

# MICROBIOLOGICAL ANALYSIS OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS STRAINS



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## Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) poses a significant epidemiological challenge in healthcare and community settings. Medical students regularly exposed to clinical environments may act as vectors for transmission [1]. Assessing colonization rates is essential for effective infection control.

## Objectives

This study aimed to determine the MRSA colonization rate among medical students, assess potential transmission between students and patients and characterize the identified student and patient MRSA strains.

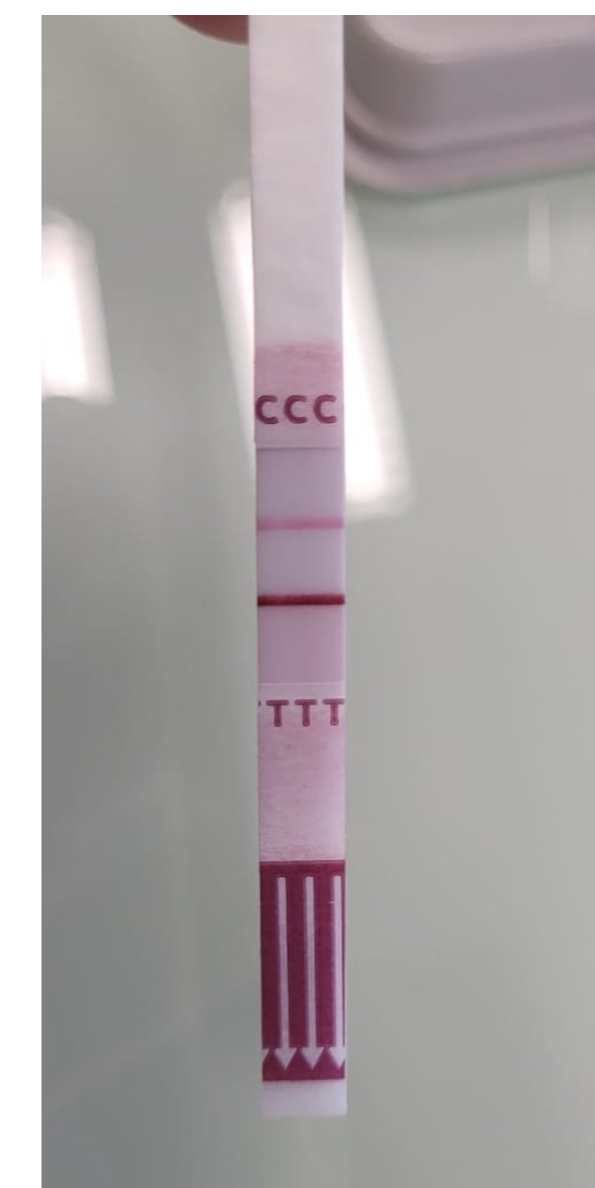
## Methodology

In May 2024, nasal swabs were obtained from 291 second-year medical students of LF UP. Additionally, methicillin-resistant *Staphylococcus aureus* (MRSA) isolates collected from patients hospitalized at the University Hospital Olomouc between 2023 and 2024 were investigated. All samples underwent standard microbiological analyses, including MALDI-TOF mass spectrometry, culture on chromogenic media (Pic. 1), immunochromatography testing (Pic. 2), and antimicrobial susceptibility testing (Pic. 3) according to EUCAST criteria [2]. *Spa* typing [3] and detection of *mecA/C* genes were performed at an affiliated research facility in Brno (Department of Public Health, Faculty of Medicine, Masaryk University) on all MRSA isolates from students and patients hospitalized in the ward where the students completed their internship in the past 12 months.

