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FROM SYMPTOMS TO SURVIVAL: TRACKING COVID-19 PATIENT OUTCOMES IN AN OUTPATIENT CLINIC

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OD SIMPTOMA DO PREŽIVLJAVANJA: PRAĆENJE ISHODA PACIJENATA SA KOVIDOM 19 U AMBULANTNOJ KLINICI

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ABSTRACT

Objective. The coronavirus disease 2019 (COVID-19) pandemic has significantly impacted public health, requiring a deeper understanding of its transmission, pathogenesis, and effective treatment strategies. This study aims to investigate the clinical outcomes of COVID-19 patients treated at an outpatient respiratory clinic, focusing on the impact of comorbidities on mortality rates.

Methods. We conducted a retrospective cohort study at Al-Zahra Hospital's outpatient respiratory clinic, involving 524 patients diagnosed with COVID-19 through PCR tests or CT scans. The study focused on evaluating changes in clinical status, laboratory parameters, vital signs, and 28-day mortality rates after treatment.

Results. An analysis of 524 COVID-19-confirmed participants demonstrated statistically significant correlations between mortality, history of cardiovascular disease, and diabetes ($p < 0.05$). However, the associations between mortality and diverse factors, such as gender, psychiatric disorders, neurological diseases, renal diseases, hypertension, and the number of vaccinations, were not statistically significant ($p > 0.05$).

Conclusion. The study revealed increased COVID-19-related mortality rates in individuals particularly with cardiovascular disease and diabetes. No substantial correlation was observed between mortality and age, gender, other illnesses, and laboratory data.

Key words: *COVID-19; outpatient clinics; hospital respiratory distress syndrome.*

SAŽETAK

Cilj. Pandemija kovida 19 značajno je uticala na javno zdravlje, zahtevajući dublje razumevanje njenog prenosa, patogeneze i efikasnih strategija lečenja. Ova studija ima za cilj da istraži kliničke ishode pacijenata obolelih od kovida 19 koji su lečeni u ambulantnoj klinici za respiratorne bolesti, sa posebnim fokusom na uticaj komorbiditeta na stope smrtnosti.

Metode. Sproveli smo retrospektivnu kohortnu studiju u ambulantnoj klinici za respiratorne bolesti bolnice Al-Zahra, u kojoj su učestvovala 524 pacijenta kojima je dijagnostikovan kovid 19 PCR testovima ili CT skeniranja. Studija se fokusirala na procenu promena u kliničkom statusu, laboratorijskim parametrima, vitalnim znakovima i stopama smrtnosti nakon 28 dana lečenja.

Rezultati. Analiza 524 učesnika sa potvrđenim kovidom 19 pokazala je statistički značajne korelacije između smrtnosti, istorije kardiovaskularnih bolesti i dijabetesa ($p < 0,05$). Međutim, veze između smrtnosti i različitih faktora kao što su pol, psihijatrijski poremećaji, neurološke bolesti, bubrežne bolesti, hipertenzija i broj vakcinacija nisu bile statistički značajne ($p > 0,05$).

Zaključak. Studija je pokazala povećane stope smrtnosti povezane sa kovidom 19 kod osoba sa kardiovaskularnim bolestima i dijabetesom. Nije primećena značajna korelacija između smrtnosti i starosti, pola, drugih bolesti i laboratorijskih podataka.

Ključne reči: *kovid 19, ambulantna klinika; respiratorni distres sindrom.*

INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has emerged as a new infectious disease with global implications in 2019. The pandemic has profoundly impacted public health and social and economic aspects of society, necessitating a better understanding of its transmission, pathogenesis, and mitigation strategies (1, 2). A positive-sense single-stranded RNA virus, SARS-CoV-2, transmits primarily through respiratory droplets and aerosols (3). Viruses cause a wide range of symptoms, with higher morbidity and mortality rates among the elderly and those suffering from pre-existing medical conditions (4).

