Original Research Article

ANTIBIOGRAMS AND MICROBIAL CARRIAGE OF UNIVERSITY OF JOS CAMPUS SHUTTLE DOOR HANDLES.

ABSTRACT

The Antibiogram and microbial transmission of infection via shuttle door handles constitutes a major threat to public health especially in the developing countries. This study was carried out to investigate the Antibiogram and microbial carriage on shuttle door handles of University of Jos Teaching Hospital. Samples were randomly collected from a total of fifty (50) door handles following standard laboratory techniques. Enumeration of the bacterial counts were carried out using pour plating technique while the bacteria isolates were identified using cultural, morphological and biochemical characteristics. The antibiotics pattern of the bacteria indicated that all the bacteria isolated were sensitive to ciprofloxacin, augmentin, gentamycin, petfloxacin, sperfloxacin, ampicolox while some are resistant to ampicolox, sperfloxacin, petfloxacin, septrin, ofloxacin. Findings suggest that the campus shuttles door handles used in public transportation could also be serving as a means of transmission of both pathogenic and non-pathogenic microorganisms which pose public health risks. Personal hygiene and sanitation such as hand washing and the use of antimicrobial wipe to clean the hands could serve as a means of reducing the incidence of microbial transmission.

KEY WORDS: Antibiograms, Microbial carriage and Door handles.

Commented [I1]: First introduce the Fomites as carriage briefly (2,3 lines)

Commented [I2]: Write formula not brand name

Commented [I3]: Classified tested medicine according to AWaRe WHO grouping

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1.0 INTRODUCTION

The spread of infectious disease through hand contact has been an area of major public health concern because of the frequent contact of the hand with fomites which are potential carriers of pathogenic organisms. This may lead to an alarming rate of outbreaks of infections transmitted by the fomites. Worldwide annually there are 1.7 million deaths from diarrhoeal diseases and 1.5 million deaths from respiratory infections (Pruss-Ustun and Covahan, 2006). These are examples of diseases which could be contracted by humans via fomites.

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Studies have shown that hard, non-porous surfaces such as shuttle door handles have the highest microbial transfer rates to hands. In recent past, a lot of effort has been invested in emphasized hand hygiene through hand wipes and hand sanitizers. Even though people are commonly aware of such practices, the possibility of inaccessibility or lack of use of these practices do exist. Up to 60% 0f adults do not wash their hands when appropriate. People believe that microbes are only present in research laboratories, hospitals or clinics and thus they have a misleading feeling of security in other places or while touching other surfaces such as shuttle door handles. (Vijayalaxmi *et al*., 2021). Lack of knowledge of the roles of micro-habitat such as shuttle door handles in dissemination of microorganisms is a threat to public health. In fact 80% of infections are spread through hand contact with hands or other objects (Reynold and Hurst, 2010). Worldwide, infections with drug-resistant pathogens significantly affect not only the public health but also the economic stability of societies. At least 25% of the 60 million year-based deaths in the world is due to microbial diseases. Despite significant advances in infection control

practices, clinical infections with drug-resistant pathogens remain significant causes of morbidity and mortality among hospitalized patients and in the community settings, affecting developed countries, middle-income countries and sub-Saharan Africa (Stone *et al*., 2017).

The discovery and development of antimicrobial agents has significantly changed the negative narrative of how infectious diseases has plagued the human race over history (O'Hara *et al*., 2013). However, due to slow pace at which these agents are developed and the emergence of resistance to antimicrobials, treating common pathogens has become a challenge. Different types of resistance have developed over time resulting in their classification as multidrug resistance (MDR), extended resistance (XDR) and Pandrug resistance (PDR) (CDC, 2019). *The Gram negative enteric bacilli are common causes of a wide variety of infections involving diverse anatomic sites in both healthy and compromised hosts. In general, among adults, the incidence of infection due to these agents increases with age*. Thus, as the mean age of the population increases, so will the number of these infections. Drug resistance is a serious medical problem. Progressive increase in resistance to commonly used antibiotics with many gram-negative bacilli being multidrug-resistant has been noticed. The emergence of antibiotic resistance in the management of infections is a serious public health issue, particularly in the developing world where apart from high level of poverty and ignorance, there is also high prevalence of fake and spurious drugs of questionable quality in circulation. This has led to a significant increase in morbidity (Vijayalaxmi *et al*., 2021). The World Health Organization (WHO) emphasizes the key role of the microbiology laboratory in antimicrobial stewardship (AMS) by informing the appropriate use of antibiotics through development of Antibiograms (Pakyz, 2007).