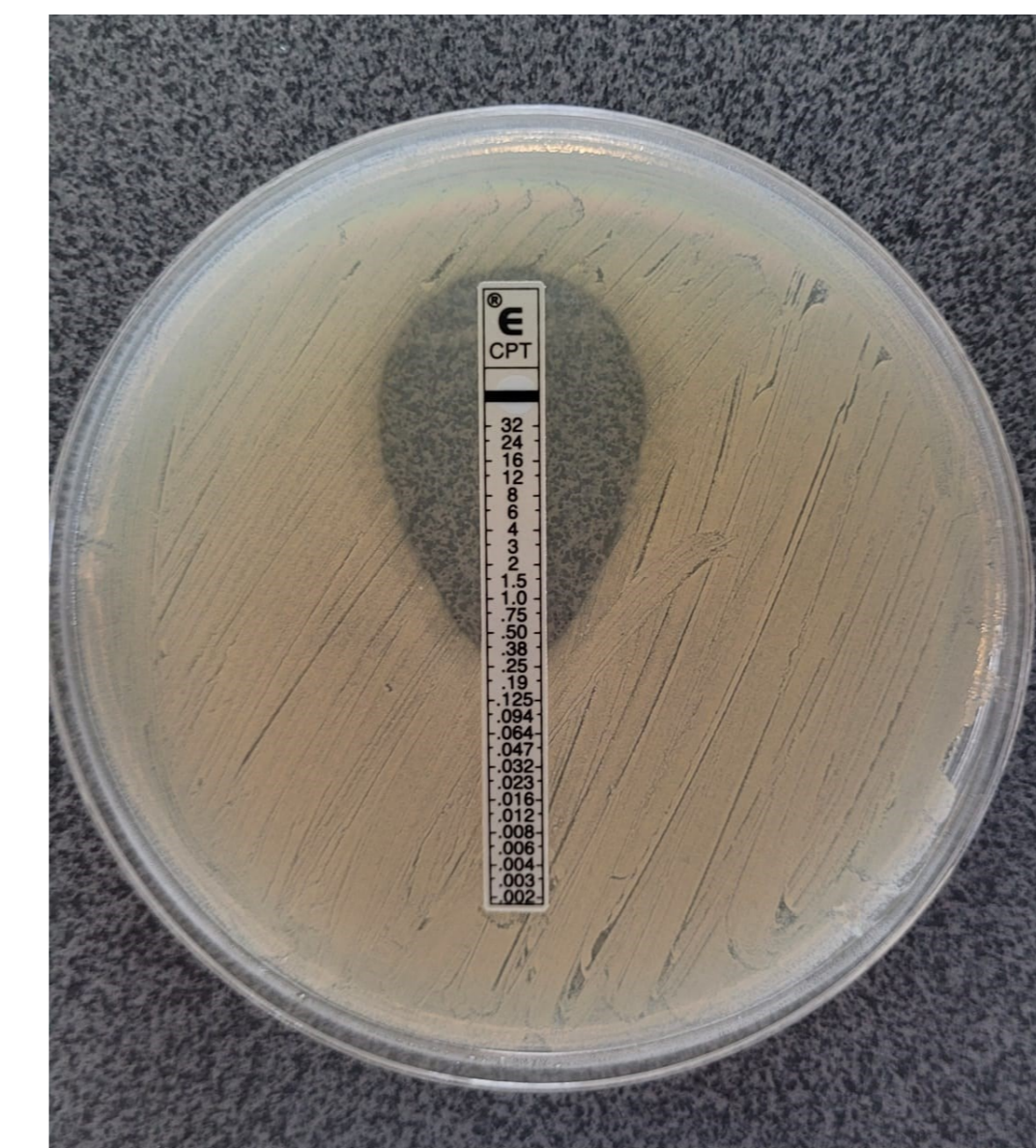
Picture 1: Positive MRSA Chromogenic Media



