

Antimicrobial Susceptibility of *Staphylococcus aureus* isolated from patient with skin wound infection in Shaafi Hospital -Mogadishu- Somalia

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Abstract

Background: Staphylococcal infections still remain an important cause of mortality and morbidity worldwide despite the development of antimicrobial agents (Onwubiko, et al 2011). *Staphylococcus aureus* the most common cause of skin and soft tissue infections, such as boils and abscesses, as well as post-operative wound infections

Objective: To identify antimicrobial susceptibility of *S.aureus* isolated from patient with skin wound infection in Shaafi hospital.

Method and Materials: The swabs were collected from wound from patients attending Shaafi Hospital. Swabs were cultured and identified according to standard conventional methods. The isolated organisms were tested for sensitivity against the antimicrobial agents that are commonly used in hospitals.

Results: 50 wound swabs were collected from patients with symptoms of wound infection attending to Shaafi Hospital, Mogadishu. Different age groups and both sexes were covered. *Staphylococcus aureus* strains were the predominant organism isolated 13 (26%) of total samples, and other 37 (74%) were no growth. All bacteria that isolated from the patients were resistant to Amoxyklav, Methicillin and penicillin, while 9 of them 69.2% were sensitive to Vancomycin and 4 of them 30.8% were resistant to Vancomycin so the highest frequency of sensitivity with observed with Vancomycin while Amoxyklav, Methicillin and Penicillin were highest resistant.

Conclusion and recommendation: Bacterial species isolated were all susceptible to Vancomycin which may be selected as the drugs of choice for treatment of wound infection. The development of bacterial resistance against Penicillin among all isolates reflects the abuse of antibiotics in Somalia. We recommended the hospitals and doctors:- Bacterial culture to ensure the appropriate antibiotics, to encourage the patients coming hospital early stages of wound, since the culture is high expensive we recommended the doctor holding seminars that persuade that the culture is the best diagnosis of bacterial infections, we recommend the doctors to give the technicians seminars about swabbing, isolation and identification of bacteria.

Keywords: *S. aureus*; antibiotic resistance; antibiotic susceptibility; vancomycin; methicillin resistant *Staphylococcus aureus* (MRSA)

{**Citation:** Ahmed S. Hussein, Hawa A. Hirsi Fatuma A. Dirie, Fartun M. Osman and Shafie A. Hassan. Antimicrobial Susceptibility of *Staphylococcus aureus* isolated from patient with skin wound infection in Shaafi Hospital -Mogadishu- Somalia. American Journal of Research Communication, 2018, 6(10): 105-115} www.usa-journals.com, ISSN: 2325-4076.

Introduction

Staphylococcal infections still remain an important cause of mortality and morbidity worldwide despite the development of antimicrobial agents. It has a remarkable capability of evolving different mechanisms of resistance to most antimicrobial agents. The aim of the present study is to establish the incidence of *S.aureus* in clinical specimens and its antibiotic sensitivity pattern to various antibiotics in this locality (*Onwubiko, et al 2011*).

Staphylococcus is a gram-positive organism with aerobic to facultative anaerobic lifestyle and colonizes skin, nares, and axillae of humans. *Staphylococcus aureus* is a catalase-, urease-, and phosphatase-positive organism with most strains secreting coagulase and it also ferments mannitol sugar to lactic acid. Testing for catalase is an important criterion to distinguish Staphylococci from Streptococci and coagulase test for distinguishing *S.aureus* from *S. epidermidis*. It reduces nitrates to nitrites, liquefies gelatin, and is methyl red and Voges-Proskauer test positive. *Staphylococcus aureus* is lipolytic (lecithinase) when grown on media containing egg yolk. *Staphylococcus aureus* reduces tellurite in media containing potassium tellurite and produces shiny black color colonies (*Reddy, P. N et al 2011*).

They are Gram positive bacteria, with diameters of 0.5 – 1.5 μm and characterized by individual cocci, which divide in more than one plane to form grape-like clusters (*Harris et al., 2002*).

Staphylococcus aureus has been a major human pathogen throughout the history and is also the leading cause of bacterial infections worldwide. It is responsible from mild to life-threatening diseases and can potentially infect any tissue in the human body. Among the various *S.aureus* infections, they can be broadly classified into superficial skin and soft tissue infections (SSTIs); systemic and life-threatening infections such as endocarditis, osteomyelitis, pneumonia,

meningitis, and bacteremia; and toxins such as food poisoning, scalded skin syndrome (SSS), and toxic shock syndrome TSS (Reddy, P. N et al 2017).

