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BACTERIAL CONTAMINATION ON HOSPITAL SURFACES IN BINGHAM UNIVERSITY TEACHING HOSPITAL JOS, NORTH CENTRAL NIGERIA

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ABSTRACT

Background: Frequently touched surfaces in hospital environment can constitute reservoir for healthcare associated infections (HAI_S). However, the spread of HAI_S involves contacts of susceptible hosts with particularly highly touched surfaces that are not adequately disinfected. Cross-transmission of microorganisms by contaminated surfaces and the hands of health care workers are considered to be the main route of the spread of nosocomial infections in many Nigerian hospitals. **Objectives:** The present study aims to determine the prevalent bacterial flora that contaminates hospital surfaces and their antibiotic susceptibility profile. We explored the bacteria present in surfaces taken from; soft surfaces textiles, tables, chairs, wash sink, cupboards, sphygmomanometer, waste bins, windows, thermometers, floors, door handles, wall, drip stand, light switches, trolleys, wheel chairs and kardex. **Materials and methods:** One hundred surface swabbed specimens were analyzed microbiologically for the presence of bacteria that contaminate hospital surfaces. Specimens were collected from predefined surfaces using a labeled sterile cottoned swab sticks moistened with sterile saline. Each swab specimen was streak-inoculated onto Chocolate agar and MacConkey agar. Cultures on Chocolate agar and MacConkey agar were incubated aerobically for 18-24hours at 37^{o}C. Bacteria identification was performed using standard microbiological procedures. **Results:** Out of the 100 surfaces sampled, 84 (84.0%) yielded growth of bacteria. The prevalence of bacterial isolates were as follows: Proteus spp. 39 (46.43%), Klebsiella species 26 (30.95%), Escherichia coli 8 (9.50%), Staphylococcus aureus 4 (4.76%) Pseudomonas species 4 (4.76%) and Coagulase negative staphylococci 3 (3.57%). **Conclusion:** This study has clearly demonstrated that highly touched surfaces have the potentials for creating a reservoir for healthcare associated infections.

KEYWORDS: Highly touched surfaces, Healthcare associated infections, Cross-transmission.

INTRODUCTION

Frequently touched surfaces in hospital environment can constitute reservoir for healthcare associated infections (HAI_S). However, the spread of HAI_S involves contacts of susceptible hosts with particularly highly touched surfaces that are not adequately disinfected. Inanimate objects which become contaminated with pathogenic bacteria and also enhance the spread of infection are referred to as fomite.[2] Studies have revealed that smooth (non-porous) surfaces like door knobs transmit bacteria better than porous materials like paper money because porous materials absorb and trap the contagion, making it harder to contract through simple touch.[1,13]

Several studies has demonstrated that hospital environments are a reservoir for transmission of pathogens directly through patient contact with the environment or indirectly through contamination of health care workers' hands and gloves.[18,17,10]

Most outbreaks of infectious diseases associated with inanimate objects are caused by items that should be sterile but unfortunately have been contaminated with pathogenic microbes. Also evidence gathered from some institutional outbreaks of enteric diseases suggests that surfaces may act as vehicles for the spread of infection.[3]

Fomites commonly found in the hospital include trolleys, curtains, dust bins, buckets, chairs, tables, wheelchairs, cupboards, wash hand basins, doors, door handles, light switches and floor etc.[7] Many studies have revealed the association of fomites with hospital-acquired infections (HAIs).[1] The most frequently encountered HAIs are surgical wounds, urinary tract infection and lower respiratory tract infection. A WHO survey and several other studies have also revealed that the highest prevalence of HAIs occurs in the intensive care units and in surgical wards.[16]

In Nigeria, the prevalence of nosocomial infection in surgical wards is ranged from 5.7 to 45.8% with an incidence density equal to 26.7 infections per 1000 surgical patients.[8]

Risk factors associated with HAIs include: host susceptibility, age, nature of illness, poor nutrition, underlying conditions like obesity, dusty conditions, duration of stay in the hospital and wet surfaces.[15,19]

Hand washing particularly among health care workers has been proven to be the single most important measure in reducing the risk of transmitting microorganisms from one person to another or from one site to another.[9]

In any case, hand washing, proper sanitation and adherence to disinfection practices in high-risk settings such as hospital environment should not be neglected.

Therefore the present study was aimed at determining the role of hospital surfaces as a reservoir for bacterial pathogens associated with hospital acquired infections and their antimicrobial susceptibility pattern in the Bingham University teaching hospital Jos, Nigeria.

MATERIALS AND METHODS

Study area

The Bingham University teaching hospital is 150-bed tertiary health care facility located in Jos north L.G.A of Plateau State, Nigeria. The study was carried between the months of December 2015 to February 2016.

Sample collection and processing

One hundred specimens were obtained from the following surfaces; soft surfaced textiles, tables, chairs, wash sink, cupboards, sphygmomanometer, waste bins, windows, thermometers, floors, door handles, wall, drip stand, light switches, trolleys, wheel chairs and kardex.