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Antibiograms assist clinicians in making initial antibiotic treatment selections for a patient before their individual susceptibility results is available (CDC, 2019; Francois *et al*., 2010). Routine antibiogram techniques are based on a phenotypic study in which microbial growth is observed in the presence of different antibiotics. These techniques include agar dilution (the gold standard for the antibiogram), broth macrodilution and microdilution, and strips with an antibiotic gradient. They yield results in around 17hrs. To evaluate reliability, according to the US Food and Drug Administration (FDA), the results of a rapid antibiogram are classified, compared to the antibiogram obtained through the gold standard, as agreements (concordance), minor errors (erroneous intermediate sensitivity result), major errors (false resistance) and very major errors (false sensitivity) (FDA, 2011). Comprehensive data on the antibiogram of microbial pathogens isolated from different body sites of infections is needed for surveillance systems which aid in monitoring antimicrobial use and resistance thus improving decision making and assessing the effect of interventions at the local, national and international level. There is scarcity of such data in developing countries including Nigeria (Gelband *et al*., 2015). Networking between laboratories may increase infection surveillance within a huge geographical region. The WHO supports the establishment of national networks for the regular exchange of information and proper support for the laboratory. However, only a few countries have local, national and international laboratory networks. The establishment of an integrated laboratory system is very important to combat many infectious diseases. In Low- Middle- Income- Countries (LMICs), there are few or no documented data on the microbial isolates and antibiogram profiles in healthcare facilities even at local level and integrated systems are financially neglected in developing countries. (Masanza *et al*., 2014)

Microbial transmission via several surfaces such as automated teller machines, mobile phones, and currency has been extensively studied but the role of shuttle door handles in the dissemination of pathogenic microorganisms have not been properly investigated, hence this research to determine the role of shuttle door handle in the transmission of pathogenic microorganism to human via hand contact and the antibiotics pattern of the potential isolates.

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2.0 MATERIALS AND METHODS

MATERIALS: Swab sticks, normal saline, culture plates, microscope, incubator, timer, applicator stick, wire loop, burnsen burner, glass slides, gram's stain.

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STUDY AREA: This project research study was carried out on the Antibiogram and microbial carriage on shuttle door handles of University of Jos campus, Jos North area of Plateau state, Nigeria.

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SAMPLE COLLECTION: A total of 50 shuttle door handles of university of Jos campus, were collected from the shuttle door handles using a swab stick and normal saline into a clean sterile universal container.

PROCEDURES FOR CULTURING: With the aid of a sterile cool wireloop, the sample was picked and inoculated into a culture media, the inoculum was smeared thoroughly over area (A-D). The wire loop was sterilized and then drawn from the three (3) parallel lines and was incubated for 18hrs.

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Commented [I13]: 18-24 hours

PROCEDURES FOR GRAM'S STAINING TECHNIQUE: A loop full of the overnight culture was place on a glass slide and a drop of normal saline was placed and the suspension were emulsified with the aid of an applicator stick, and passed through a burnsen burner flame three (3) times before leaving to air dry on the staining rack. The smear was flooded with crystal violet (primary stain) for 60 seconds and was rinsed with water. It was then flooded with the Lugol's iodine (Mordant) for 60 seconds and was rinsed in water. Then the smear was flooded with acetone (decolorizer) briefly and raised in water. It was then flooded with Safranin (counter stain) briefly, rinsed in water and allowed to air dry. They were examined microscopically using x100 objective lens.