Staphylococcus aureus a very common cause of infection in hospitals and is most liable to infect newborn babies, surgical patients, old and malnourished persons and patients with diabetes and other chronic diseases. (Onwubiko, et al 2011)

In one study from Canada, the reported incidence of invasive *S.aureus* infections was 28.4 cases /100 000 individuals and infections was more common in persons over 65 years and in males (Laupland et al., 2003). In the United States, 0.8 % of all hospital inpatients was diagnosed with an *S.aureus* infection and these patients had significantly longer stay in hospital, paid higher costs and had a higher risk of death than inpatients without *S.aureus* infection (Noskin et al., 2005). In Europe the level of bacteremia caused by methicillin sensitive *S.aureus* (MSSA) consistently increased between 2002-2008 (Kraker et al. 2012).

In laboratory diagnosis: Specimens: The specimens to be collected depend on the type of lesion, for example: pus from suppurative lesions. Direct microscopy with Gram stained smears is useful in the case of pus, where cocci in clusters may be seen. Culture: The specimens are cultured on a blood agar plate. Identification: Relatively simple biochemical tests (e.g. positive reactions for coagulase (clumping factor), and mannitol fermentation) can be used to differentiate *S.aureus* and the other staphylococci. (samaranayake, L, 2011).

Most of the *S.aureus* isolated from hospitals and community are resistant to multiple antibiotics which therefore makes the treatment of *S aureus* infections complicated. Treatment of infections by multidrug-resistant *S aureus* is possible only with last line of antibiotics such as vancomycin and linezolid (Reddy, P. N et al 2017).

At present, vaccination might be beneficial to people at high risk such as dialysis patients, patients at risk of endocarditis, patients undergoing surgery, sports persons, prison inmates, and health care workers who are the potential sources of dissemination of hospital-associated MRSA in hospitals and to patients (Reddy, P. N et al 2017).

Method and Materials

This was a descriptive and cross sectional study isolated from patient with skin wound infection in Shaafi hospital.

Sample collection:

Demographical data was collect from patients using a direct interviewing questionnaire covering information regarding name, age, gender and clinical symptoms. Collection of specimens from infected wounds *was* be done swabbing.

The patient was given a concise explanation of the need for the microbiological investigation. Sterile cotton swabs *were* usually used. If the wound *was* moist a swab can be used straight from the packaging; but if the wound *was* dry, the swab tip *was* moistened with sterile saline to increase the chances of recovering organisms from the site. Then the swabs *was* transport to the microbiology lab within one hour.

Culture specimen:

All specimens *were* directly cultured on standard media such as blood agar. Plates *was* incubated aerobically at 37° C for 24 hours. The isolates *was* identified using different biochemical reactions such as catalase test, DNase test, coagulase test, and novobiocin sensitivity test *was* used for identification of Gram positive organisms.

Sensitivity testing:

Antimicrobial susceptibility testing *was* performed Kirby-Bour agar disc diffusion method. Isolates *was* swabbed uniformly across a Muller-Hinton agar plate. Inoculum *was* adjusted as per McFarland turbidity standard. Filter-paper disks *was* placed on the surface of the agar and incubated at 37°C overnight. The antimicrobial drugs used *was* penicillin, methicillin, Amoxclavin, vancomycin, Ampicillin, amoxicillin and Cloxacillin on the inoculum and incubate overnight at 37° C and then measure the zone of inhibition to determine the sensitivity pattern.

Results

50 wound swabs were collected from patients with symptoms of wound infection attending to Shaafi Hospital, Mogadishu. Different age groups and both sexes were covered. *Staphylococcus aureus* strains were the predominant organism isolated 13 (26%) of total samples, and other 37 (74%). were no growth. All bacteria that isolated from the patients were resistant to Amoxyklav, Methicillin and penicillin, while 9 of them 69.2% were sensitive to Vancomycin and 4 of them 30.8% were resistant to Vancomycin so the highest frequency of sensitivity with observed with Vancomycin while Amoxyklav, Methicillin and Penicillin were highest resistant.

Table 1: Respondent by gender

Gender	Frequency	Percent
Male	7	53.8
Female	6	46.2
Total	13	100

Table 1: Respondents by Gender shows that the total of respondents was 13 persons, 7 of them was male that 53.8%, and 6 of them was female that 46.2%.

