

# ISOLATION, CHARACTERIZATION AND ANTIBIOTIC SUSCEPTIBILITY PROFILES OF BACTERIA AND FUNGI FROM SELECTED AUTOMATED TELLER MACHINE (ATM) KEYPADS AT KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY (KNUST), KUMASI

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## INTRODUCTION

With increasing digitalization, Automated Teller Machines (ATMs) have become common public touch surfaces, facilitating millions of transactions daily (Abban & Tano-Debrah, 2011). Their frequent use facilitates microbial contamination and transfer. Studies have identified bacteria and fungi such as *Staphylococcus* spp., *Escherichia coli*, *Pseudomonas* spp., and *Aspergillus* spp., some showing multidrug resistance (Acharjee *et al.*, 2019). Understanding the composition, resistance patterns, and contamination levels of these microbes on ATM keypads is crucial to improve knowledge of microbial survival and related public health risks.



Plate 1: People using ATMs

## OBJECTIVES

### Main Aim

- ✓ To determine the bacterial and fungal diversity on ATM keypads and evaluate their antibiotic resistance patterns.

### Specific Objectives

- ✓ To isolate, identify, and characterize the bacterial and fungal species present on ATM keypads.
- ✓ To determine the antibiotic resistance patterns of bacterial isolates from ATM keypads.

## METHODS

- ✓ A cross-sectional study with 7 selected ATMs.
- ✓ Sampling by swabbing ATM keypads.



Plate 2: Sample Collection; swabbing

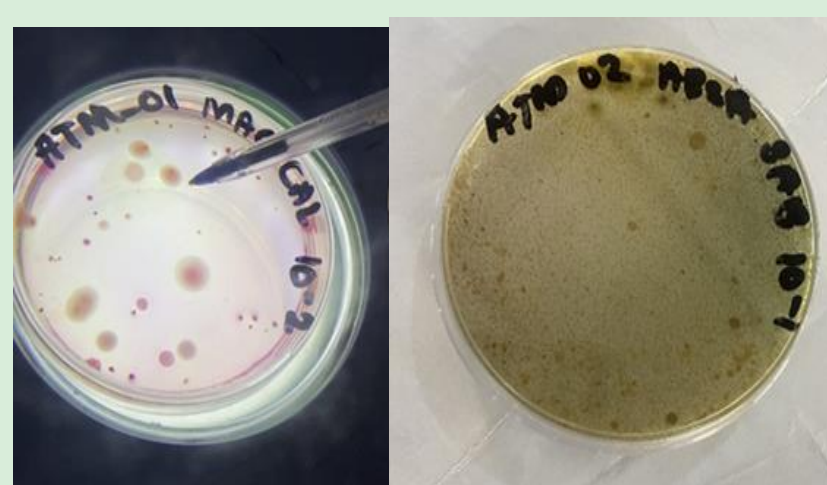


Plate 3: Microbial Cultures

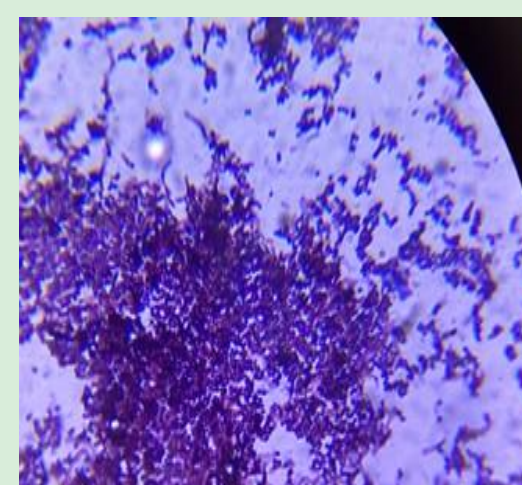


Plate 4: Microscopic view of gram-positive bacteria



Plate 5: Indole Test

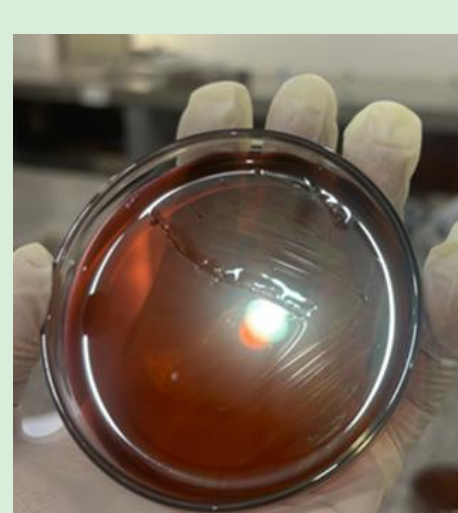


Plate 6: Confirmation of *E. coli*



Plate 7: Kirby Bauer disk diffusion method

## RESULTS AND DISCUSSION

- ✓ ATMs located at Commercial area have higher bacterial loads than Parade ground ATMs ( $p > 0.05$ ).

