

The epidemiological characteristics, clinical manifestations, and outcomes of individuals diagnosed with COVID-19 infection at Al-Salama, Al-Ameria Hospital, during the period of April to August 2022

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ABSTRACT

Background: : The majority of individuals who contract COVID-19, a disease caused by a novel coronavirus, are capable of recuperating at home without requiring hospitalization. However, elderly individuals and those with pre-existing medical conditions, such as heart disease, diabetes, chronic lung disease, or cancer, are at a greater risk of developing severe illnesses and may require hospitalization.

The objective of this study: is to provide a detailed account of the epidemiology, clinical manifestations, and outcomes of COVID-19 patients who were admitted to Al-Salama Hospital, Al-Ameria, Baghdad, Iraq.

Method: In this study, a retrospective analysis was conducted to investigate cases of COVID-19 infection that were admitted to Al-Salama Hospital, located in Al-Ameria, of Al-Karkh Health Directorate in Baghdad. Demographic data, clinical presentation, and outcomes were extracted using a specialized form.

Results: The study included 101 cases admitted to Al-Salama Hospital from April to August 2022, out of which 87 were confirmed positive for COVID-19 through PCR testing while 14 were not tested. Among those who were tested, 5 cases tested negative and were discharged, while 9 cases tested positive, resulting in a total of 96 diagnosed cases of COVID-19.

The duration of hospitalization was determined based on the severity of the illness. Moderate-severe cases (85/96) were discharged improved after a hospital stay of 3-7 days, while severe-critical cases (11/96) resulted in fatalities. The primary causes of death were respiratory failure and sepsis, and the patients stayed in the hospital for 8-21 days.

Of the cases studied, 35/96 had been vaccinated against COVID-19. Out of the 11 deceased patients, 9 had a history of vaccination, while 26/85 of the discharged patients had been immunized. Males accounted for 56% of the cases, and the age range of 60-69 years had the highest number of male patients. Most female patients were in the age group of 80-95 years. The distribution of hospital admissions followed a trend similar to the 3rd and 5th waves of the epidemic that hit Iraq in July 2021 and 2022, respectively. Respiratory symptoms were the most common clinical presentation (74%), followed by gastrointestinal symptoms (12%), headache (8%), and chest pain (7%). Comorbidities were prevalent, with hypertension (43%), diabetes mellitus (32%), and cardiovascular disease (15%) being the most common.

Conclusions: In conclusion, the findings of this study may have implications not only for Al-Salama Hospital Al-Ameria in Iraq but also for other countries with comparable epidemiological and clinical characteristics and disease outcomes during the pandemic.

Keywords: COVID-19, Quarantine, Co Morbidity, And Case Fatality Rate.

Article Information

Received: June 08, 2023; Revised: June 30, 2023; Online: July 31, 2023

INTRODUCTION

The respiratory infection known as COVID-19 emerged in late 2019 and is caused by the SARS-CoV-2 coronavirus, which is believed to have originated in infected bats in China. While its symptoms are similar to those of seasonal flu, it can be more severe in elderly individuals and those with certain chronic illnesses or undergoing treatments. Notably, about 40% of infected adults are asymptomatic on average, with higher rates among children and lower among the elderly.

Coronaviruses are a family of viruses that can affect both animals and humans, with four human coronaviruses accounting for 15 to 20% of colds and nasopharyngitis cases. They are also responsible for SARS, which occurred between 2012 and 2013, and MERS, a rare infection that sporadically emerged in the Middle East since 2014.

The first cluster of COVID-19 cases linked to the Huanan South China Seafood Market in Wuhan City was reported on December 31, 2019. Among the initial 41 cases detected in Wuhan, most were linked to the market where live animals were sold, and it was closed and disinfected on January 1, 2020, making it challenging to identify the exact source of the infection. Genetic analysis suggests that SARS-CoV-2 originated from a bat coronavirus and became infectious to humans by acquiring genes specific to pangolin coronaviruses, although the exact conditions of its emergence are still unclear.

Unlike SARS and MERS, COVID-19 does not always cause symptoms, which makes it difficult to control its spread. Infected individuals who are unaware of their condition can transmit the virus to others for several days. Despite improved medical

treatments and protocols, COVID-19 still poses significant challenges, and many vaccines have been developed. Al-Salama H. was established in March 2022 to receive COVID-19 patients referred from other hospitals in Baghdad's Al-Karkh Health Directorate, with 100 beds distributed across several units.

METHODS

We obtained information regarding the demographic and clinical characteristics of 101 patients with COVID-19 who were reported at Al-Salama Hospital between April and August 2022. The data was collected from the patients' medical records during their hospitalization and compiled using a designated form. The data can be found in Table 1.

Table (1): The data of the study was collected using a specific form and is presented as below.

Variable:
Gender
Age
Occupation
Patient's place of residence (inside or outside of Baghdad)
Length of hospital stay
History of recent travel outside Iraq
Respiratory symptoms (including fever, shortness of breath, and cough)
Gastrointestinal symptoms (such as vomiting and diarrhea)
Other symptoms (such as chest pain, headache, and malaise)
Pre-existing chronic conditions (including hypertension, diabetes, heart disease, and malignancy)

Outcome of COVID-19 illness
Results of RT-PCR testing
Results of chest computed tomography (CT) scans
Whether the patient was admitted to the RCU or not.
COVID-(19 vaccine).

