Medical Comorbidities and Risk Of COVID-19 Severity

**Sawsan M. Jabbar AL-Hasnawi[1], Dhiaa H. Jawad Al-khayat[2] , Hind Kadhim Mooh[3]
, Diyar Khalil Khatar[3]**

1 Department of Medical Microbiology/College of Medicine of Kerbala University, Karbala, Iraq.
2 Department of Anesthesia and Intensive Care/ Imam Al-Hussein Teaching Medical City, Karbala, Iraq.
3 Medical Student/ College of Medicine of Kerbala University, Karbala, Iraq.

*Corresponding Author

sawsan.m@uokerbala.edu.iq

Abstract

Background: COVID-19 is a disease caused by SARS-CoV-2 that can cause respiratory infections. It may affect the sinuses, the upper airways of the nose and throat, or the lower airways of the trachea and lungs. Infections range from mild to deadly. Older people and people of all ages with medical comorbidities such as hypertension and diabetes may have a poorer prognosis and be at greater risk for hospital and intensive care unit admissions.

Objectives: The present study aimed to determine the effects of pre-COVID-19 comorbidities on the progression of disease severity and outcome in Iraqi patients.

Method: This descriptive cross-sectional study was carried out on COVID-19 patients using an online electronic questionnaire in Google form all over Iraq from September 2021 to July 2023. The total number of participants was 789, of whom approximately 282 were excluded, and the net was 507; they received an online questionnaire,

The questionnaire literature review was completed after debuting in Arabic after a thor. This self-administered questionnaire consisted of 15 closed-ended questions and six open questions.

Result: < 40 was the highest group affected by COVID-19, and those> 60 years were the most minor group involved. Females are affected more than males. Most of the cases were from the middle region of Iraq. 87.8% of participants have no smoking history. Fever, headache & fatigue were the most prevalent symptoms of patients. Past medical history of hypertension presented in 11.8% of patients, while diabetes mellitus represented 9%, asthma 5.5%, and cardiovascular diseases 4.9%. Other comorbidities were present in lower percentages. The history of hospitalization was positive in 37 patients with past medical comorbidities. Of those patients who were admitted to the hospital, 18 required Intensive care unit admission. Among them, 7 had hypertension, 4 had asthma & 3 had diabetes mellitus. Steroid treatment was given to 9% of patients with COVID-19.

Conclusion: The need for hospitalization and Intensive care unit admission was higher among COVID-19 patients with comorbidities, especially hypertension, followed by diabetes, then asthma, and cardiovascular diseases.

الأمراض الطبية المتزامنة ومخاطر خطورة كوفيدـ١٩ سوسن محمد جبار الحسناوي , ضياء هادي جواد

الملخص

الخلفية: كوفيد-١٩ هو مرض يسببه SARS-CoV-2 ويمكن أن يسبب التهابات الجهاز التنفسي. وقد يؤثر على الجيوب الأنفية، أو الممرات الهوائية العلوية للأنف والحنجرة، أو الممرات الهوائية السفلية للقصبة الهوائية والرئتين. وتتراوح حالات العدوى من خفيفة إلى مميتة. قد يكون لدى كبار السن والأشخاص من جميع الأعمار الذين يعانون من أمراض مصاحبة طبية مثل ارتفاع ضغط الدم والسكري تشخيصًا تكهنيا سيئًا ويكونون أكثر عرضة لدخول المستشفى ووحدة العناية المركزة.

الأهداف: هدفت الدراسة الحالية إلى تحديد آثار الأمراض المصاحبة لما قبل فيروس كورونا (COVID-19) على تطور شدة المرض ونتائجه لدى المرضى العراقيين.

الطريقة: هذه دراسة مقطعية وصفية تم إجراؤها على مرضى كوفيد-١٩ باستخدام استبيان إلكتروني عبر الإنترنت في نموذج جوجل في جميع أنحاء العراق من سبتمبر ٢٠٢١ إلى يوليو ٢٠٢٣. وكان العدد الإجمالي للمشاركين ٧٨٩، منهم حوالي ٢٨٢ تم استبعادهم، وبلغ صافيهم ٥٠٧، تلقوا استبياناً إلكترونياً، وقد تم الاستبيان بعد مراجعة شاملة للأدبيات وتم توزيعه باللغة العربية على المشاركين. يتألف هذا الاستبيان الذاتي من ١٥ سؤالاً مغلقًا و٦ أسئلة مفتوحة.