There are a variety of symptoms associated with COVID-19, including fever, cough, nausea, vomiting, and diarrhea. The disease can progress from an asymptomatic state to a severe acute respiratory distress syndrome (ARDS) and multi-organ failure if the lungs are affected (5). The cytokine storm, caused by the host immune response to SARS-CoV-2, is the primary factor leading to ARDS and multi-organ failure, with pro-inflammatory factors such as IL1, TNFα, and IL6 playing significant

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roles in these complications (6). Despite the lack of a definitive COVID-19 treatment, some medications can be beneficial. Therapeutic intervention with anti-inflammatory and antiviral drugs may improve patient outcomes and decrease mortality in the severe stage of the disease. It is generally recommended that patients be hospitalized at this point (7-10).

In Iran, temporary respiratory clinics were established during the pandemic to address the relative shortage of hospital beds while adhering to physical and personal isolation principles (11). Corticosteroids, remdesivir, and anticoagulants were administered to patients with defined indications in these clinics (8, 9). COVID-19 walk-in clinics had become a valuable resource for managing the pandemic by providing patients with accessible testing and treatment options. Despite their benefits, these clinics had limitations. These limitations included limited resources, inadequate care for severe cases, infection control challenges, reliability of rapid tests, accessibility issues, and continuity of care (12-15). We aim to improve this situation by spatially separating the respiratory clinic from the areas designated for daily patient consultations with internists. Due to the scarcity of research on COVID-19 patients admitted to temporary clinics, this study aimed to assess changes in clinical status, laboratory parameters, and vital signs of these patients. Additionally, the study aimed to evaluate the outcomes, specifically the 28-day mortality rates, for patients who were provisionally admitted to the walk-in clinic at Al-Zahra Hospital in Isfahan city for pharmacological interventions and consultations with medical specialists.

PATIENTS AND METHODS

Our retrospective cohort study evaluated patients referred to Al-Zahra Hospital's outpatient respiratory clinic. Patients were eligible for inclusion if they had a confirmed COVID-19 diagnosis based on a positive polymerase chain reaction (PCR) test from oropharyngeal samples or computed tomography (CT) scan findings consistent with the disease. Furthermore, the study required written informed consent. We excluded patients from the study if their condition included diminished consciousness, hemodynamic irregularities, respiratory rates exceeding 30 breaths per minute, incomplete medical documentation, low saturation of peripheral oxygen (SPO2) levels, contraindications to our prescribed medication, or refusal to provide written informed consent.

This study was supervised and approved by the board members of the Internal Medicine Department of the Internal Medicine Department of Isfahan University, on behalf of the Ethical Committee of Isfahan University of Medical Sciences (IR.ARI.MUI.REC.1400.102). Informed consent was obtained from all participants in the study. Written informed consent for publication was secured from the patients.

The participants were enrolled into this study based on their initial hospitalization date for COVID-19 treatment, using an open-cohort design. Based on the study criteria, we identified a group of eligible patients who had received outpatient treatment for COVID-19 between 2021 and 2022. We collected personal and clinical data from these participants. The information collected included the patient's gender, age, chief complaint, the onset of symptoms, and accompanying symptoms. Furthermore, we obtained information regarding the patient's medical history and vaccination status.

As part of the study protocol, the admitting physician documented patients' shortness of breath and vital signs during visits for up to four days. They also recorded the results of liver and kidney function tests, blood sugar measurements, inflammatory markers, and complete blood counts conducted on the first and fourth days of the visit. Moreover, details about the type and dosage of medications administered to patients were noted in their files.

Using established criteria, a radiology attending physician evaluated the imaging results for patients who had undergone High Resolution Computed Tomography (HRCT). Each lung was separately evaluated according to COVID-19 severity scoring systems , and scored as results revealed no lung involvement (0%), mild lung involvement (1-25%), moderate involvement (26-50%), severe involvement (51-75%), and critical lung involvement (76-100%) (16, 17).