-Inclusion cases: These cases exhibit new symptoms of fever, cough, and headaches and have tested positive for RT-PCR. Despite these symptoms, their general condition remains stable.

-The severity of COVID-19 can be classified into five categories:

-The first category is asymptomatic, which indicates a positive PCR test without any symptoms. -The second category is mild, characterized by a positive PCR test and mild symptoms.

-The third category is moderate and includes individuals who show evidence of lower respiratory disease, have positive PCR tests, and have oxygen saturation levels (SpO₂) $\geq 94\%$ in the room.

-The fourth category is severe and is characterized by individuals who have SpO₂ $< 94\%$ in room air, a ratio of arterial partial pressure of oxygen to fraction of inspired oxygen (PaO₂/FiO₂) < 300 mm Hg, a respiratory rate of > 30 breaths/min, or lung infiltrates $> 50\%$. The risk factors for progressing to severe COVID-19 include old age, cancer, cardiovascular disease (CVD), chronic kidney disease, liver disease, lung disease, diabetes, obesity, pregnancy, and smoking (1).

-The fifth and most critical category involves individuals who have respiratory failure, septic shock, and/or multiple organ dysfunction (2).

-Ethical Considerations

In accordance with ethical considerations, all participants in this research were provided with a full understanding of the study's details and objectives. Prior to participating, they provided their consent through their investigations, medical history, and follow-up.

-STATISTICAL ANALYSIS

For statistical analysis, all cases diagnosed with COVID-19 were described using SPSS version 26. Continuous data were presented in the form of mean and standard deviation (SD).

Numbers (and/or percentages) were used to present maximum and/or minimum categorical data, while normality tests were employed to determine the distribution of continuous variables.

Case fatality rate:

(CFR = No. of death due to COVID-19 / No. of confirmed cases of COVID-19 * 100) (3).

RESULTS

The table shows that a study was conducted between April and August 2022, a total of 101 patients were enrolled. The highest number of admissions occurred in July, accounting for

53% of the cases. It was worth noting that despite receiving the vaccine, 11% of the admitted patients unfortunately passed away, as indicated in table 1.

Table (1) : The relationship between vaccination and COVID-19 cases, highlighting the impact of vaccination efforts over the specified months.

Month	Not Vaccinated	Vaccinated	Total Cases
April	0	0	3
May	0	0	4
June	0	5	31
July	2	2	53
August	0	2	10
Total	2	9	101

Table (2): Displays the overall number of patients admitted and death.

Gender	Frequency	Percent	Min	Max	SD	Mean	Median	Range
Male	56	55.4%	16	95	20	64	69	16-95
Female	45	44.6%						
Total	101	100%						

presents the descriptive data of all cases, indicating that 56% of male patients were diagnosed with COVID-19, while 44% of female patients, ranging in age from 16 to 95 years old, were affected. The average age for both genders was 64, with a mean of 69 and a standard deviation of 20.

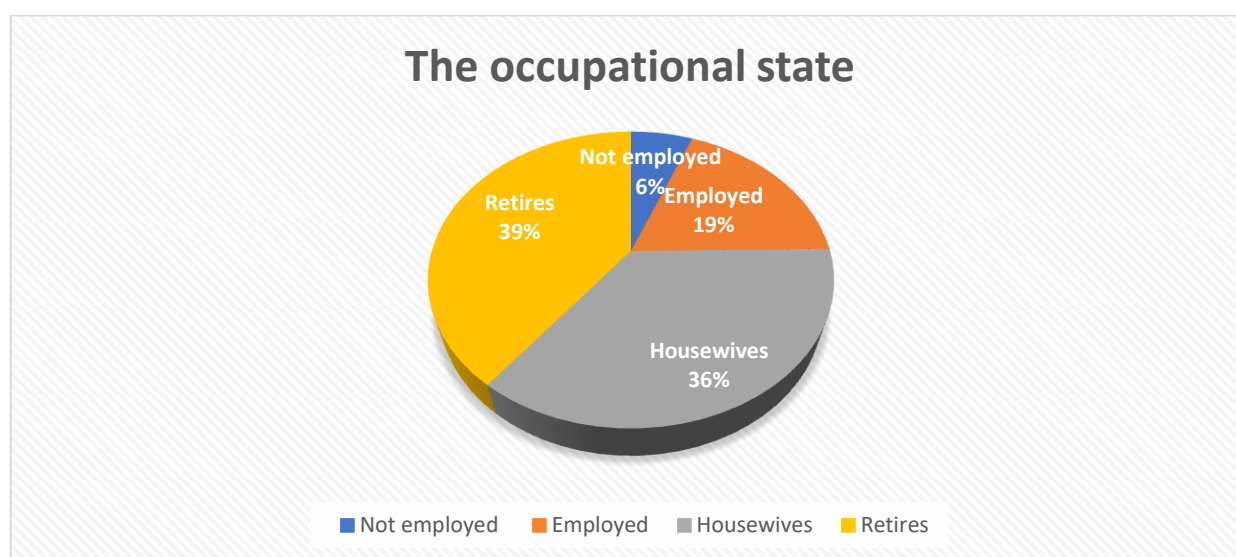


Figure (1): illustrates the occupational distribution of all the cases. The majority of cases were categorized as retired individuals, accounting for 39% of the total, followed closely by housewives, representing 36%.

