Prevalence and antibiotic sensitivity profiles of Staphylococcus aureus nasal carriage among preclinical and clinical medical students in a Malaysian university

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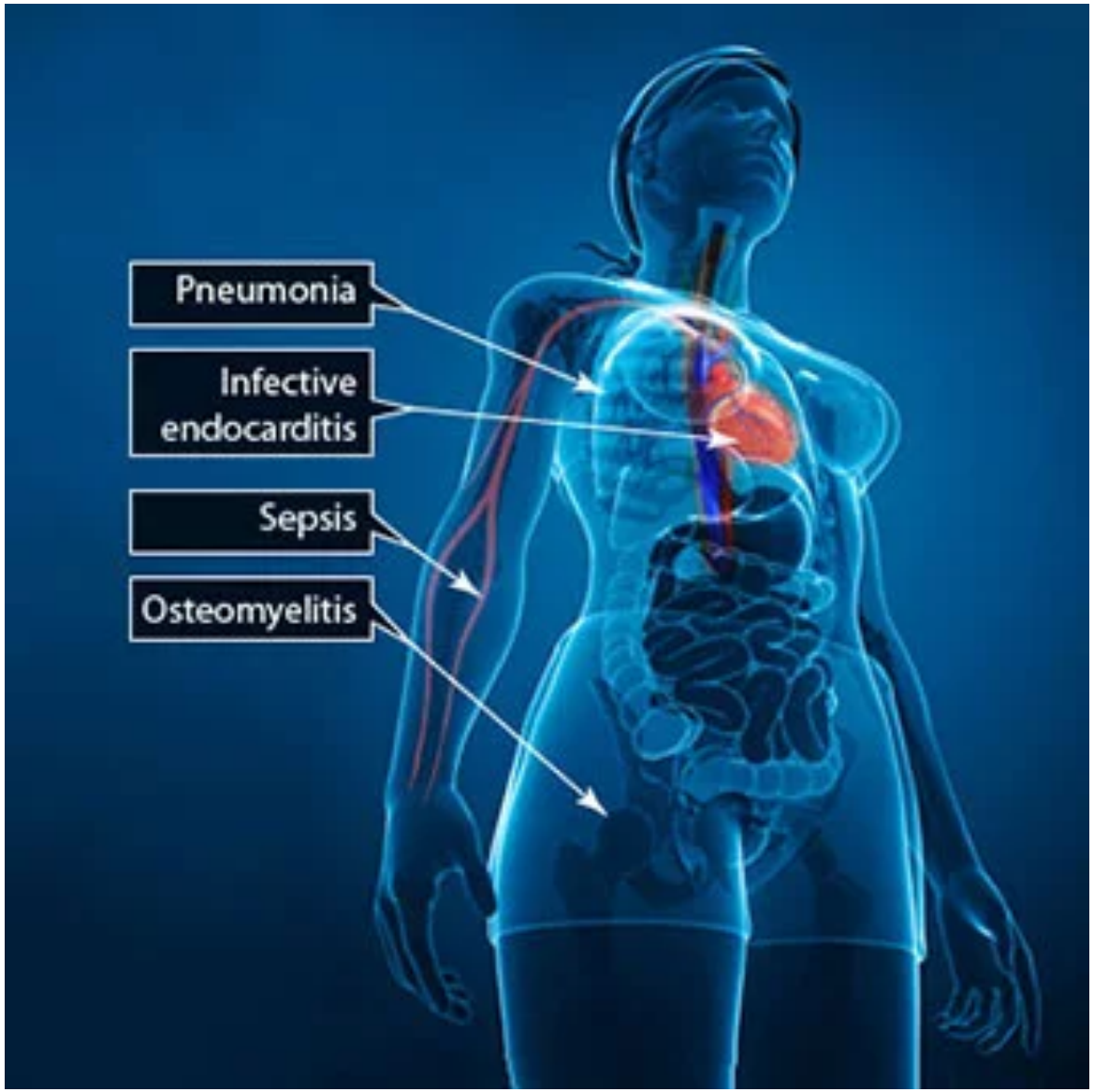
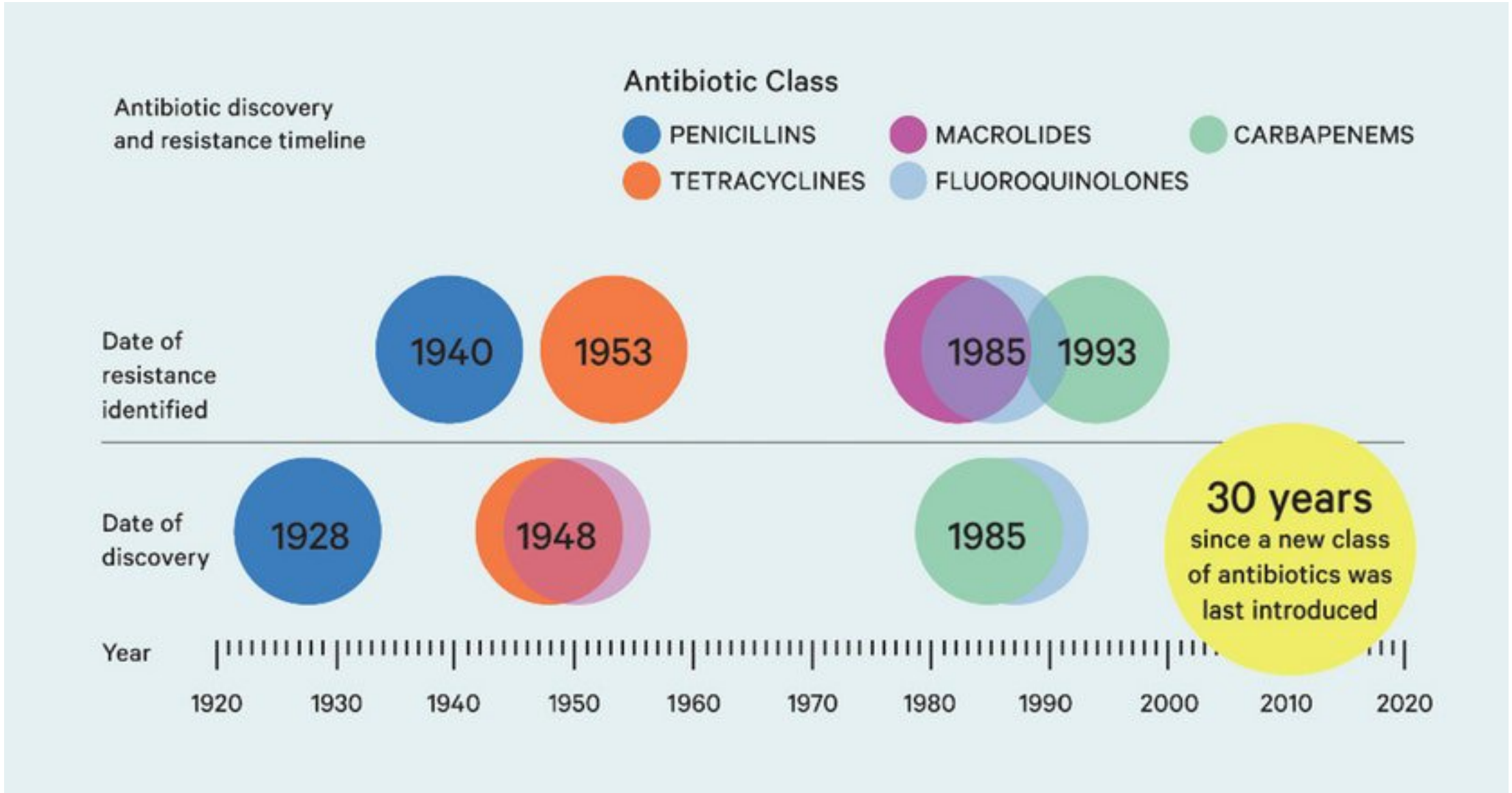