The sterile cottoned swab sticks used for sample collection were moistened with sterile saline prior to the collection of specimens. These were streak-inoculated onto Chocolate agar and MacConkey agar. Cultures on Chocolate agar and MacConkey agar were incubated aerobically for 18-24hours at 37^{o}C.

Identification of Bacterial isolates

Bacterial isolates were identified on the basis of cultural characteristics on growth media. And further identification was done using Gram staining, followed by other biochemical tests: catalase, oxidase test, coagulase test, indole, citrate utilization, mannitol fermentation, urease activity and sugar fermentation tests using Triple sugar ion agar (TSIA) tests.

RESULTS

The following bacteria were isolated: Proteus spp. 39 (46.43%) ranking highest, others were Klebsiella species 26 (30.95%), Escherichia coli 8 (9.50%), Staphylococcus aureus 4 (4.76%) Pseudomonas species 4 (4.76%) and Coagulase negative staphylococci 3 (3.57%) as reported in table 1.

Out of the 100 surfaces sampled 84(84.0%) yielded growth of bacteria. A breakdown of the result shows that all the tables, chairs, cupboards, sphygmomanometers, waste bins, window, floor, wall, wheel chairs and kardex had 100.0% growth, soft surfaced textiles had 97.2% growth, trolley had 75.0% growth, doors had 55.5%, light switch and drip stand had 25.0% with thermometers showing no growth as reported in table 2

Figure1: Shows the antibiotic susceptibility pattern of bacterial isolates from fomites. Bacterial isolates showed the highest sensitivity to Levofloxacin 95.2% followed by Streptomycin 83.3% while the least sensitive were recorded with Ampicillin and Norfloxacin having sensitivity of 51.1% and 40.4% respectively.

Table 1: Percentage distribution of bacteria isolated from surfaces in Bingham University Teaching Hospital.

Isolates	No of isolates	Percentage %
Escherichia coli	8	9.52
CoNS	3	3.57
Klebsiella spp.	26	30.95
Proteus spp.	39	46.43
Staphylococcus aureus	4	4.76
Pseudomonas spp.	4	4.76
Total	84	84.0

CoNS- Coagulase Negative Staphylococci.

Table 2: Distribution of bacteria growth on surfaces of Bingham University Teaching Hospital.

Fomites	No. of surfaces	No of surfaces with growth	Percentage growth
Soft surfaced textiles	36	35	97.2
Table	4	4	100.0
Chair	4	4	100.0
Wash sink	4	4	100.0
Cupboard	5	5	100.0
Sphygmomanometer	4	4	100.0
Waste bin	4	4	100.0
Window	1	1	100.0
Thermometer	4	0	0.0
Floor	4	4	100.0
Door	9	5	55.5
Wall	4	4	100.0
Drip stand	4	1	25.0
Light switch	4	1	25.0
Trolley	4	3	75.0
Wheel chair	4	4	100.0
Kardex	1	1	100.0
Total	100	84	84.0

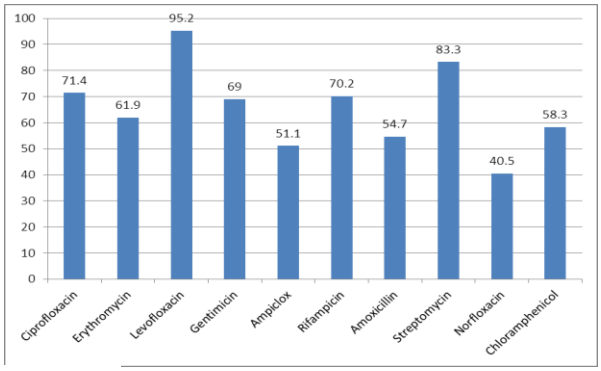

Figure 1: Antibiotic sensitivity pattern of bacteria isolates from surfaces in Bingham University Teaching Hospital.

DISCUSSION

The high prevalence of bacteria contaminating hospital surfaces as recorded in our study is an evidence that surfaces have potentials for habouring and spreading of hospital associated infections. However, our study revealed a 84.0% prevalence, this result is higher than the 23.3% reported by [11] from Sokoto Northern Nigeria, 65.7% from Zaria, Kaduna Nigeria.[20] Nevertheless, our finding is comparable to the study by[21] who revealed a prevalence of 99% from Jos Nigeria. Historically, most of the organisms implicated in nosocomial infections are Gram negative bacilli[4] this assertion agrees with our study and other studies conducted elsewhere.[6,11]

Results from antimicrobial susceptibility testing revealed that most isolates where susceptible to Levofloxacin and Streptomycin.

From the aforementioned, we have clearly demonstrated that potential pathogenic bacteria contaminate and survive on surfaces of several types of materials commonly found in hospital environment. Nevertheless, it is generally very difficult to determine whether and to what extent hospital surface play a role in the spread of potential pathogens.

CONCLUSION

We therefore emphasize strict adherence to hygiene practices like hand washing, the use of hand gloves particularly among healthcare workers. Also a systematic strategy and guideline on environmental cleaning and disinfection should be put in place by hospital management to reduce the spread of healthcare associated infections in our hospitals.

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