ejpmr, 2023, 10(6), 16-20

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

SURVEY ON THE PREVALENCE OF *STAPHYLOCOCCUS AUREUS* AMONG PHARMACY AND DENTISTRY STUDENTS RESIDING IN HAMA AND HOMS-SYRIA

Kanaan Al-Tameemi[1]*, Raian Alzoaabi[2], Sousan Alkhanei[1] and Ola Khadour[1]

[1]Faculty of Pharmacy, Arab Private University for Science and Technology, Hama, Syria.
[2]Faculty of Dentistry, Arab Private University for Science and Technology, Hama, Syria.

***Corresponding Author: Kanaan Al-Tameemi**

Faculty of Pharmacy, Arab Private University for Science and Technology, Hama, Syria.

Article Received on 23/03/2023 **Article Revised on 13/04/2023** **Article Accepted on 03/05/2023**

ABSTRACT

Staphylococcus aureus "also known as golden staph" are widespread bacteria. Under certain conditions, they are considered pathogens and can cause various sepsis that may lead to death. We conducted Cross-Sectional Study of *Staph. aureus* to investigate its epidemiology among students of medical specializations (Pharmacy, Dentistry) according to three variables (gender, residence, faculty of the students). We concluded that there was differences in prevalence of *Staph. aureus* among students regardless of studied variables. The prevalence was fairly high, and this is an indicator of the need to pay attention to health education to raise the awareness and adhere to the necessary health rules to prevent its prevalence.

INTRODUCTION

Staphylococcus aureus is a Gram-positive, commensal bacterium, lives normally on the surface of skin and mucous membrane in many animal species and humans.[1] In the 19th century, Scottish surgeon noticed grape-like clusters in human pus he called them Staphylococcus.[2] It constantly evolves due to mutation and mobile genetic elements (MGEs) which causes increasing in resistance and virulence, and thus challenging in treatment it. By 1961, scientists distinguished between two strains of *Staph. aureus* according to their resistance to penicillin, these strains are methicillin-resistant *Staph. aureus* (MRSA) and methicillin-sensitive *Staph. aureus* (MSSA).[3,4] Staph bacteria (MRSA) are resistant to all β-lactam antibiotics including all penicillins and cephalosporins, and it is considered more severe than MSSA due to its ability to evolve.[3-7] The nasal cavity is the main habitat of *Staph. aureus*, but it could colonize other areas such as the groin, axillae, throat, gastrointestinal, rectum and vagina. Normally, *Staph. aureus* does not cause infections on healthy skin.[8-10] However, if it penetrates the internal tissues or bloodstream (because of wounds or scratches), it may cause acute and chronic infections, including Bacteremia, Pneumonia, Endocarditis and Osteomyelitis. Although anyone can get infected by *Staph. aureus*, certain people are more risk, like people with diabetes, cancer, atopic dermatitis, lung disease and those who had surgeries.[11-13] Meticillin-resistant *Staph. aureus* is easily spread and remain in the environments for long time. In hospital, Healthcare workers like doctors, nurses and any health care providers, or even visitors are identified as reservoirs of pathogens.[14-16] We aimed in our study to investigate the presence of MRSA among a group of students of the Faculties of Pharmacy and Dentistry in Hama and Homs-Syria.

MATERIALS AND METHODS

The Area of Study

The study was carried out on students from the Arab Private University for Science and Technology living in Homs and Hama, and studying in the faculties of Pharmacy and Dentistry.