Implication of Staph aureus infection


Antibiotic discovery and resistance timeline
Antibiotic Class
PENICILLINS
MACROLIDES
CARBAPENEMS
TETRACYCLINES
FLUOROQUINOLONES
Date of resistance identified
1940
1953
1985
1993
Date of discovery
1928
1948
1985
30 years
since a new class of antibiotics was last introduced
Year
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

By Animals

Animals develop resistant bacteria when treated with antibiotics

Fertilizer or water containing animal faces and drug- resistant becteria is used on food crops.

Drug-resistant bacteria in the animal faces can remain on crops and be eaten. These bacteia can remain in the human gut.

Drug-resistant bacteria can remain on meat from animals.

Resistant bacteria can spred to human if meat is not properly cooked.

By Human

Human develop Resistant bacteria in gut when treated with antiblotics.

Medical care at Hospital

Resistant bacteria may spread from unclean surfaces, toilets with the facility

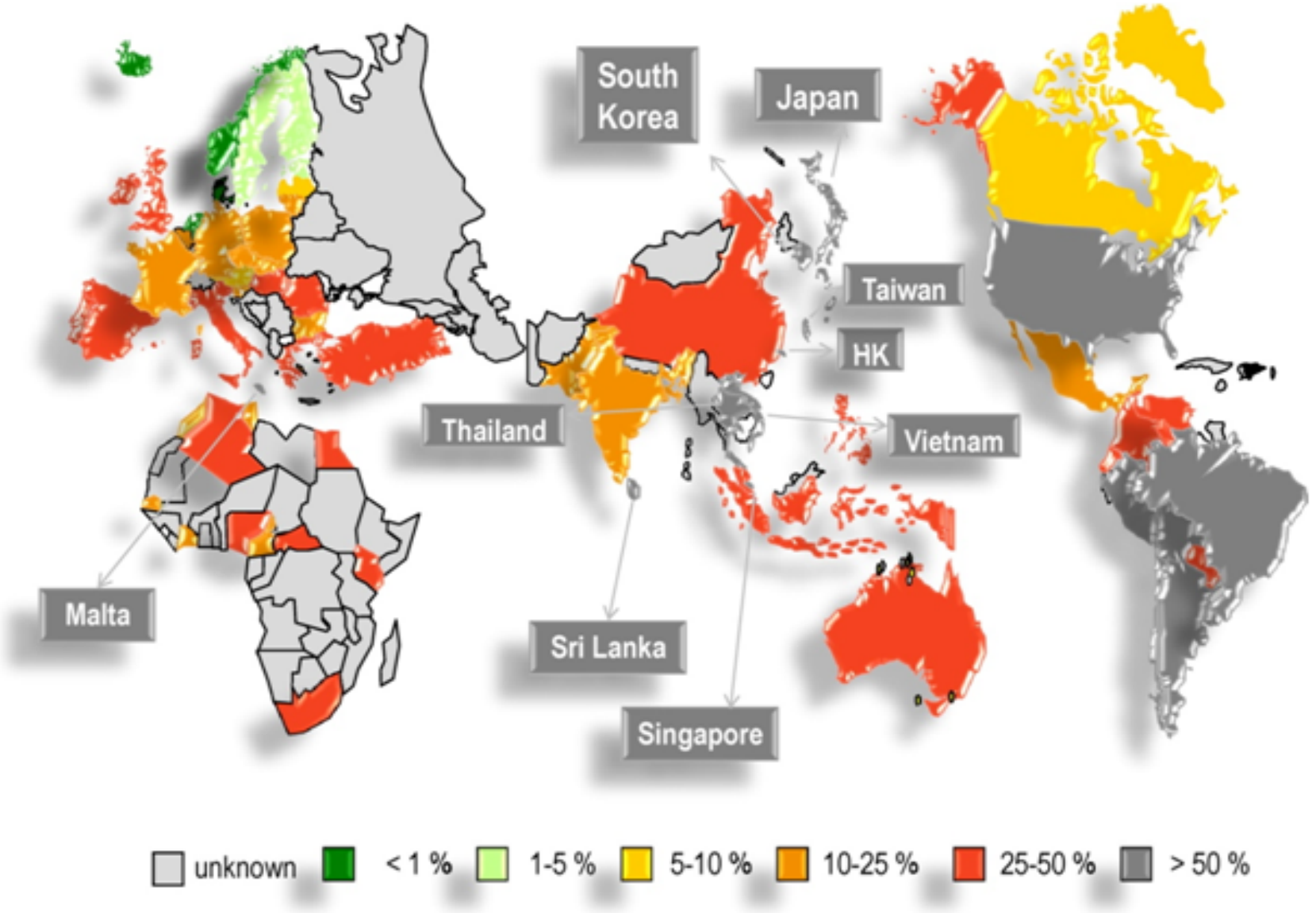
Patients go home.

