



Can Antibiotic Resistant Bacteria Occur In Automated Teller Machines In Ilorin Metropolis?

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ABSTRACT

The rise of multiple resistance bacteria among the pathogenic bacterial community is becoming a serious threat to public health most especially those contaminating environmental surfaces like the surface of Automated Teller Machine (ATM). This study was carried out in order to evaluate the prevalence of microbial contamination with its antibiotic resistance on automated teller machine and to elucidate its implications on the users of ATM. Twelve samples were collected from different ATM centers including the ATM at Kwara State General Hospital, Al-Hiqma University and the only ATM located around the busy part of Garin Alimi along Asa dam, Ilorin. Based on standard microbiological methods, the distribution of these organisms shows that 28.6% of the isolated organisms were *Pseudomonas aeruginosa*, 11.9% were *Proteus vulgaris*, 38.1% were *Morganella morganii*, 19.0% were *Klebsiella edwardsii*, and 2.4% were *Proteus mirabilis*. Antibiotic susceptibility test revealed that all the isolated organisms (100%) were resistance to septrin and 80% of all the organisms were resistance to chloramphenicol, amoxacillin, augmentin and Pefloxacin. From this study, it can be concluded that there is heavy bacterial contamination of ATM surfaces with bacteria that are resistant to commonly used antibiotics in human medicine, therefore, there is urgent need for frequent disinfection of ATM machines and its accessories along with periodical microbiological surveillance.

Keywords: ATM, Antibiotics, Hygienic, Microbes, Resistance

INTRODUCTION

Bank Automated Teller Machines are the essential requirements of our social life. They are frequently localized in city centers, trade areas, and around the hospitals. Hundreds of people whose socio-economic levels and hygienic status are quite different with each other use ATMs daily. Customers contact with their hand the surfaces of keypad and/or screen of these devices (Tekerekoğlu *et al.*, 2013). The ATM is likely to be contaminated with various microorganisms due to their vast contact by multiple users. There is no restriction as to who has access to the facility and no guideline to ensure hygienic usage. But like all surfaces microbial colonization of these metallic keypads are eminent, particularly when there are no proper cleaning regimens in place for most of these facilities (Stanley *et al.*, 2014). The hygiene of environmental surfaces from shopping, ATM machines, telephones and computers and miscellaneous sites play a major role in spreading serious infections caused by bacteria that have become resistant to commonly used antibiotics and has become a major global healthcare problem in the 21st century (Alanis, 2005).

Many factors have been shown to influence the bacterial transfers between surfaces, including the source and destination surface features, bacterial species involved, moisture levels, pressure and friction between the contact surfaces, and inoculum size on surfaces. Oils in the skin, dust, grime, moisture and warmth from central heating systems also provide an ideal environment for these germs to accumulate. The presence of viable pathogenic bacteria on inanimate objects has been reported by earlier investigators (Gerba, 2005; Famurewa et al., 2009; Gholamreza et al., 2009). Bacteria that can cause severe gastroenteritis have been found on ATM machine keypads. Roxburgh (2005) demonstrate that germs can be readily transferred from your hands to almost any frequently used surface. Other studies have implicated environmental surfaces in the transmission of bacteria (Bures et al., 2000; Manning et al., 2001). However, the role of environmental surfaces in the transmission of disease remains an issue of scientific debate and fundamental information concerning the microbial transfer rates from environmental surfaces to the hands and from the hands to the mouth remains scarce. In view of this, the present study was undertaken to investigate the bacterial load of these devices (i.e. the touched metallic keypads of Banks ATMs) in and around hospital premises within Ilorin metropolis.

MATERIALS AND METHODS

The twelve Automated Teller Machine (ATM) used for this study were located at Ilorin metropolis, Kwara State, Nigeria. These ATM were selected randomly at various location in the city based on high patronage. These locations include the ATM at Kwara State General Hospital, Al-Hiqma University and the only ATM located around the busy part of Garin Alimi along Asa dam. Sterile swabs soaked in sterile saline were used to swab the ATM keyboards, card swiping machines, and money outlets. The swabs were transported to the laboratory within 24 hours from the time of collection and processed according to standard microbiological methods. The isolation of bacteria was completed within 24 hours of samples collection. This was carried out by mixing 1ml of the samples with 9mL of sterile distilled water and diluted serially up to 10^{-10} . This was repeated for all the samples. 0.2mL (aliquot) of the suspension was plated out on Mueller – Hinton agar that has been supplemented with 50µg/mL of Septrin respectively. The plates were incubated 35°C for 24 hours. Distinct colonies growing on each plate were counted selected, sub-cultured and stored on slants. Pure cultures of all the isolates were subjected to biochemical test.