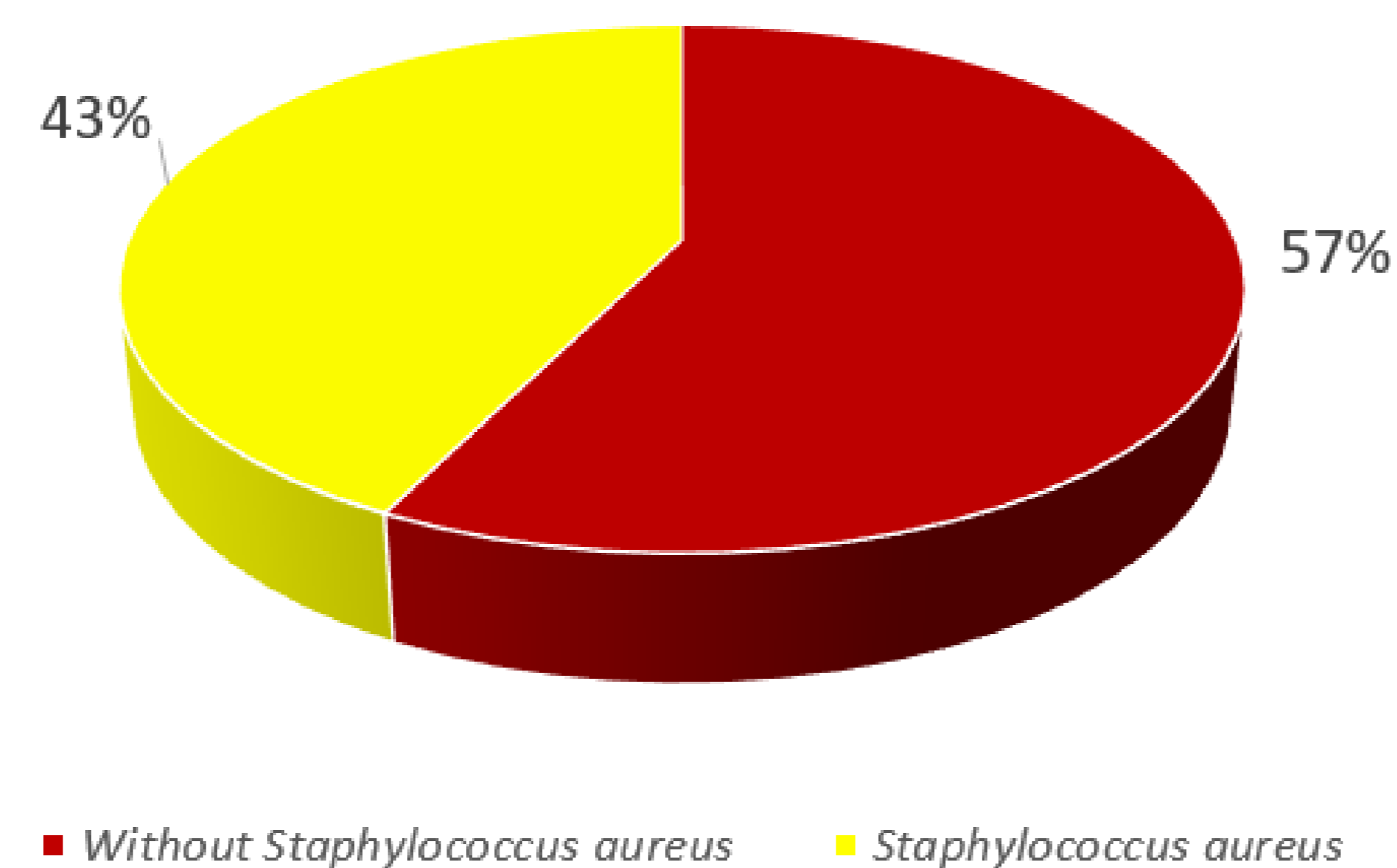
Picture 2: Positive MRSA Immunochromatography Test