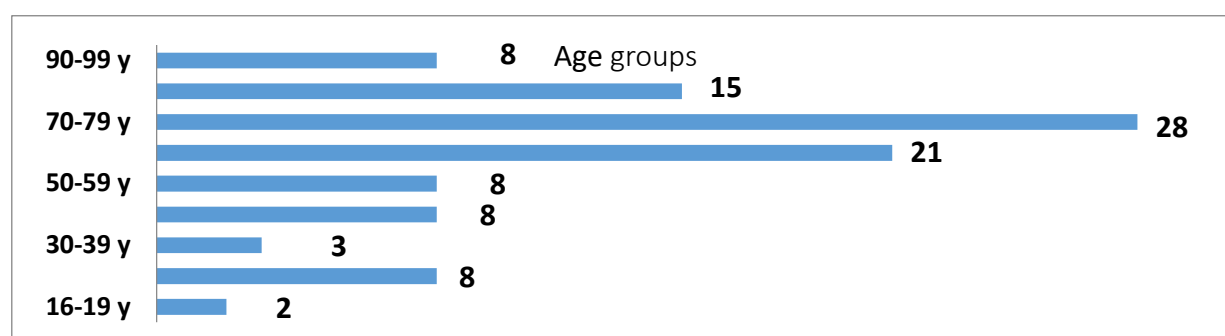


Figure (2): We categorized the cases' ages into several groups with a 10-year interval. Our analysis revealed that the highest proportion of COVID-19 affected cases fell within the age range of 70-79 years, accounting for 28% of the total. The second highest age group was 60-69 years, comprising 21% of the cases, as depicted in figure 2).

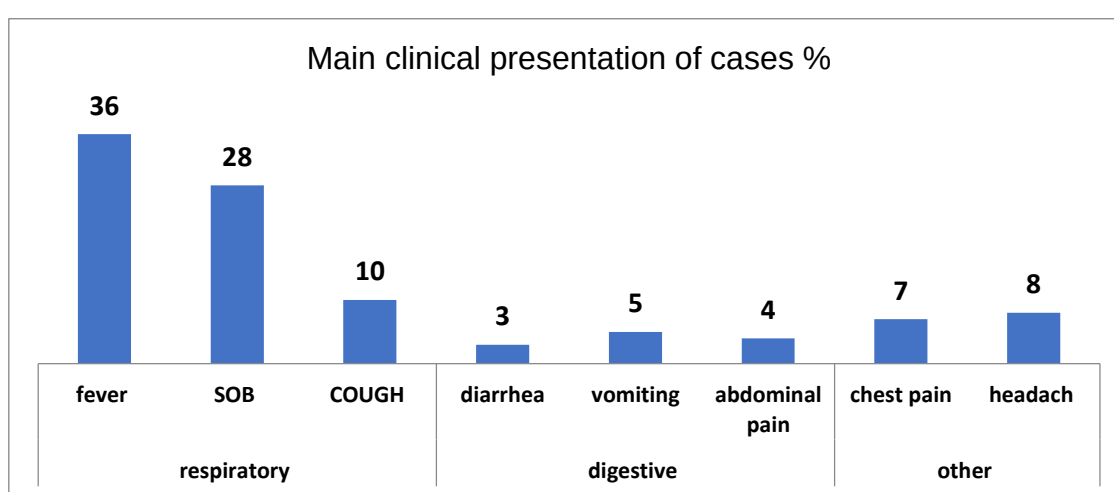


Figure (3): The primary clinical manifestations observed in all cases included respiratory symptoms (74%), fever (36%), gastrointestinal issues (12%)—particularly vomiting (5%)—as well as other symptoms such as headache (8%) and chest pain (7%), as depicted in figure (4). Notably, the majority of cases presented with multiple signs or symptoms, exceeding two in number.

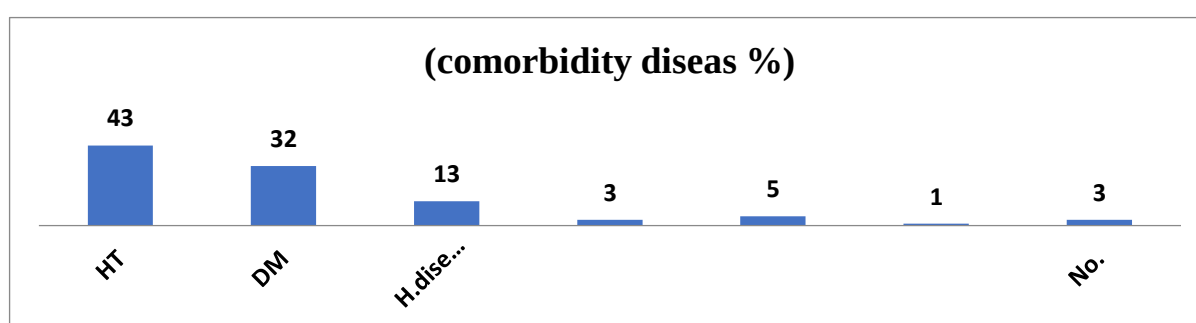


Figure (4): Notably, the majority of cases presented with multiple signs or symptoms, exceeding two in number.