The susceptibility of the bacteria Isolates was assayed using disc diffusion method as described by the British Society for Antimicrobial Chemotherapy (BSAC) (Andrews, 2008). A suspension of each Isolate in normal saline was compared with 0.5 McFarland standards to standardize the inoculums. The suspension was used to Inoculate MHA Plates using sterile swabs sticks and antibiotics disc containing septrin (30µg), Chloramphenicol (30µg), Sparfloxacin (10µg), Ciprofloxacin (30µg), Amoxicillin (30µg), Augmentin (25µg), Gentamycin (10µg), Pefloxacin (10µg), Tarivid (30µg) and Streptomycin (10µg) was aseptically layered on the surface of the plates. The plates were incubated at 35°C for 24 hours. After incubation, zone of growth inhibition around each disc was measured and used to classify the organisms as sensitive or resistant to an antibiotic according to the interpretive standard of the Clinical and Laboratory Standard Institute (CLSI, 2005).

RESULTS

All the 12 swabs that were collected from various ATM centers showed microbial contamination. Forty-two microorganisms were isolated. The bacterial isolates were identified by standard biochemical tests (Table 1). The distribution of microorganisms isolated from all the ATM is given in Fig. 1. From the table 28.6% of the isolated organisms were identified to be *Pseudomonas aeruginosa*, 11.9% were *Proteus vulgaris*, 38.1% were *Morganella morganii*, 19.0% were *Klebsiella edwardsii*, and 2.4% were *Proteus mirabilis*. This is an indication that *Morganella morganii* was the predominant isolate from the entire 42 isolated organisms. The results in table 2 revealed that the isolated organisms were highly resistance and less susceptible to the selected antibiotics.

