

An Overview of the Distribution of Staphylococcus aureus in the hospital Environment

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Background: *Bacteria are the major causes of nosocomial infections. Staphylococcus aureus is highly invasive and virulent strains have been described as the aetiological agents of nosocomial infections in different hospitals. The objective of the study was to determine the distribution of S. aureus qualitatively from various spaces in the hospital.*

Materials: *A general hospital in a semi urban community in Bayelsa State, Nigeria was used for this study. Sterile swab sticks moistened in sterile water were used to smear the various spaces in the hospital. Mannitol salt agar was used for the culturing and identification was done using standard microbiological procedures.*

Results: *The result showed a prevalence of 54.05% of Staphylococcus aureus contaminated surfaces in the hospital environment. S. aureus was present in all the samples but the samples collected from the hospital toilet had 100% positive results followed by samples collected from the reception area while the lowest positive result was recorded in the samples collected from the hospital wards.*

Conclusion: *The fact that these contaminants were at high levels in these environments as established in this study is of great concern. These results suggest that disinfection by wiping with 80% (v/v) ethyl alcohol is not adequate for total elimination of S. aureus.*

I. Introduction

Bacteria are the major cause of nosocomial infection, accounting for ninety percent of hospital infections (Raka et al., 2006). Most bacterial infection in the hospital are caused by organisms which are common among people, where they cause mild or no disease. Common bacteria isolated from hospital facilities include- coagulase-negative Staphylococcus, Bacillus, Corynebacterium, Streptococcus, Clostridium perfringens, Enterococcus, Staphylococcus aureus which can survive in inanimate surfaces for months (Rutala et al., 2006) Staphylococcus aureus is among the most frequently reported bacterial nosocomial pathogens (Teresa et al., 2008) and could be found on common surfaces in hospitals such as floors and door handles even after disinfection, and can indirectly be transmitted through fomites, or contaminated inanimate objects, causing infections (Kramer et al., 2006). Staphylococcus aureus is highly invasive (Gillespie and Bamford 2003) and virulent strains have been described as the aetiological agents of nosocomial infections in different hospitals (Martin-Odoom et al., 2012). The primary cause of lower respiratory tract infection and the second leading cause of nosocomial bacteria pneumonia and cardiovascular infection is attributed to S aureus (Bereket et al., 2012). Infection rate are higher among patients with increased susceptibility due to old age, underlying disease or chemotherapy. Studies prove that many hospitals in developing countries have no effective infection control program due to lack of awareness of the problems, lack of personnel, poor water supply, erratic electricity supply, ineffective antibiotic policies with emergence of multiple antibiotic resistant microbes, poor laboratory backup, poor funding and non-adherence to safe practices by health workers (Samuel et al., 2010). The study aimed to determine the distribution of S aureus on various surfaces in Kolo General Hospital, Bayelsa State, Nigeria and to proffer solution to the problems that led to their contamination.

The general Hospital is located in the rural area in Bayelsa State, Nigeria. The hospital accommodates 19 bed spaces and provide prevention and treatment services to over 3000 people in the neighbourhood. The wards were usually overcrowded with patients. The sanitary condition of the hospital was poor with evidence of dirt around walls and floors, especially in the toilet. Water supply in the hospital was poor and electricity supply was erratic.

An area of concern identified is the shared use of toilets by staff and patients which could provide a source of fomite transmission. This could be explained that fomite transmission can occur by contact with toilet seats, door handles, walls, floors and electrical switches. Five (5) surfaces (floor, walls, door handles, tables and knobs) in regular contact with staff and patients were selected for culture. Sterile swab sticks moistened in sterile water were smeared through the respective surfaces. Swabbs were inoculated on solid agar medium and incubated at 37 °C for 24 hours. Isolates were identified after 24 hours of culture using Gram staining and biochemical methods. The coagulase and catalase positive cocci were identified as S. aureus. Isolates were subjected to Methicillin antibiogram test using Mueller Hinton agar. Zones of inhibition around

organisms were considered as sensitive to Methicilin while zones without inhibition mark were considered Methicilin Resistance staphylococcus.