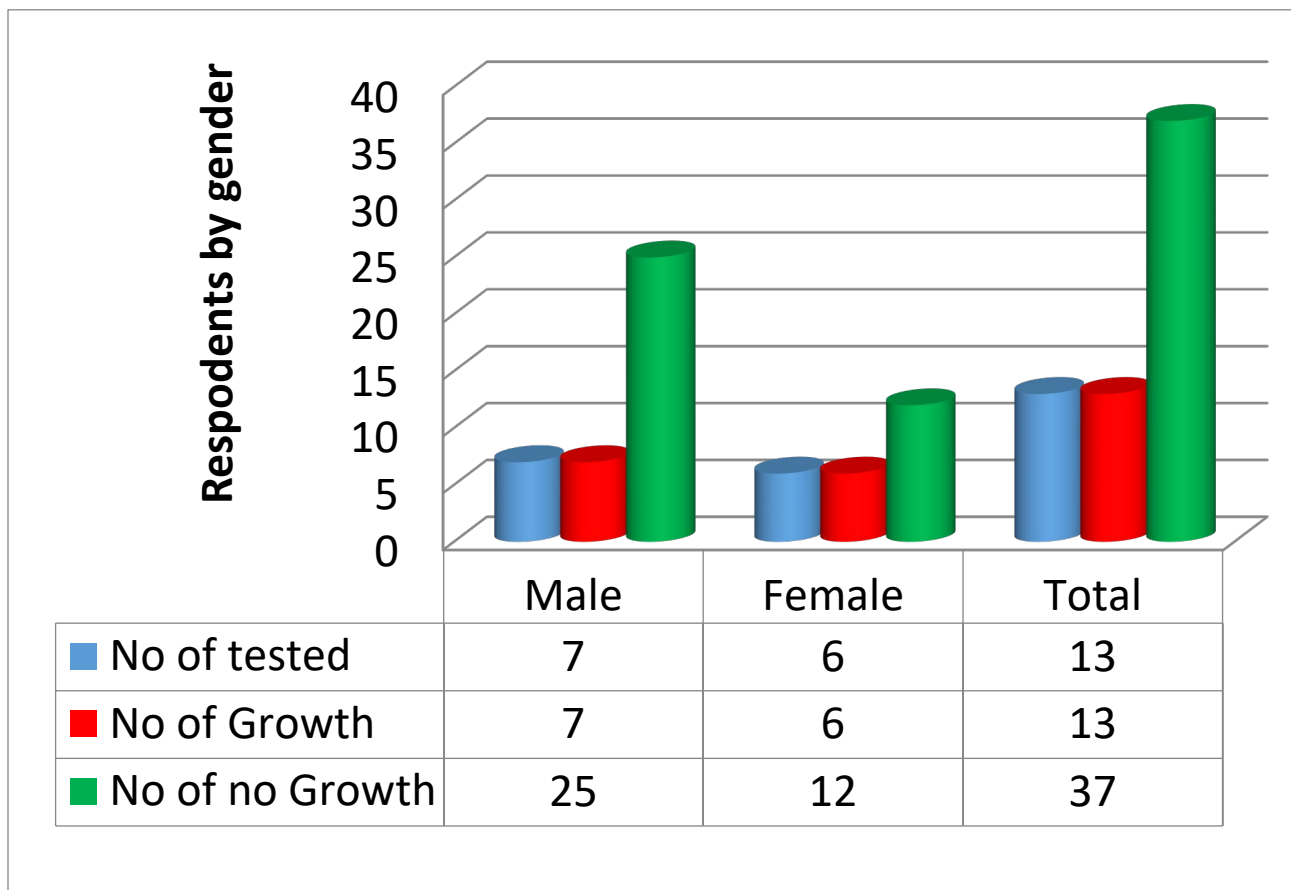


Figure 1 shows that the total of respondents was 13 persons, 7 of them was male that 53.8%, and 6 of them was female that 46.2%, and also number of growth and no growth.

Table 2 Respondents by age

Age	Frequency	Percent
1-20 yrs	2	15.4
21-40 yrs	5	38.5
41 and Above	6	46.2
Total	13	100

Table 2: shows that the most age of respondent was 41 years and above 46.2%, while the least was 20 year and below 15.4%.