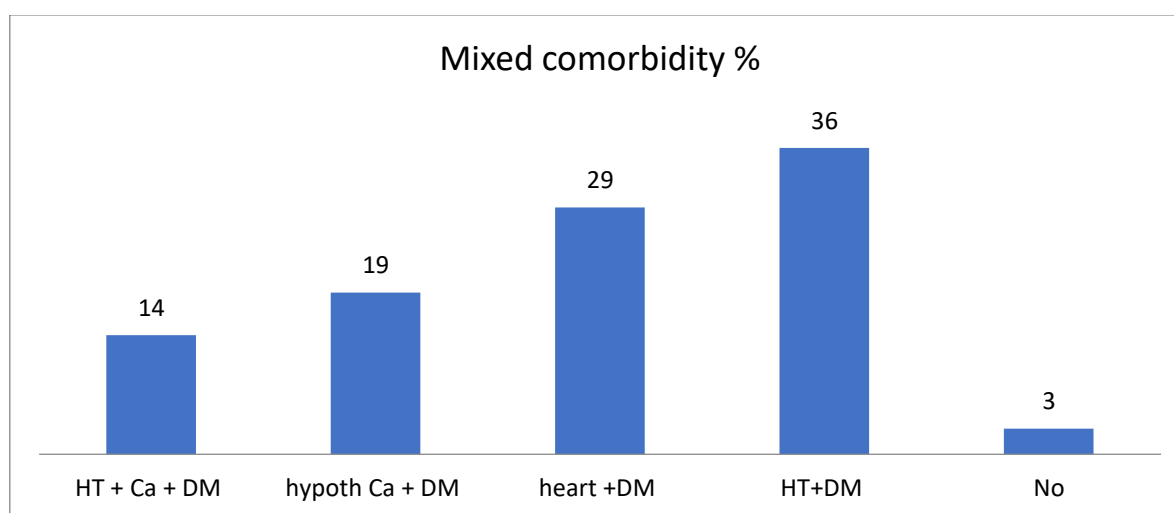


Figure (5): In terms of associated comorbidities, the prevalent conditions among the cases were hypertension (43%), diabetes mellitus (32%), heart diseases (15%), malignancy (5%), hypothyroidism (3%), and thalassemia (1%). A significant proportion of patients had multiple comorbidities, with most individuals presenting with more than two morbid diseases. Additionally, 3% of cases did not have any comorbidities, as depicted in figures (4) and (5).

Table (3) "International Travel Frequency and Percentage Analysis".

(International travel)	(Frequency)	Percentage
Yes	4	4%
No	97	96%
Total	101	100%

With respect to the connection between COVID-19 and recent international travel, we discovered that approximately 4% of the admitted cases had a documented history of traveling outside of Iraq, as indicated in table (3).

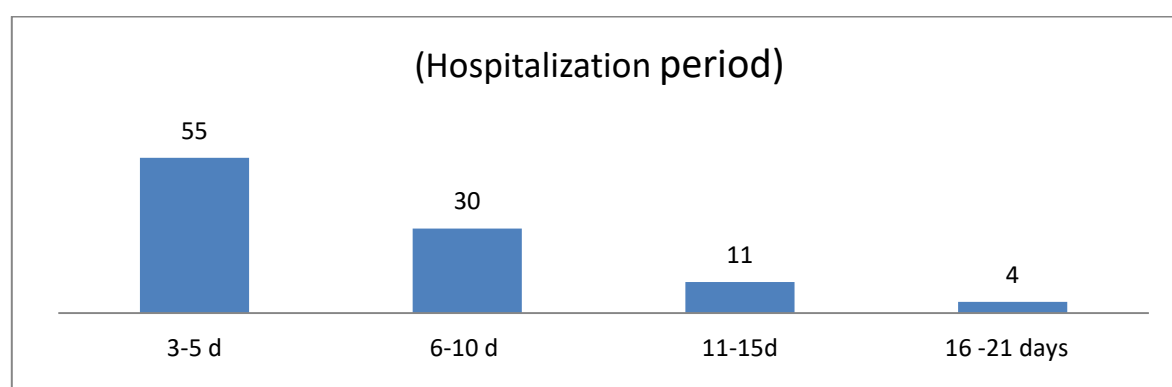


Figure (6): The duration of hospitalization for the cases (as depicted in figure 7) was categorized into four groups, with a 5-day interval. The majority of cases (55%) were admitted for a period of 3-5 days, while a small proportion (4%) required a longer stay of 16-22 days. There was one case that remained hospitalized for 30 days but was eventually discharged home upon showing signs of improvement.

