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RESEARCH

Trends in Pulmonary and Respiratory Medicine

COVID-19 in Najran Region, Saudi Arabia: Demographic, Clinical, Laboratory Profile, Radiological Presentation, Predictors, and Outcomes

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Abstract

Background: *On December 31st, 2019, the World Health Organization (WHO) office was alarmed with several pneumonia cases of etiology of unknown origin before, emerging in Wuhan, Hubei Province of China. However, the first case of COVID-19 in the KSA was reported on 2nd March 2020 from Qatif, an eastern region through a Saudi citizen who had recently visited Iran.*

Methods: *A multi-center, retrospective cross-sectional study was conducted on confirmed COVID-19 admitted patients between April 1st, 2020 until August 30th, 2020. The data were extracted from medical records and analyzed using Statistical packages IBM SPSS (V. 20).*

Results: *The results for 1245 patients showed that the mean age of confirmed patients was 48 ± 18 years, and most of them were Saudi nationals and females. The most commonly observed symptoms were fever (71.5%), cough (66.6%), and shortness of breath (47.8%). The hematological parameters showed that neutrophils and lymphocytes were above the normal reference ranges (mean of 20 × 10^9/L and 6 × 10^9/L, respectively). D-dimer was significantly higher (mean of 1548 ng/mL) in all cases, while prothrombin time and activated partial thromboplastin time marginally increased (mean of 15 and 38, respectively). This study demonstrated that the most commonly identified comorbidities were diabetes mellitus (23.2%), hypertension (18.6%), and lung diseases (4.0%). The fatality rate of COVID-19-positive patients was 5.8%, which was lower than that in previously reported studies. The significant factors associated with death were age, liver diseases, kidney diseases, and concomitant bacterial infection.*

Conclusion: *The summary of common complications, lab results, CT features, and risk factors of death (e.g., age, renal diseases, liver diseases, and secondary bacterial infection) could help medical personnel better manage patients who may develop severe conditions or death.*

Keywords: *Demographic, Clinical, Risk Factors, Outcome, COVID-19, Najran*

Abbreviations: *COVID-19: Coronavirus Disease 2019, WHO: World Health Organization, KSA: Kingdom of Saudi Arabia, IBM: International Business Machines Corporation, SPSS: Statistical Package for the Social Sciences, CT: Computed Tomography, 2019-nCoV: Novel Coronavirus, SARS- CoV-2: Severe Acute Respiratory Syndrome Coronavirus-2, MOH: Ministry of Health, HCWs: Healthcare Workers, RT-PCR: Reverse Transcription Polymerase Chain Reaction, SD: Standard Deviation, HIV: Human Immunodeficiency Virus, SPO2: Saturation of Peripheral Oxygen, ESR: Erythrocyte Sedimentation Rate, PT: Prothrombin Time, PTT: Partial Thromboplastin Time, MERS-CoV: Middle East Respiratory Syndrome Coronavirus, OR: Odds Ratio, CI: Confidence Interval, CDC: Centers for Disease Control, DM: Diabetes Mellitus, WBCs: White Blood Cells, RBCs: Red Blood Cells, ALT: Alanine Transaminase, LDH: Lactate Dehydrogenase, ICU: Intensive Care Unit, AST: Aspartate Aminotransferase, BUN: Blood Urea Nitrogen, CRP: C-Reactive Protein, Rh−: Rhesus Negative, U.S.: United States, CFR: Case Fatality Rate*

Introduction

On December 31st, 2019, the World Health Organization (WHO) office was alarmed by several pneumonia cases of unknown origin that emerged in Wuhan, Hubei Province of China [1]. On January 7th, 2020, the Chinese health authorities confirmed that this cluster was associated with a novel coronavirus, and it was called 2019-nCoV [2]. Subsequently, the task of experts from the International Committee on Taxonomy of Viruses named it severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [3] owing to similarities to SARS-CoVs, which caused the SARS outbreak in 2003. In February 2020, WHO named the disease caused by SARS-CoV-2 as COVID-19, which stands for coronavirus disease 2019 [4]. Owing to the rapid spread of COVID-19 and the steep rise in morbidity and mortality it caused, the World Health Organization (WHO) declared it a global pandemic on March 11, 2020 [5].