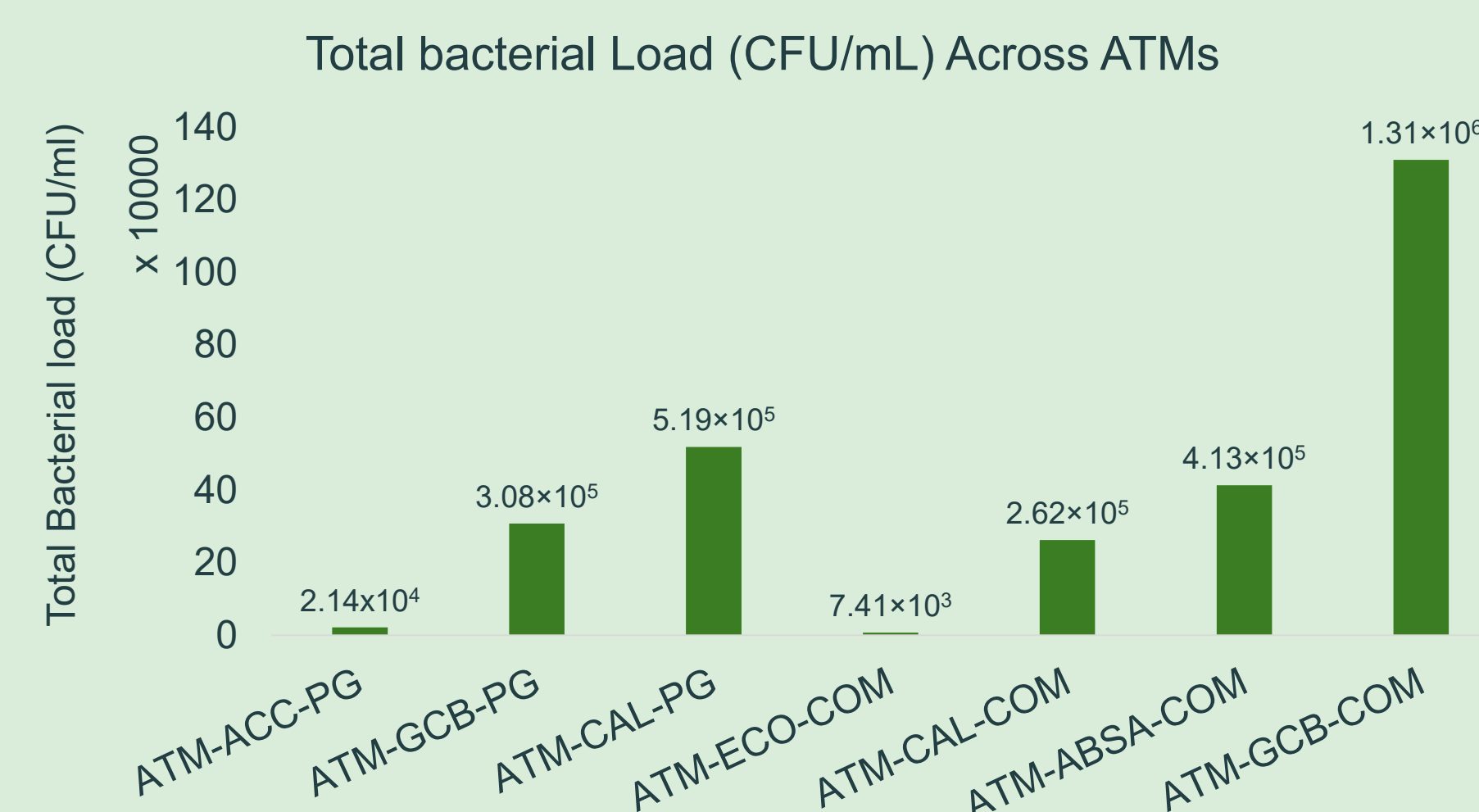


Figure 1: Total Bacterial Load (CFU/mL) Across ATMs.

- ✓ Fungal contaminations are greater on ATMs in Commercial area compared to Parade grounds ( $p > 0.05$ ).