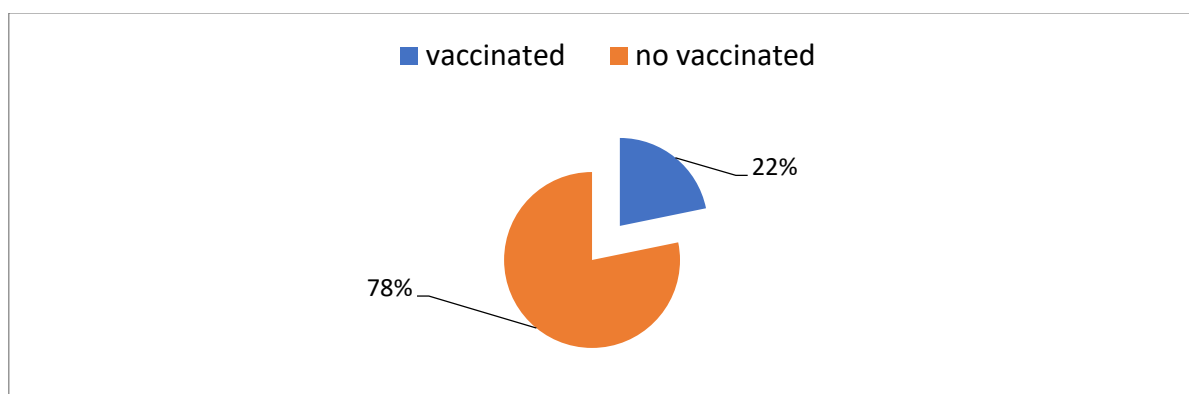


Figure (7): Out of the total cases, approximately 22% had received vaccinations, either one or two doses, while the remaining 78% were unvaccinated, as illustrated in Figure 8.

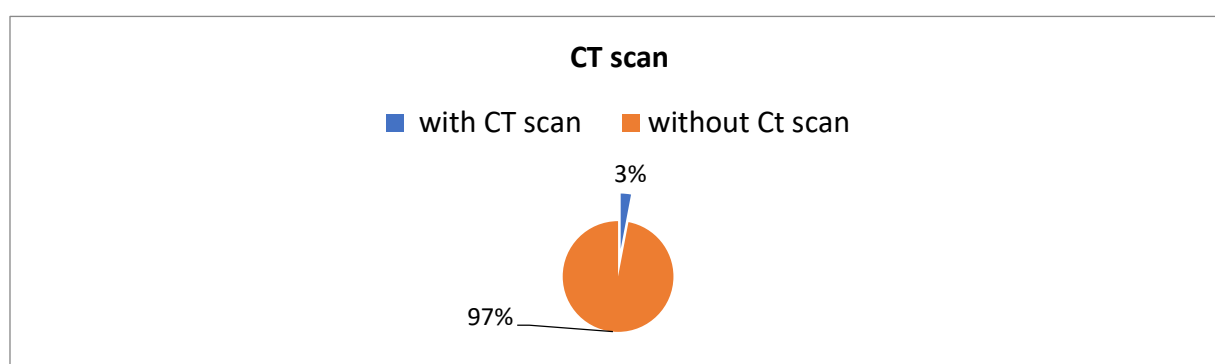


Figure (8): The findings from CT scans of the cases (as depicted in Figure 9) indicate that approximately 3% underwent CT scans upon referral to the hospital, even without a PCR test, solely based on their presenting signs and symptoms of illness.

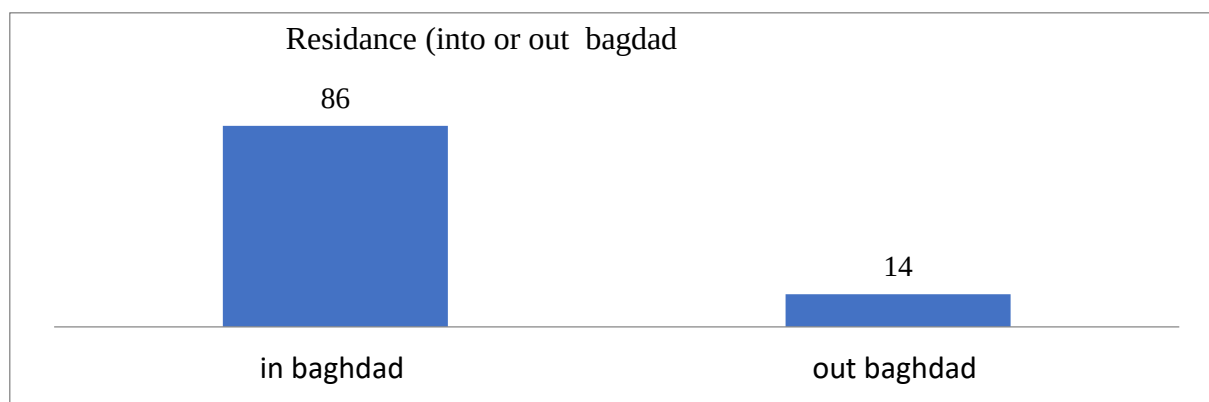


Figure (9): Approximately 4% of the cases originated from areas outside Baghdad, specifically Nahia or Qatha' in the vicinity of Baghdad city. This data provides insight into the epidemiological situation of the COVID-19 pandemic beyond the boundaries of Baghdad, as illustrated in Figure (10)