Sampling

The study included 140 students who ranged in age from 20 to 25 years (90 students from the Faculty of Pharmacy, and 50 students from the Faculty of Dentistry), and who recorded the required information (place of residence, gender). The samples were collected by inserting a sterile swab moistened with physiological serum 2 cm into both nostrils of each student. The samples were cultured by carefully rolling the cotton swab over Chapman's Agar (Mannitol Salt Agar for *Staph. aureus*, made in India). We sterilized the culture media using an autoclave (121°C for 15 minutes), after sterilization and cooling, we poured the agar into sterile Petri dishes. Several streaked lines were drawn on the culture medium. Then, the culture media was incubated at 37°C for 24 hours. Suspicious samples were confirmed using the coagulase test. Students who took antibiotics that affect *Staph. aureus* (like vancomycin, cefazolin, cephalexin, dicloxacillin, oxacillin, trimethoprim/ sulfamethoxazole, clindamycin) during the preceding two weeks of sampling were excluded. The data is analyzed using SPSS 24 program, The P.value less than 0.05 is considered statistically significant.

RESULTS

During the incubation period, *Staph. aureus* produces yellow-pigmented staphyloxanthin after fermentation of Mannitol, so distinctive gold colonies are formed in all media rich in these bacteria (Fig. 1). The total number of students with *Staph. aureus* reached 24 in 140 study participants (Table 1), with a percentage of 17.14%, 11 of whom were males (17.4%) and 13 females (16.8%) (Fig. 2). In reviewing the residency information of these students, we found that 22 students with *Staph. aureus* are living in the town (18.33%) and two students lived in the countryside (10%) (Fig. 3). The percentage of *Staph. aureus* carriers among the Dentistry students was 20% (10 students), that is higher than the percentage of those with *Staph. aureus* among the Pharmacy students 15.5% (14 students) (Fig. 4).

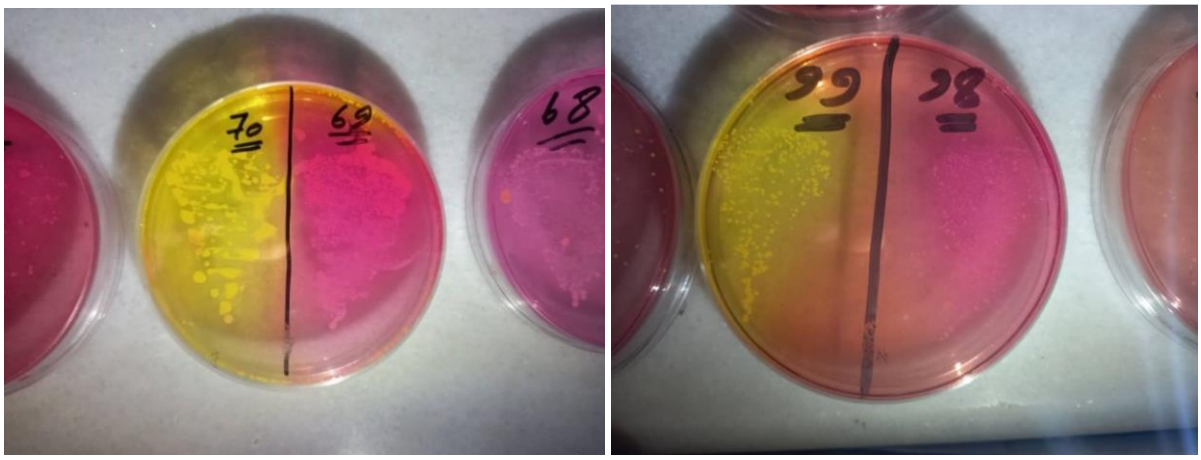

Fig. 1: Culture media in tow colors (gold color with *Staph. aureus,* pink color without *Staph. aureus).*

Table 1: Total number of students enrolled in this study and the number of students with *Staph. aureus* by variables studied.