The first case of COVID-19 in KSA was reported on March 2nd, 2020 in an eastern region Qatif in a Saudi citizen who had recently visited Iran. At the time, Iran had already reported multiple cases of COVID-19. Further, the second case was reported on March 4th, 2020 in a person who was in contact with the first case [6]. Concomitantly, until June 27th, 2020, approximately 170,639 confirmed cases had been reported throughout KSA with 1428 deaths, as announced by the Saudi Ministry of Health (MOH) [7].

Clinical presentation of COVID-19 ranges from asymptomatic [8-10], mild symptoms to severe illness and death [11-13]. The main symptoms are fever, cough, fatigue, shortness of breath, anorexia, and the presence of invasive lesions in bilateral lungs [14-16]. Some patients may develop complete respiratory failure and require intensive care for mechanical ventilation [11,17,18]. Evidence suggests that symptoms may develop 2–14 days after getting infected with the virus, and the mean incubation period is 5 days [19-22].

At the early stage of the COVID-19 pandemic, the World Health Organization (WHO) reported that most estimated COVID-19 fatality ratios were based on cases detected through surveillance and calculated using crude methods, which resulted in widely variable estimates of the case fatality ratio by country, i.e., from less than 0.1% to over 25% [23]. The government officials in all countries continued to make efforts to minimize human contact by facilitating countrywide shutdowns of public places, and various steps were initiated to ensure the safety of the people, e.g., social distancing and self-quarantine, which limited social interactions. The avoidance of COVID-19-recovered patients may be due to the fear of contracting the virus. To overcome this situation, an epidemiological survey focusing on the health status of COVID-19-recovered patients should be performed for the betterment of society. Knowing the possible complications of its after effect from the recovered patients will help to ascertain future disease complications and will provide more information for the development of vaccines and drugs for these types of pandemics in the future. Additional research is required on the diagnostic and therapeutic approaches to develop vaccines and drugs [24].

Since the introduction of COVID-19 in Najran Region and until March 2021, there have been few studies concerned with COVID-19 not from the clinical aspects. For example, the study conducted by Al Sulayyim *et al.* that evaluated the knowledge of HCWs about this new disease [25]. Therefore, this study aims to identify the epidemiological, clinical, laboratory profile, radiological presentation as well as the case fatality rate and associated factors of approximately 1245 COVID-19-positive cases in Najran Province, KSA and try to develop better understanding about it.

Materials and methods

A retrospective record-based study was conducted in Najran Region, KSA on all confirmed COVID-19 patients who were admitted to 5 governmental hospitals (two referral hospitals: King Khalid hospital Najran and New Najran General Hospital, and three general hospitals: Sharourah General Hospital, Yadamah General Hospital, and Hubuna General Hospital) between April 1, 2020 until August 30th, 2020. The data were obtained from medical records, nursing notes, laboratory and radiological results at the hospitals. We gathered demographic, clinical, laboratory, radiology, and outcome data.

This study was approved by the Institutional Review Board at Najran General Directorate of Health Affairs with approval number 2020-07 E.

Patients were included in this study if they were admitted to one of the 5 governmental hospitals and diagnosed with positive RT-PCR COVID-19 results. Nasopharyngeal swabs were obtained by a trained HCW and sent to the regional laboratory in Jeddah, KSA and Najran regional laboratory. Additionally, the RT-PCR test was repeated in case of false positive, weak positive, or suspicious results.

Table 1. *Demographic, clinical presentation (signs/symptoms), and comorbidities of 1245 confirmed COVID-19 cases admitted to the hospitals.*