النتيجة: كانت الفئة العمرية أقل من ٤٠ عامًا هي الفئة الأكثر تأثراً بـ COVID-19 وكانت الفئة العمرية الاكبر من ٦٠ عامًا هي المجموعة الأقل تأثراً. وتتأثر الإناث أكثر من الذكور. وكانت معظم الحالات من المنطقة الوسطى من العراق. ٨٧,٨٪ من المشاركين ليس لديهم تاريخ للتدخين. وكانت الحمى والصداع والتعب من أكثر الأعراض شيوعا لدى المرضى. التاريخ الطبي السابق لارتفاع ضغط الدم يظهر في ١١,٨٪ من المرضى بينما يمثل داء السكري ٩٪، والربو ٥,٥٪، وأمراض القلب والأوعية الدموية ٤,٩٪. وكانت الأمراض المصاحبة الأخرى موجودة في نسب أقل. كان تاريخ الاستشفاء إيجابيا في ٣٧ مريضا يعانون من أمراض مصاحبة طبية سابقة. ومن بين هؤلاء المرضى الذين تم إدخالهم إلى المستشفى، احتاج ١٨ مريضًا إلى دخول وحدة العناية المركزة، بينهم ٧ مصابين بارتفاع ضغط الدم، و٤ مصابون بالربو، و٣ مصابون بداء السكري. تم إعطاء العلاج الستيرويدي لـ ٩٪ من مرضى كوفيد-١٩.

الاستنتاج: كانت الحاجة إلى دخول المستشفى ووحدة العناية المركزة أعلى بين مرضى كوفيد-١٩ الذين يعانون من أمراض مصاحبة، وخاصة ارتفاع ضغط الدم يليه مرض السكري، ثم الربو وأمراض القلب والأوعية الدموية.

1. Introduction

COVID-19 is a disease caused by SARS-CoV-2 that can cause respiratory infections. It may affect the sinuses, the nose and throat's upper airways, or the trachea's and lungs' lower airways. In 2020, after the outbreak in China in December 2019, the World Health Organization specified SARS-CoV-2 as a new type of coronavirus. Like other coronaviruses, it is spread primarily through personal contact. Infections range from mild to fatal (Organization, 2022).

Seven human coronaviruses (HCoV) have been identified, four of which are common. It is
low-risk and usually causes only mild respiratory illness in healthy adults. However, they cause one-third of the common cold and can cause long-term, life-threatening diseases in at-risk people with weakened immune systems. They can cause long-term, life-threatening illness.

The other three (causing cases of MERS, SARS, and COVID-19) are known to cause more severe illness. COVID-19 disease tends to be milder than SARS and MERS but more severe than the diseases caused by the four common coronaviruses (Harrison *et al.*, 2023).

The most common symptoms of COVID-19 include fever or chills, dry cough and shortness of breath, extreme fatigue, Muscle and body aches, headaches, loss of taste and smell, sore throat, nausea and vomiting, and diarrhea. These symptoms may appear 2 to 14 days after being infected with the virus (Wu *et al.*, 2022).

There are many risk factors for COVID-19, such as older age, sex, weak immunity, and past medical comorbidities (Singh *et al.*, 2021). Older adults may have vulnerable immune systems (Landstra and de Koning, 2021).

The risk of hospitalization may increase up to 75% in patients with comorbidities such as hypertension, diabetes, cardiovascular diseases (CVD), and obesity (Statsenko *et al.*, 2022).

Certain drugs used for comorbidity treatment could interfere with angiotensin-converting enzyme 2 (ACE2) receptor expression and increase the risk of infection (Landstra and de Koning, 2021). Females have a lower risk for COVID-19 infection than males. This could be due to the effect of sex hormones, as estrogen can enhance the immune system by impacting Vitamin D. On the other hand, the activity of male sex hormones increases ACE-2 receptor expression (Singh *et al.*, 2021).