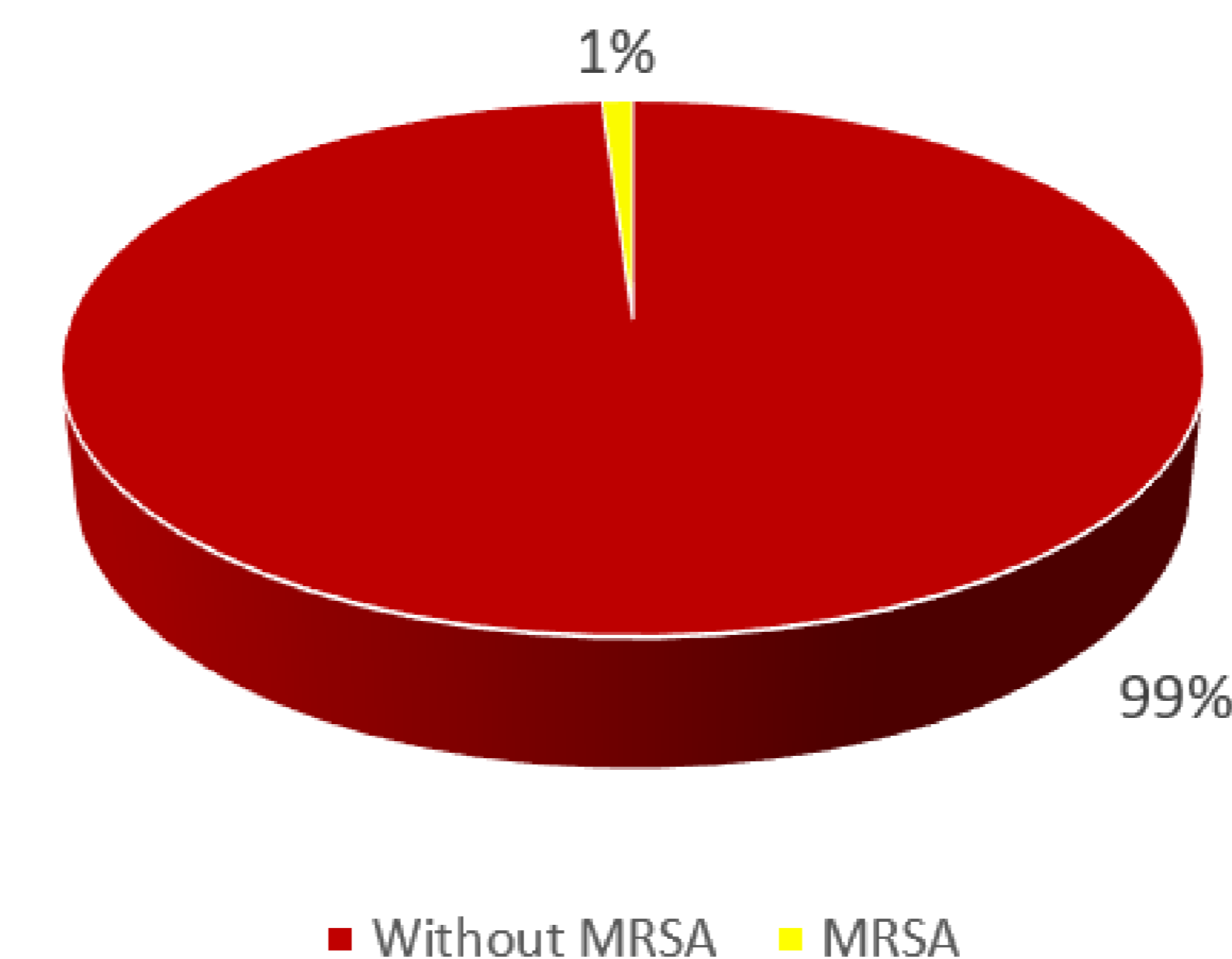
Picture 3: E-Test, Antibiotic susceptibility testing