DISCUSSION

A study conducted in the Levant Countries by Bizri et al., 2021 (4), revealed that Iraq had the highest incidence of COVID-19, while Syria had the lowest. Similarly, Iraq recorded

the highest number of deaths, while Syria had the lowest. On the other hand, Palestine and Syria exhibited higher recovery rates. When considering the government response stringency index, Jordan obtained the highest

score compared to other countries. Following Jordan, the countries ranked in descending order of stringency were Palestine, Iraq, Lebanon, and Syria.

Lami et al. (2021) conducted a study (5) focusing on various methods implemented to curb the waves of the pandemic. These methods included border control, lockdown measures, mask-wearing, social distancing, establishment of COVID-19 isolation centers, and expansion of laboratory capacity. In a separate study by Peshawa et al. (2020) (6), strategies implemented by the Kurdistan Region, located near the border with neighboring countries, were examined. These strategies involved the quarantine of all individuals returning from abroad.

In order to prevent the spread of the virus, individuals returning from abroad were subjected to a mandatory quarantine period of approximately 14 days. Moreover, testing was conducted on the relatives and close contacts of infected patients. To ensure the safety of healthcare workers, including doctors, nurses, pharmacists, and other staff employed in hospitals and healthcare sectors, adequate personal protective equipment (PPE) was provided.

Our findings indicate that men (56%) exhibit a higher susceptibility to COVID-19 infection compared to women (44%). This aligns with a coinciding study conducted by Raheem et al. (2021) in Baghdad-Al Resafa (7), as well as a study by Yauhen S. et al. (2021) in Dubai Medicine and Al Ain Hospitals, which highlights the increased severity of COVID-19 in men and older patients (8). The higher number of male patients could be attributed to their slightly elevated risk of infection or the slightly larger male population in Iraqi society, as supported by data from the Ministry of Planning.

In Sudan, Elfatih A. et al. (2021) propose that the behavioral characteristics of males

contribute to the higher susceptibility observed among them (9). In Spain, two separate studies were conducted—one in a shopping center in Madrid and the other conducted online. The findings from both studies indicate that women in Spain exhibit a "more responsible attitude toward COVID-19 than men" (10). On the other hand, a study conducted in multiple governorates in Iraq (Kirkuk, Diyala, and Sulaimaniyah) by Oxfam House, John Smith (2020) revealed that women and girls face increased vulnerability to COVID-19. They may experience added pressure during the pandemic and encounter challenges in accessing healthcare and support services due to movement restrictions, societal norms, limited decision-making power, and insufficient information about COVID-19 itself (11).

Our findings indicate that the elderly, particularly those aged between 70-79 years, are the most vulnerable age group, comprising 28% of the cases. This vulnerability aligns with the results of a study conducted in Sudan, which also highlighted the increased susceptibility of the elderly, particularly those aged 60-69 years (28.4%), and those above 70 years (23.5%), attributed to weakened immune functions (9). Furthermore, a systematic review of published articles by Tadesse S. et al. (2020) found that the age range of infected patients spanned from 25 to 94 years, with a median age of 69 years, a result consistent with the study by Fang W. et al. (2020) which reported a median age of 53-71 years and 51.2% male (13). Notably, the age range in our study was 16-95 years, higher than the findings of Daniela F. et al. (2020) in Canada, America, Africa, and China, where the median age ranged from 28 to 70 years (14).

According to the data, the findings indicated that 40% of the individuals in the study were

classified as retired, while 36% were identified as housewives. This observation can be attributed to the fact that a significant proportion (approximately 85%) of the cases belonged to the older age group, which aligns with the results of a similar study conducted in China by Fang W. et al. in 2020 (13). The Chinese study reported that 51.2% of the infected cases were male, and 38.9% were retirees.

The predominant clinical manifestations observed in the moderate and severe groups were fever (36%), shortness of breath (28%), and cough (10%). These findings are consistent with a study conducted in Sudan by Elfatih A. et al. in 2021 (9), which reported that shortness of breath and cough (69%) were the most commonly observed symptoms. Additionally, our study revealed that mild and moderate COVID-19 cases exhibited other symptoms such as vomiting, diarrhea, and headache. These findings align with a study conducted in China by Li J, Chen Z, Nie (15), which documented headache (23.1%) and sore throat (16.2%). Another study conducted at the University-Hospital of Parma, Italy by Tadesse S. et al. in 2020 (12) found that females exhibited a higher incidence of symptoms compared to males, both during the acute phase and follow-up. Sex was identified as a significant factor in the development of long-covid syndrome, as it was a substantial predictor of persistent symptoms in females, including dyspnea, fatigue, chest pain, and palpitations (16).

