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Prevalence of Antibiotic-Resistant Bacteria on High-Contact Surfaces in a Nigerian Healthcare Facility

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Abstract: - Bacterial contamination on high-touch surfaces in healthcare and office environments poses a significant public health risk, contributing to the spread of nosocomial and community-acquired infections. This study assessed the bacteriological profiles of hand-touch surfaces in administrative offices at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Nigeria, using a cross-sectional design. A total of 10 samples were collected from shared desks, toilet flushers, door knobs, light switches, and keyboards using sterile swabs and analyzed for bacterial load and species identification. Results revealed substantial contamination across all surfaces, with total bacterial counts ranging from 1.0×10^2 to 2.0×10^4 CFU/mL. Shared desks and keyboards exhibited the highest contamination levels, while fecal coliforms were detected in shared desks, door knobs, and keyboards, indicating poor hygiene practices. Five bacterial species were isolated: *Staphylococcus aureus* (37.04%), *Streptococcus spp*. (25.93%), *Enterobacter spp*. (14.81%), *Proteus spp.* (11.11%), and *Bacillus cereus* (11.11%). *Staphylococcus aureus*, a leading cause of healthcare-associated infections, was the most prevalent. Statistical analysis showed no significant association between bacterial isolates and surface type ($p = 0.952$), suggesting contamination was driven by environmental exposure and inadequate hygiene rather than surface material. These findings underscore the urgent need for enhanced infection control measures, including regular disinfection of high-touch surfaces, hand hygiene promotion, and staff training on microbial transmission risks. Implementing touchless technologies and routine microbiological monitoring in high-traffic areas is recommended to mitigate infection risks. This study highlights the critical role of environmental hygiene in preventing pathogen transmission in healthcare settings and calls for institutional policies to enforce stricter sanitation protocols. By addressing these gaps, healthcare facilities can reduce the burden of surface-mediated infections and safeguard both staff and patient health.

Keywords: Antibiotic-Resistant Bacteria, Environmental hygiene, Public health risk, Nosocomial infections.

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Introduction

Microorganisms are commonly found throughout nature and play a significant role in every ecosystem. Bacteria, fungi, parasites and viruses can be found in our bodies, homes, workplaces and the environment at large. While many of these microorganisms are essential for life, some can pose health risks and lead to various illnesses (Umeanaeto *et al*., 2021). The human skin hosts a diverse array of microorganisms that can offer protection but may also act as a potential source of infection. Improper antiseptic procedures performed by untrained individuals in contaminated settings, use of non-sterilized containers and extended usage can result in microbial contamination, potentially leading to infections and even fatalities (Sserwadda et al., 2018). According to Artasensi *et al*. (2021), Bacteria are single celled organisms (0.3 - 1.5 um) with independent life cycle. Bacterial cells are generally surrounded by two concentric protective layers: an inner cell membrane and an outer cell wall. A resource exploited by some bacteria is the formation of endospores that are dormant and highly resistant cells able to preserve the genetic material. This ruse helps the bacteria to survive even without nutrient or under extreme stress. Among endospores - producing bacteria, the most common are Bacillus and Clostridium genera. Another Bacteria's survival mechanism is the formation of biofilms: clusters of bacteria that are attached to a surface and/or to each other. During biofilm development, bacteria secrete extracellular polymeric substances (EPS) which are crucial to the production of an extracellular matrix. This network maintains cohesion between cells and the surface and protects accumulation of microorganisms against chemical, biological and mechanical stressors. As biofilm protects from harsh conditions and resistance towards antibiotics, it represents a serious global health concern. Furthermore, biofilm is involved in persistent chronic infection and may potentially contribute to their pathogenesis (Artasensi *et al.*, 2021).

