Letter to the Editor

Changes in *Staphylococcus aureus* Infection before and after the COVID-19

Dear Editor,

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a spherical nonmotile coagulant that causes blood clots. It is also one of the most common human pathogens worldwide and the most common cause of skin and soft tissue infections, endocarditis, and gastrointestinal and respiratory infections. It is often believed to be the cause of nosocomial pneumonia caused by *S. aureus*.[1] Depending on the sensitivity to methicillin, *S. aureus* can be divided into MRSA and methicillin-sensitive *S. aureus* (MSSA). However, compared to patients with MSSA, the death rate of patients with bacteremia with MRSA increased by 40% for methicillin-sensitive bacteria.[2] It was found that there is an indirect relationship between infection with coronavirus disease 2019 (COVID-19) and types of bacteria that affect the respiratory system, including the lungs, in particular. From 2019 to 2021, coinciding with a decrease in infection with the COVID-19 virus at a rate of 70%,[3] and most recent studies indicate an increase in immunity rates and the ability to resist antibiotics in *S. aureus* and *Klebsiella pneumoniae*, which refers to the increased use of various antibiotics for cases of pneumonia during the COVID-19 pandemic. Most studies have confirmed that deaths from pulmonary insufficiency result from damage to lung tissue due to antibiotic-resistant bacteria, particularly *S. aureus* and *K. pneumoniae*, which aggressively attack the respiratory system during infection with COVID-19.[4,5]

A total of 285 samples were collected for patients attending the health departments of the Iraqi city of Tikrit, and a control sample without bacterial infection was also collected for the patients for the period from November 1, 2022, and the collection continued to the period of February 3, 2023. The patient's information was recorded in a special form that included general clinical symptoms, such as abdominal pain, fever, vomiting, infections of lymph node infections of the respiratory tract infections, and areas of wounds and skin [Table 1].

Bacterial colonies were initially diagnosed based on their morphological and culture characteristics on the culture media, which included the size, color, edges, and height of the colonies. To determine the type or genus of bacteria in each sample, chemical tests were carried out. This test is used to distinguish between (positive) *S. aureus*, which produces a blood-clotting enzyme, from (negative) *S. aureus* bacteria produce two types of blood clots, free blood clots and blood clots associated with the conversion of fibrinogen into fibrin by the coagulase enzyme. For the detection of free blood clotting using the method (tube test clotting in the test tube), the positive result in both methods is interpreted when there is a lump or clot in the sample, either when no lump or clot is observed in the sample then the result is observed. The tests were conducted according to Garcia-Vidal *et al.*,[6] Jasim *et al.*,[7] and Sadiq *et al.*[8]

It is noticeable from Figure 1, that the rate of infection with MRSA in the respiratory system was very high compared with other body systems or other areas of infection. It recorded 54 infections in the respiratory system compared with other samples from the digestive system, abscesses, and other areas, which were 27, 18, and 5, respectively. For the first group infected with the (COVID-19) virus, this is certainly due to the low resistance of the immune system in the lungs and bronchi, due to the presence of the COVID-19 and the preoccupation of white blood cells in all their forms with virus resistance, which led to the opportunity for *S. aureus* to multiply and spread rapidly because it is an opportunistic bacterium, and this is consistent with a study conducted in China on samples from children infected with the COVID-19.[1]

Table 1: Samples collected from infected and noninfected patients

The sample, according to the infection		Sex		Total
Infected	Noninfected	Male	Female	
131	154	132	153	285

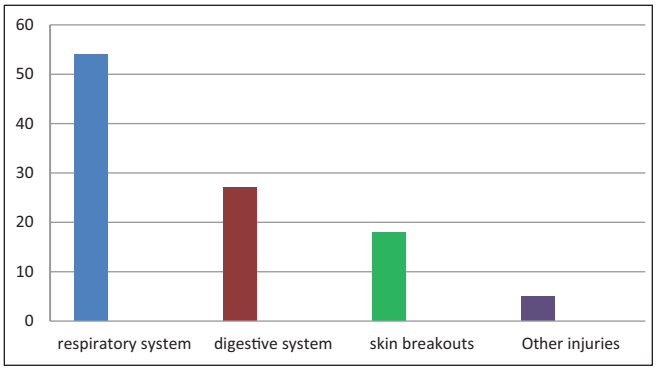

Figure 1: Distribution of samples infected with *S. aureus* and COVID-19 virus together, according to body regions

Table 2: Relationship between the number of infections (COVID-19) and infection with antibiotic-resistant bacteria under study