The current study aimed to assess the association between medical comorbidities and these variables among Iraqi patients to understand the role of these medical comorbidities in COVID-19 infection, whether there is more risk for disease, or effects on severity of illness and hospitalization.

2. Material and methods

2.1 Study design & Settings

This descriptive cross-sectional study was carried out on COVID-19 patients using an online electronic questionnaire in Google form throughout Iraq from September 2021 to July 2023.

2.2 Data collection and questionnaire:

The total number of participants was 789, of whom approximately 282 were excluded, and the net was 507. They received an online questionnaire. The questionnaire was prepared after a thorough literature review and distributed to the participants in Arabic. This self-administered questionnaire consisted of 15 closed-ended questions and six open questions.

When the electronic questionnaire was published on social networking sites, especially Telegram, Instagram, and Facebook, a note regarding inclusion criteria was added: Only the people for whom the PCR scan was conducted answered the questionnaire. Some people from whom we received responses and answered the questionnaire did not do the PCR, but they were excluded from the study.

2.3 Ethical Consideration

In the beginning, approval from the Department of Family and Community Medicine was obtained. The Ethical Committee of Kerbala College of Medicine/ University of Kerbala provided ethical approval for the study with referral number 71. Also, written approval from each participant was taken before answering the questionnaire. Confidentiality of the information was assured, and the privacy of respondents was maintained at a safe level.

3. Statistical Analysis

Patients' information was extracted into an Excel worksheet, and then the SPSS .chi-square test was used to compare variables. A p-value < 0.05 was considered statistically significant. The data is placed as symbols that represent it. The steps were encoding the data, putting data in the program, choosing the appropriate form, testing and analyzing the data, defining the variable data to be explored, and achieving the statistics process.

4. Result

The age group of < 40 was the highest group affected by COVID-19 (83.33%), and those> 60 years were the most minor group involved (5.1%). Females were affected more than males (71%). Most of the cases were from the middle region of Iraq (81.1%). 87.8% of participants have no smoking history. Fever, headache & fatigue were the most prevalent symptoms of patients Table 1

Table 1: Demographic and Clinical Characteristics of Patients

Variable		No.	%
Age Groups	< 40	422	83.3%
	40-49	31	6.1%
	50-59	28	5.5%
	60 & >	26	5.1%
Gender	Male	147	29%
	Female	360	71%
Region	Middle Iraq	411	81.1%
	South of Iraq	62	12.2%
	East	16	3.2%
	North of Iraq	8	1.5%
	West	10	2%
History of Smoking	Yes	62	12.2%
	No	445	87.8%
Symptoms	Fever	398	78.5%
	Cough	262	51.7%
	SOB	29	5.7%
	Rhinorrhea	12	2.4%
	Sore Throat	6	1.1%
	Headache	398	78.5%
	Red Eye	7	1.4%
	Fatigue	338	66.7%
	Diarrhea	114	22.5%
	N & V	139	27.4%
	Abdominal Pain	9	1.8%
	Constipation	4	0.8%
	Loss of Smell & Taste	322	63.5%
	Palpitation	9	1.8%
	Syncope	3	0.6%
	Vertigo	9	1.8%
	Insomnia, Mode Changes & Loss of Concentration	8	1.6%
	Skin Rash	3	0.6%

For medical comorbidities, a Past medical history of hypertension was present in 11.8% of patients, while diabetes mellitus represented 9%, asthma 5.5%, and CVD 4.9%. Other comorbidities were present in lower percentages **Table 2**.

Table 2: Medical Comorbidities Distribution Among the Study Group

Variable	No.	%
Hypertension	60	11.8%
Cardiovascular Diseases	25	4.9%
Diabetes Mellitus	46	9%
Atopy & Asthma	28	5.5%
Chronic Pulmonary Diseases	2	0.4%
Renal Diseases	5	1%
AIDS	7	1.4%

The history of hospitalization was positive in 37 patients with past medical comorbidities, which is a highly significant statistical result compared to patients with no comorbidities Table 3.