A combination of corticosteroids, remdesivir, and anticoagulants was administered to patients who met the defined criteria. An internist conducted routine clinical evaluations, vital sign assessments, and laboratory evaluations, as well as measurements of SPO2 via pulse oximetry. The patients were recommended for inpatient hospitalization if their SPO2 declined to levels below 90% in a room atmosphere, their dyspnea severity increased, their clinical status did not improve, they developed organ failure, their respiratory rate exceeded 30 breaths per minute, or their inflammatory markers elevated. For severe cases or those presenting with moderate disease displaying clinical or radiographic signs of lower respiratory tract complications (with SPO2≥94%) and a high risk of disease progression, Remdesivir was prescribed: 200 mg IV on the first day followed by 100 mg daily for four days (five days in total). In addition to the elderly, the patients with comorbidities such as chronic obstructive pulmonary disease, cardiovascular disease, type-2 diabetes, obesity (body mass index ≥ 30), sickle cell anemia, chronic kidney disease, malignancies, or immunocompromised following organ transplants were

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also considered at elevated risk for disease progression. For hypoxic patients requiring supplemental oxygen, corticosteroid treatment was prescribed, including IV dexamethasone at 8 mg daily, oral prednisolone at 50 mg daily, or IV methylprednisolone at 40 mg daily. It was decided whether to prescribe oral or IV anticoagulants based on clinical judgment and renal function. Potential options included 5000 U subcutaneous heparin two to three times daily, 40 mg daily subcutaneous enoxaparin, and 10 mg daily oral rivaroxaban.

Following treatment, we conducted telephone follow-ups with patients 7 and 28 days after treatment to determine their clinical status. In particular, we monitored the patients' overall health, hospitalization, ICU admission, mortality, and return to work.

Study samples were collected from the outpatient COVID-19 clinic patient files using convenience sampling. Additionally, follow-up telephone calls were made 7 and 28 days after completing the patients' treatment to collect additional data. The collected data was entered into SPSS software for analysis. The quantitative data were presented as mean and standard deviation, and the independent t-test was used to compare the results. Qualitative data were expressed as numbers and percentages, with the chi-square test used to compare them. Statistical significance was determined by a p-value less than 0.05 in our study.

RESULTS

We evaluated a total of 524 participants, with a mean age of 46.75 ± 14.13 years, ranging from 14 to 81 years. Patient demographic data, underlying diseases, and symptoms at presentation are summarized in Table 1.

Among the participants, 184 individuals (35.2%) had not received any COVID-19 vaccine doses, 212 (40.6%) had received one dose, 125 (23.9%) had received two doses, and only one individual (0.2%) had received three doses. Of 337 vaccinated participants, Sinopharm was the most commonly administered vaccine, given to 274 participants (81.3%), followed by AstraZeneca (8.9%), COVIran Barekat (8.0%), and Sputnik (1.8%). However, 35.7% of participants (187 cases) had no recorded vaccine type.

Among 523 cases, HRCT results revealed no lung involvement in 44 participants (8.4%). Mild lung involvement was present in 181 cases, moderate involvement in 166 cases (31.7%), severe involvement in 118 cases (22.6%), and critical lung involvement in 14 cases (2.7%).

In our study, survivors (n=518) had a mean age of 46.57 ± 13.97 years, while non-survivors (n=6) had a mean age of 61.83 ± 20.99 years, and the 15.26 years difference revealed no significant difference (p = 0.135).

Table 1. Descriptive statistics of mortality and ICU admission variables for patients.

Variable		Number (percentage)
Gender		
Male		260 (49.6%)
Female		264 (50.4%)
Age		
<20		9 (1.7%)
20-29		38 (7.3%)
30-39		139 (26.5%)
40-49		130 (24.8%)
50-59		99 (18.9%)
60-69		75 (14.3%)
>=70		34 (6.5%)
Underlying diseases		
Mental disorders	No	499 (95.4%)
	Yes	24 (4.6%)
Neurologic disorders	No	514 (98.3%)
	Yes	9 (1.7%)
Renal disease	No	497 (95.0%)
	Yes	26 (5.0%)
Ichemic heart disease	No	475 (90.8%)
	Yes	48 (9.2%)
Hypertension	No	437 (83.6%)
	Yes	86 (16.4%)
Diabetes mellitus	No	458 (87.6%)
	Yes	65 (12.4%)
Other diseases		
Asthma		9 (12.5%)
Hypothyroidism		7 (9.7%)
Dyslipidemia		5 (6.9%)
Fatty liver		3 (4.2%)
Systemic lupus erythematosus		3 (4.2%)
Thrombocytopenia		2 (2.8%)
Seizure		4 (5.6%)
Cancer		7 (9.7%)
Anemia		3 (4.2%)
Minor thalassemia		2 (2.8%)
Rheumatoid arthritis		2 (2.8%)
Others		25 (34.7%)
Symptoms		
Dyspnea	No	139 (26.6%)
	Yes	383 (73.4%)
Weakness	No	62 (11.9%)
	Yes	460 (88.1%)
Vomiting	No	452 (86.6%)
	Yes	70 (13.4%)
Diarrhea	No	444 (85.1%)
	Yes	78 (14.9%)
Chest pain	No	248 (47.5%)
	Yes	274 (52.5%)
Myalgia	No	121 (23.2%)
	Yes	401 (76.8%)
Cough	No	89 (17.0%)
	Yes	433 (83.0%)
Fever	No	96 (18.4%)
	Yes	426 (81.6%)