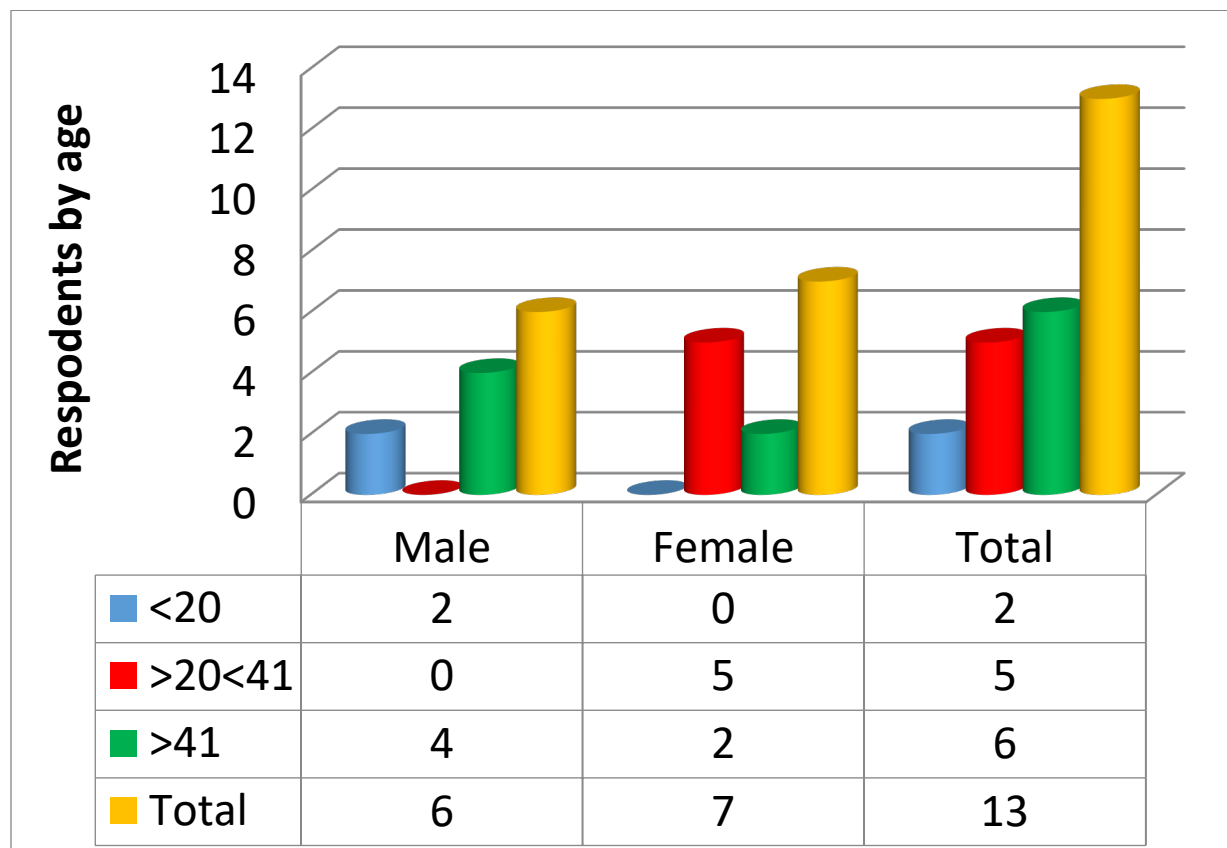


Figure 2: shows that the most age of respondent was 41 years and above 46.2%, while the least was 20 year and below 15.4%.

Table 3: Bacterial species isolated

Number of samples	N. o isolates	% of total isolates
50	13	26.0%

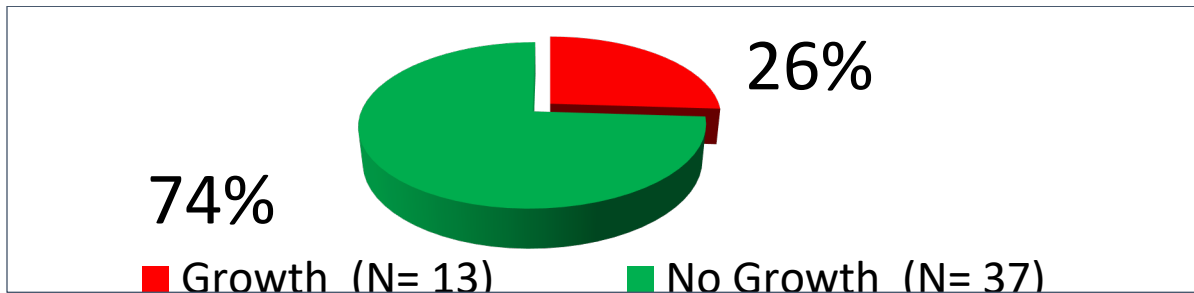


Figure 3: illustration of Growth and growth for wound swap samples.