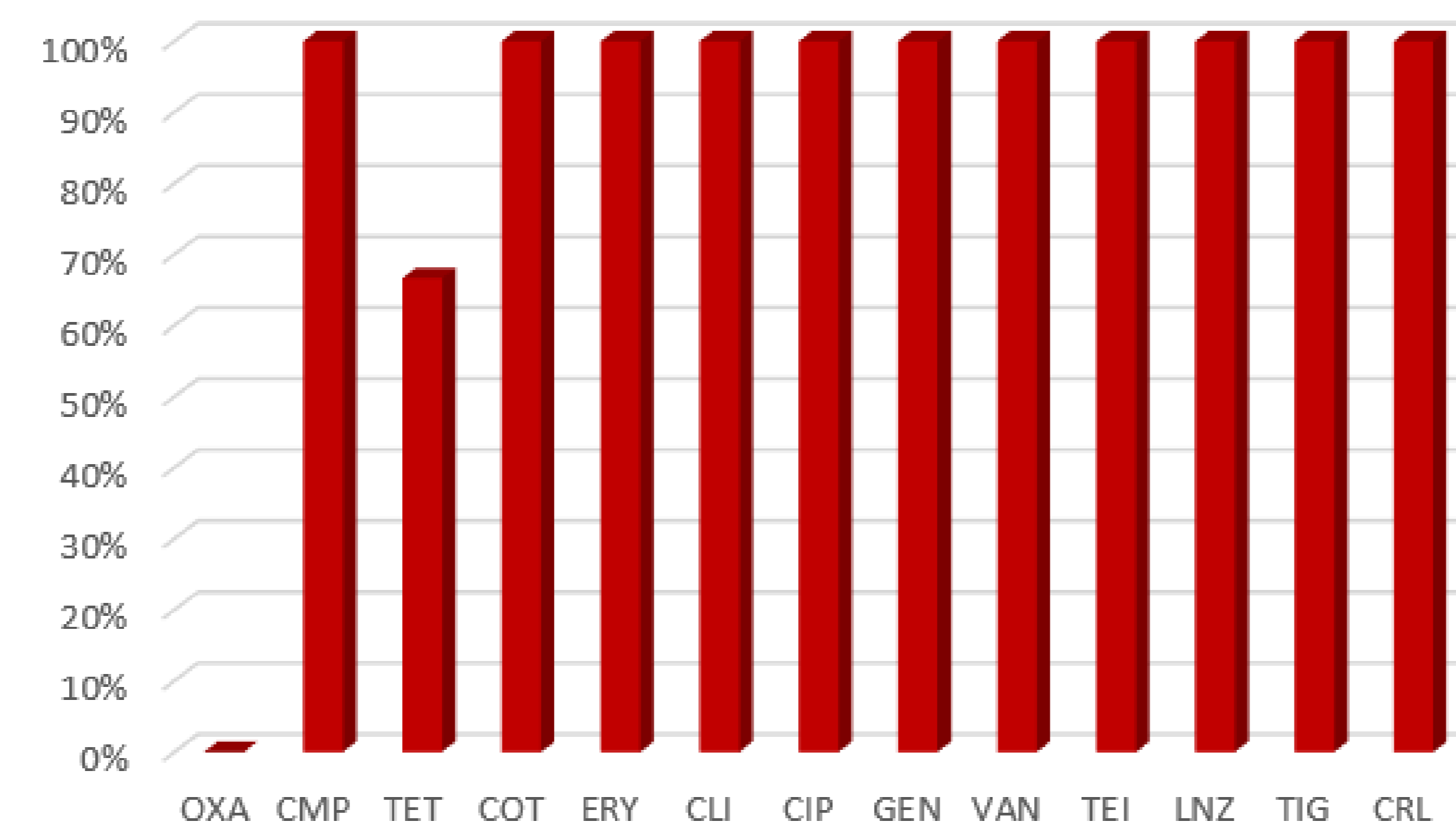
Graph 1: Prevalence of *S. aureus* from all swabs



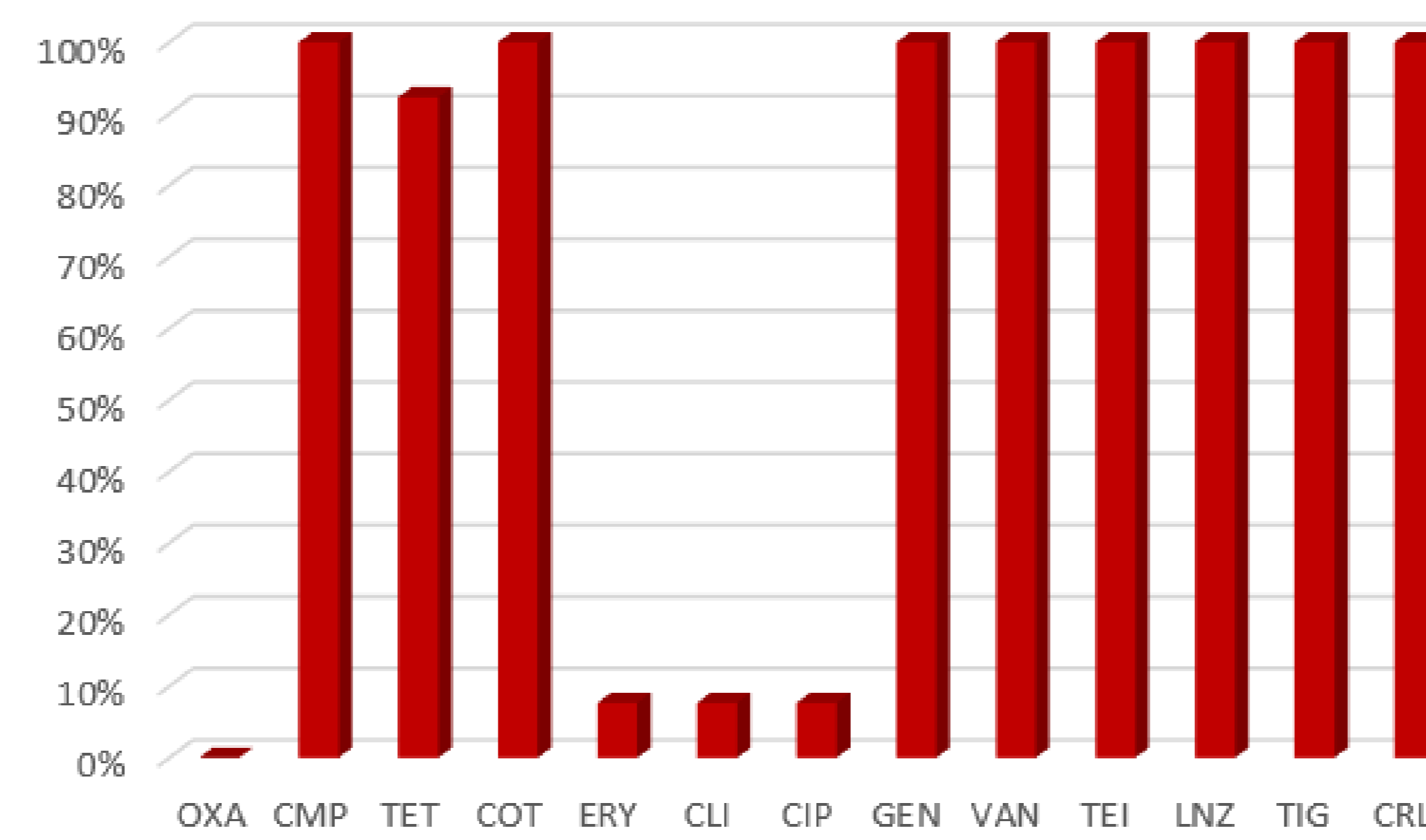
Graph 2: Prevalence of MRSA from all swabs