II. Results

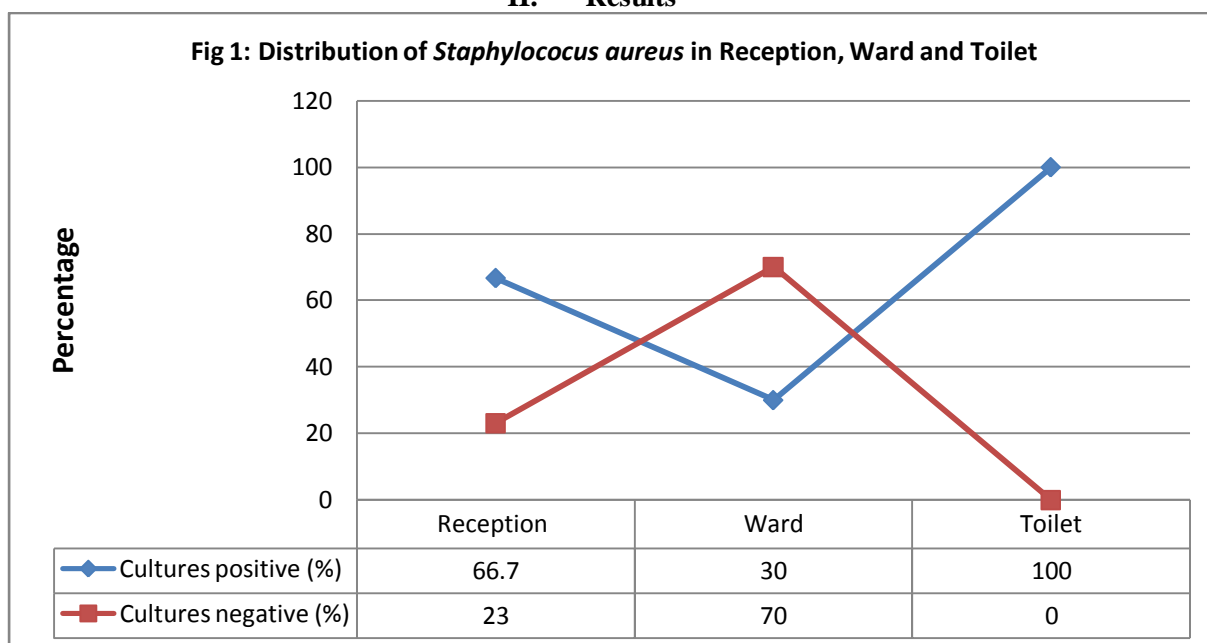


Fig 1. shows that swabb cultured from the toilet had 100% positive, followed by those from reception unit (66.7%) and the least (30%) from the ward

