93.9) | 60(90.9) | 57(86.4) | 57(86.4) | 21(31.8) |
| | | R | 22(33.3) | 23(34.8) | 34(51.5) | 51(77.3) | 63(95.5) | 31(47.0) | 4(6.1) | 6(9.1) | 9(13.6) | 9(13.6) | 45(68.2) |

S= sensitive, R= resistance, CEP = Cephalothin, CHF = Chloroanphicol, KAN = Kanamycin, VAN = Vancomycin, PEN = Penicillin, MET = Methicillin, AUG= Augmentine, ERY = Erythromycin, CLI = clindamycin, AMI = Amikacin, POLM= Polymyxin –B

comparable to these finding (16). Similarly, Bhat and Vasaikar also reported penicillin and methicillin was resistant *S.aureus* isolates in burn wound infections (15). Yet, the isolates at Yekatit 12 Hospital are highly susceptible to vancomycin, clindamycin, Kanamycin and Erythromycin. This result is in agreement with Uchenna (2005) and Gebreselassie (2000) studies (17, 18).

In the present study, all the *S. aureus* isolates were multi-drug resistant and only one isolate was pane-resistant. This could be due to continuous usage of broad-spectrum antibiotics and non-adherence to a hospital antibiotic policy. Additionally, selective pressure in the hospital wards could also be taken as the most probable factor for the increased resistance in isolates from the patients (19).

The emergence of worldwide antimicrobial resistance among a wide variety of human, bacterial and fungal burn wound pathogens, particularly nosocomial isolates, limits the available therapeutic options for effective treatment of burn wound infections (20). Methicillin-resistant *coagulase-negative staphylococci*, vancomycin-resistant *enterococci*, and multi-drug resistant gram-negative bacteria that possess several types of beta-lactamases, including extended spectrum beta-lactamases, *ampC* beta-lactamases, and metallo-beta-lactamases, have been emerging as serious pathogens in hospitalized patients (20). In view of the variety of burn wound isolates seen and their generally increasing antimicrobial resistances regular microbiological surveillance, *in-vitro* testing and monitoring of these parameters would play an

important role in guiding the proper empirical antimicrobial therapy in burn patients, preventing multidrug resistance by virtue of using antimicrobials that target specific organisms and decreasing infection-related complications. Empirical usage of broad-spectrum antibiotics was probably the cause of high percentage of multi drug resistant isolates (21).

The current study is highly important and informative for the high level of multi-drug resistant *S. aureus* isolates in burn patients. This study result may pave a way for providing useful guidelines in choosing to empirical antimicrobial therapy especially in areas where culture facility is not available against *S. aureus* isolate from burn patients. Finally, strict consideration for *S. aureus* infection and proper usage of antibiotic policy are recommended in decreasing the incidence and occurrence of multidrug resistant (MDR) *S. aureus* infections in Yekatit 12 Hospitals.

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