Demographics		N	%
Age, mean ± SD		48 ± 18	
Nationality	Saudi	652	52.4
	Non-Saudi	593	47.6
Gender	Male	367	29.5
	Female	878	70.5
Healthcare worker	Yes	47	3.8
Clinical presentation			
Fever	Yes	890	71.5
Cough	Yes	829	66.6
Shortness of breath	Yes	595	47.8
Malaise	Yes	223	17.9
Sore throat	Yes	168	13.5
Headache	Yes	147	11.8
Diarrhea	Yes	135	10.8
Vomiting	Yes	125	10
Myalgia	Yes	85	6.8
Nausea	Yes	76	6.1
Abdominal pain	Yes	53	4.3
Chest Pain	Yes	49	3.9
Runny nose	Yes	45	3.6
Irritability/confusion	Yes	33	2.7
Arthralgia	Yes	21	1.7
Hemoptysis	Yes	9	0.7
Comorbidities			
Diabetes mellitus II	Yes	289	23.2
Hypertension	Yes	232	18.6
Lung diseases	Yes	50	4
Kidney diseases	Yes	30	2.4
Allergies	Yes	20	1.6
Liver diseases	Yes	13	1
HIV	Yes	7	0.6
Vital signs		Mean ± SD	
Temperature (°C)		37 ± 1	
Pulse rate (/minute)		92 ± 16	
Respiratory rate (/minute)		23 ± 9	
Blood pressure (mm Hg)	SYSTOLIC	131 ± 33	
	DIASTOLIC	77 ± 21	
SPO_2 (%)		93 ± 6	

Table 2. *Hematological, bio-chemistry, microbiological, and radiological results of 1245 confirmed COVID-19 cases admitted to the hospitals*

Blood routine parameter		**Mean**	**SD**
Red blood cells (mcL; normal range: 4.7–6.1)		5	1
Leucocytes (× 10^9 per L; normal range: 3.5–9.5)		8	13
Neutrophils (× 10^9 per L; normal range: 1.8–6.3)		20	36
Lymphocytes (× 10^9 per L; normal range: 1.1–3.2)		6	11
Monocytes (2.0–8.0%)		2	4
Eosinophils (0.0–6.0%)		0	1
Basophils (<1.0%)		0	1
Platelets (× 10^9 per L; normal range: 125.0–350.0)		242	104
Coagulation function			
D-dimer (ng/mL; normal range: <250)		1548	20906
Prothrombin time (normal range: 10.5–13.5)		15	7
Activated partial thromboplastin time (normal range: 21.0–37.0)		38	90
Blood biochemistry			
Albumin (g/L; normal range: 40.0–55.0)		20	16
Blood urea nitrogen (mmol/L; normal range: 3.6–9.5)		3	24
Serum creatinine (μmol/L; normal range: 57.0–111.0)		78	67
Total bilirubin (μmol/L; normal range: 1.71–20.5)		12	14
Direct (mg/dL; normal range: <5.1)		2	6
Indirect (mg/dL)		0	3
Creatine kinase (U/L; normal range: 50.0–310.0)		62	169
Alkaline phosphatase (ALP) (U/L; normal range: 44.0–147.0)		45	56
Alanine aminotransferase (ALT) (U/L; normal range: 9.0–50.0)		50	767
Aspartate aminotransferase (AST) (U/L; normal range: 15.0–40.0)		29	53
Sodium (mEq/L; normal range: 135–145)		136	13
Potassium mmol/L; normal range: 3.6–5.2)		5	13
Fibrinogen (factor I) (g/L; normal range: 2.0–4.0)		6	64
Lactate dehydrogenase (U/L; normal range: 120.0–250.0)		99	164
Serum amylase (U/L; normal range: 30–110)		18	39
Infection-related biomarkers		Mean	SD
C-reactive protein (mg/L; normal range: 0.0–5.0)		3	8
Erythrocyte sedimentation rate (mm/h; normal range: 0.0–15.0)		60	33
Chest X-ray and CT results		N	%
X RAY	No	904	72.6
	Unilateral pneumonia	269	21.6
	Bilateral pneumonia	72	5.8
CT SCAN	No	1131	90.8
	Unilateral pneumonia	11	0.9
	Bilateral pneumonia	103	8.3
Co-bacterial infection		N	%
No		1194	95.9
Yes		51	4.1

In terms of the severity of the disease, they were classified from mild to critical [26].

Mild to moderate: mild symptoms and mild pneumonia

Severe: dyspnea, hypoxia, or more than 50% lung involvement in imaging

Critical: respiratory failure, shock, or multi-organ system dysfunction

Statistical analysis

Data were described using frequency for categorical variables, mean, and standard deviation mean (±SD) for numerical variables. We used logistic regression to identify variables associated with the outcome of death or recovery. The variables involved demographic, blood group, underlying comorbidities, lifestyle (e.g., smoking habits), and concomitant bacterial infection. These variables were used in the univariate analysis and subsequently significant variables were included in the multivariate model. Statistical package IBM SPSS (release 20) was used to analyze the data. P value <0.05 was considered significant.