Associations between mortality and various health conditions are summarized in Table 2. In our study, ischemic heart disease (IHD) and diabetes mellitus (DM) were significantly higher in non-survivor cases (p = 0.012

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Table 2. Association between mortality and underlying health conditions.

Variable		Fatal outcome		p
		No	Yes	
Gender	Male	255 (98.1%)	255 (98.1%)	0.120
	Female	263 (99.6%)	1 (0.4%)	
Mental disorders	No	493 (94.0%)	6 (1.0%)	1.000
	Yes	24 (100.0%)	0 (0.0%)	
Neurologic disorders	No	508 (98.8%)	6 (1.2%)	1.000
	Yes	9 (100.0%)	0 (0.0%)	
Renal disease	No	492 (99.0%)	5 (1.0%)	0.256
	Yes	25 (96.2%)	1 (3.8%)	
Ishemic heart disease	No	472 (99.4%)	3 (0.6%)	0.012
	Yes	45 (93.8%)	3 (6.2%)	
Hypertension	No	433 (99.1%)	4 (0.9%)	0.257
	Yes	84 (97.7%)	2 (2.3%)	
Diabetes mellitus	No	455 (99.3%)	3 (0.7%)	0.028
	Yes	62 (95.4%)	3 (4.6%)	

numbers represent absolute frequency (percentage); p-probability

Table 3. Association between mortality and symptoms at presentation.

Variable		Fatal outcome		p
		No	Yes	
Dyspnea	No	137 (98.6%)	2 (1.4%)	0.659
	Yes	379 (99.0%)	4 (1.0%)	
Weakness	No	61 (98.4%)	1 (1.6%)	0.534
	Yes	455 (98.9%)	5 (1.1%)	
Vomiting	No	446 (98.7%)	6 (1.3%)	1
	Yes	70 (100.0%)	0 (0.0%)	
Diarrhea	No	438 (98.6%)	6 (1.4%)	0.598
	Yes	78 (100.0%)	0 (0.0%)	
Chest pain	No	243 (98.0%)	5 (2.0%)	0.107
	Yes	273 (99.6%)	1 (0.4%)	
Myalgia	No	119 (98.3%)	2 (1.7%)	0.627
	Yes	397 (99.0%)	4 (1.0%)	
Cough	No	87 (97.8%)	2 (2.2%)	0.272
	Yes	429 (99.1%)	4 (0.9%)	
Fever	No	96 (100.0%)	0 (0.0%)	0.598
	Yes	420 (98.6%)	6 (1.4%)	

numbers represent absolute frequency (percentage); p-probability

and p = 0.028, respectively). Gender, psychologic disorders, neurologic disorders, renal disease, and HTN were not significantly different between mortality groups (Table 2).

The relative risk of COVID-related mortality in patients with diabetes was 7.04 times higher than in those without diabetes (p = 0.015, 95% CI: 1.45–34.18). Similarly, the patients with ischemic heart disease (IHD) had a 9.89 times higher risk of mortality compared to those without IHD (p = 0.0043, 95% CI: 2.05–47.68). On the other hand, as summarized in Table 3, we found no statistically significant correlations between mortality and different patient symptoms at onset (p > 0.05) (Table 3).

Table 4 summarizes the results of association between COVID-19 vaccination status, number of doses, type of vaccine, and mortality outcomes. A significant correlation was observed between mortality and increased levels of

Table 4. Association between COVID-19 vaccination status, number of doses, vaccine type, and mortality.