Resistant bacteria may spread to other patients or indrectly on unclean hands of health care prodivders

Can spread resistant bacteria if staying home

These bacteria can remain in the human gut

Worldwide prevalence of hospital-acquired methicillin-resistant Staphylococcus aureus



However, the highest prevalence rates of HA-MRSA and CA-MRSA in the world today is currently in Asia, with the range of 70 – 80% in certain regions. This could be attributed to healthy individuals who act as the medium to transfer MRSA into the communities.

Introduction

- Previous studies have shown that developing countries had lesser S. aureus carriers than in the developed countries.
- In Malaysia, 21% cases of bacteraemia were reported to be caused by MRSA

Klevens et al., 2007; Alvarez-Uria and Reddy 2012, Al-Talib et al., 2013; Dulon et al., 2014
Song *et al*., 2011; Chen and Huang, 2014; You *et al*., 2017, Boucher and Corey, 2008; Song *et al*., 2011

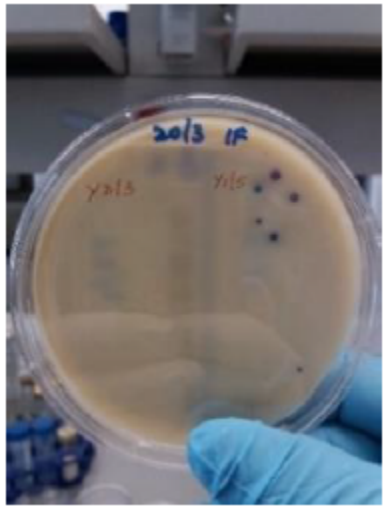
Deaths attributable to antimicrobial resistance every year by 2050

Source: Review on Antimicrobial Resistance 2014

- Local studies on MRSA trend is lacking, especially in different sub communities. Understanding it may help in reducing the morbidity and mortality of MRSA.
- This study assessed the prevalence and antibiotic sensitivity profile of S. aureus and MRSA isolates from medical students

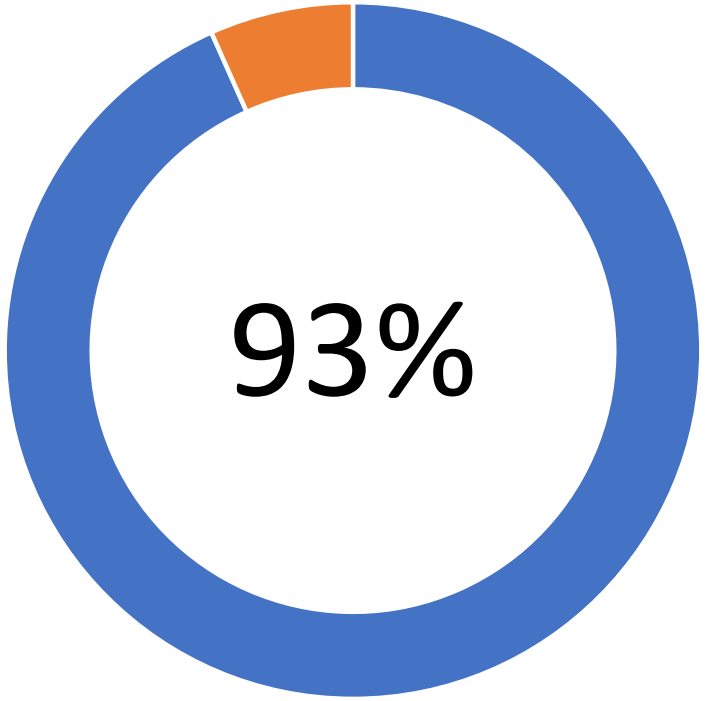
Materials and Methods

- Cross sectional studies involving 60 medical students – 24 preclinical and 36 clinical medical students.
- The preclinical students had little or no patient encounters while the clinical students were more involved in bedside teaching.
- Micro bacterial sampling:
  - Nasal swab + culturing
  - Tested for sensitivity by measuring the inhibition zone for erythromycin (15ug), fusidic acid (10ug), gentamicin (10ug) methicillin (5ug), penicillin (10ug)and vancomycin (30ug)
  - The final antibiotic resistance validation was done on Brilliance MRSA agar (*ThermoFisher Scientific*)