Results

A total of 1245 cases confirmed by RT-PCR and admitted were included in the final analysis. Demographic, clinical presentation (signs/symptoms), and comorbidities of 1245 confirmed COVID-19 admitted to the hospital cases are shown in (Table 1). The mean age of infected patients was 48 ± 18 years, and most of them were Saudi nationals and females. The vast majority were non-HCWs. In terms of clinical presentation, the most commonly reported symptoms were fever (71.5%), cough (66.6%), and shortness of breath (47.8%). Diabetes mellitus (DM) (23.2%) and hypertension (HTN) (18.6%) were the most common comorbidities; however, lung diseases (4.0%) and kidney diseases (2.4%) were relatively low. Respiratory rate had the largest variation from the normal values, and sometimes the rates were double the normal values.

Upon admission, red blood cells, leukocytes, monocytes, basophils, eosinophils, and platelets were within normal reference ranges in almost all patients, while neutrophils and lymphocytes were above normal reference ranges (mean of 20 × 10^9/L and 6 × 10^9/L respectively). D-dimer was significantly higher (mean of 1548 ng/mL) in all cases, while prothrombin time (PT) and activated partial thromboplastin time (APTT) were marginally higher (mean of 15 and 38, respectively). Albumin was significantly lower (mean of 20 g/L), while all liver function enzymes were within normal reference values. Lactate dehydrogenase (LDH) was lower (mean 99 U\L). None of the patients showed any renal injury, and blood urea nitrogen/serum creatinine were within reference values. C-reactive protein (CRP) was within the normal reference value, but erythrocyte sedimentation rate (ESR) was significantly higher with a mean value of 60 mm/h. All patients were tested for MERS-CoV and the nucleic acid of influenza viruses A and B; however, none of the patients were identified to be positive for either. Bacterial cultures were performed at the same time, and at least 51 patients (4%) were determined to have some bacterial infection in the blood (Table 2).

According to chest X-ray, 269 (22%) patients showed bilateral pneumonia, and 72 (6%) patients showed unilateral pneumonia. In CT scans, 103 (8%) patients showed bilateral pneumonia, and 11 (1%) patients showed unilateral pneumonia (Table 2).

The blood groups of 1245 COVID-19-positive patients are shown in (Figure 1). The majority (39.4%) of patients were O+, followed by (30.4%) A+. Approximately 18.5% of the patients were B+; however, only 11.7% of the patients were AB+. Interestingly, none of the patients were Rh−, which opens a new area for further research to determine whether Rh factor has any association with getting infected.

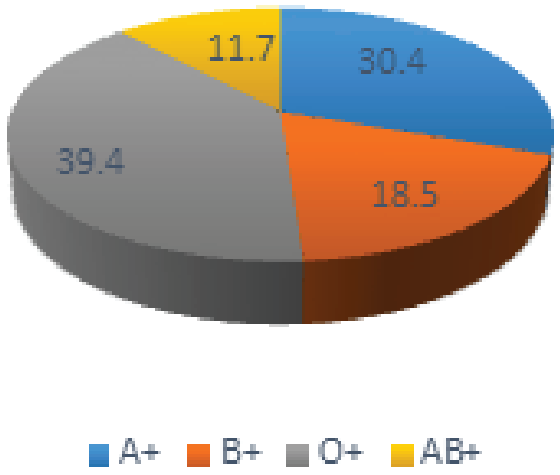

Figure 1: *Blood Group of 1245 confirmed COVID-19 cases admitted to the hospitals.*