Variables		Total	Students with *Staph. aureus*	P-value
Gender	Male	63	11	P=0.92>0.05 >(5%)
	Female	77	13	
Residence	Town	120	22	P=0.36>0.05 >(5%)
	Countryside	20	2	
Faculty	Pharmacy	90	14	P=0.36>0.5 >(5%)
	Dentistry	50	10	

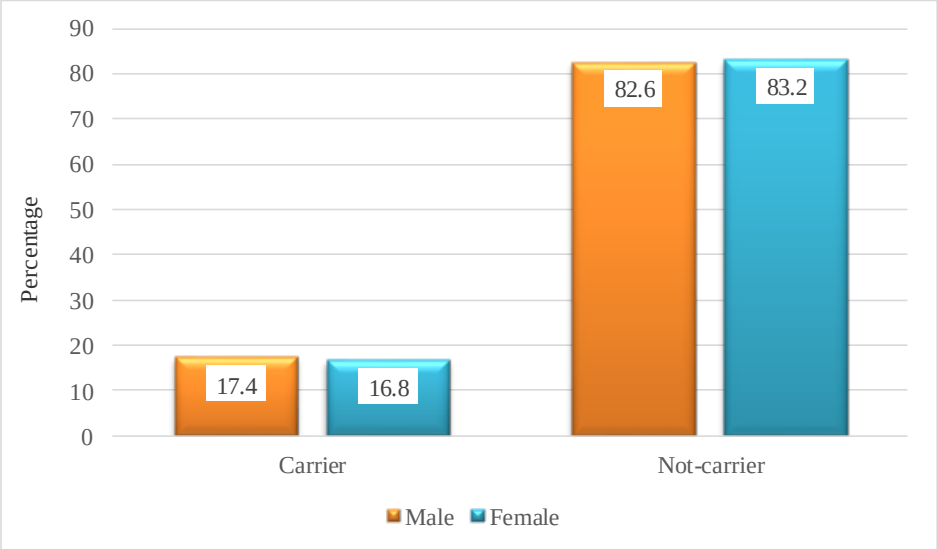

Fig. 2: Percentage of the students with and without *Staph. aureus* according to gender.

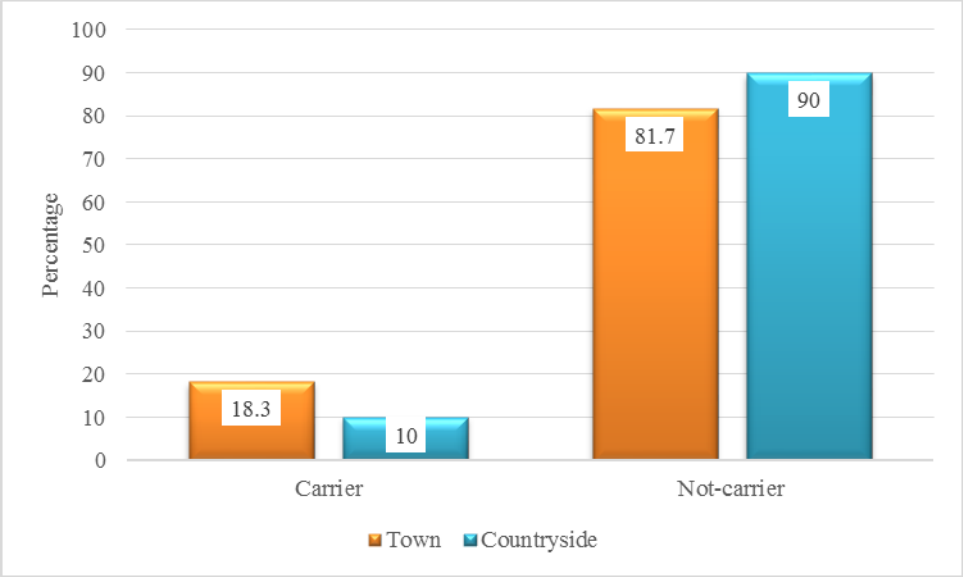

Fig. 3: Percentage of the students with and without *Staph. aureus* according to residence.