As early as the 1500, Formites (or formes) were first thought of as "seed of diseases" found in the clothing of infected individuals. Today Formites are generally considered as any inanimate object that when contaminated with infectious organisms, can serve as a means of transferring disease - causing agents to a new human host (Stephen *et al*., 2019). They can also be defined as materials that can carry pathogens from one susceptible individual or surface to another. This transmission often occurs via secondary exposure routes, such as oral ingestion or direct contact, allowing pathogens to enter hosts, including both enteric and respiratory pathogens. When Formites frequently come in contact with humans or the natural habitats of pathogenic organisms, they become a key factor in the spread of infectious diseases. Common examples of such Formites include door knobs/handles, toilet seats/faucets, Lockers and cabinets, Chairs and tables, particularly those located in public areas like offices, hospitals, hotels, restaurants and rest rooms (Umeanaeto *et al*., 2021). The most important Formites for contamination and transmission tends to be those found in the built environment and those that humans frequently come into direct contact with such as, doorknobs, handrails, countertops/tables (Stephen *et al*., 2019). Recent studies indicate that modern jet-air dryers, commonly found in hospital washrooms, create aerosols that can disperse bacteria onto various surfaces, thereby increasing the risk of infection instead of mitigating it. These types of dryers are also utilized in public spaces like rest rooms in train stations, airports and shopping malls. This highlights the importance of hand touch surfaces that naturally have antimicrobial properties which can help limit the spread of bacteria (Chang *et al*., 2021). Bacteria have been found to survive for varying durations on the surfaces of Formites. The risk of transmission is directly related to how long bacteria can persist on contaminated objects. This colonization and survival are influenced by geographical and environmental factors such as temperature, humidity, presence of organic matter, ability to form biofilms and existing infection control practices. Door knobs are among the most common Formites that facilitates contamination. Research indicates that hard, non-porous surfaces like door handles exhibits the highest rates of bacterial transfer to hands. Previous studies have identified several bacterial pathogens isolated from door knobs including, *Staphylococcus aureus, Klebsiella pneumonia, Escherichia coli, Enterobacter spp., Citrobacter spp., Pseudomonas aeruginosa, Proteus spp., Streptococcus spp., Salmonella spp., Shigella spp*., and *Campylobacter spp*. These organisms can cause a range of diseases from mild to severe, including conditions such as pimples, impetigo, scalded skin syndrome, pneumonia, meningitis, osteomyelitis, rhinoscleroma, kidney failure and septicemia (Umeanaeto *et al.*,2021).

Formite transmission is typically prevented by implementing two types of interventions, namely hand hygiene and environmental surface hygiene (decontamination) . Hand hygiene typically involves washing hands with water, plain soaps, or antimicrobial products, while surface hygiene involves cleaning and disinfecting inanimate surfaces. Hand hygiene and surface hygiene should be coupled to effectively prevent contamination (Xiao *et al.,* 2024). According to Xiao *et a*l. (2024), as stated in a work done by Lei *et al*. (2020), a hygiene criterion was introduced which emphasizes the importance of considering the combined frequency of hand and surface hygiene practices to mitigate surface contamination in homogeneous hand touch surface network. This criterion stipulates that the product of the pathogen removal rate (due to hygiene practices and natural microbial death) for hands and surfaces must not be less than that of the hand and surface contact frequency. Thus, the criterion highlights the necessity of implementing integrated hygiene practices within indoor environments.

According to Chang *et al.* (2021) as cited in a World health organization (WHO) report, antibiotic resistance is currently one of the major threats to global health and food safety leading to longer hospital stays, increased medical costs and higher rates of morbidity and mortality. Indoor hygiene (IH) surfaces, particularly hand touch areas like door handles and knobs in hospitals, offices, as well as in commercial and residential environments are acknowledged as a potential reservoir for infectious agents and contributors to the spread of multi-resistant organisms, thereby elevating the risk of infection. This research study focuses on the assesment of bacteria contamination on hand touch surfaces in offices in Nnamdi Azikiwe University Teaching Hospital Nnewi.

Materials and Methods

Research Design

This study adopted a cross-sectional research design to assess bacterial contamination on hand touch surfaces such as door knobs, shared desks, light switch , keyboard and toilet flushers within the offices in Nnamdi Azikiwe University Teaching Hospital, Nnewi (NAUTH). This design was appropriate as it allowed for the

collection of data at a single point in time, facilitating the identification of contamination levels across various surfaces.

Area of Study

The study was conducted in the offices within Nnamdi Azikiwe University Teaching Hospital (NAUTH) in Nnewi, Anambra state, Nigeria. This facility serves as a critical healthcare provider in the region, catering to a diverse patient population with various medical needs. As a teaching hospital, it also plays a pivotal role in training healthcare professionals, making the assessment of hygiene practices particularly important.