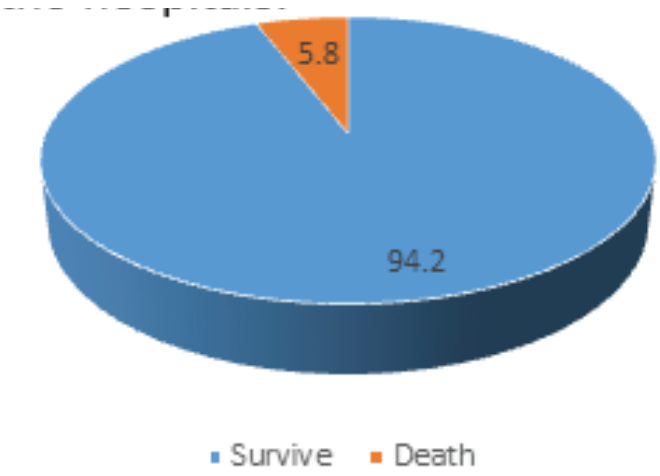

Figure 2: *Case fatality rate of 1245 confirmed COVID-19 cases admitted to the hospitals.*

The case fatality rate is shown in (Figure 2). According to the pie chart, the percentage of patients who died after acquiring COVID-19 was 5.8%; nevertheless, the survival percentage was approximately 94%.

Variables associated with mortality of COVID-19 patients are shown in (Table 3). Univariate logistic regression revealed five independent variables associated with the death of COVID-19-positive patients. Age (OR = 0.05; 95 CI = 1.036–1.066), patients with liver diseases (OR = 2.029; 95 CI = 2.285–25.332), patients with kidney diseases (OR = 2.394; 95 CI = 4.991–24.035), blood group: B+ (OR = 1.271; 95 CI = 1.020–12.453) and O+ (OR = 1.268; 95 CI = 1.076–11.745), and patients with concomitant

Table 3: *Variables associated with mortality of COVID-19 patients of 1245 confirmed COVID-19 cases admitted to the hospitals [1]. OR: Odds Ratio, CI: Confidence Interval, *Significant at α = 0.05*

		Univariate analysis		Multivariate analysis	
Variable	N (%)	OR (95 CI)	P	OR (95 CI)	P
Age		0.05 (1.036–1.066)	0	.048 (1.033–1.066)	0
Comorbidities					
Liver disease	13 (1)	2.029 (2.285–25.332)	0.001*	1.602 (1.205–20.442)	0.027*
No liver disease	1232 (99)	1		1	
Kidney Disease	30 (2.4)	2.394 (4.991–24.035)	0.000*	1.515 (1.836–11.278)	0.001*
No Kidney Disease	1215 (97.6)	1		1	
Blood Group					
A+	379 (30.4)	0.923 (.733–8.632)	0.142	−0.353 (.3781–305)	0.263
B+	230 (18.5)	1.271 (1.020–12.453)	0.047*	−1.178 (.090–1.050)	0.06
O+	490 (39.4)	1.268 (1.076–11.745)	0.038*	−0.271 (.382–1.523)	0.443
AB+	146 (11.7)	1		1	
Concomitant infection					
Bacterial infection	18 (4)	2.229 (4.852–17.786)	0.000*	2.201 (4.306–18.961)	0.000*
No infection	408 (91.3)	1		1	

bacterial infection (OR = 2.229; 95 CI = 4.852–17.786) were statistically significantly associated with death. According to multivariate logistic regression, the same significant independent variables found in univariate analysis were also significant except for patients with blood groups.

Discussion

COVID-19 is one of the global public health issues which resulted in the acquisition of the infection and consequently patients required to stay at home, admitted to the hospital, or to die. This study highlighted some key findings which helps healthcare providers such as doctors and nurses to provide better management for patients who might be at the risk of death. Moreover, laboratory parameters such complete blood count and blood chemistry, and radiological images have shown the prognosis of the patients.

This study showed that the most common clinical presentations of hospitalized in-patients diagnosed to be suffering from COVID-19 were fever (71.5%), cough (both dry and productive) (66.6%), and shortness of breath (47.8%). Other symptoms were malaise (17.9%), sore throat (13.5%), headache (11.8%), diarrhea (10.8%), and vomiting (10%). The least common symptoms were myalgia (6.8%), nausea (6.1%), abdominal pain (4.3%), chest pain (3.9%), runny nose (3.6%), irritability/confusion (2.7%), arthralgia (1.7%), and hemoptysis (0.7%).

Multiple previous studies have also shown that fever, cough, and shortness of breath are the major symptoms in patients diagnosed to be suffering from COVID-19 [13,27-29]. Furthermore, the centers for disease control (CDC) have also listed these symptoms as the major symptoms [16]. The other symptoms in our study have been listed by most other studies [30-37]. However, there were no complaints from our admitted patients regarding the unexplained loss of smell and/or taste; this symptom was not present in any hospitalized COVID-19 cases.