Not infected (COVID-19)	Injury once (COVID-19)	Injury more than once (COVID-19)	Bacteria according to infection	
27	104	16	131	+ Infected
17	83	4	154	−Non-infected

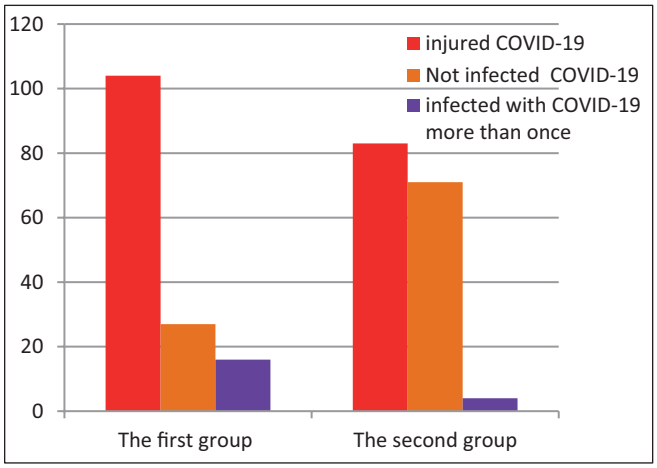

Figure 2: Percentages of infection with the COVID-19 virus in the study groups

As it is clear from Table 2 and Figure 2, the percentage of infection more than once with the COVID-19 virus recorded 16 cases for the samples of the first group infected with *S. aureus* as well, whereas the percentage of infection with the COVID-19 virus more than once for the second group not infected with *S. aureus* was only four cases, and from this, we can conclude that there is indirect cooperation in attacking the human immune system between the COVID-19 virus and *S. aureus*. Both of them alike lead to a weakening of the immune system when they are present together in any area of the human body, which makes it easier for the other to attack and multiply faster and more effectively, especially if the bacteria are resistant to most antibiotics, as well as the COVID-19 that mutates a lot and is considered one of the coronaviruses that is, difficult to eliminate easily. This was consistent with a group of other studies, such as Kajihara *et al.*,[9] which emphasized taking preventive measures against co-infection between antibiotic-resistant bacteria and the virus. As well as the co-infection and the extent of its impact on the infected, as well as the high rates of retroviral infection for people infected with more than one pathogen. Coronary infections are constantly mutating.

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Conflicts of interest
There are no conflicts of interest.

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References

1. Ying L, Jieming L, Ligong H, Xianwei Z, Guangjun H. Changes of *Staphylococcus aureus* infection in children before and after the COVID-19 pandemic, Henan, China. J Infect 2023;86:e70-1.
2. Li X, Fang F, Zhao J, Lou N, Li C, Huang T, *et al*. Molecular characteristics and virulence gene profiles of *Staphylococcus aureus* causing bloodstream infection. Braz J Infect Dis 2018;22:487-94.
3. Hirabayashi AT, Kajihara K, Yahara K, Shibayama M. Impact of the COVID-19 pandemic on the surveillance of antimicrobial resistance. J Hosp Infect 2021;117:147-56.
4. Al-Musawi AM-S, Al-Charrakh AH, Al-Juwethry AH. ESKAPE pathogens among pediatric patients in Iraq. Ann Trop Med Public Health 2020;23:SP231632.
5. Tiri B, Sensi E, Marsiliani V, Cantarini M, Priante G, Vernelli C, *et al*. Antimicrobial stewardship program, COVID-19, and infection control: Spread of carbapenem-resistant *Klebsiella pneumoniae* colonization in ICU COVID-19 patients. What did not work? J Clin Med 2020;9:2744.
6. Garcia-Vidal C, Sanjuan G, Moreno-García E, Puerta-Alcalde P, Garcia-Pouton N, Chumbita M, *et al*. Incidence of co-infections and superinfections in hospitalized patients with COVID-19: A retrospective cohort study. Clin Microbiol Infect 2021;27:83-8.
7. Jasim ST, Noori AM, Sadiq ST, Flayyih MT. Antimicrobial and antibiofilm activity of D-amino acids combined with nanoparticles against *Candida albicans*. Syst Rev Pharm 2020;11:2020.
8. Sadiq ST, Jasim ST, AL-Bayati AA, Hasaanzadeh S, Eren AE, Tunç G. Practical Notes for quantification of antibiotics resistance bacteria and antibiotics resistance genes in wastewater. Eurasian J Biol Chem Sci 2019;2:90-1.
9. Kajihara T, Yahara K, Hirabayashi A, Shibayama K, Sugai M. Current status, international collaboration, and future directions of a comprehensive antimicrobial resistance surveillance system. Jpn J Infect Dis 2021;74:87-96.

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