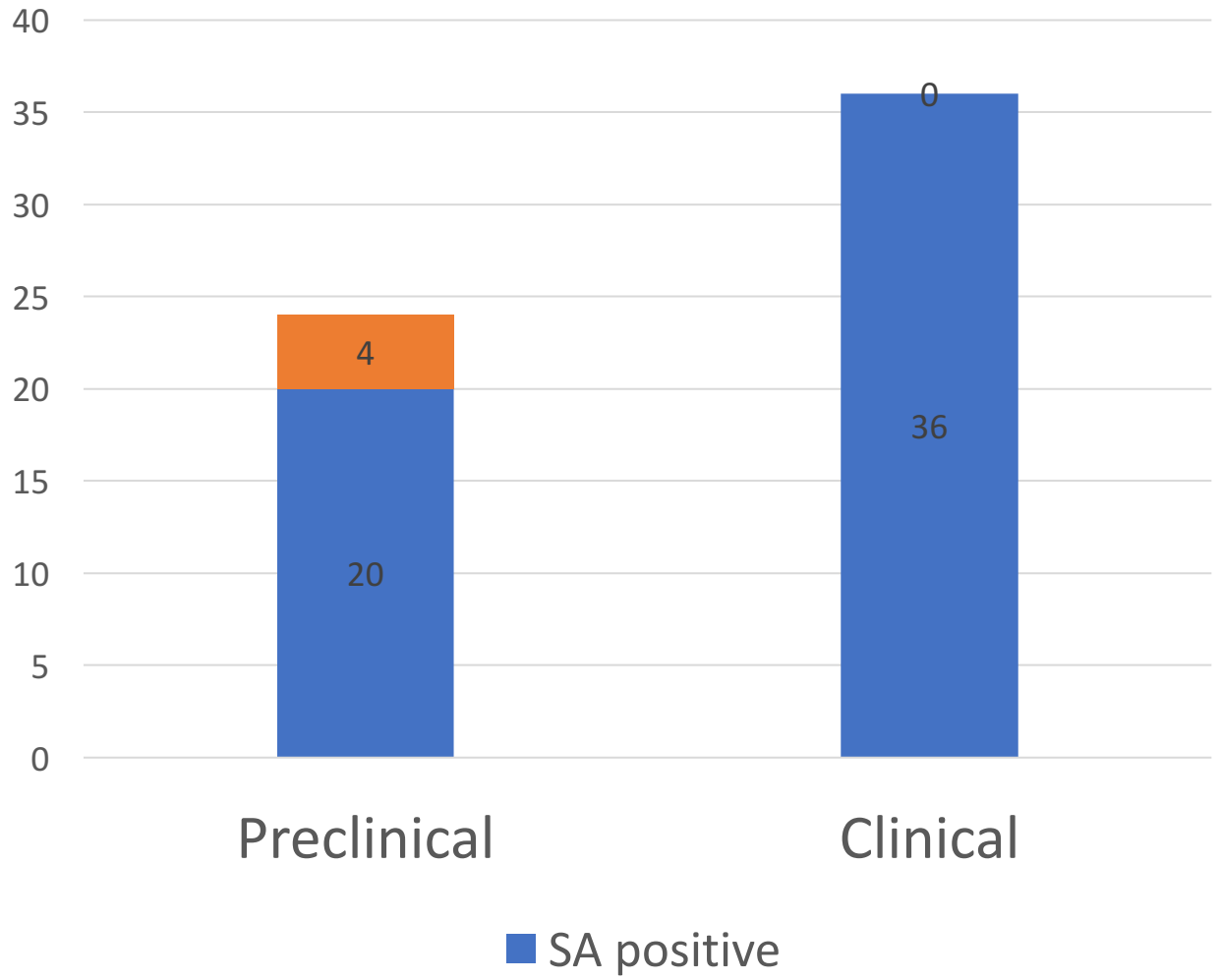


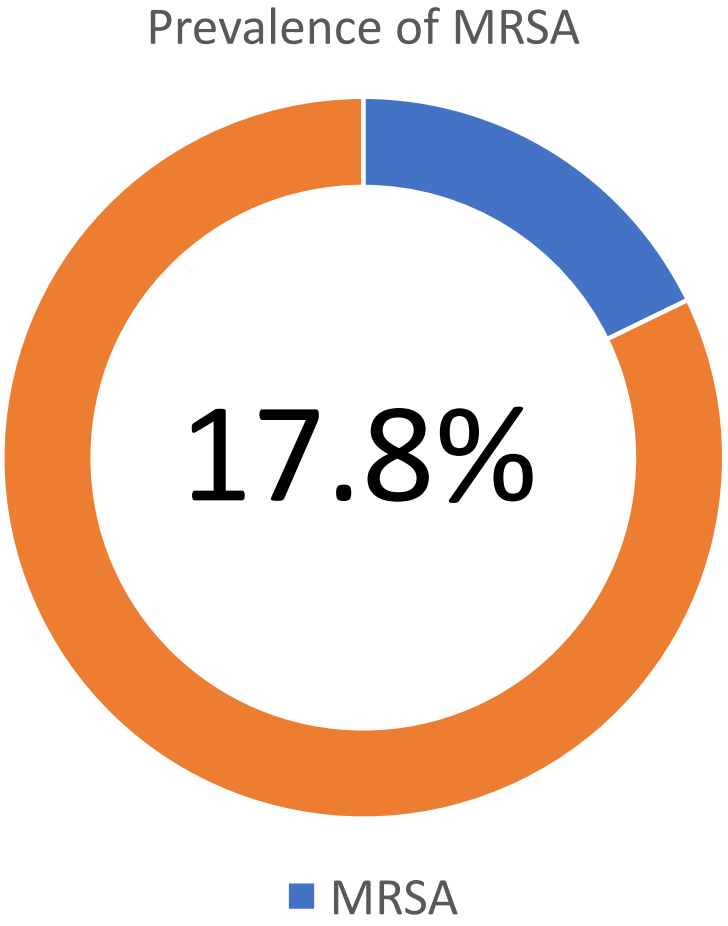
Result