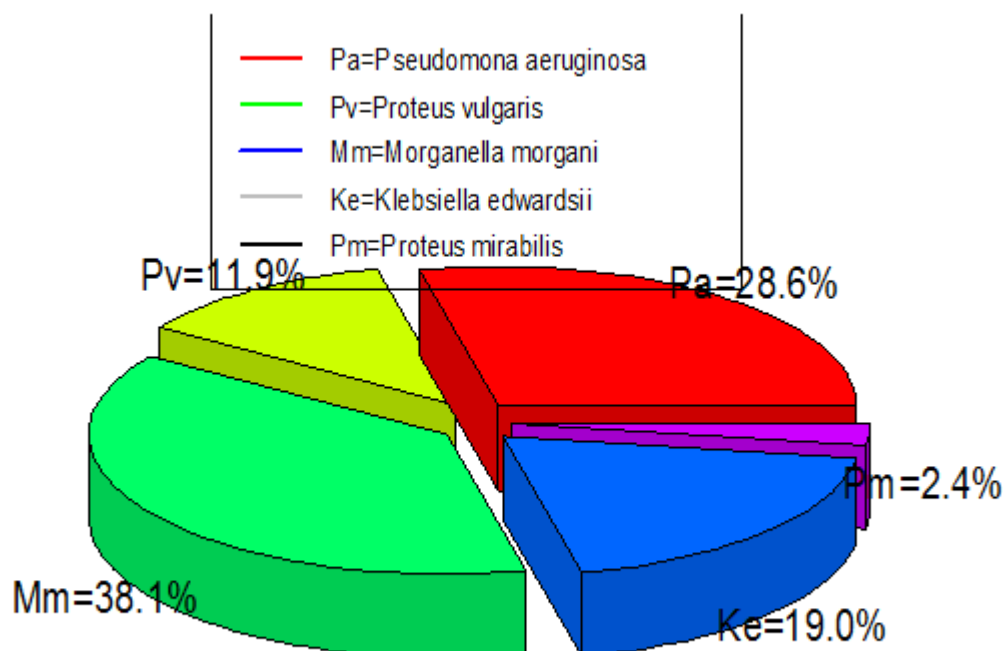


Fig. 1: Pie Chart of Common Organisms Associated with the use of ATM

Table 1: Resistance patterns of the isolated organisms to selected antibiotics

ISOLATED ORGANISM/ ANTIBIOTICS	SXT	CH	SP	CPX	AM	AU	CN	PEF	OFX	S
<i>Pseudomonas aeruginosa</i>	R	I	R	S	R	S	S	R	R	S
<i>Proteus vulgaris</i>	R	R	I	R	R	R	S	R	R	R
<i>Morganella morganii</i>	R	R	R	S	I	R	R	S	S	S
<i>Klebsiella edwardsii</i>	R	R	R	R	R	R	R	R	S	R
<i>Proteus mirabilis</i>	R	R	I	R	R	R	S	R	R	R

SXT=Septrin; CH=Chloramphenicol; SP=Sparfloxacin; CPX=Ciprofloxacin; AM=Amoxicillin; AU=Augmentin; CN=Gentamicin; PEF=Pefloxacin; OFX=Tarivid; S=Streptomycin

Table 2: Antibiotic resistant profile of bacteria isolates

Isolated Organism	Number of resistance drug	Number of intermediate resistance drug	Number of susceptible drug
<i>Pseudomonas aeruginosa</i>	5	1	4
<i>Proteus vulgaris</i>	8	1	1
<i>Morganella morganii</i>	5	1	4
<i>Klebsiella edwardsii</i>	9	0	1
<i>Proteus mirabilis</i>	8	1	1
Total	35 (70%)	4 (8%)	11 (22%)

DISCUSSION AND CONCLUSION

Improvement in technology has brought about changes in the way we handle our day to day activities in which the banking sectors are not left out. Today, ATMs are installed at various locations in cities and suburbs to enhance easy dispensation of cash but this improvement has also given birth to contamination from unexpected sources. The hand borne transmission through ATM is one of the most important routes for the spread of infectious agents in the community. To investigate whether ATMs can serve as potential vectors for transmission of infection, the study was carried out by collecting swabs from ATM centers in and around Ilorin. The results revealed the presence of bacteria in ATMs particularly the pathogenic bacteria such as *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Morganella morganii*, *Klebsiella edwardsii* and *Proteus mirabilis* that are also resistant to commonly used antibiotics in human medicine, this is worrisome because of their pathogenicity and ubiquity.

This is because all the organisms isolated are responsible for serious infections like pneumonia, urinary tract infections, septicemia, meningitis, diarrhoea, septic arthritis, bacteremia and soft tissue infection among others. Also, it is clear from this study that antibiotic resistant patterns of the isolated organisms is far greater than their susceptibility pattern thus, making us conclude that the organisms are highly resistance to commonly used antibiotics.

These multiple resistant bacteria isolated from ATM surfaces indicated that ATM plays an important role in the transmission of multiple resistant bacteria in the community which is an indication that ATM centres could be a threat to public health if adequate logistic measures are not put in place to ameliorate these levels of contamination.

Sequel to the findings of this study, the following are therefore recommended:

- ❖ Regular disinfection of ATM keyboards, screen and other parts with antibacterial covers for the contact surfaces or using alcohol wipes before and after use may help in limiting bacterial accumulation, growth and transmission.
 - ❖ Cleaning regimen aimed at reducing the population and presence of these organisms on such surfaces should be developed using appropriate sanitizers and strictly adhered to by operators of such facilities.
 - ❖ Hygienic measures such as thorough hand washing with soap after using currency notes and ATM machine should be observed and the practice of eating snacks while using ATM should be discouraged.
 - ❖ Antibiotic-resistant bacteria on ATM centers are being reported in the study. Therefore, continuous microbiological surveillance is needed to monitor these organisms and put them under control.
 - ❖ Furthermore, the use of saliva during counting of currency notes should be avoided as well as desists from placing money in the mouth and biting off corners of currency notes.
- Moreover, ready-to- eat food sellers should be educated on proper hygienic measures to avoid possible cross contamination between currency notes and the food they sell.

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