Table 3: Association of Medical Comorbidities and Hospitalization

Variables	Hospitalized No. (%)	Non hospitalized No. (%)		Total	*p-value*
Positive History of Medical Comorbidities No. (%)	37(25)	111(75)		**148**	**< 0.001**
Negative History of Medical Comorbidities No.	24(7.1)	314(92.9)		338	
Total	61	425		486*	

Of those patients admitted to the hospital, 18 required ICU admission. Among them, 7 had hypertension, 4 had asthma & 3 had D.M. Table 4.

Table 4: Medical Comorbidities and Hospitalization History

Variable	No.	%	ICU requirement	No.
Hypertension	60	11.8%	Yes	7
			No	53
Cardiovascular Diseases	25	4.9%	Yes	2
			No	23
Diabetes Mellitus	46	9%	Yes	3
			No	43
Atopy & Asthma	28	5.5%	Yes	4
			No	24
Chronic Pulmonary Diseases	2	0.4%	Yes	0
			No	2
Renal Diseases	5	1%	Yes	1
			No	4
AIDS	7	1.4%	Yes	1
			No	6

All ICU patients (18) required C-PAP, while 69 other hospitalized patients (with or without comorbidities) Wore Masks. Steroid Treatment Was Given to 9% of Patients with COVID-19 Table 5.

Table 5: Oxygen & Steroid Treatment

Variables		No.	%
Oxygen Requirement	Mask	69	13.6%
	C-PAP	18	3.6%
Steroid Treatment	Yes	46	9%
	No	461	91%

5. Discussion

In the current study, the Age group of < 40 was the highest group affected by COVID-19 (83.3%), while the group > 60 years was the least affected (5.1%). These findings were similar to a previous study in India, where population groups of 20-49 years were highly vulnerable to infection. (Jakhmola, Baral and Jha, 2021) This could be explained as younger people may be in the streets and workplaces more often than older people, making them more vulnerable to the virus.

Present data showed that females were affected more than males, 71%. This may be because X chromosomes increase the expression of essential immune functions, and women have two X chromosomes, not just one X chromosome, like men. Another possibility is that the female sex hormones estrogen and progesterone can promote an immune response and reduce inflammation. (Lamptey, 2021) This result is contrary to a past study in Nigeria that showed that males were affected more than females. Most cases were male (65.8%), and the median age was 43. (Osibogun *et al.*, 2021) Similarly, Iraqi studies in Dyala and Thiqar reported that the female gender was affected more, with 61% of survey respondents female and 39% male. Gender distribution showed females (57.2%) were higher in Thiqar than males (42.8%) (10,11). However, in studies conducted in Thailand, Singapore, and China, men were more affected than women. (Htun *et al.*, 2021) This could be due to the difference in respondents, as more females answered the electronic questionnaire than males. Another explanation is that women in Iraq are not vaccinated with the Corona vaccine

because of the common myths that it causes sterility, death, etc., and the fear and anxiety that women have from the virus reduces immunity. One of the most critical obstacles for our study was the presence of a large percentage of participating women, which led to a difference in the research statistics concerning the number of people affected by COVID-19.

Most of the cases in the present study were from the middle region of Iraq (81.1%). Baghdad is considered one of the most densely populated governorates, followed by the south of Iraq, especially in Basra, and at least one north of Iraq. This is strengthened by a previous study done in Iraq. In comparison, Anbar, Ninewa, Diwaniya, and Salah-Aldeen reported the fewest confirmed cases of COVID-19; most cases were reported in Baghdad (2233 cases), followed by Basra (747 cases) and Najaf (318 cases). ،Although the samples are relatively large compared to our study, they reached the same. (13)

current study revealed that 87.8% of participants have no smoking history. But This does not mean smoking does not affect people with COVID-19 or increase the severity of the disease. These percentages could be because most of the participants in this study were women and young. Tobacco includes additives that disrupt the regular epithelial lining of the respiratory system and impair mucociliary clearance. This may be because tobacco smoke suppresses the feature of innate immune cells, consisting of respiratory epithelium, alveolar surfactant, macrophages, neutrophils, and lymphocytes. This can make smokers more vulnerable to developing complications of COVID-19 like pneumonia. (Htun *et al.*, 2021)

