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A Bacteriological Study of Patients with Covid-19 in Baghdad and Diyala Provinces

A Thesis
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By

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Introduction

Coronavirus disease-19 (COVID-19) which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first discovered in Hubei Region, China, in December 2019 (Ezeokoli *et al*., 2021). COVID-19 has caused 119.6 million infections and 2.65 million deaths worldwide till 14 of March 2021 (Ruan *et al*., 2022).

For decades, viruses that cause respiratory tract infections have been the cause of high morbidity and mortality rates around the world, often in a seasonal pattern (Hoque *et al*., 2022). Although the focus during a viral disease emergency is primarily on clinical management of the original infection, secondary bacterial infections that develop in patients during or after the initial infection must also be considered.

Co-infections, in which a second pathogen of viral or bacterial origin infects the same person at the same time as the first, can also happen and have the same result. Two different pathogens have caused complications in the patient (Wang *et al*., 2018). COVID-19 patients are more likely to require prolonged hospitalization and to contract bacterial and fungal infections acquired in the hospital. Critical illness, prolonged hospitalization, mechanical ventilation, and immune dysregulation are all risk factors for poor outcomes associated with nosocomial infections in these patients (Clancy and Nguyen, 2020).

Secondary bacterial infections are a well-known side effect of viral respiratory infections, and they frequently result in clinical deterioration. In previous well-studied influenza pandemics and during seasonal influenza, as well as other respiratory diseases, secondary bacterial infections were a significant cause of morbidity and mortality (Morris and Clarke, 2017).

Disruption of the airway epithelium and its barrier function as a result of viral-induced immune-mediated damage, as well as dysregulation of both innate and adaptive immune responses, are thought to promote bacterial colonization (McCullers, 2014). This is due to the host's impaired ability to clear bacterial pathogens as a result of the release of specific cytokines such as IL-10, IL-6, IL-17, and IL-23; decreased dendritic cell function, macrophages, natural killer cells, CD4+ and CD8+ T-cells; and certain phagocyte-independent mechanisms by which virus infection may facilitate secondary bacterial infection (Mirzaei *et al*., 2020).

Secondary infections in COVID-19 patients have been linked to poor health outcomes in the past. According to recent studies, bacterial co-infection occurred in 3.1–3.7% of COVID-19 patients upon admission, while secondary bacterial infections occurred in up to 16% of patients following hospitalization (Garcia-Vidal *et al*., 2021). A higher risk of mortality has been reported in COVID-19 patients with bacterial superinfection, and several recommendations encourage the use of antibiotics on an empirical basis in severely ill patients (World Health Organization, 2020).

Some patients must be hospitalized due to serious respiratory disease in humans, and in severe cases, intensive care with mechanical ventilation support is required (5–15 %) (Zu *et al*., 2020). Patients' health may deteriorate in the presence of lower respiratory tract infections in intensive care units, where nosocomial pneumonia (NP) remains a major risk factor for patients.

Nosocomial infections (NIs) are infections acquired during hospital lization and spread primarily through person-to-person contact, devices, and instruments within 48–72 hours of admission (Agaba *et al*., 2017). Bacteria such as *Staphylococcus spp*., *Enterococcus spp*., *Klebsiella pneumoniae*, *Enterobacter spp*., *Escherichia coli*, *Acinetobacter spp*., and *Pseudomonas spp*.,

are the most commonly detected NIS causative agents among microorganisms (Dandagi, 2010). These opportunistic pathogens can also cause superinfections in hospitalized patients, especially when combined with viral respiratory tract infections. Patients without underlying diseases and of all ages, on the other hand, may be at risk of co-infections (Hendaus *et al*., 2015).

According to some studies, viral agents such as influenza viruses are linked to secondary bacterial pneumonia, which can occur during hospitalization and result in death in people with or without preexisting respiratory diseases (Rynda-Apple *et al*., 2015). Damage to ciliated cells has also been linked to respiratory syncytial virus infection, which can lead to a decrease in mucociliary clearance, increased bacterial adhesion to mucins, and increased bacterial colonization in the airway.