Population of Study

The study population includes hand touch surfaces within the offices in Nnamdi Azikiwe University Teaching Hospital, Nnewi. This encompasses doorknobs, shared desks, light switch, keyboards, and toilet flushers that are commonly used by the Hospital administrative staff. The study population used for this research were the offices in the hospital's administrative block.

Sample Size Determination

The sample size was determined by the number of swabs (samples) collected from selected offices in the hospital's administrative block. The administrative block consist of the following units ;

1. Personnel unit

2. Clinical service unit

3. Pension unit

4. National health in administration unit

5. General administrative unit, and

6. Director of administration unit

The sample size was determined using simple random sample collection method

Number of selected offices= 2

Sample per office = 5

Total sample size= 2 × 5 = 10 samples.

Sampling Technique

The simple random sampling technique was adopted for this study.

Instruments used for Data Collection and Analysis

1. Sterile swab

2. Sterile normal saline

3. Sterile containers

4. Personal protective equipments such as gloves, lab coats, and nose masks

5. Laboratory equipments such as; test tubes, test tube racks, petri dish, culture media, biochemical reagents, incubator, autoclave, Bunsen burner, inoculating loop, microscope slides, microscope, colony counter, data collection sheet, digital thermometer, marker for labelling and cello tape.

Validity and Reliability of Instruments

The instruments were validated by the supervisor and laboratory specialist, the validity of the swabing technique was ensured by using sterile swabs and following standardized procedures for sample collection, transportation , analysis and processing. Reliability was assessed by conducting preliminary tests to ensure consistent results across multiple trials.

Methods of Data Collection

Data was collected using the following steps;

1. Selection of surfaces based on the sampling technique.

2. Swabing technique

According to Cheesbrough (2006), sterile swabs were used to collect samples from specific surfaces, and these swabs were properly moistened with sterile normal saline to enhance bacteria recovery. Each swab was labeled with the name of the hand touch surface and the code number to maintain accurate records.

3. Transportation and storage

The samples were transported to the laboratory in a sterile container/ cold box in order to prevent changes in bacteria population.

Methods of Data Analysis

Sterilization of materials: Test tubes, conical flask, pipettes, petri dishes, beaker and culture medium (those requiring sterilization) were sterilized by autoclaving at 1210C at 15Ibs for 15 minutes. Test tubes, pipettes and Petri dishes were also sterilized by dry oven in the laboratory at a temperature of 150C for 1 hour before use. The work bench was sterilized with pads soaked in isopropyl alcohol.

Procedure for total bacterial count: The spread plate method was used. 9ml of sterile normal saline solution was distributed in five test tubes for serial dilution. The test tubes were sterilized by autoclaving at 1210C for 15 minutes after which 1ml of the water sample was transferred into the tube containing 9ml normal saline using sterile pipette to make the tenfold serial dilution. The first tube gave 10-1 dilution, subsequent tenfold serial dilutions were prepared up to 10-5. Using a sterile 1ml pipette, 0.1ml from 10-3 and 10-5 dilution were transferred aseptically onto the surface of solid nutrient agar, SS agar, MS agar, SDA, listeria agar plates. Each dilution was plated in duplicate. The innoculum were evenly spread over the surface of the medium using sterile bent glass rods. The glass rods was sterilized by dipping into 70% alcohol and flaming, and then allowed to cool. The plates were then inverted and incubated at 25 - 370C for 24-96 hours. The colonies on each plate were counted and the colony forming units per ml of samples were computed using its formular.

$$\text{Total Count} = \frac{\text{Number of organism counted}}{\text{Volume of sample plated}} \times \frac{1}{\text{dilution factor}}$$

Total Coliform Determination: A tenfold serial dilution of the sample was made with diluents (physiological saline). An aliquot (0.1ml) from the 10-5 was seeded onto Mac-conkey agar and incubated for 18-24 hours at 370C.

The Multiple Tube Fermentation Technique: (Most Probable Number) for Faecal Coliform. Feacal coliform was enumerated

using the most probable number technique. The test was performed using three columns of test tubes. This test was carried out in three stages. The three stages include presumptive, confirmatory and completed test stages.