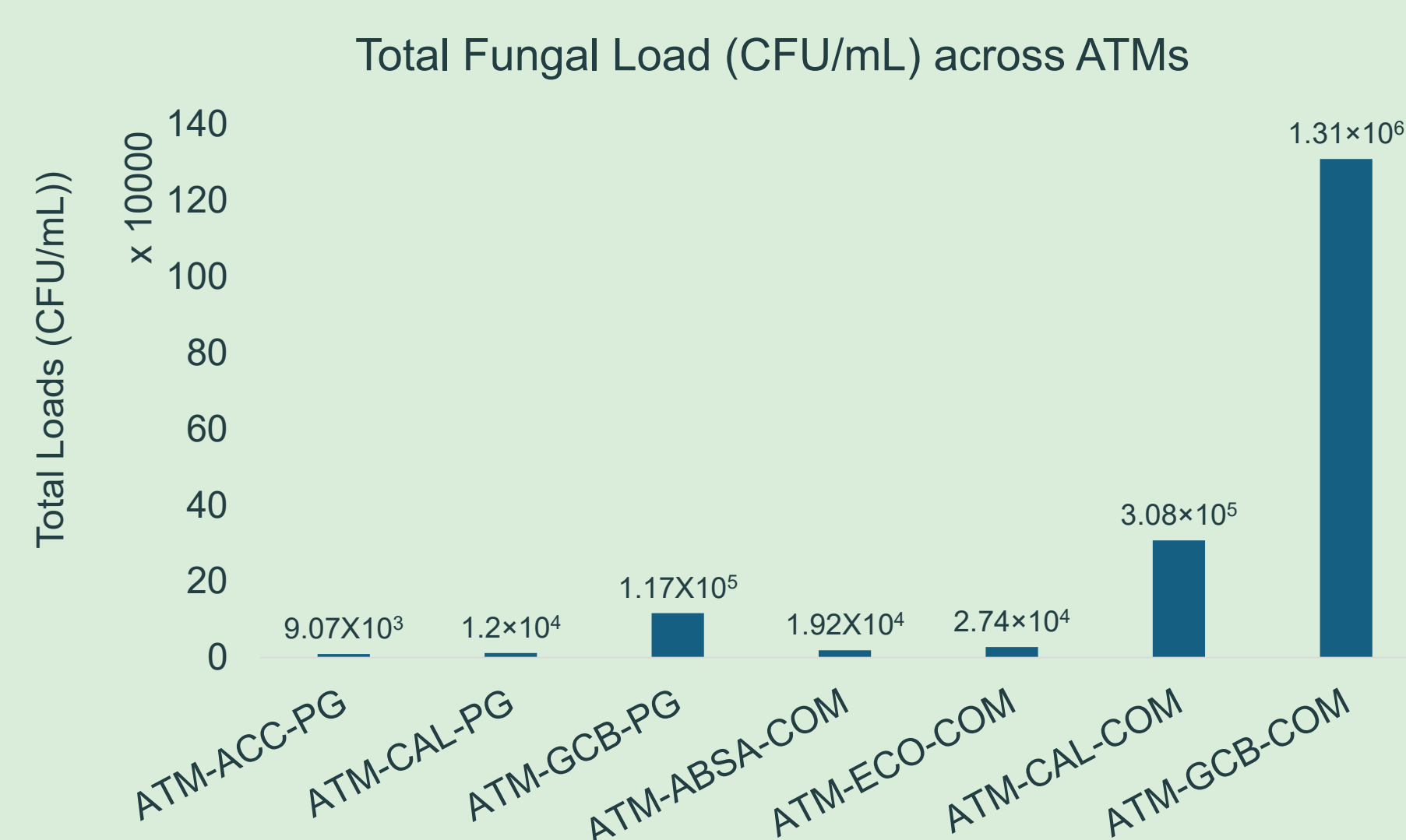


Figure 2: Total Fungal Load (CFU/mL) Across ATMs.

- ✓ *Staphylococcus* (42%) was the most dominant isolate, followed by *Bacillus* (20%) and *Klebsiella* (12%). The detection of faecal indicator bacteria (*Escherichia*, *Klebsiella*) and water-associated organisms (*Vibrio*) suggests contamination possibly linked to poor hand hygiene and environmental exposure.

