

BMJ Open Spectrum of COVID-19 clinical characteristics among patients presenting to the primary healthcare in Qatar during the early stages of the pandemic: a retrospective multicentre cross-sectional study

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ABSTRACT

Objectives To describe clinical characteristics and laboratory investigations of patients with COVID-19 diagnosed in primary care in Qatar and to assess predictors of hospitalisation.

Design A retrospective cross-sectional study.

Setting and participants 3515 confirmed patients with COVID-19 diagnosed in any of the 27 primary healthcare centres in Qatar between 9 April 2020 and 30 June 2020.

Main outcome measures Demographic characteristics, comorbidities, contact tracing, clinical and laboratory data, in addition to patient disposition at the time of diagnosis

Results Mean age of patients was 35.5 years (± 14.7). 2285 patients (65.0%) were males, 961 patients (27.3%) had a history of concomitant comorbidity and 640 patients (18.2%) were asymptomatic. Adult patients (19–64 years old) were more likely to report symptoms than children or elderly. Fever and cough were the most frequently documented symptoms affecting 1874 patients (46.7%) and 1318 patients (37.5%), respectively. Most patients had normal vital signs at presentation; however, patients who were subsequently hospitalised had higher median temperature than non-hospitalised patients (37.7°C, IQR: 37.0°C–38.4°C, and 37.2°C, IQR: 36.8°C–37.8°C, respectively). Hospitalised patients had significantly higher C reactive protein (CRP) (median CRP: 20 mg/L, IQR: 5.0–61.2 mg/L) than non-hospitalised patients (median CRP: 4.6 mg/L, IQR: 1.7–11.50 mg/L), and lower median absolute lymphocyte count ($1.5 \times 10^3/\mu\text{L}$, IQR: $1.1 \times 10^3/\mu\text{L}$ – $2.1 \times 10^3/\mu\text{L}$, and $1.8 \times 10^3/\mu\text{L}$, IQR: $1.3 \times 10^3/\mu\text{L}$ – $2.4 \times 10^3/\mu\text{L}$, respectively). Predictors of hospitalisation were increasing age (adjusted OR (AOR): 2.614, 95% CI 1.281 to 5.332 for age between 50 years and 64 years, and AOR: 3.892, 95% CI 1.646 to 9.204 for age ≥ 65 years), presence of two or more comorbidities (AOR: 2.628; 95% CI 1.802 to 3.832) and presence of symptoms (AOR: 1.982; 95% CI 1.342 to 2.928).

Conclusion The majority of COVID-19 cases diagnosed in primary healthcare in Qatar were symptomatic. Most cases had normal vital signs and laboratory results at presentation. Predictors of hospitalisation were increasing

Strengths and limitations of this study

- This study reflects primary healthcare experience on clinical characteristics and laboratory findings of confirmed COVID-19 cases.
- Patients were included from all health centres distributed in Qatar reflecting different socioeconomic backgrounds.
- Data were extracted from electronic medical records which were incomplete for some patients.
- Likely, patients with severe illness presented directly to secondary care.

age, the presence of symptoms and having two or more comorbidities.

INTRODUCTION

Since the emergence of COVID-19 in Wuhan, China, in December 2019, enormous pressure has been exerted on the healthcare systems to cope with the rising number of cases alongside maintaining their essential functionalities. During this pandemic, primary healthcare continued to be the primary point of contact for patients with COVID-19 and non-COVID-19-related conditions.¹ Given the non-specific features of this infectious disease, even more pressure is placed on primary care physicians in making decisions on which suspected or confirmed patients with COVID-19 to send home, refer to specialists or send to hospital.²

The WHO defined confirmed cases of COVID-19 as persons with laboratory confirmation of COVID-19 who could either be asymptomatic or symptomatic. Symptomatic cases are further classified into mild, moderate, severe or critically ill.³ Transmission

mainly occurs from symptomatic or pre-symptomatic infected people to others by close contact through respiratory droplets, with an average incubation period of 5–6 days, although it might extend up to 14 days.⁴