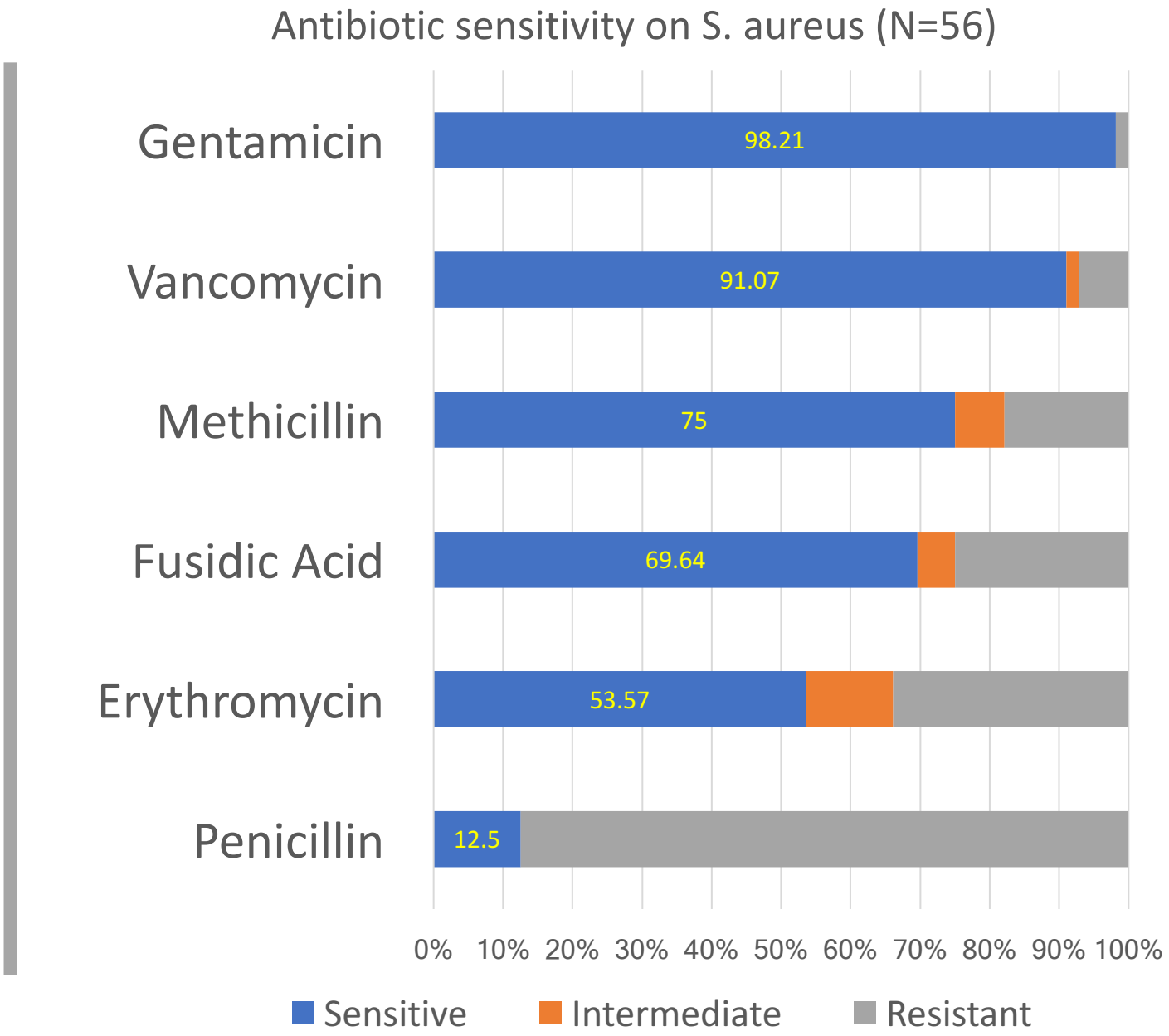
Prevalence of S aureus nasal carriers (N=60)