In our study, we identified the primary risk factors, with hypertension being the most prevalent underlying comorbidity (43%). Additionally, diabetes mellitus (32%), cardiovascular diseases (10%), and other comorbidities such as malignancy (5%), hypothyroidism (3%), and thalassemia (1%) were observed. Around 3% of the cases did not present any comorbidities. These findings

support previous research by Elfatih A. et al. in 2021 (9), highlighting hypertension and diabetes mellitus as the most common chronic diseases associated with increased severity of COVID-19. Notably, the presence of multiple comorbidities was found to elevate the fatality rate, as evidenced by a study conducted in seven countries of the Eastern Mediterranean Region by Faris Lami et al. in 2022 (17). This study reported that nearly half of the patients had comorbidities, with hypertension and diabetes being the most prevalent. Advanced age, diabetes mellitus, high blood pressure, and heart disease were all strongly correlated with COVID-19 severity and mortality. Smoking and renal diseases showed a significant association with severity but not mortality, while male gender, respiratory diseases, and malignancy were significantly associated with mortality but not severity.

Regarding the international travel history, the majority of cases (96%) did not have a history of traveling. This finding is consistent with a study conducted in China by Yilin et al. in 2021 (18), which revealed that older adults, particularly those aged 70 years and above, were more susceptible to social exclusion during the pandemic and faced a higher mortality rate if they contracted the virus. Additionally, a study conducted on Asian individuals residing in the UAE reported that less than 5% of them had recently traveled (19).

In our study, we examined the duration of hospitalization and categorized it into several groups based on 5-day intervals. The results indicated that 56% of the cases had a hospital stay of 3-5 days, while 30% stayed for 6-10 days. Furthermore, 11% had a hospitalization period of 11-15 days, and the remaining 4% stayed in the hospital for 16-22 days. These findings differ from a study conducted in Brazil (20), which reported that the average length of hospital stay for all patients was 9

days (22 days for patients requiring intensive care and 7 days for those not requiring intensive care). Similarly, another study conducted in Eastern Ethiopia revealed a range of 8-17 days for the length of hospital stay in COVID-19 cases (21).

Various sociodemographic factors, including sex, age, marital status, occupation, and place of residence, as well as clinical factors such as comorbidities, COVID-19 symptoms, disease stage, ventilator usage, and laboratory results, could contribute to variations in hospitalization durations. Furthermore, the influence of risky behaviors, such as drinking history and smoking status, was also considered as potential predictors. Numerous studies have explored the impact of these "predisposing factors" on the length of hospital stay during COVID-19.

A retrospective study conducted at the University of California-San Diego examined the relationship between the usage of statins, angiotensin-converting enzyme inhibitors (ACE inhibitors), and angiotensin receptor blockers (ARBs) within one month prior to hospital admission, and the risk of severe outcomes and time to recovery among COVID-19 hospitalized patients (22). The study found that 53% of COVID-positive inpatients experienced severe disease. The median time from hospitalization to the onset of severe disease was two days, while the median time to recovery was seven days. Notably, the use of statins prior to admission was associated with a reduced risk of severe COVID-19 and a faster recovery time for patients without severe disease.

In a cross-sectional study conducted by Keila C. et al. in 2021 in Brasilia (23), it was observed that hospitalization prevalence increased with age, particularly among individuals aged 60 years or older. Additionally, lower levels of education and the presence of multiple chronic conditions

(multimorbidity) were associated with higher rates of hospitalization.

In a cross-sectional study conducted by Ali M. et al. in 2022 (24), focusing on COVID-19 patients hospitalized in Tehran province, Iran, significant disparities were observed in hospitalization and mortality rates between individuals from different income brackets. The study revealed a substantial contrast, with hospitalization rates ranging from 30% in the low-income group to 10% in the highest income class.

Regarding CT scans, a small percentage (approximately 3%) of individuals who tested positive for COVID-19, particularly males without a PCR test, exhibited positive findings when referred to the hospital. This aligns with a study conducted by H.-W. REN et al. in 2020 (25) at the Fifth Medical Center of Chinese PLA General Hospital in Beijing. The study identified that ground-glass opacities were the primary manifestations observed in patients with the common type of COVID-19, and these lesions were predominantly distributed in the peripheral regions of the lungs.

In the present study, the vaccination status indicates that 22% of individuals have received the vaccine, while the remaining 78% remain unvaccinated. Interestingly, these findings contrast with a study conducted in China by Eun Lee et al. in 2022 (26), where 77% of the participants were vaccinated. Additionally, a website (5) demonstrated that approximately 20% of the population in Iraq has been fully vaccinated with two doses, while the global vaccination coverage stood at 64%.

In line with previous research, a study conducted by Sun K. et al. in 2022 (reference 27) confirmed the effectiveness of COVID-19 vaccination in preventing illness. Ayoubkhani et al. in 2022 (reference 28) also found that

symptoms of long-COVID tended to decrease following COVID-19 vaccination. Furthermore, evidence suggested that this improvement was sustained after receiving the second dose, at least during the median follow-up period of 67 days. Vaccination has the potential to contribute to reducing the overall health burden of long-COVID in the population, although longer-term follow-up studies are necessary to fully understand its impact.