According to Lipsitch *et al*, expansion of the public health service is necessary to elucidate the epidemiology of this novel virus and to characterise its potential impact. More studies are needed to define the impact of the COVID-19 pandemic by measuring the number of persons infected, the infection's transmissibility and the spectrum of clinical severity. Counting the number of cases in the whole spectrum of disease severity, ranging from asymptomatic patients to different degrees of symptomatology to death, will better calibrate the epidemic spread of this infection.⁵ Also, understanding the clinical characteristics of COVID-19 and predictors of hospitalisation is essential information for primary healthcare physicians who are the first point of contact to the community, especially that around 80% of patients with COVID-19 have a mild disease.⁶

Role of PHCC in Qatar during the early stages of the pandemic and patient flow

In Qatar, Primary Health Care Corporation (PHCC) is considered the main provider of primary healthcare to both citizens and expatriates through 27 health centres distributed all over the country. In 2019, 1.4 million out of the 2.8 million total population in Qatar were registered with one of the PHCC health centres.⁷ The first reported case in Qatar was in February 2020 for a Qatari male who returned from Iran. In March 2020, Qatar started reporting increased numbers of COVID-19 positive cases where national restrictions were put in place. In responding to the outbreak of COVID-19, the Ministry of Public Health in Qatar developed an emergency action plan with the collaboration of both primary and secondary care institutions represented by PHCC and Hamad Medical Corporation, respectively.⁷

In addition to testing patients who fit the criteria for COVID-19, PHCC contributed to a large scale of community screening by conducting contact tracing of confirmed cases, testing patients at the country's ports of entry, as well as screening community members who were known to have comorbidities and or were older than 55 years of age.⁸

In response to the pandemic, PHCC introduced several changes to its service, including dedicating 4 out of the 27 health centres as test and hold facilities, while rearranging triaging areas in the rest health centres to separate suspected cases of COVID-19 from other patients and provided at least one room for COVID-19 testing. Once patients were identified to have confirmed COVID-19 disease, further investigations were done, including laboratory tests (full blood count, renal function test, liver function test and C reactive protein (CRP)), chest X-ray and ECG. Patients' disposition to quarantine facilities or referral to hospital was dependent on their disease severity classification categorised in alliance with the

National Institute of Health guidelines⁹ (online supplemental table 1) were patients who were asymptomatic or had mild disease were sent to quarantine, whereas patients with moderate, severe or critical illness were referred to hospital. However, the decision of hospitalisation was made by secondary care physicians.

An earlier epidemiological study by Al Kuwari *et al* on the first 5685 cases of confirmed COVID-19 cases in Qatar during the period of 28 February–18 April 2020 found that the vast majority of the patients were young males with few comorbidities and were mostly asymptomatic.¹⁰ However, less information is available on patients with COVID-19 who presented to the primary care in the subsequent period of the earlier study where the infection had spread from the young male working group to the rest of the community affecting older people and those with comorbidities. It is also important to identify characteristics of patients with asymptomatic infections and predictors of hospitalisation among patients presenting to the primary healthcare. Identifying these features will help to map the disease burden and guide the pandemic management at the primary healthcare level.

Therefore, this study aimed to describe clinical characteristics and laboratory investigations of patients with COVID-19 diagnosed at the primary care in Qatar during the period of 9 April–30 June 2020, and to assess characteristics of asymptomatic infections and predictors of hospitalisation among those patients.

MATERIALS AND METHODS

Study design and setting

This was a multicentre, retrospective cross-sectional study. Research data were extracted by the health information management department in PHCC on patients with positive COVID-19 reverse transcriptase-PCR (RT-PCR) who were diagnosed in any of the 27 health centres across the country during the period of 9 April–30 June 2020. All patients who had their CDC notification forms completed on Cerner electronic medical records (Cerner EMR) were included in the study (a total of 3515 patients).

Data collection and study variables

The following data were extracted from Cerner EMR using a unique medical record number for each patient: (1) demographic information such as age, gender, nationality and occupation, (2) comorbidities, including (a) diabetes mellitus, (b) hypertension, (c) asthma, (d) cardiovascular diseases, including ischaemic heart disease, heart failure, arrhythmia and stroke, (e) chronic kidney disease, (f) cancer, (g) immunodeficiency disorders and (h) chronic lung disease, including chronic obstructive pulmonary disease, interstitial lung disease and bronchiectasis, (3) symptoms of COVID-19, (4) vital signs (5) laboratory results, (6) contact tracing and (7) patients' disposition at the time of diagnosis of COVID-19. Comorbidities were extracted using the International Classification of Diseases 10th edition, Australian Modification. Symptoms