Presumptive Test Stage Procedure: An aliquot (10ml) of each water sample (undiluted) was transferred into tubes containing 10mls of double strength lactose broth. 1ml of the sample was inoculated into the tube containing 10ml of single strength lactose broth and 0.1ml of the sample which was diluted to 10-1 was inoculated into tubes containing 10ml of single strength lactose broth. In each case, sterile inverted Durham tube was inserted and triplicate tubes were made. A control was used. The tube were inoculated at 370C for 24-48 hours and observed for gas production in the Durham tubes. The total feacal counts from positive tubes were read directly from the MPN.

Confirmatory Test Stage Procedure: Cultures from positive tubes from the presumptive tests were streaked into brilliant green lactose bile broth with the aid of a sterile wire loop. Incubation at 370C for 24-48 hours was done. The tubes were observed for colour change from purple to yellow (acid) and gas production in the inverted Durham tubes.

Completed Test Stage Procedure : The feacal coliform colonies observed in the confirmed test were then transferred aseptically onto eosine – methylene blue (EMB) agar plates with the aid of a sterile wire loop, the plates were incubated at 370C for 24 -48 hours and observed for growth of a pink mucoid colonies with metallic sheen. Gram staining were made with colonies from EMB plates. Non-spore forming gram negative rods from the agar plate constituted the completed test for faecal coliforms. A quantitative analysis of food samples was employed to give a statistical estimate of the number of bacteria that would give the observed result. It was used in the enumeration of feacal coliforms.

Gram staining: This was carried out following the gram staining techniques. Staining bacteria makes them more visible under light microscope. This procedure divides bacterial species into gram positive and gram negative. Gram positive bacteria retains the purple colour of crystal violet after decolourization with alcohol, while gram negative bacteria loose the purple colour and take the colour of the counter stain. Gram staining was done by taking a portion of the colony from the 24hours culture into a drop of normal saline on a clean slide. A smear was made and allowed to air dry. The slide was fixed and then flooded with crystal violet and rinsed with water for 60seconds. Iodine was added and rinsed after 60seconds followed by addition of 70% alcohol which was rinsed off after 30seconds. Lastly, safranine (a counter stain) was applied and washed after 2-3minutes. The slide was allowed to air dry and viewed under oil immersion objective lens after putting a drop of immersion oil. A purple colouration indicates a gram positive organism, while a pink or red colouration indicates a gram negative organism (Cheesbrough, 2006). Finally, the cultural morphological and biochemical characteristics of respective isolates are compared with the criteria in Bergey's manual of Determinative Bacteriology (1994).

Stock culture preparation: Colonies from the different culture media were streaked on nutrient agar plates. The colonies were picked from the various culture media based on their morphology, colour, size, shape, elevation and edge. The subculture on the nutrient agar was done to obtain a discrete colony. This was carried out by first inoculating into peptone water and incubated for 24hours at 37°c. Loop full of different organisms were streaked on nutrient agar plates and inoculated at 37°c for 24hours. After preparation of this stock culture, biochemical tests were used in the identification and characterization of the isolates. The biochemical test was done using the stock culture prepared.

Biochemical tests procedures

1. Oxidase test: A speck of the 24hours old culture of the test organism from various media was placed on a filter paper and soaked with oxidase reagent and rubbed with glass rod, the appearance of a deep blue-purple colour within 10seconds indicated a positive test reaction (Cheesbrough, 2006).

2. Catalase test: Test organisms were aseptically collected from the stock culture with sterile wire loop and placed on a glass slide. A drop of 30% (v/v) hydrogen peroxide was added to the slide, It was then mixed. Production of gas bubbles indicated catalase positive test (Cheesbrough, 2006).

3. Indole test: This test shows the ability of certain bacterial to decompose the acid in trytophen to indole, which accumulates the medium. Indole was tested for colour change. Peptone water was inoculated with the bacterial culture and incubated for 48hours at 37°c. After that, 0.5ml of Kovac's reagent was added and shaken gently. The appearance of red colouration at the surface indicates the presence of indole, a positive reaction. Yellow colouration indicates a negative reaction (Cheesbrough, 2006).

4. Coagulase test: A drop of physiological saline was placed on a clean slide and the isolates was emulsified in each drop. A drop of plasma was added to each suspension and mixed gently. Clumping of the mixture within 10seconds indicates a positive reaction (Cheesbrough, 2006).