Variable		Fatal outcome		p
		No	Yes	
Vaccinations	Done	333 (98.5%)	5 (1.5%)	0.671
	Not done	183 (99.5%)	1 (0.5%)	
Number of vaccinations	0	183 (99.5%)	1 (0.5%)	0.347
	1	210 (99.1%)	2 (0.9%)	
	2	122 (97.6%)	3 (2.4%)	
	3	1 (100.0%)	0 (0.0%)	
Type of vaccine	Sinopharm	269 (98.2%)	5 (1.8%)	1.000
	Barekat	27 (100.0%)	0 (0.0%)	
	Astrazeneca	30 (100.0%)	0 (0.0%)	
	Sputnik	6 (100.0%)	0 (0.0%)	
Lung involvement*	0%	42 (95.5%)	2 (4.5%)	< 0.001
	1–25%	181 (100.0%)	0 (0.0%)	
	26–50%	165 (99.4%)	1 (0.6%)	
	51–75%	118 (100.0%)	0 (0.0%)	
	76–100%	11 (78.6%)	3 (21.4%)	
ICU admission	No	510 (100.0%)	0 (0.0%)	< 0.001
	Yes	8 (57.1%)	6 (42.9%)	
Dyspnea	Mild	199 (99.5%)	1 (0.5%)	0.06
	Moderate	125 (100.0%)	0 (0.0%)	
	Severe	141 (97.2%)	4 (2.8%)	
	Critical	30 (96.8%)	1 (3.2%)	
Dyspnea severity		4.88 ± 2.44	6.67 ± 1.86	0.075

numbers represent absolute frequency (percentage); p-probability; *high resolution computer tomography

Table 5. Association between laboratory parameters and mortality.

Variable	Fatal outcome		p
	No	Yes	
CRP Day 1	42.14 ± 32.45	54.00 ± 42.93	0.531
CRP Day 4	13.37 ± 15.39	58.00 ± 35.93	0.164
ALT Day 1	40.15 ± 25.59	57.00 ± 36.43	0.259
ALT Day 4	55.68 ± 42.64	73.00 ± 48.75	0.484
AST Day 1	35.40 ± 16.73	64.67 ± 64.42	0.514
AST Day 4	38.43 ± 21.27	76.00 ± 48.14	0.309
BUN Day 1	15.14 ± 5.92	26.50 ± 14.34	0.211
BUN Day 4	17.70 ± 4.71	49.67 ± 27.15	0.178
Creatinine Day 1	1.10 ± 0.20	1.63 ± 0.78	0.268
Creatinine Day 4	1.01 ± 0.16	2.50 ± 1.04	0.132
Blood Sugar Day 1	133.29 ± 57.45	169	0.536
Blood Sugar Day 4	141.16 ± 58.51	253.50 ± 106.77	0.376
SpO_2 Day 1	92.96 ± 2.63	92.50 ± 2.38	0.729
SpO_2 Day 4	93.80 ± 2.66	94	0.942
PR Day 1	89.95 ± 16.57	92.50 ± 19.19	0.76
PR Day 4	80.96 ± 14.24	85	0.777

numbers represent the mean ± standard deviation; p-probability; laboratory parameters were measured on Day 1 (admission) and Day 4 (follow-up). Reference ranges and units are as follows: CRP (mg/dL, reference range: 1-7); ALT (U/L, reference range: 10-41); AST (U/L, reference range: 10-40); BUN (mg/dL, reference range: 8.8-20.5); Creatinine (mg/dL, reference range: 0.86-1.4); Blood Sugar (mg/dL, reference range: 70-135); SpO_2 (%, reference range: 95-100); PR (Pulse Rate, beats/minute, reference range: 60-100). Abbreviations: CRP, C-reactive protein; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BUN, blood urea nitrogen; SpO2, oxygen saturation; PR, pulse rate.

lung involvement on HRCT, as well as ICU admission (P < 0.001). Interestingly, unvaccinated individuals exhibited a slightly lower mortality rate compared to vaccinated

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individuals; however, this difference was not statistically significant. Notably, a statistically significant age disparity was identified between vaccinated and unvaccinated patients, with the mean age of vaccinated individuals being 49.09 ± 14.25 years, compared to 42.15 ± 12.53 years for unvaccinated individuals ($P < 0.001$) (Table 4).