Regarding the presentation of COVID-19, current data reported Fever in 78.5%, cough in 51.7%, headache in 78.5% & fatigue in 66.7% which were the most prevalent symptoms of patients. When compared with a previous study in China and Myanmar, the same results were concluded: fever (88.0%), followed by dry cough (70.2%), and fatigue (42.8%) (Guan *et al.*, 2020). Another study recorded percentages of fever at 54.1%, loss of smell at 50.3%, and cough at 30.9%. (Htun *et al.*, 2021) The initial manifestation of fever in COVID-19 in the first week during the viral phase of the disease is likely a manifestation of the body's immune response to viral replication to boost immunity. (Gul, Htun and Inayat, 2021)

Medical comorbidities distribution among study group present results showed that past medical history of hypertension presented in 11.8% of patients while diabetes mellitus represented 9%, asthma 5.5% & and CVD 4.9%. Other comorbidities were present in lower percentages. Compared with a similar study in China, out Of the 856 patients, 242 (28.3%) had comorbidities, including hypertension 142 [16.6%], diabetes mellitus 64 [7.5%], cardiac disease 13 [1.5%], chronic hepatitis B 27 [3.1%].

, malignancies 8 [0.9%], chronic kidney disease 7 [0.8%], and COPD 5 [0.6%]. (Ye *et al.*, 2020)

The reason why people with high blood pressure may be at higher risk of contracting the coronavirus is unknown. One possibility is a connection between high blood pressure and the immune system. Long-term health problems and aging weaken the immune system, making it less able to fight off the virus. Almost two-thirds of people over sixty have high blood pressure. Another possibility is that the higher risk is not due to high blood pressure but to some drugs used to treat ACE inhibitors and angiotensin receptor blockers(17).

COVID-19 infection disrupts homeostasis and glucose metabolism in patients with and without D.M. due to developing a cytokine storm (C.S.), ACE2 suppression,

and direct damage to pancreatic β-cells. (18) COVID-19 is associated with a high inflammatory burden, known as the inflammatory or cytokine storm, which causes vasculitis, myocarditis, and cardiac arrhythmia, which can exacerbate heart damage. (Aggarwal *et al.*, 2020)

 Present findings showed that the history of hospitalization was positive in 37 patients with past medical comorbidities, which is a highly significant statistical result compared to patients with no comorbidities. These findings were similar to the study conducted in January 2020, where 41 patients who tested positive for COVID-19 were admitted to a hospital in Wuhan, China, with slight variation in the number of patients due to a large sample (Sanyaolu *et al.*, 2020). In another study in Saudi Arabia, out of over l 35,284 COVID-19 patients, 81.8% were adults, and 21.7% were hospitalized. Compared to non-hospitalized patients, hospitalized patients had more women (52.1% vs. 47.3%, and an elevated incidence of diabetes mellitus, arterial hypertension, coronary artery disease, cancer, COPD, and asthma (Abolfotouh *et al.*, 2022).

Current data showed that those patients admitted to hospital 18 required ICU admission. Among them, 7 have hypertension, 4 have asthma & 3 have D.M.

Compared with previous studies in Saudi Arabia showed that patients have significantly higher rates of diabetes, hypertension, coronary artery disease, cancer, COPD, and asthma (Abolfotouh *et al.*, 2022).

Present data recorded that all ICU patients 18 required C-PAP 3.6%, while the other hospitalized patients 69 were on mask13.6%. Steroid treatment was given to 9% of patients with COVID-19. C-PAP therapy is commonly used in patients who have stopped breathing due to severe COVID-19 pneumonitis, including patients who are not likely to benefit from invasive mechanical ventilation (22). Corticosteroid use in patients with severe acute respiratory syndrome coronavirus 2 delayed viral clearance and did not result in a convincing improvement in survival. Therefore, corticosteroids should be cautiously used to treat COVID-19 (Wang *et al.*, 2021). A past study in China revealed that out of 214 patients, 34 (9%) were treated with corticosteroids (Li *et al.*, 2020).