In terms of COVID-19 Comorbid Diseases, most studies on COVID-19 have shown that people of any age with serious underlying medical conditions (e.g., diabetes; hypertension; lung, liver, and kidney disease; cancer; smokers; transplant recipients) and patients taking steroids are at an increased risk of developing severe disease owing to COVID-19 infection. The extent of severity of COVID-19 is largely dependent on comorbid patient conditions [27,28,38,39]. Furthermore, it has been reported that the number of comorbidities is a significant predictor of the COVID-19 mortality rate [40]. Similarly, this study demonstrated that the most common comorbidities identified in patients were diabetes mellitus, hypertension, and lung diseases. However, the less common comorbidities were kidney diseases, allergic diseases, liver diseases, and coexisting HIV infection. Moreover, the higher incidence of DM in our patients is in an agreement with a similar result shown in multiple other studies [11,39,41-44]. In contrast, other studies demonstrated that hypertension and cardiovascular diseases were the most common comorbidities [17,45,46]. This controversy can be due to the number, age, and/or ethnicity of each group of patients.

Regarding the Hematological and Biochemical Change in COVID-19 Patients, previous studies have shown that the hematological profile of severe COVID-19 patients exhibits increased white blood cells (WBCs) count and neutrophil count, decreased lymphocyte, platelet, eosinophil count, and hemoglobin levels [47]. Patients with severe disease exhibited only a mild increase in WBCs count, while patients who died had a more clinically significant increase in WBC count. As such, in patients with severe disease, a significant increase in WBCs may signify clinical worsening and increased risk of poor outcome. WBCs count, lymphocyte count, platelet count, and serum ferritin can be used as markers for monitoring potential progression to critical illness, particularly in hospitalized COVID-19 patients [48]. A study on 138 novel coronaviruses (2019-nCoV)–infected pneumonia patients revealed lymphopenia, prolonged prothrombin time (PTT), and elevated lactate dehydrogenase (LDH) in 70.3, 58, and 39.9% of the cases, respectively [17].

During the previous year (COVID-19 outbreak), few studies have reported that coagulopathy is associated with progression to critical states; thus, it is one of important prognostic factors in patients with COVID-19. The most typical finding in patients with COVID-19 coagulopathy is increased D-dimer concentration, a relatively modest decrease in platelet count, and prolongation of the prothrombin time (PTT) [49]. Similar results of increased D-dimer levels have been observed in other patients (0.91 µg/L in severe vs. 0.27 µg/L in mild patients) [50]. Our findings found that red blood cells (RBCs), leukocytes, monocytes, basophils, eosinophils, and platelets were within the normal reference ranges in almost all patients, while neutrophils and lymphocytes were above the normal reference ranges. Coagulation profile [D-dimer, prothrombin time (PT), activated partial thromboplastin time (PTT)] was above the normal range.

It has been reported that biochemical and hematological changes [e.g., leukocytosis, neutrophilia, lymphopenia, cytokine storm, decreased albumin, increase in alanine transaminase (ALT), total bilirubin, lactate dehydrogenase (LDH), and procalcitonin levels] were significant predictors of ICU admission among 140 COVID-19 patients (13 with severe disease) [11]. Additionally, elevated procalcitonin levels were observed in critical patients and, thus, reported to be the marker to assess the prognosis of COVID patients. During the last year (COVID-19 outbreak), few studies have reported that biochemical findings in COVID-19 patients include decreased albumin and higher levels of AST, ALT, total bilirubin, blood urea nitrogen (BUN), creatinine, creatinine kinase, lactate dehydrogenase, creatinine kinase MB, and cardiac troponin I. Significant elevation in liver enzymes (ALT and AST), renal biomarkers (BUN and creatinine), and CRP levels have been reported in patients with a severe form of the disease [48]. In this study, it was determined that serum creatinine, BUN, creatinine kinase, lactate dehydrogenase, total bilirubin, alkaline phosphatase, ALT and AST, and C-reactive protein were within the normal range; however, erythrocyte sedimentation (ESR) rate was slightly high.