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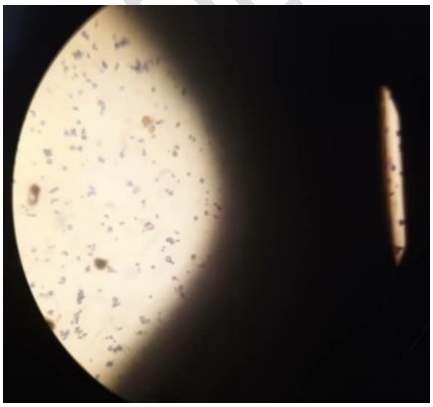
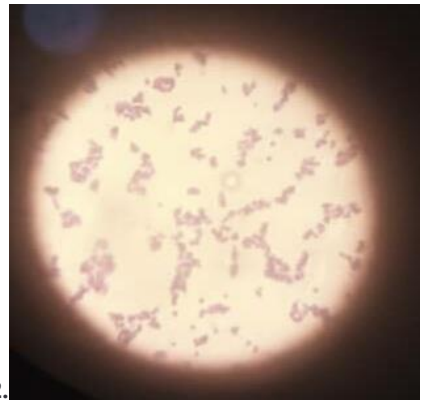
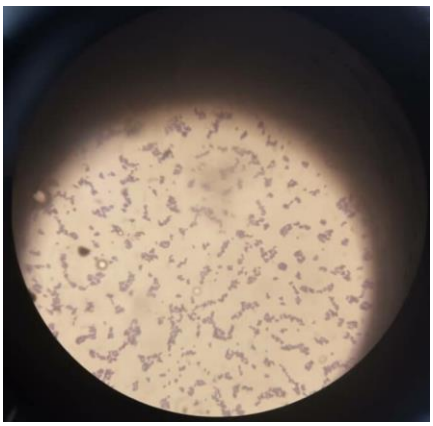
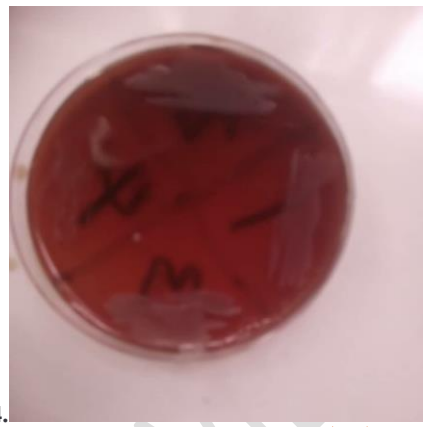
1. 

2. 



3. 

4.

Plates 1-3 showing Gram positive cocci, **plate 4** showing growth on a blood agar plate

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4.0 RESULTS

15 staphyloccocus specie isolate from the cultured samples gotten from university of Jos campus shuttle door handles with antibiotic sensitivity and antibiotic resistance. 35 samples cultured showed no growth.

Table 1: Staphyloccocus specie isolated from the cultured samples

S/n	Organisms isolated	Antibiotic sensitivity	Antibiotic resistance
001	Staphylococcus specie	Cpx, Au, pet, ofx	Apx, spx, sep
002	Stapylococcus specie	Au, Gn, Cpx, ofx	Pet, apx
003	Stapylococcus specie	Gn, Au, Cpx, ofx	Spx, sep, pet
004	Stapylococcus specie	Pet, Gn, Au, cpx	Ofx, Spx, sep
005	No growth	_ _	_ _
006	No growth	_ _	_ _
007	No growth	_ _	_ _
008	No growth	_ _	_ _
009	Stapylococcus specie	Gn, Au, Cpx, lev	_ _
010	No growth	_ _	_ _
011	No growth	_ _	_ _
012	No growth	_ _	_ _
013	No growth	_ _	_ _
014	No growth	_ _	_ _
015	Stapylococcus specie	Gn, Au, Cpx, lev	Apx, Spx, sep
016	No growth	_ _	_ _
017	No growth	_ _	_ _
018	Stapylococcus specie	Gn, Au, Cpx, lev, spx	Apx, ofx, sep
019	No growth	_ _	_ _
020	No growth	_ _	_ _
021	Stapylococcus specie	Gn, lev, Cpx, Ofx, spx	Apx, sep, pet
022	No growth	_ _	_ _
023	No growth	_ _	_ _
024	No growth	_ _	_ _
025	No growth	_ _	_ _
026	Stapylococcus specie	Lev, Cpx, Gn, Au, ofx	

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Commented [I17]: Also mentioned percentage of sensitivity data of tested medicines

Commented [I18]: Add concentration of each tested antibiotics

Commented [I19]: How you confirm Staphylococcus specie, write above identification method, catalase, coagulase etc

Commented [I20]: Classified them according to major grouping of antibiotics, like penicillin, cephalosporins