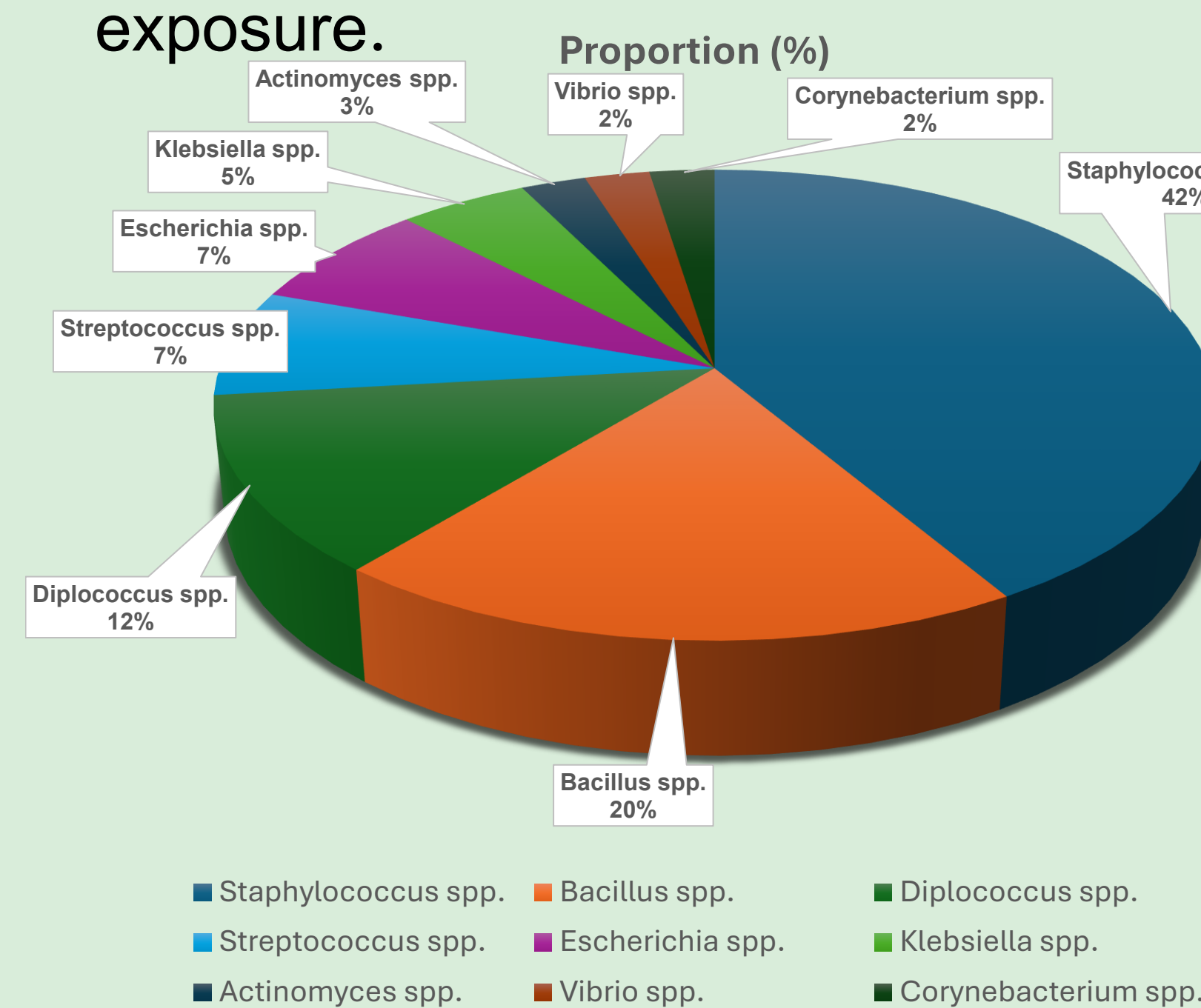


Figure 3: Proportion of Bacterial Species Across all ATMs

- ✓ The predominance of Yeasts and *Aspergillus fumigatus* on ATM keypads indicates that these high-touch surfaces harbour potentially opportunistic fungi. Less common species such as *Penicillium*, *Curvularia*, and *Aspergillus flavus* reflect a diverse fungal population.