5. Motility test: The principle of the test is that the medium contains a small concentration of the agar (0.2 - 9.5%) and motile organisms are able to move from the line of inoculation through the sloppy agar. The motility medium was inoculated by making a fine stab with a sterile needle to a depth of 1.2cm short at the bottom of the tube. The line of the inoculation will not be sharply defined and the vest of the medium will be cloudy if the organism is motile. If the organism is not motile, growth will be restricted and the media remains clear (Cheesbrough, 2006).

6. Triple sugar iron test: Test organisms were inoculated in slants of triple sugar iron medium, by streaking, stabbing and then incubated at 37°c for 48hours. Growth on the medium specified the gram negative enteric bacilli that fermented carbohydrates without hydrogen sulphide gas production. This was observed by an air gap at the bottom of the test tube. Blackening of the medium indicates H2s production while yellow colouration shows acid production (Cheesbrough, 2006).

7. Morphological tests: Using a sterile straight wire loop, isolated organism was stabbed vertically into the center of soft agar but to a depth of 2cm. Cultures were then incubated at 37°c for 24hours. Spreading growths of the organism form the stab line indicating a positive reaction (Cheesbrough, 2006).

Statistical analysis

The bacterial counts from each sample gotten from the hand touch surfaces will be recorded as colony-forming units (CFU/g). The

CFU counts will be grouped by the types of hand touch surface tested and descriptive statistics (mean) will be calculated to determine the overall bacterial contamination levels. The bacterial specie identified during biochemical testing will be analysed . Data will be analysed using SPSS (Statistical package for social science).

Ethical Consideration/Informed Consent

The ethical approval for this research was obtained from Nnamdi Azikiwe Univesity Faculty of Health Science and Technology ethics committee prior to the commencement of this study.

Result

Table 4.1: Mean viable count of bacteria from different hand touch surfaces from offices in NAUTH.

Sample	TBC (CFU/ml)	Total coliform (CFU/ml)	Feacal coliform (MPN/ml)
Shared desks	2.0×10^4	1.0×10^2	1.5×10^2
Toilet flusher	2.0×10^4	0	0
Door knob	1.05×10^4	5.0×10^1	1.0×10^2
Light switch	1.0×10^2	0	0
Keyboard	1.75×10^4	5.0×10^1	1.5×10^2

Table 4.1 above illustrates the bacterial load of samples from different hand touch surfaces gotten from offices in NAUTH. The result obtained shows the mean total bacteria counts of all the hand touch surface ranging from 1.0×10^2 to 2.0×10^4 CFU/ml, the mean total coliform counts ranging from 5.0×10^1 to 1.0×10^2 CFU/ml and the mean feacal bacteria counts ranging from 1.0×10^2 to 1.5×10^2 MPN/ml. In Total bacteria counts it was observed that shared desks and toilet flusher recorded the highest bacterial load of 2.0×10^4 (CFU/ml) each. In Total coliform it was also observed that shared desks recorded the highest bacteria load of 1.0×10^2 (CFU/ml). In Feacal coliform it was observed that shared desks and keyboard recorded the highest bacteria load of 1.5×10^2 (MPN/ml) each.

TABLE 4.2: Bacterial isolates by Characterization, morphology and biochemical tests.

Isolate bacteria	Morphology	Gram's reaction	Urease	Methyl red	Indole	Vp	Citrate	Catalase	Oxidase	Coagulase	Glucose	Maltase
Staphylococcus aureus	Cocci	+	-	+	-	-	-	-	+	-	+	+
Streptococcus specie	Cocci	+	-	+	-	-	-	+	-	+	+	+
Enterobacter specie	Rods	-	-	-	-	+	+	+	-	-	+	+
Proteus specie	Rods	-	+	+	+	-	-	+	-	-	+	+
Bacillus cereus	Rods	-	-	-	-	+	-	+	+	-	+	+

Table 4.2 above identifies bacteria species based on Characterization, Morphology and Biochemical tests. A total of five colonies were identified, they include; *Staphylococcus aureus, Streptococcus specie, Enterobacter specie, Proteus sp*ecie, and *Bacillus cereus*.The plus (+) sign signifies bacteria growth while the minus (-) sign signifies no bacteria growth. Under the grams reaction plus (+) sign signifies positive stain while the minus (-) sign signifies negative stain. Two (2) of the isolated bacteria were cocci in shape while three (3) were rod in shape.