Table 4: Sensitivity pattern of isolated organisms

No.	Name of antibiotics	Sensitivity pattern			Resistance pattern
		Sensitive (%)	Moderately Sensitive (%)	Total (%)	
06	Amoxyclav	0 (13)	0(13)	13(13)	0 (13)
07	Penicillin G	0(13)	0(13)	13(13)	0 (13)
08	methicilin	0 (13)	0(13)	13(13)	0 (13)
09	vancomycin	9 (13)	0(13)	13(13)	4 (13)

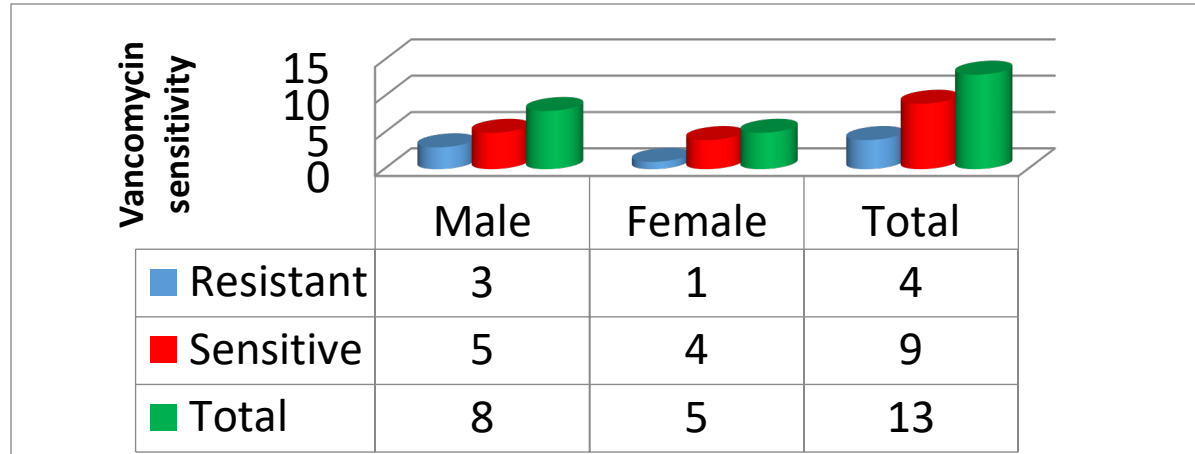


Figure 4: explains 4 of respondent 30.8% were resistant to vancomycin, while 9 of them were sensitive, 8 of them were male and 5 of them were female.

Discussions

Study done in Nigeria, the age and sex distribution of patients with *Staphylococcus aureus* infection in Kano, Males (62.0%) had higher infection rate than females (38.0%). The highest frequency of isolates of *Staphylococcus aureus* occurred in the age group (0-10) yrs while the least was in the (51- 60) yrs group.

According to our study the age and sex distribution of patients with *S.aureus* infection in Shaafi Hospital males was 53.8%, while Females was of 46.2% so males were higher infection rate than females. The highest frequency of isolates of *Staphylococcus aureus* occurred in the age group (41 and above) yrs while the least was in the (1-2s) yrs group. So our study has agree the infection while disagree the frequency.

Another previous study in Eritrea the antimicrobial susceptibility study of *S.aureus* isolates revealed high resistance to penicillin (77%), and most of them were methicillin resistant. According to our study penicillin was one of the highest resistant 100%, and also was methicillin resistant.

Conclusions

The antimicrobial susceptibility of *S.aureus* was different, so the four antibiotics those were used in our study were resistant except Vancomycin that had high sensitive 69%. So the drug of choice of our study was Vancomycin since it was the highly sensitive.

Most of the antimicrobial resistance which is now making it difficult to treat some infectious diseases is due to the extensive use and misuse of antimicrobial drugs which have favoured the emergence and survival of resistant strains of micro-organisms. Drug-resistant strains are common among staphylococci.

Bacteria become resistant to antimicrobial agents by a number of mechanisms, the commonest being: production of enzymes which inactivate or modify antibiotics, changes in the bacterial cell membrane, preventing the uptake of an antimicrobial, modification of the target so that it no longer interacts with the antimicrobial. So in our study the cause of antibiotic resistance we think due to extensive use and misuse of antimicrobial drugs and lack of an effective microbiology lab in our country.

Recommendation

The conclusion of our study result from that *S.ureus* is resistant most of tested antibiotics so we recommended the hospitals and doctors:-

- To do AST before prescribing antibiotics
- To train the staff for culture and sensitivity testing.
- Establish Antimicrobial stewardship in hospitals.

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