Graph 3: Antimicrobial Susceptibility of Student MRSA Isolates



Graph 4: Antimicrobial Susceptibility of Patient MRSA Isolates



Legend: OXA = Oxacillin, CMP= Chloramphenicol, TET=Tetracycline, COT=Co-Trimoxazol (Sulphamethoxazol+Trimethoprim), ERY=Erythromycin, CLI=Clindamycin, CIP=Ciprofloxacin, GEN=Gentamicin, VAN=Vancomycin, TEI=Teicoplanin, LNZ=Linezolid, TIG=Tigecycline, CRL=Ceftaroline.

## Results

Among 291 screened students, 124 (43%) tested positive for *Staphylococcus aureus* (Graph 1). Within these isolates, 3 (2% of *S. aureus* isolates; 1% of all participants, as shown in Graph 2) were identified as MRSA. Molecular analysis confirmed the *mecA* gene in all MRSA isolates from students and in twelve isolates from patients. Additionally, the *mecC* gene was detected in one MRSA isolate from a patient. All strains remained susceptible to first-line MRSA treatment options, including co-trimoxazole, vancomycin, tigecycline, linezolid, and ceftaroline. Graphs 3 and 4 illustrate that isolates from students were not multi-resistant, in contrast to the majority of patient-derived isolates. *Spa* typing revealed three distinct types (t132, t018, t437) among medical students, while patient samples predominantly exhibited t003 (n=11), along with t014 (n=1) and t1535 (n=1).

## Conclusion

The study found a low MRSA colonization rate (1%) among medical students, with no molecular evidence of transmission between students and hospitalized patients. MRSA isolates from students exhibited lower resistance levels compared to isolates from hospitalized patients.

## References

- [1] Smelikova E, Drevinek P, Nyc O, Brajerova M, Tkadlec J, Krutova M. To screen or not to screen medical students for carriage of multidrug-resistant pathogens? J Hosp Infect. 2023;[Volume(Issue)]:15–23. doi:10.1016/j.jhin.2023.06.028.
- [2] European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters [Internet]. Available from: <http://www.eucast.org>.
- [3] Strommenger B, Kettlitz C, Weniger T, Harmsen D, Friedrich AW, Witte W. spa typing of *Staphylococcus aureus* as a frontline tool in epidemiological typing. J Clin Microbiol. 2008;46(2):574–81.