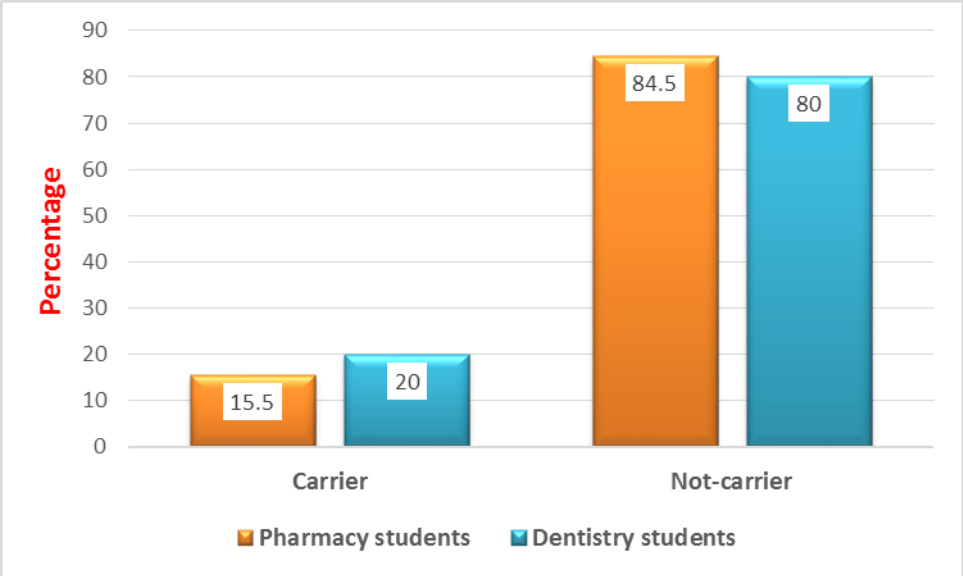

Fig. 4: Percentage of the students with and without *Staph. aureus* according to their faculties.

DISCUSSION

The prevalence of *Staph. aureus* among students of the Faculties of Pharmacy and Dentistry was 17%, which is considered a high rate, and this percentage is somewhat close to many studies[17-24], while other studies showed higher rates than that.[25-27] Our results showed that there is a variations in the prevalence of *Staph. aureus* bacteria among students according to the variables of gender, residence, and faculty. According to the results of this study, we found that although the percentage of carriers among residents of the town (18%) was higher compared to residents of countrysides (10%), we did not find that this difference was statistically significant (P-value 0.36). When studying the number of students carrying *Staph. aureus* according to gender, the percentage of females was higher (17.4%) compared to the percentage of males (16.8%). However, we did not find that this variable had a significant statistical significance since the p-value was 0.92. The percentage of *Staph. aureus* carriers among the Dentistry students was 20%, which is higher than the percentage of those carrying *Staph. aureus* among the Pharmacy students 15.5%. Despite that, we did not find a significant statistical significance (P.value 0.504). Through this study, we found that the prevalence of *Staph. aureus* among students was not necessarily related to the variables studied.

CONCLUSION

Our study showed a high prevalence of *Staph. aureus* among students, and this reflects the extent to which this group of students affects the transmission of infection to patients who are in direct contact with them. From this point of view, awareness must be raise among the medical specializations students (Pharmacy, Dentistry), and adequate education should be received regarding infection control methods. We recommend conducting

more survey research on medical students and workers in medical fields and the extent of prevalence of MRSA and Vancomycin resistant *Staph. aureus* (VRSA) strains to avoid its transmission and reduce the development of antibiotic resistance.

Author contributions: KA designed the research and wrote the introduction and discussion of the manuscript. RA designed the research and wrote the material and methods. SA collected the samples and cultured them. OK statistically analyzed the data and wrote the results. All authors read and approved the final manuscript.

Conflicts of Interest: None.