In terms of the residency of the cases referred to our hospital, it was observed that 86% of them resided within Baghdad, while the remaining 14% came from outside the city, specifically from Nahia or Qatha'. This finding is consistent with the epidemiological situation of COVID-19 in Baghdad. Furthermore, Diego F. et al. in 2021 (29) conducted a study indicating that rural residents are less likely to receive flu shots compared to residents of urban areas, further supporting the observed pattern.

In terms of patient outcomes, the majority of admitted patients had relatively short hospital stays of 3-5 days or less, and only a small percentage (2-3%) required intensive care unit (ICU) admission. A significant proportion (90%) of cases were discharged to their homes, with the majority experiencing an uncomplicated disease course. However, there were potential complications such as sepsis, respiratory failure, acute respiratory distress syndrome (ARDS), pneumonia, or pulmonary embolism, which were the most commonly observed. Hence, early identification and appropriate treatment of critical cases are crucial in order to prevent further complications or fatalities, particularly in underserved communities (30).

The mortality rate among admitted cases can be attributed to various factors, with the worsening economic situation of the country being the most significant. This poses challenges to expanding diagnostic

capabilities, contact tracing efforts, conducting thorough investigations, and ensuring proper management of cases. Another contributing factor is drug insecurity, which can be defined as either the lack of essential medications or the inability of patients to afford them due to their high cost (31). The mortality rate observed in our study was 11%, primarily due to AL Salama H. serving as a quarantine hospital for severe COVID-19 cases referred from other medical facilities. It is important to note that the case fatality rate (CFR) varies globally, currently ranging from 2-3% according to the World Health Organization (WHO) in Asia, while it was higher at 3-4% during the initial phase of the pandemic.

In Italy, the CFR ranges from 5% to 18%, influenced by factors such as the environmental situation, individual behaviors, and the country's healthcare system. Notably, a study conducted by Laura T. et al. in 2021 (33) and another study by Achim Doerre and Gabriele Doblhammer in 2022 (reference 34), both conducted in Germany, revealed a positive correlation between the CFR and the age of cases, with clinical significance (P-value: 0.025). These studies also indicated that infection rates are highest among young and working-age individuals, but they have also increased among the elderly population.

Regarding gender disparities, it was found that at working ages, women face a higher risk of infection compared to men, while the opposite is true at older ages. Additionally, across all age groups, the death rates for men are twice as high as those for women. A study by Scott W. et al. (35) reported that among COVID-19 patients hospitalized, 15-30% die during hospitalization. However, the specific causes of death, the prevalence of organ system dysfunction prior to death, and the characteristics of end-of-life care for COVID-19 patients remain unclear.

According to a multicenter retrospective cohort study conducted in Spain, it was observed that older patients exhibited the most severe clinical characteristics. Specifically, one in three patients developed respiratory distress, and one in five patients succumbed to the disease. These findings provide further evidence of a strong association between advanced age and increased mortality rates (36).

Similarly, a study carried out in Iraq by Naghim A. Mawlood and Riyadh K. Lafta in 2022 (37) revealed that mortality rates were higher among males, accounting for 62.7% of the deaths. Additionally, 50.0% of the deaths occurred in individuals aged over 50 years. The age group of 30-60 years was the most affected for both genders. The case fatality rate was reported to be 1.2%, with males having a slightly higher rate of 1.3% compared to 1.1% among females. Other factors associated with an increased case fatality rate included male gender, advanced age, and underlying health conditions (38).

CONCLUSION

1- Al-Salama Hospital, located in Al-Ameria, was constructed following international standards and is equipped with highly trained staff and advanced equipment.

2- The admission pattern at the hospital aligns with the 3rd and 5th waves of the epidemic that affected Iraq in July 2021 and 2022. A total of 101 cases were included in the study, with the majority being male (56%). Among them, 90% were discharged, while 11% succumbed to the disease due to complications such as respiratory failure or sepsis.

3- The majority of fatalities occurred in females who were of advanced age and had not received a COVID-19 vaccination.

4- The primary clinical symptoms observed were respiratory issues (74%), gastrointestinal

symptoms (12%), headache (8%), and chest pain (7%).

5- Common comorbidities among the cases included hypertension (43%), diabetes mellitus (32%), and heart diseases (15%).

6- Approximately 55% of the cases had a hospitalization period ranging from 3 to 5 days.

7- Around 22% of all cases had received one or two doses of the COVID-19 vaccine.

8- About 3% of the cases were referred to hospitals without undergoing PCR tests, and only CT scans were conducted in these instances.

RECOMMENDATIONS

1- Creating a comprehensive database that can serve as a foundation for future studies conducted over an extended duration and across multiple centers.

2- Giving heightened consideration and providing enhanced care for patients with known comorbidities or risk factors that could potentially amplify their susceptibility to illness or mortality.

3- Implementing proactive measures and strategic preparations to anticipate the potential occurrence of future pandemics, drawing from past lessons and avoiding repeating previous errors.

4- Launching nationwide awareness campaigns to promote the significance and safety of COVID-19 vaccination, particularly targeting individuals at high risk of infection and those with underlying health conditions.

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