Antibacterial Susceptibility Study of *Staphylococcus Aureus* Isolated from Selected Hospitals and Non-Hospitals Fomites, In Bakura of Zamfara State

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Abstract
Staphylococcus aureus is a pathogenic microorganism that is responsible for mild to life threatening infection. It is one of the common causes of hospital and community acquired disease particularly in rural communities where there is poor sanitation practice. In carrying out the treatment process of S. aureus it appears to be difficult due to the incidence of methicillin resistant S. aureus that shows a significant public health challenge. Therefore the available options on the treatment of the S. aureus are significantly inadequate. The Hospital and non-hospital fomites are being increasingly observed as a significant means of transmission of S. aureus infections in the community. In this study the common hospital and non-hospital fomites were tested to study the occurrence of S. aureus,and their susceptibility to the most commonly used antibacterial agents in the treatment of methicillin resistance S. aureus infection. The hospital and non-hospital fomites were obtained using a cotton swab procedure. The isolates of S. aureus were identified using their morphological characterization on mannitol salt agar and biochemical analysis.Susceptibility of the isolated S. aureus to selected antibacterial agentswere determined using a disc diffusion method. Getting to70% of sampled fomites were positive for S. aureus. Hospital and non-hospital isolates of S. aureus have shown a similar susceptibility pattern to selected antibacterial agents except in their susceptibility to ciprofloxacin and Amoxil. By considering the results obtained in this study it shows that fomites may have a significant risk of S. aureus infection.

1.0 Introduction

Staphylococcus aureus is one of the most dangerous of all the staphylococcal bacteria. It is gram positive bacteria. These gram-positive bacteria often responsible for the most of the skin infections but can cause pneumonia, heart valve infections and bone infections (Cogen *et al.,* 2008). These bacteria are spread by direct contact with an infected person, by using a contaminated materials, or by inhaling infected droplets disseminated by sneezing or coughing.Skin infections are very common, but the bacteria can spread through the bloodvessels and infect distant organs.Skin infections may cause blisters, abscesses, and redness and swelling around the infected area.The diagnosis is based on the appearance of the skin or identification of the bacteria in a sample of the infected material (Milani*et al*., 2012). Frequent and thorough washing the hands can help prevent spread of infection.

Antibiotics are also essential and chosen based on whether they are likely to be effective against the strain causing the infection. *S.aureus* is found in the nose (usually temporarily) of about 30% of healthy adults and on the skin of about 20% (Milianiet *al*., 2012). The percentages are higher for people who are patients in a hospitals or who work there.The bacteria can be spread from person to person by direct contact, through contaminated objects (such as telephones, door knobs, television remote controls, or elevator buttons), or, less often, by inhalation of infected droplets dispersed by sneezing or coughing (Dereli*et al*., 2013). *S aureus* can asymptomatically inhabit the skin and mucous membrane of both human and animals. A carrier rate between 20 - 50% have been variously reported in healthy individuals with the nasal cavity as the most colonised body site and often acting as a reservoir for *S. aureus* infection (Wertheim*et al.,* 200)]. *S. aureus* is a common human pathogen responsible for various human infections ranging from mild skin infections to invasive life threatening diseases (Tabatabaei, *et al.,* 2015). These include wound infections, bacteremia and toxin mediated diseases such as toxic shock syndrome []. It's one of the most common hospital acquired pathogens and has also been variously reported as the causative agent for increasing casesof community acquired diseases (Desai *et al.,* 2011, Miller *et al.,* 2008).

Though, the anterior nares have been termed as the principal reservoir of *S. aureus* infections, the importance of fomites as route of transmission of *S. aureus* infection is being increasingly recognized [Hart and Kariuki, 2007, CLSI, 2010]. Due to the increasing recognition of the threat pose by community acquired *S. aureus* infection to public health, investigation of *S. aureus*colonisation of community fomites is of vast public health significance. Emergence of *S. aureus* resistance to penicillin and subsequently methicillin and other commonly used antibacterial agents limits treatment option for staphylococcal infection, thereby posing a significant public health threat. This is more challenging in developing countries, where the use of antibiotics is less regulated, a situation that potentially encourage antibiotics resistance (Omololu-Aso*et al.,* 2011, Nwankwo, 2013).

In this study, we examined the occurrence of *S. aureus* on common hospital and non-hospital fomites in a community in Bakura of Zamfara state, North Western Nigeria and the susceptibility of the isolates to antibacterial agents commonly used in the treatment of methicillin resistant *S. aureus.*

2.0Methods

2.1 Sample Collection

Common fomites in a public hospital in Bakura area of Zamfara state Nigeria as well as fomites in the same community were sampled using sterile swab moisten with sterile distilled water. Fomites sampled in the hospital include stethoscopes, cell phones, kidney dish and dressing tray while door knobs, cell phones as well as ATM machines were sampled in the community. A total of 20 sampling were each made from hospital and community fomite.