Despite their clinical importance, the role of secondary bacterial infections in COVID-19 severity and mortality is yet unknown. Several studies have looked at this topic, however variability in testing methodology, site-specific nosocomial infections, differing definitions of early vs. late infections, and treatment modalities make it difficult to interpret the results. The prevalence and profile of secondary infections (SIs) in COVID-19 Iraqi patients is not very well understood. Therefore, our aim was to reveal the most common types of secondary bacterial infections in Iraqi hospitals to evaluate secondary bacterial infections and their antibiotic resistance in COVID-19 positive patients admitted to ICUs in Baghdad and Baqubah city.

The present study was carried out with an objective to understand the etiology and antimicrobial resistance profile of secondary bacterial infections and subsequent clinical outcomes in hospitalized COVID-19 in patients.

الخلاصـــــة

تم جمع ثلاثمائة واثنين وأربعين عينة من مصادر سريرية مختلفة (مسحة أنف ، مسحة بلعومية ، البلغم ، دم ، ادرار) ، ومن أعمار مختلفة من المرضى الذين دخلوا مستشفيات متعددة في بغداد و ديالى بعد التأكد من إصابتهم بمرض كوفيد ١٩ باستخدام تقنية RT-PCR للفترة من 2 ايلول إلى 5 تشرين الثاني 2021. كان معظم مرضى كوفيد ١٩ يعانون من الغثيان 120 (35٪) ، القيء 95 (28٪) ، الصداع 270 (79٪) ، الحمى 270 (79٪) ، السعال (88%) 300 ، فقدان الشم والتذوق (84%) 290، إسهال (23%) 80 , تنفس قصبي وضيق تنفس (73%) 250 , استخدام (65%) 235 من المرضى تنفس صناعي, بينما تم استخدام (64%) 220 من المضادات حيوية.

أظهرت النتائج 57 عزلة بكتيرية ثانوية من إجمالي 342 عينة ، بعد التشخيص باستخدام طرق مختلفة , تم عزل العزلات الموزعة على المصادر على النحو التالي: العنقودية الذهبية (16) عزلة من مسحا من الانف و مسحات من البلعوم ، وادرار حيث بلغت النسبة المئوية (68.75%) ، (18.75%) و (12.5%) على التوالي ، بينما 6 عزلات (10.5%) من الزائفة الزنجارية , البلغم 5 (83.3%) والدم 1(16.6%) ، 9 عزلات (15.7%) من الراكدة البومانية من مسحة البلعوم والبلغم كانت 6 (66.6%) و 3 (33.3%) على التوالي ، 20 (35%) عزلة من الكلبسلا الرئوية معزولة من مسحة البلعوم (55٪) ، البلغم (35٪) والدم (10%) و 6 (10.5٪) من الإشريكية القولونية من عينات الادرار فقط.

اظهر اختبار الحساسية للمضادات الحيوية مقاومة عالية للعدوى البكتيرية الثانوية (SBIs) في مرضى كوفيد ١٩ مقابل 12 مضادًا حيويًا لكل بكتيريا ، وأظهرت معظم العزلات مقاومة الأدوية المتعددة (MDR) و المقاومة الشديدة للأدوية (XDR) على النحو الاتي: المكورات العنقودية الذهبية (60%, 40%) , الراكدة البومانية (70% ,30%) ,

Aims of the study

1. Study the bacteria isolates from the patients with COVID- 19 .
2. Identification the isolated bacteria by traditional biochemical laboratory test.
3. Confirm the identification by VITEK 2 compact system.
4. Phenotypic Detection the virulence factors.
5. Study the resistance of the isolates to several antibiotics.
6. A comparative study of the effect of antibiotics and formation of biofilms on multi drug resistance bacteria.
7. Study the blood group of all patients with COVID- 19.