Previous studies have reported a correlation between ABO blood type and various diseases (e.g., peptic ulcers, cancer, renal, respiratory, cardiovascular diseases) as well as blood group typing and susceptibility to certain infections including hepatitis, human immunodeficiency syndrome (HIV), and syphilis [51-56].

During the last year (COVID-19 outbreak), few studies have reported a correlation between ABO blood type and COVID-19 susceptibility, morbidity, and mortality [57,58]. However, the results are controversial compared to other studies [59,60]. Other studies did not identify any association between ABO blood groups and COVID-19 severity/mortality [61-64]. According to our findings, the prevalence of COVID-19 infection was slightly increased among O types followed by A, B, and AB types. However, others reported that blood group A was associated with an increased risk of developing COVID-19. On the other hands, group O had a protective effect, with a lower risk of COVID-19 infection [57,65-67]. Furthermore, our study interestingly demonstrated that none of the hospitalized COVID-19-positive patients (1245) had a negative rhesus blood type (Rh−), which indicated that it had a protective effect against COVID-19, and we consider it as a novel finding.

Case Fatality Rate (CFR) is a proportion of cases who are fatal of specific diseases or condition in a certain time, and it is one of the most important ways to measure the burden of COVID-19. Furthermore, it helps us to understand the severity of a disease, identify at-risk populations, and evaluate healthcare quality [68]. The mortality of COVID-19 patients admitted to the hospitals is mainly due to the development of acute respiratory failure, pulmonary embolism, septic shock, or hemorrhagic stroke, which can be due to high doses of anticoagulants [69,70].

Countries worldwide have reported very different case fatality ratios [68,71-73].

In Italy, Bellan et al. reported that the fatality rate of hospitalized patients in Northern Italy during the ascending phase of the COVID-19 pandemic approached 30% [74]. In the United Kingdom, a study included 21,082 adults hospitalized with COVID-19, of whom 5,484 (26%) died [75]. In another study conducted in Belgium, van Halem et al. reported that the fatality rate of the hospitalized COVID-19 patients was 25% [76]. In the United States (U.S.), the in-hospital mortality of patients with COVID-19 was 20.3% [77]. In a recent Saudi study conducted in Riyadh Province, et al. reported that the mortality rate among hospitalized patients was (20.5%) for diabetic COVID-19 patients compared to 12.3% for non-diabetic COVID-19 patients [78]. Furthermore, A study conducted in Najran region on MERS-CoV patients found the CFR was significantly higher than what is going on COVID-19 in the same region (Najran, KSA) [79]. Incongruous, in our study, CFR of hospitalized COVID-19-positive patients was 5.8%, which was much lower than that in the studies from other countries.

In terms of factors associated with the death of COVID-19 patients, our study revealed that age, liver diseases, kidney diseases, and concomitant bacterial infection were significant factors associated with the death of COVID-19 patients. Similarly, Williamson et al. identified variables associated with the death of COVID-19 patients (i.e., age and some comorbidities such as liver diseases). The above mentioned authors also identified significant variables that did not agree with our findings, e.g., gender, ethnicity, and some chronic diseases [80]. Another study reported some factors associated with the death of COVID-19 patients; similar to our results, age was identified as a factor. However, factors that we different were gender, dyspnea, hypertension, and diabetes [81].

This study has the following limitations; first, the design was carried out retrospectively. Second, the sample was recruited from the hospitals and some mild to moderate cases from the community were missing because their ability to receive the medications and stay at their homes as well as their fears from hospitals. The patients were recruited from five governmental hospital affiliated with MOH, and one military hospital and three private hospitals were not included. Although, these limitations in the study was able to address demographic, clinical, laboratory profile, radiological presentation, predictors, and case fatality and associated factors of COVID-19 confirmed cases in Najran region, KSA.

Conclusion

The ongoing global outbreak of COVID-19 indicated the importance of laboratory diagnosis of human coronavirus infections to stop the spread and appropriately treat patients with serious infection. Severe COVID-19 symptoms were manifested in all patients. This study indicated that fever, cough, shortness of breath, and elevated D-dimer were positive signs of COVID-19 infection. Moreover, factors that are associated with the death of COVID-19 patients are age, liver diseases, kidney diseases, and concomitant bacterial infection.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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