2.2 Isolation and Identification of S. Aureus

Samples were immediately transported into the laboratory and inoculated on mannitol salt agar. Inoculated plates were incubated at 37oC for 24 hrs. Colonies showing the characteristic ability to grow and also ferment mannitol were subjected to Gram staining, catalase and coagulase tests. Gram positive, catalase and coagulase positive cocci isolates were identified as *S. aureus.*

2.3 Antibiotics susceptibility test

The susceptibility of *S. aureus* isolates to selected antibiotics ware evaluated using disc diffusion method according to the Clinical and Laboratory Standard Institute (CLSI) 2010 guidelines (Del Rio, 2009). All tests were performed on Mueller-Hinton agar with inoculum standardize to 0.5 McFarland standard.

3.0 Results and Discussion

The results show that more than 55% of both hospital and non-hospital fomites sampled showed S. aureus contamination with non-hospital fomites showing a slightly higher percentage of S. aureus contamination as shown in Table 1. S. aureus isolates from both hospital and non-hospital sources generally showed a similar antibiotics susceptibility profile except in their susceptibility to vancomycin and lincomycin (Table 2).

Table 1: Percentage Occurrenceof *S. aureus*on Hospital and Non-hospital

Sources	Total sample	Total number of *S. aureus* on contaminated fomite	Percentage of occurrence
Hospital fomites	40	22	55
	40	24	75

S. aureus was isolated from more than 50% of the fomites sampled in this study. *S. aureus* contamination of fomites have likewise been variously reported (Singh,*et al.,* 2002). The reported percentage of occurrence ranges between 8 – 65% depending on the types of sampled fomites and studied community. The relatively high percentage of *S. aureus* occurrence on both hospital and non-hospital fomites as shown in this study indicated they are potential route of *S. aureus* transmission. This represents a potential risk of staphylococcal infection for immunocompromised individuals, diabetic patients and individuals with other predisposing factors such as wounds (Singh et al., 2002). The ability of fomites to transmit *S. aureus* infection has been demonstrated (Smith et al., 1996).

Table 2: Antibiotic Sensitivity Profile of *Staphylococcus aureus* Isolated from Hospital and Non-Hospital Fomites.

Antibiotics		**Hospital isolates n= 22**		**Non-hospital isolates n= 26**	
	Total number of isolates tested	**Number of resistant isolates**	**% of resistant isolates**	**Number of resistant isolates**	**% of resistant isolates**
Ciprofloxacin	25	7	54.55	6	53.85
Chloramphenicol	25	7	63.64	7	61.54
Gentamycin	25	6	72.73	8	69.23
Vancomycin	25	7	45.46	6	46.15
Erythromycin	25	9	72.73	10	84.62
Augmentin	25	2	18.18	2	23.08
Amoxil	25	2	36.36	4	38.46
Cefuroxime	25	2	9.09	0	0
Septrin	25	4	36.36	2	15.38

n= Total no of isolates

The antibiotics susceptibility profile of isolated S. aureus revealed an interesting pattern. Although the antibiotics susceptibility profiles of isolates from hospital and non-hospital fomites are mostly similar, isolates from non-hospital fomites showed no or relatively lower resistance to vancomycin and lincomycin.

This observation may be due to the pattern of use of these antibiotics in the studied community. Vancomycin is usually employed in the treatment of life threatening staphylococcal infections, this may be responsible for the observed low occurrence of vancomycin resistant limited only to the hospital isolates (Schliever*et al.,* 1997) while studying the pattern of antibiotics usage in a city in Nigeria, reported no vancomycin prescription for the three years of the study period (Omololu-Aso*et al*. 2011). Likewise, Donkor et al. (2012) showed that vancomycin is the least self-prescribed antibiotics by a selected tertiary level student in Ghana.

Isolation of vancomycin resistant isolates from hospital sources has also been reported (Thati, *et al.,* 2011). A resistance of about 10 % of the isolates from hospital fomites to vancomycin represent a significant public health importance since it's usually the drug of last resort in the treatment of methicillin resistant S. aureus (Gardete and Tomasz, 2014). Likewise, the percentage of lincomycin resistance isolates was lower in isolates from non-hospital fomites compared to hospital associated isolates. Lincomycin resistance has been previously reported from both hospital and non-hospital sources (Anwar and Bokhari, 2003). These observations underscore the contribution of indiscriminate use of antibiotics to emergence of antibiotic resistant. More than 50% of the isolates from both hospital and non-hospital sources showed resistance to cephalothin, cephalexin, amikacin and erythromycin. This indicates wide spread resistance to these antibiotics in the studied community.

4.0 Conclusion

Finding from this study revealed a wide spread contamination of both hospital and non-hospital fomites by antibiotics resistant strains of S. aureus in the studied community, this further show the need for the implementation of hygiene awareness and decontamination program as well as regulated use of antibiotics as a deliberate public health policy in developing communities

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