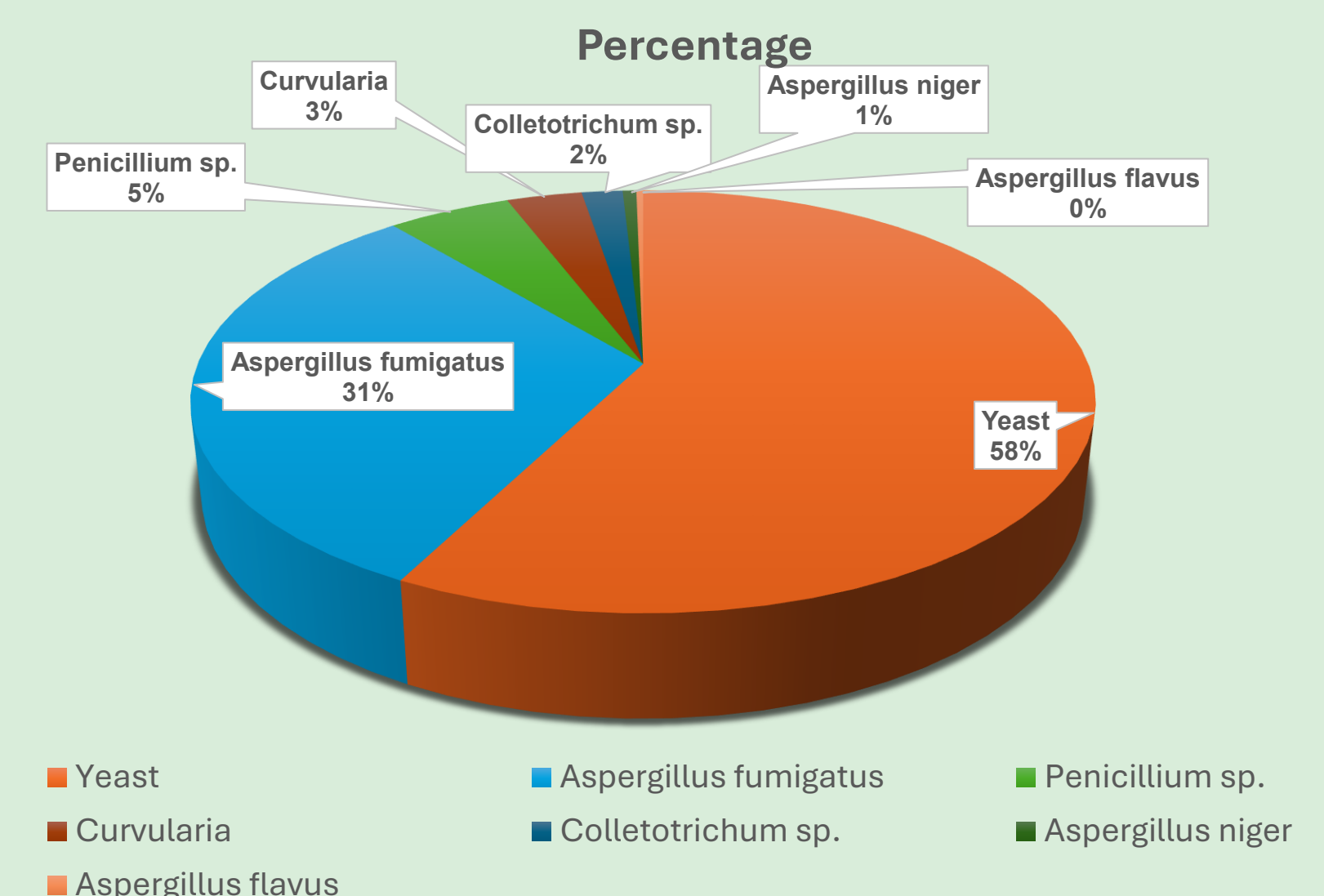


Figure 4: Proportion of Fungal Species Across all ATMs

- ✓ Gram-positive bacteria show high resistance to co-trimoxazole and cephalexin, with variable resistance to other antibiotics.
- ✓ Gram-negative bacteria exhibit high resistance to most  $\beta$ -lactams and co-trimoxazole, with lower resistance to aminoglycosides and fluoroquinolones.