In conclusion, the need for hospitalization was higher among COVID-19 patients with comorbidities, especially hypertension followed by diabetes,

asthma & CVD.

References

Abolfotouh, M. A. *et al.* (2022) 'Clinical characteristics and outcome of Covid-19 illness and predictors of in-hospital mortality in Saudi Arabia', *BMC Infectious Diseases*. Springer, 22(1), p. 950.

Aggarwal, G. *et al.* (2020) 'Association of cardiovascular disease with coronavirus disease 2019 (COVID-19) severity: a meta-analysis', *Current problems in cardiology*. Elsevier, 45(8), p. 100617.

Guan, W. *et al.* (2020) 'Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis', *European Respiratory Journal*. Eur Respiratory Soc, 55(5).

Gul, M. H., Htun, Z. M. and Inayat, A. (2021) 'Role of fever and ambient temperature in COVID-19', *Expert Review of Respiratory Medicine*. Taylor & Francis, 15(2), pp. 171–173.

Harrison, C. M. *et al.* (2023) 'Evaluating the virology and evolution of seasonal human coronaviruses associated with the common cold in the COVID-19 era', *Microorganisms*. MDPI, 11(2), p. 445.

Htun, Y. M. *et al.* (2021) 'Initial presenting symptoms, comorbidities and severity of COVID-19 patients during the second wave of epidemic in Myanmar', *Tropical Medicine and Health*. Springer, 49, pp. 1–10.

Jakhmola, S., Baral, B. and Jha, H. C. (2021) 'A comparative analysis of COVID-19 outbreak on age groups and both the sexes of population from India and other countries', *The Journal of Infection in Developing Countries*, 15(03), pp. 333–341.

Lamptey, E. (2021) 'Should breakthrough SARS-CoV-2 infection affect our confidence in the COVID-19 vaccines?', *Infection & Chemotherapy*. Korean Society of Infectious Diseases, 53(4), p. 676.

Landstra, C. P. and de Koning, E. J. P. (2021) 'COVID-19 and diabetes: understanding the interrelationship and risks for a severe course', *Frontiers in endocrinology*. Frontiers, 12, p. 649525.

Li, Q. *et al.* (2020) 'The Effect of Corticosteroids on Severe Patients of COVID-19: A retrospective study'.

Organization, W. H. (2022) 'WHO Director-General's opening remarks at the media briefing on COVID-19', *January*, 30.

Osibogun, A. *et al.* (2021) 'Outcomes of COVID-19 patients with comorbidities in southwest Nigeria', *PloS one*. Public Library of Science San Francisco, CA USA, 16(3), p. e0248281.

Sanyaolu, A. *et al.* (2020) 'Comorbidity and its impact on patients with COVID-19', *SN comprehensive clinical medicine*. Springer, 2, pp. 1069–1076.

Singh, M. K. *et al.* (2021) 'A meta-analysis of comorbidities in COVID-19: Which diseases increase the susceptibility of SARS-CoV-2 infection?', *Computers in biology and medicine*. Elsevier, 130, p. 104219.

Statsenko, Y. *et al.* (2022) 'Impact of age and sex on COVID-19 severity assessed from radiologic and clinical findings', *Frontiers in cellular and infection microbiology*. Frontiers Media SA, 11, p. 777070.

Wang, J. *et al.* (2021) 'The proportion and effect of corticosteroid therapy in patients with COVID-19 infection: A systematic review and meta-analysis', *PloS one*. Public Library of Science San Francisco, CA USA, 16(4), p. e0249481.

Wu, Y. *et al.* (2022) 'Incubation period of COVID-19 caused by unique SARS-CoV-2 strains: a systematic review and meta-analysis', *JAMA network open*. American Medical Association, 5(8), pp. e2228008–e2228008.

Ye, C. *et al.* (2020) 'Impact of comorbidities on patients with COVID-19: a large retrospective study in Zhejiang, China', *Journal of medical virology*. Wiley Online Library, 92(11), pp. 2821–2829.