Table 4.3: Profile load of bacteria isolate across hand touch surfaces in offices in NAUTH.

Bacteria	Total isolated bacteria (percentage)
Staphylococcus aureus	10 (37.04%)
Streptococcus specie	7 (25.93%)
Enterobacter specie	4 (14.81%)
Proteus specie	3 (11.11%)
Bacillus cereus	3 (11.11%)
Total	27 (100%)

The results in table 4.3 represents the distribution of bacteria isolates across hand touch surfaces in offices in Nnamdi Azikiwe University Teaching Hospital (NAUTH). *Staphylococcus aureus* recorded highest with 10(37.04%), followed by *Streptococcus species* with 7(25.93%), followed by *Enterobacter species* with 4(14.81%) , and the least being *Proteus specie* and *Bacillus cereus* with 3 (11.11%) each. Therefore, the most prevalent bacterial specie associated with hand touch surfaces in offices in NAUTH is *Staphylococcus aureus.*

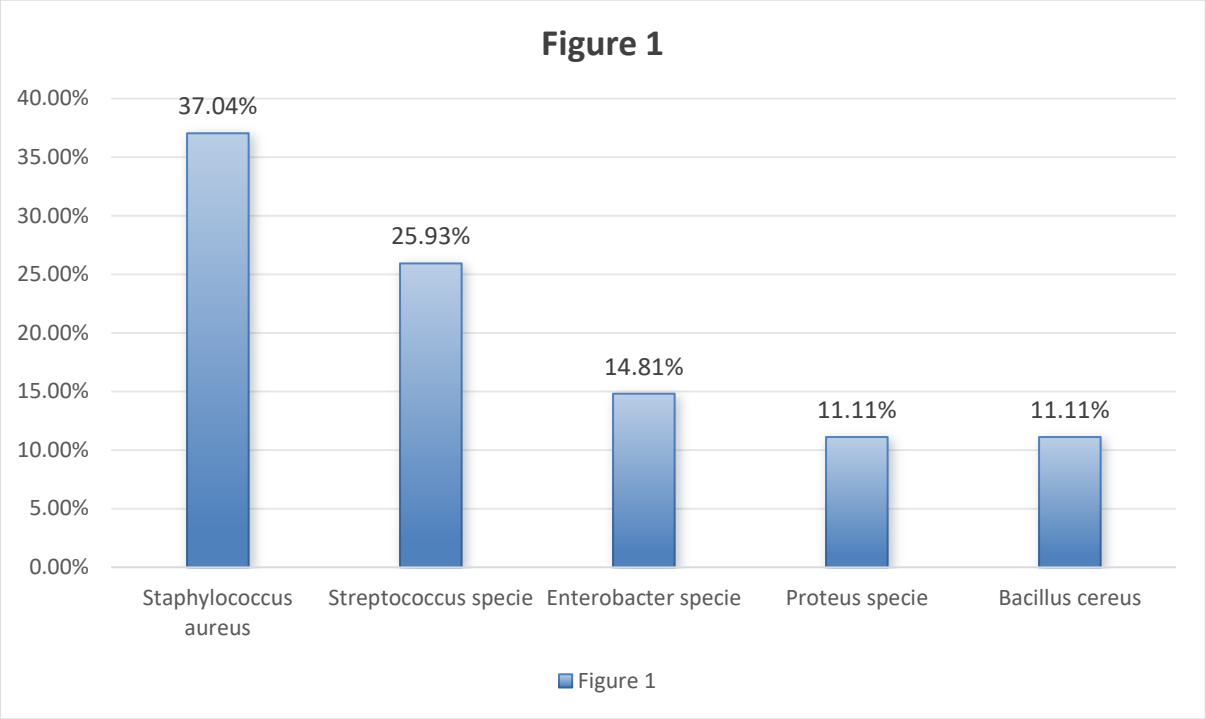

FIGURE 4.1: Profile loads of bacteria isolates across hand touch surfaces in offices in NAUTH.

The results in figure 4.1 above represents the distribution of bacteria on hand touch surfaces in offices in NAUTH. *Staphylococcus aureus* records highest with 37.04% while *Proteus specie* and *Bacillus cereus* records lowest with 11.11% each.