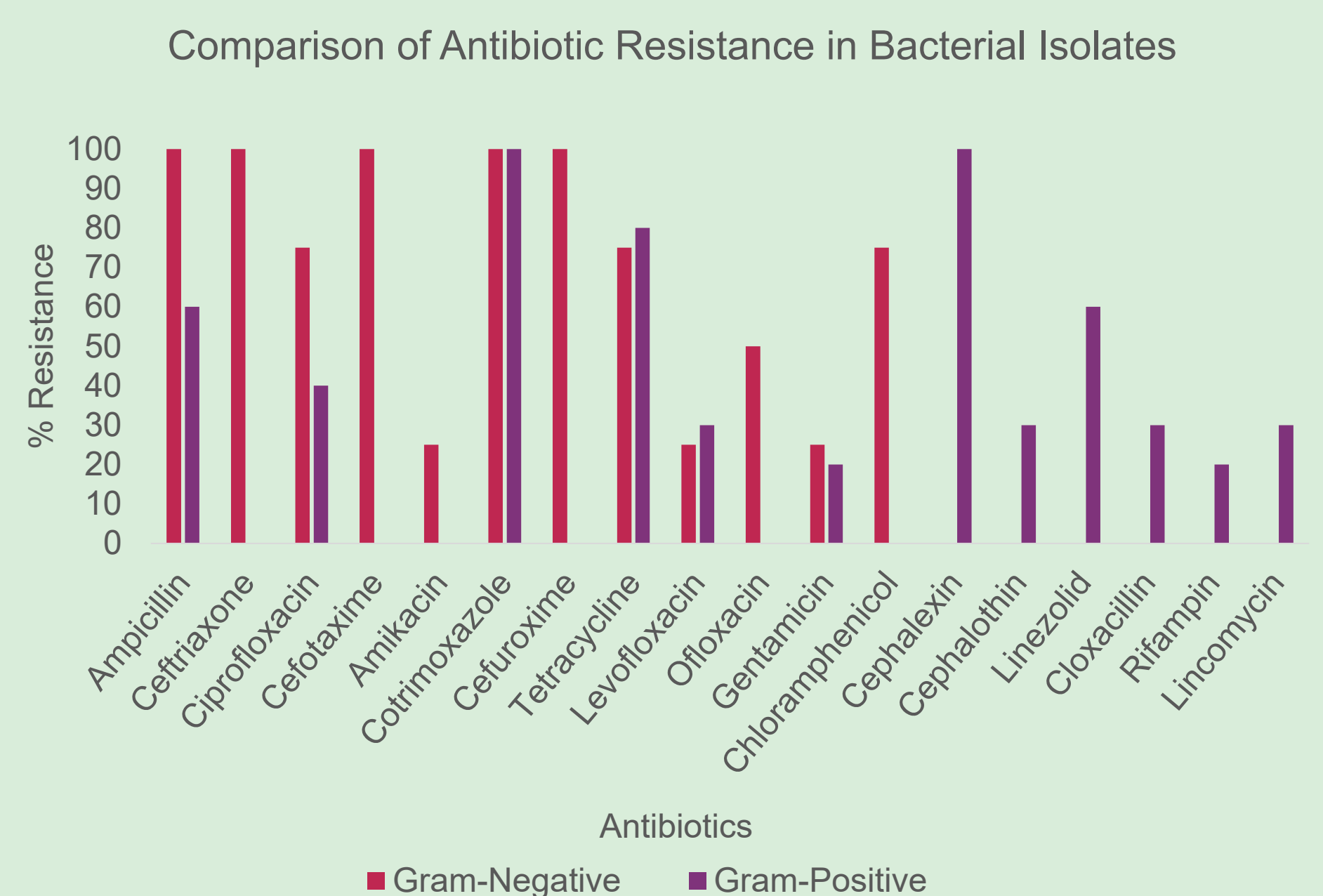


Figure 5: Comparison of Antibiotic Resistance in Gram-Negative and Gram-Positive Bacterial Isolates

## CONCLUSION AND RECOMMENDATION

- ✓ ATM keypads at KNUST harbour diverse bacterial and fungal species, including multidrug-resistant strains such as *Staphylococcus aureus* and *Escherichia coli* highlighting the potential role of public touch surfaces in microbial transmission.
- ✓ Regular disinfection, improved hand hygiene, and further monitoring are needed, with future studies expanding sampling, testing, and assessing microbe transfer between surfaces and users.

## ACKNOWLEDGEMENT

- ✓ We thank the Managers of GCB Bank, Calbank, Ecobank, ABSA bank and Access bank for allowing us to take samples from their ATMs.

## REFERENCES

- ✓ Abban, S., & Tano-Debrah, K. (2011). Automatic teller machines (ATMs) as potential sources of food-borne pathogens –a case from Ghana. *Nature and Science*, 2011;9(9).
- ✓ Acharjee, M., Akter, T., Tabassum, N., Rahaman, M. M., & Noor, R. (2019). Prevalence of Methicillin and Vancomycin resistant *Staphylococcus aureus* on the touch screen of automated teller machines in Dhaka city. *Bangladesh Journal of Microbiology*, 36(1), 23–27.