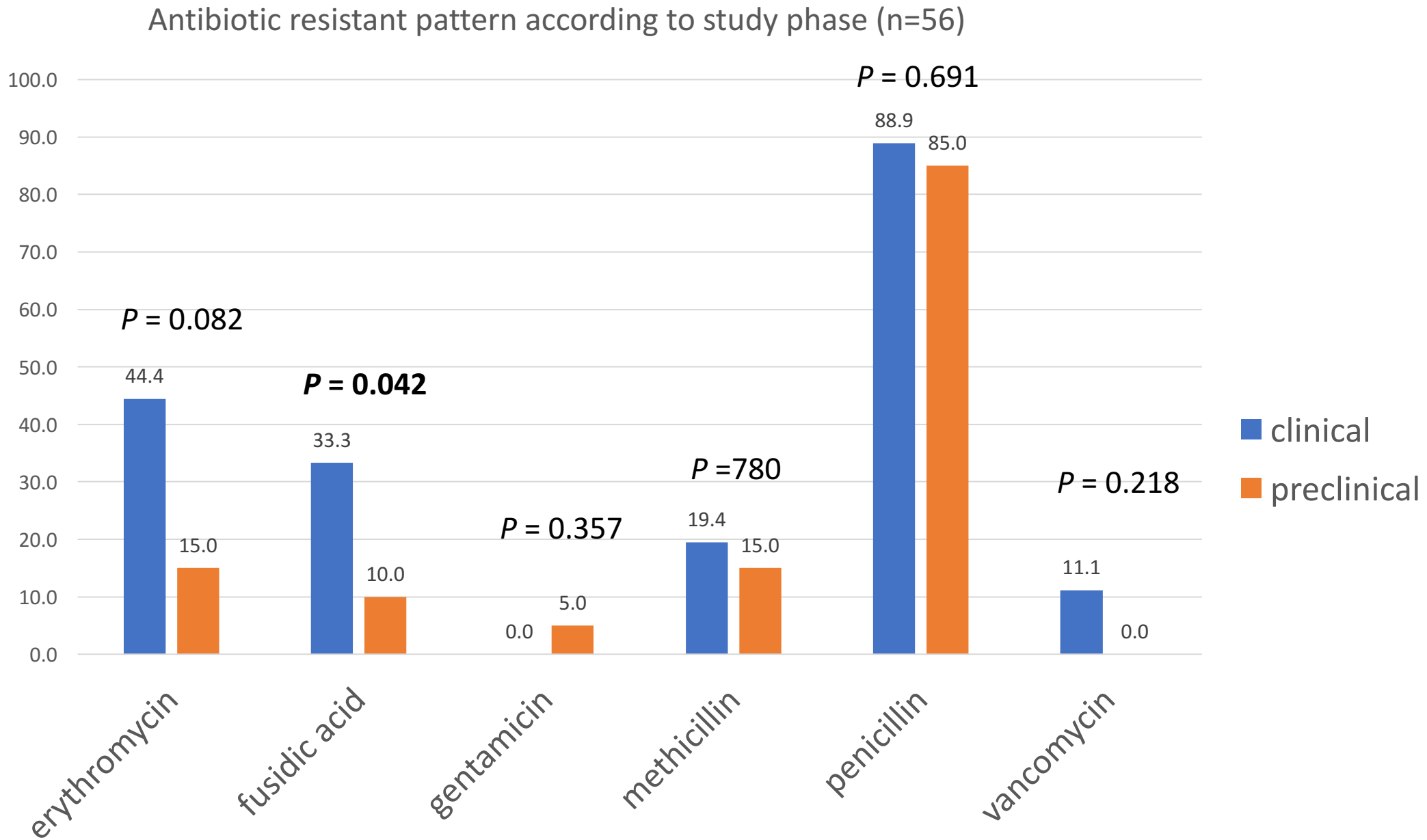


S. aureus status among samples (N=60)




Prevalence of MRSA
17.8%
MRSA


Antibiotic sensitivity on S. aureus (N=56)
Gentamicin
98.21
Vancomycin
91.07
Methicillin
75
Fusidic Acid
69.64
Erythromycin
53.57
Penicillin
12.5
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Sensitive
Intermediate
Resistant


Antibiotic resistant pattern according to study phase (n=56)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
P = 0.082
44.4
15.0
P = 0.042
33.3
10.0
P = 0.357
0.0
5.0
P =780
19.4
15.0
P = 0.691
88.9
85.0
P = 0.218
11.1
0.0
erythromycin
fusidic acid
gentamicin
methicillin
penicillin
vancomycin
clinical
preclinical

Discussion

- 93% of the samples collected were positive for *S. aureus* in contrast with previous studies conducted in West Malaysia at 26% and 28.7% and China at 46% respectively.
- The rate is higher compared to studies that includes hospital admitted patients.
- This is an important finding as high nasal Staph aureus colonization is a potential source of infection as colonization often precedes infection.

(Neela et al., 2010; Ma et al., 2011; Al-Talib et al., 2013).
Al-Talib et al., 2010; Al-Talib et al., 2013

- 17.8% of S aureus sampled were MRSA, which was lower than some studies reported among medical students in HUSM (21.5%). The prevalence of MRSA ranged between 17% (1986) to 44.1% (2007)
- This study demonstrated that duration of clinical exposure (preclinical vs clinical) did not increase the risk of being an MRSA carrier status. The prevalence of MRSA in both cohorts are almost similar.
- However, our observation noted that the inhibition zone for samples taken from clinical students were smaller compared to that from preclinical students.

- Penicillin is almost non effective towards Staph aureus (resistance rate >85%), despite a low MRSA nasal colonization.
- Penicillin is a widely used as a first line antibiotic, even higher in the private setting, where cold cases such as URTI are treated.
- Staph aureus was most sensitive to both gentamicin and vancomycin.
- Limitation: small sample size, thus the risk factors for acquisition of MRSA among medical students cannot be identified.

Conclusion

- This study demonstrated a high prevalence of Staph aureus nasal carriage among medical students.
- Although MRSA prevalence is comparatively low, the penicillin resistant Staph aureus was prevalent.
- Another larger sample size study in different settings is recommended to provide essential epidemiological information on MRSA.

Thank you