REFERENCES

1. Felipe FT, Paula HS, Joao PT, Leticia RD, Nícolas HB, Victoria ST. Antimicrobial treatment of *Staphylococcus aureus* biofilms. Antibiotics, 2023; 12(87): 1-24. https://doi.org/10.3390/antibiotics12010087
2. Rajan PA. Staphylococcal Infections: Host and Pathogenic Factors. Microorganisms, 2021; 9(5): 1-8. https://doi: 10.3390/microorganisms9051080
3. Zhu L. A review of *Staphylococcus aureus* and the emergence of drug-resistant problem. Advances in Microbiology, 2018; 8(1): 65-76. https://doi: 10.4236/aim.2018.81006.
4. Nicholas AT, Batu KS, Stacey AM, Emily ME, Pratik PS, Manuela C et al. Methicillin-resistant *Staphylococcus aureus*: An overview of basic and clinical research. Nature Reviews Microbiology, 2019; 17(4): 203-18. https://doi.org/10.1038/s41579-018-0147-4
5. Adriano L, Giulio I, Vittoria T, Elisabetta G, Patrizia B, Silvia B et al. Epidemiology and antimicrobial susceptibility of *Staphylococcus aureus* in children in a tertiary care pediatric hospital in Milan, Italy, 2017-2021. Ital J Pediatr, 2022; 48: 67. https://doi: 10.1186/s13052-022-01262-1
6. Jhon C, Iván FG, Katherine B, Yeni AS, Pablo V, Leydi CG et al. Differences Between Methicillin-susceptible Versus Methicillin-resistant *Staphylococcus aureus* Infections in Pediatrics, Multicenter Cohort Study Conducted in Bogotá, Colombia, 2014–2018. Pediatr Infect Dis J, 2022; 41(1): 12-9. https://doi: 10.1097/INF.0000000000003349
7. Henry FC, Frank RD. Waves of Resistance: *Staphylococcus aureus* in the Antibiotic Era. Nat Rev Microbiol, 2009; 7(9): 629-41. https://doi: 10.1038/nrmicro2200
8. Franklin DL. How staphylococcus adapts to its host. N Engl J Med, 2011; 364(21): 1987-90. https://doi: 10.1056/NEJMp1100251
9. Baron S. Medical Microbiology. 4th edition. Galveston (TX): University of Texas Medical Branch at Galveston; 1996.
10. Stefan M, Geoffrey C, Anna CS, David CC, Patrick A, Michael B. A field guide to pandemic, epidemic and sporadic clones of methicillin-resistant *Staphylococcus aureus*. PLoS One, 2011; 6(4): 1-24. https://doi: 10.1371/journal.pone.0017936
11. Huanquan C, Junyan Z, Ying H, Zhuoyi L, Zhengtong L, Jianze C et al. Exploring the role of *Staphylococcus aureus* in inflammatory diseases. Toxins, 2022; 14(7): 464. https://doi: 10.3390/toxins14070464
12. Centers for Disease Control and Prevention. *Staphylococcus aureus* in Healthcare Settings. From: https://www.cdc.gov/hai/organisms/staph.html. [Last reviewed on 2011 January 17, accessed on 2023 March 20].
13. Fabio B, Rino R, Guido G. *Staphylococcus aureus* Microbiology, Pathology, Immunology, Therapy and Prophylaxis. Springer International Publishing AG, Switzerland, 2017; 409: 263-96.
14. Alexandra F. *Staphylococcus aureus*. Elsevier Inc., UK, 2018; 163-88.
15. Moremi N, Claus H, Vogel U, Mshana SE. The role of patients and healthcare workers *Staphylococcus aureus* nasal colonization in occurrence of surgical site infection among patients admitted in two centers in Tanzania. Antimicrob Resist Infect Control, 2019; 8: 102. https://doi: 10.1186/s13756-019-0554-y
16. Coia JE, Wilson JA, Bak A, Marsden GL, Shimonovich M, Loveday HP et al. Joint Healthcare Infection Society (HIS) and Infection Prevention Society (IPS) guidelines for the prevention and control of meticillin-resistant *Staphylococcus aureus* (MRSA) in healthcare facilities. J Hosp Infect, 2021; 118S: S1-39. https://doi: 10.1016/j.jhin.2021.09.022
17. Shamshul A, Rajendra G, Sony S, Safiur RA, Shankar NS, Muni RC. Risk factors assessment for nasal colonization of *Staphylococcus aureus* and its methicillin resistant strains among pre-clinical medical students of Nepal. BMC Res Notes, 2016; 9: 214. https://doi: 10.1186/s13104-016-2021-7
18. Soleiman A, Nima HJ, Yaeghob S. Methicillin-resistant *Staphylococcus aureus* nasal carriage between healthy students of medical and nonmedical universities. Am J Infect Control, 2017; 45(7): 709-12. https://doi: 10.1016/j.ajic.2017.02.034
19. Benedikt H, Raphael R, Hassan A, Denise D, Andreas H, Anna J et al. Prevalence of nasal colonisation by methicillinsensitive and methicillin-resistant *Staphylococcus aureus* among healthcare workers and students in Madagascar. BMC Infect Dis, 2016; 16: 420. https://doi: 10.1186/s12879-016-1733-6
20. Al-Tamimi M, Himsawi N, Abu-Raideh J, Abu jazar D, Al-jawaldeh H, Al Haj Mahmoud S et al. Nasal colonization by methicillin-sensitive and methicillin-resistant *staphylococcus aureus* among medical students. J Infect Dev Ctries, 2018; 12(5): 326-35. https://doi: https://doi.org/10.3855/jidc.9908
21. Zarizal S, Putri AR, Norhidayah MA, Chew CY, Syafinaz AN, Abdul RA et al. Characterization of resistance to selected antibiotics and Panton Valentine leukocidin-positive *Staphylococcus*