Various laboratory parameters, including CRP, ALT, AST, BUN, creatinine, BS, SpO_2, and PR, were assessed for their association with mortality. While statistically significant changes were observed in CRP, ALT, BUN, creatinine, BS, SpO2, and PR between day 1 and day 4 of hospitalization ($p < 0.05$), no significant differences in these parameters were identified between survivors and non-survivors. AST showed a slight, non-significant increase (mean difference: -2.64 ± 20.69, 95% CI: -5.30 to 0.009, $p = 0.051$), and respiratory rate exhibited no significant change (mean difference: 0.60 ± 3.33, 95% CI: -1.25 to 2.45, $p = 0.497$) between day 1 and day 4. A detailed summary of the analysis is provided in Table 5.

DISCUSSION

This investigation examined a cohort of 524 patients diagnosed with COVID-19 using PCR tests or CT scan results. A significant portion of the study participants presented with at least one comorbidity, with hypertension, diabetes, and cardiovascular disease being the most frequently observed conditions among them.

Abolfathi and associates reported a high prevalence of comorbidities in their study, with hypertension and diabetes being the most common (18). This finding is consistent with multiple other investigations documenting higher occurrences of these comorbidities in COVID-19 patients (4, 19). Such studies highlight the importance of understanding the role of comorbidities in COVID-19 infection and their potential impact on patient outcomes.

The elevated incidence of comorbidities among individuals with severe COVID-19 can be attributed to the impact of these conditions on the immune system and the body's capacity to withstand various diseases. For instance, patients with hypertension and diabetes often exhibit compromised immune systems, resulting in a diminished ability to mount an effective immune response against pathogens, including the SARS-CoV-2 virus (20, 21). Additionally, cardiovascular disease can impair the body's ability to cope with the added stressors of a viral infection, potentially leading to more severe outcomes (22). Thus, the high prevalence of comorbidities among COVID-19 patients is a significant finding that warrants further investigation to better understand the interplay between these conditions and the progression of the disease.

In this investigation, the mean age of COVID-19-related survivors was not significantly different with non-survivors, although non-survivors were approximately 15 years older. In contrast, individuals who were not vaccinated had a slightly lower mortality rate. Further investigation revealed significant age gap between survivors and non-survivors who received COVID-19 vaccines, suggesting the probable confounding effect of death in older ages. It is worth noting that disparities in age thresholds in our study and across different studies may be attributable to variations in lifestyle and genetic factors among populations (23). These factors can influence the development of comorbidities and immune system changes, affecting COVID-19-related mortality rates.

This study found no significant association between a history of psychiatric illness and mortality in COVID-19 patients. One potential explanation for this finding is that individuals with psychiatric disorders might have immune and cardiovascular system function comparable to healthy individuals without comorbidities, leading to a similar physiological response to the virus. Additionally, our patients were not classified in terms of their detailed diagnosis of mental disorders as part of the current study.

Several investigations propose that individuals with pre-existing psychiatric illnesses and who take psychiatric drugs may be at higher risk of contracting COVID-19 (24). However, conflicting findings have also been reported. Various studies suggest a correlation between psychiatric disorders and susceptibility to COVID-19 (23-25). However, some other research suggests that there may not always be a strong association between these factors (26). More studies are being conducted to better understand the actual relationship between psychiatric illnesses and COVID-19 risk. It is crucial to consider that comorbidities and other illnesses in individuals with psychiatric disorders, as in the general population, can influence mortality outcomes. For example, individuals with psychiatric disorders may have a higher prevalence of lifestyle-related comorbidities, such as obesity or substance use disorders, which can contribute to a more severe course of COVID-19 and potentially increased mortality rates (23, 27).

We observed that the mortality rate among males was over five times greater than among females; however, no significant association was identified between gender and mortality in COVID-19 patients. This finding may seem counterintuitive, as one might expect that a higher mortality rate in one gender would translate into a significant association with mortality.

Mohammadi Farid and associates similarly found that, although females were more prone to comorbidities, gender was not correlated with mortality in COVID-19 patients (28). Conversely, Khan and associates reported a higher prevalence rate of COVID-19 in males but a higher mortality rate in females, with gender playing a significant role in predicting mortality (29).