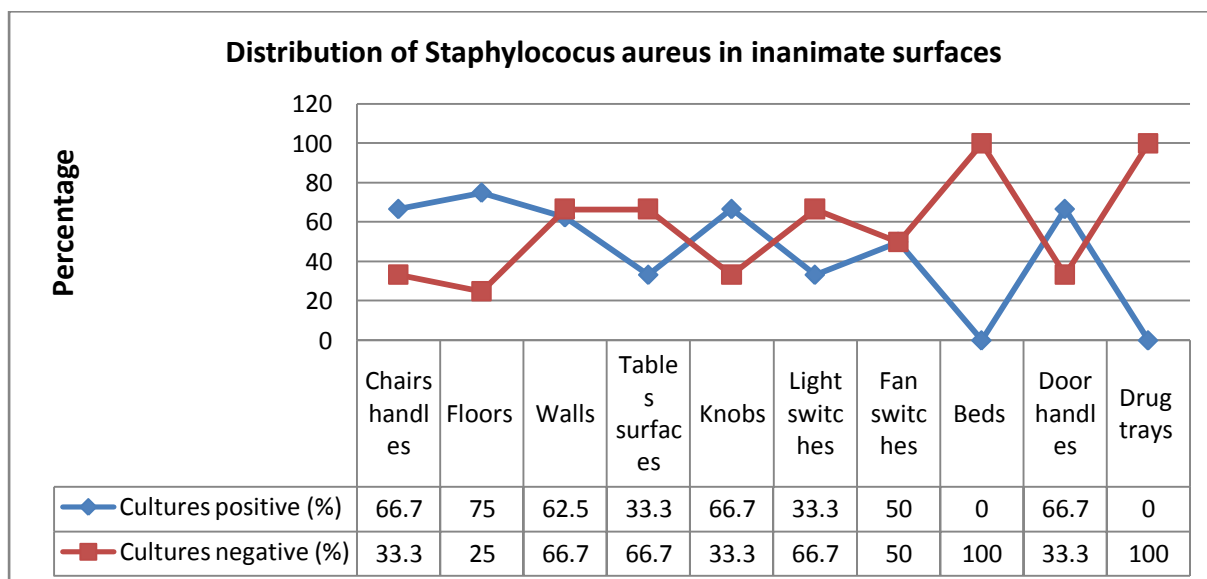


Fig 2: shows that cultures from floor swab had the highest positive cases (75%), followed by knobs (66.7%), chairs (66.7%), door handles (66.7%). Walls had (62.5%), fan switch (50%) and the least contaminants were from the table (33.3%) and light switch (33.3%).

This study reports that *Staphylococcus aureus* can survive in inanimate surfaces and as such commonly handled objects contaminated by microorganisms could serve as reservoir of infection to human. All surfaces swabbed were in regular contact with humans which could constitute sources of spread of infectious diseases. Despite routine daily cleaning with Disinfectants such as Izal and wipe with 80%v/v ethyl alcohol, Methicilin Resistance *Staphylococcus aureus* was cultured from all swabbed surfaces in the hospital. In this study the result showed a prevalence of 54.05% of *Staphylococcus aureus* contaminating surfaces in the hospital environment. This study conforms with only one report of 55.6% prevalence by AnyadohNwadike et al., (2011). A lower prevalence value was reported by Ike and Isamade (2011) 44.3%, Najjuka et al., (2011) 38% and Nkwelang et al., (2009) 36.8% . In related studies by Shrestha et al., (2012) 20.9%, Tagoe and Desbordes

(2014), 17.98%; Carvalho et al., (2007) 16.8% and Ekrami et al., (2011) 13.7% had much lower values. The effective disinfection of hospital surfaces is recognised as an important factor in preventing hospital-acquired infections (Cotter et al 2011), although irregular surfaces could harbour organisms in the environment. One of the most implicated probable sources of infections is door handles of toilets and toilet seats. This study recorded 66.7% prevalence in *S. aureus* contamination in handles of doors and chairs. The reception room, ward bay and restrooms tested were contaminated with *S. aureus* and *E. coli* bacterial types were identified. These are sites that might contaminate the hands of staff regularly and could result in pathogen transfer from inanimate objects to patients. Every swabbed surface in the toilet was contaminated with *Staphylococcus aureus* which were resistance to methicillin, signifying that the toilet is a potential reservoir of the MRSA and could positively be implicated in the transmission of MRSA (Reynolds, 2005). The emergence of bacterial resistance to disinfectants and antiseptic could be attributed to either overuse or under use that probably induce selective pressure (Iroha et al., 2011). Izol was the first line disinfectant used in the study hospital and the study shows a decreased rate in susceptibility of *S. aureus* to it. The hospital adopted mopping and wiping methods of cleaning which is inadequate. Taguchi et al, 1992 suggested thorough rinsing between mopping and wiping to avoid cross transmission. Song (2011) recommends use of paper towel to turn faucets and to open door, and where there is no soap and water then alcohol based sanitizer could be used. Experimental use of alcohol wipes on public toilet seats resulted in a 99.75 % kill of all bacteria and no MRSA was recovered from toilet seats after use of wipes (Giannini et al., 2010). French (2004) recommends that hydrogen peroxide vapour decontamination is highly effective method of eradicating MRSA from rooms, furniture and equipment. The study proved that the General hospital had no effective control program against infectious disease. The fact that these contaminants were at high levels in these environments as established in this study is of great concern. These results suggest that disinfection by mopping with Izol and wiping with 80% (v/v) ethyl alcohol is not adequate for total elimination of *S. aureus*.

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