aureus in a healthy student population at a Malaysian University. Germs, 2018; 8(1): 21-30. https://doi: 10.18683/germs.2018.1129
22. Shadi AZ. Prevalence of methicillin-resistant *Staphylococcus aureus* nasal colonization among medical students in Jeddah, Saudi Arabia. Saudi Med J, 2015; 36(7): 807-12. https://doi: 10.15537/smj.2015.7.11609
23. Ksenia SM, Jakub K, Katarzyna Ż, Katarzyna S, Andrzej M, Grażyna M. Prevalence of methicillin resistant and mupirocinresistant *Staphylococcus aureus* strains among medical students of Medical University in Warsaw. Przegl Epidemiol, 2019; 73(1): 39-48. https://doi: 10.32394/pe.73.05
24. Guido AG, Tilman L, Selma T, Heinz B. Low nasal carriage of drug-resistant bacteria among medical students in Vienna. GMS Krankenhhyg Interdiszip, 2012; 7(1): 1-4. https://doi: 10.3205/dgkh000188
25. Radhakrishna M, Aishwarya T, Pooja R. Nasal carriage of *Staphylococcus aureus* with special emphasis on methicillin-resistant *Staphylococcus aureus* among students of a south Indian medical college - prevalence and antibiogram pattern. Asian J Pharm Clin Res., 2016; 9(2): 129-32. https://doi: https://doi.org/10.22159/ajpcr.2016.v9s2.13274
26. Aidyn GS, Taras PB, Yaroslav VS, Evelina AC, Volodymyr OS, Olena VD et al. Prevalence of nasal carriage of methicillin-resistant *Staphylococcus aureus* among healthcare workers in departments of otorhinolaryngology and dentistry in Kyiv, Ukraine. Wiad Lek, 2020; 73(12 cz 1): 2563-7. https://doi: 10.36740/WLek202012101
27. Abdulrahman RN, Rasheed HN. Prevalence of Nasal Carriage Rate and Antimicrobial susceptibility testing of *Staphylococcus aureus* strains isolated from Syrian students in Kurdistan, Iraq. Middle East J Rehabil Health Stud, 2020; 7(3): 1-5. https://doi: 10.5812/mejrh.103394