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The discrepancies observed across studies concerning the influence of gender on COVID-19 mortality may be attributable to various factors. For instance, variations in healthcare and treatment conditions between genders in different societies could contribute to these differing findings (30). Additionally, disparities in comorbidities and other factors affecting mortality between the sexes, such as lifestyle factors, genetic predispositions, and immune system differences, may also play a role in the observed discrepancies (31).

Mortality on the first day of symptom documentation was not associated with either SpO_2 or heart rate. Consequently, mortality was not associated with SpO_2 or lung involvement in the early stages of the disease where there was no significant drop in SpO_2.

The lack of a relationship could be due to differences in the timing of symptom recording concerning disease onset among individuals. It is possible that some patients had their symptoms recorded earlier in the disease course. In contrast, others might have had their symptoms recorded later, leading to a wide range of values for these parameters. This variation in timing could obscure any potential relationship between these parameters and mortality.

Additionally, other factors, such as the presence of comorbidities, age, immune system function, and treatment modalities, may significantly impact mortality outcomes more than arterial oxygen pressure or heart rate alone (32). As a result, the lack of association between these parameters and mortality could also be due to the influence of these other factors.

Across multiple studies and countries, the impact of comorbidities on mortality and various COVID-19 complications has been found to be inconsistent, although all generally confirm the influence of these diseases on mortality outcomes. In the present study, comorbidities also played a role in mortality, with a history of cardiovascular disease and diabetes emerging as the most critical factors contributing to increased mortality.

These findings are consistent with research conducted by Huang and associates (33) and numerous other studies (28, 34, 35), which have demonstrated a significant association between the presence of cardiovascular disease and diabetes and higher mortality rates in COVID-19 patients. The significance of these two diseases may be related to their long-term effects on the circulatory system, the cumulative damage they inflict on various organs, and the potential for fluctuations in blood sugar and pressure to cause complications during viral infection (9, 10).

Cardiovascular disease and diabetes can both lead to endothelial dysfunction, inflammation, and impaired immune response, which may exacerbate the severity of COVID-19 (36). Moreover, COVID-19 has been shown to directly affect the cardiovascular system, causing myocardial injury, arrhythmias, and thromboembolic events (37). Patients with pre-existing cardiovascular disease and diabetes may be at greater risk of these complications, further increasing their mortality risk.

In conclusion, the present study supports the notion that comorbidities, particularly cardiovascular disease, and diabetes, play a significant role in COVID-19-related mortality. These findings align with previous research, highlighting the importance of considering the presence of these comorbidities when assessing patient prognosis and determining appropriate treatment strategies.

Some limitations should be acknowledged in this study. Firstly, the sample size is small, and the participants were recruited from a single center using convenience sampling. Consequently, the findings may be different from the greater population, and sampling bias may affect generalizability. Furthermore, the retrospective study design relied on patients' previous medical histories, which could be subject to recall bias, leading to inaccurate information. Moreover, telephone follow-ups of patients may also be subject to recall bias, resulting in inaccurate details about their treatment. These factors may lead to misclassification and, ultimately, biased findings.

The study also limits the identification and adjustment of several critical confounding variables, such as socioeconomic status, lifestyle, and access to healthcare. The variables were collected primarily from walk-in clinic patients, so they could not be compared to hospitalized patients. The presence of these limitations tends to reduce the validity of the results and their generalizability. Therefore, future studies could consider employing a prospective, multi-center design, using random sampling, collecting more comprehensive data on potential confounders, and employing other similar patients to improve the quality and reliability of the findings. These measures would enable researchers to adjust for potential confounding variables and ensure valid, reliable, and generalizable results.

In conclusion, there was no significant association between age, gender, history of illnesses, or symptoms and mortality, except for DM and IHD. Similarly, vital signs and laboratory findings did not differ significantly with respect to the mortality status of COVID-19 patients. However, significant changes were observed in these parameters between days 1 and 4 of hospitalization, except for AST and respiratory rate, which remained unchanged.

NOTES

Availability of Data:

Data supporting the conclusions of this study can be provided by the corresponding author upon a valid request. Certain data may be restricted due to privacy or

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ethical constraints. The authors ensure that all relevant data are included within the article or its supplementary information files.

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