027	Stapylococcus specie	Lev, Cpx, Gn, Au, ofx	Apx, pet, sep
028	No growth	_ _	_ _
029	Stapylococcus specie	Lev, Gn, cpx,Au, ofx	Apx, pet, sep
030	No growth	_ _	_ _
031	No growth	_ _	_ _
032	Stapylococcus specie	Apx, cpx, Au, Lev, Gn	Pet, ofx, sep
033	No growth	_ _	_ _
034	No growth	_ _	_ _
035	No growth	_ _	_ _
036	No growth	_ _	_ _
037	No growth	_ _	_ _
038	No growth	_ _	_ _
039	Stapylococcus specie	Lev, cpx, Au, Gn, ofx	Pet, sep, apx
040	Stapylococcus specie	Lev, Au, Gn, ofx, cpx	Pet, sep, apx
041	No growth	_ _	_ _
042	No growth	_ _	_ _
043	No growth	_ _	_ _
044	No growth	_ _	_ _
045	Stapylococcus specie	Lev, Au, Gn, ofx	Cpx, sep, apx
046	No growth	_ _	_ _
047	No growth	_ _	_ _
048	No growth	_ _	_ _
049	No growth	_ _	_ _
050	No growth	_ _	_ _

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5.1 DISCUSSION

Over the years, different researches has been conducted to examine the role of various surfaces, such as tables, computer key boards and mobile phones on the carriage and dissemination of pathogenic infection, but the role of shuttle door handles as a route of microbial transmission has not been reported. Hence the need to assess the carriage and transmission of microorganism by shuttle door handles. The knowledge of this is expected to broaden our understanding of the microbial carriage of the shuttle door handles and their antibiotics pattern. This will help to implement public health preventive and control measure to forestall future outbreak of infection that may result from this pathogenic microorganisms associated with the shuttle door handles.

In the past 60 years, antibiotics have been critical in achieving a dramatic rise in life expectancy and significant improvements in public health. However, the viability of Gram positive and Gram negative organism under various environment conditions have been described (Noskin *et al*., 2020; Mazel and Monastery, 2012). Disease-causing microbes have become increasingly resistant to the antibiotics commonly in use. It has been clearly shown that the use of antimicrobials leads to selection of resistant strains both in the individual and in the community, and overuse or inappropriate use only increases this risk. History suggests that microbes will never run out of ways of developing resistance, but we may run out of effective antimicrobials (Reynold and Hurst, 2010).

This study found 15 staphylococcus specie isolated from the cultured samples collected from university of Jos campus shuttle door handles with antibiotic sensitivity and antibiotic resistance. The staphylococus specie were sensitive to ciprofloxacin, Augmentin, petfloxacin, ofloxacin, Ampicolox, levofloxacin and were resistant to Ampicolox, septrin, sperfloxacin, ofloxacin, petfloxacin, ciprofloxacin. Staphylococus specie demonstrated the highest resistance to

Ampicolox, septrin, sperfloxacin, ofloxacin and ciprofloxacin. A research study carried out by Ansari *et al*., 2014 shows a similar antibiotic resistance. The viability of Gram positive and Gram negative organism under various environment conditions have been described (Reynold and Hurst, 2010). Studies also found Gram positive *Staphylococcus aureus*, and Gram negative bacteria such as *Escherichia coli*, Klebsiella species, Pseudomonas species contaminated various contact surfaces including chairs, tables, windows, shuttle door handles and many other common household fixtures. The presence of these pathogenic bacteria on environmental surfaces poses a potential risk (Pruss-Ustun and Covahan, 2006; Masanza *et al*., 2014).

5.2 CONCLUSION

Antimicrobial resistance is one of the major global threats in the spectrum of infectious diseases. Worldwide, studies has revealed the declining of the effectiveness of antibiotics in the stock and the rising of bacterial resistance to all first-line and last-resort antibiotics. Thus, the impact of antibiotic resistance is clinical, economical and societal. Most of the staphylococus specie isolated in this study were resistant to ampicolox, septrin, sperfloxacin, augmentin, ofloxacin, ciprofloxacin. At the same time, the rate of multiple drug-resistant isolates are alarmingly high. Therefore, it is recommended to have strict antibiotics utilization policies within standard laboratories or hospitals to support clinicians on rational choice of antibiotics therapy and regularly update the list and reliable sources of drugs.

Abbreviations

Lev: Levofloxacin, Ofx: Ofloxacin, Apx: Ampicolox, Spx: Sperfloxacin, Gn: Gentamycin, Au: Augmentin, Cpx: Ciprofloxacin, Pet: Petfloxacin, Sep: Septrin

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