TABLE 4.4: Percentage of bacteria isolates from different hand touch surfaces in offices in NAUTH.

Bacteria	Shared desk	Toilet flusher	Door knob	Light switch	Keyboard	Total
Staphylococcus aureus	2(20%)	2(20%)	2(20%)	2(20%)	2(20%)	10(37.04%)
Streptococcus specie	2(28.57%)	1(14.29%)	1(14.29%)	2(28.57%)	1(14.29%)	7(25.93%)
Enterobacter specie	2(50%)	0(0%)	1(25%)	0(0%)	1(25%)	4(14.81%)
Proteus specie	1(33.33%)	0(0%)	0(0%)	0(0%)	2(66.67%)	3(11.11%)
Bacillus cereus	0(0%)	0(0%)	2(66.67%)	0(0%)	1(33.33%)	3(11.11%)
Total	7(25.93%)	3(11.11%)	6(22.22%)	4(14.81%)	7(25.93%)	27(100%)

Table 4.4 illustrates the percentage of bacteria isolates from different hand touch surfaces in offices in NAUTH. Shared desks and Keyboard has the highest record of isolated bacteria with 7(25.93%) each, followed by Door knob with 6(22.22%) , then light switch with 4(14.81%) and the least being Toilet flusher with 3(11.11%).

Discussion

The assessment of bacterial contamination on hand touch surfaces in offices in NAUTH is a critical endeavor that carries significant implications for public health and infection control. As health care facilities are vital environments where patient safety is paramount, understanding the extent and nature of microbial contamination on hand touch surface is essential in developing effective strategies to mitigate the risks of healthcare-associated infections (HAIs). The main objective of this research is to isolate the bacteria present on hand touch surfaces, to identify them and to determine the most prevalent bacterial specie. The findings gotten through this research provides a clear insight on the need for combined intervention of effective hand hygiene and environmental surface hygiene (decontamination). The data gotten from the research revealed that the most prevalent bacterial specie associated with hand touch surfaces in offices in NAUTH was *Staphylococcus aureus* with 37.04% while the other bacteria species found were , *Streptococcus specie* with 25.93%, *Enterobacter specie* with

14.81%, *Proteus specie* with 11.11% and lastly, *Bacillus cereus* with 11.11%. This finding is consistent with the notion by Umeanaeto *et al.* (2021), that bacterial pathogens commonly associated with hand touch surfaces like doorknobs include; *Staphylococcus aureus, Streptococcus specie, Enterobacter specie, Proteus specie* etc. These organisms can lead to a range of diseases from mild to severe, including conditions such as pimples, impetigo, scalded skin syndrome, pneumonia, meningitis, osteomyelitis, rhinoscleroderma, kidney failure and septicemia. The research also revealed that keyboard and shared desk had the highest level of contamination with 25.93% each, followed by door knobs with 22.23%, light switch with 14.81%, and lastly, toilet flusher with 11.11%. This finding is as a result of high hand contact with shared desk, keyboard and doorknobs and this emphasizes the need for a targeted environmental surface decontamination as well as efficient allocation of cleaning resources to surfaces that are more likely to come in contact with human hands.

Conclusion

The assessment of bacterial contamination on hand touch surfaces in offices at NAUTH reveals a critical intersection between public health and workplace hygiene. Findings from the research underscores the alarming prevalence of pathogenic bacteria on frequently touched surfaces, highlighting a significant risk factor for the transmission of infections among staff and visitors alike. This study not only emphasizes the urgent need for stringent cleaning protocols and regular microbial assessments but also calls for a cultural shift towards heightened awareness of hygiene practices in the workplace. The implications of the findings extend beyond NAUTH, serving as a compelling reminder for institutions everywhere to prioritize environmental health. As we move forward, it is imperative to implement targeted interventions, including educational programs on proper hand hygiene and surface disinfection, to mitigate the risks identified. By fostering a proactive approach to microbial management, we can enhance health outcomes, reduce absenteeism, and create a safer working environment. Ultimately, this research serves as a clarion call for collective action—an invitation to reimagine our approach to hygiene in shared spaces, where each touch represents not just a moment of interaction, but a pivotal opportunity to safeguard our health and well-being.

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