of COVID-19 were collected from a built-in CDC notification form that was prompted whenever a pre-approved diagnosis code for COVID-19 was entered into Cerner. A confirmed case of COVID-19 was defined as a positive result on real-time RT-PCR assay of nasal and oropharyngeal swab specimens.¹¹ Nasopharyngeal and throat swabs were collected from suspected cases with symptoms suggesting COVID-19 and from close contacts of confirmed COVID-19 cases. Close contacts were defined based on the US Centers for Disease Control and Prevention criteria as ‘any individual who was within 6 feet of an infected person for at least 15 min starting from 2 days before illness onset or, if asymptomatic, 2 days before positive specimen collection’.¹² Also, PHCC contributed to screening travellers at the country’s port of entry as well as individuals older than 55 years of age and/or those with comorbidities. All biological samples were sealed and transferred to the laboratory in strict accordance with the standard protocol. Real-time RT-PCR was used to detect SARS-CoV-2 infections using TaqPath COVID-19 Combo Kit (Thermo Fisher Scientific, Waltham, Massachusetts, USA) or Cobas SARS-CoV-2 test (Roche Diagnostics, Rotkreuz, Switzerland). These tests are highly sensitive and specific with no cross-reactivity against multiple other respiratory viruses.¹²⁻¹⁴

Statistical analysis

The data were analysed using the IBM SPSS Statistics for Windows (version 23, IBM Corp., Armonk, N.Y., USA). Both descriptive and analytic statistics were applied. For the descriptive statistics, frequency distribution tables and percentages were used for categorical variables while mean and SD were used for numeric variables when data were normal or as medians and IQRs otherwise. For analytical statistics, Student’s t-test and Mann-Whitney U test was applied for numerical outcomes, while the χ^2 test was applied for categorical outcomes. Multivariable logistic regression analysis was performed to identify the predictors of hospital admission. Statistical significance was considered at $p < 0.05$.

Patient or public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research

RESULTS

We extracted and analysed demographic data, clinical characteristics, and laboratory investigations for 3515 patients with confirmed COVID-19, who were diagnosed in 27 primary healthcare centres across Qatar during the period of ninth of April to 30th of June 2020. **Table 1** shows the demographic characteristics of COVID-19 cases in primary care. Most cases were in the age group 19–49 and the mean age was 35.5 (± 14.7). About two-thirds of the cases (65.0%; $n=2285$) were males. The most frequent nationality was Indian

Table 1 Demographic characteristics of COVID-19 cases in primary care in Qatar, 2020 (N=3515)

Variable	Frequency (%)
Age (years)	
≤18	423 (12.0)
19–49	2518 (71.6)
50–64	480 (13.7)
≥65	94 (2.7)
Mean±SD	35.5±14.7
Gender	
Female	1230 (35.0)
Male	2285 (65.0)
Nationality	
Indian	783 (22.3)
Qatari	541 (15.4)
Egyptian	427 (12.1)
Pakistani	374 (10.6)
Bangladeshi	249 (7.1)
Filipino	235 (6.7)
Sudanese	137 (3.9)
Others*	774 (21.9)
Arab	1523 (43.3)
Non-Arab	1992 (56.7)
Occupation	
Unemployed	382 (14.3)
Service workers	662 (24.7)
Office staff	591 (22.1)
Technical professional	286 (10.7)
Students	188 (7.0)
Healthcare professionals	88 (3.3)
Housewife	226 (8.4)
Others	252 (9.4)

Missing data: occupation ($n=840$).

*Includes Lebanese, Kenyan, Tunisian, Ethiopian, Saudi, Somali, Indonesian, Jordanian, Nepalese, Iranian, Syrian, Sri Lankan, Palestinian and Yemeni.

(22.3%; $n=783$), followed by Qatari (15.4%; $n=541$), Egyptian (12.1%; $n=427$), and Pakistani (10.6%; $n=374$). A quarter of patients (24.7%; $n=662$) were service workers and 22.1% ($n=591$) were office staff.

Table 2 displays the distribution of comorbidities of COVID-19 cases. About three-quarters of patients (72.7%; $n=2554$) had no known comorbidity. Of those who had any comorbidity (27.3%; $n=961$), about 64% ($n=618$) had one comorbidity and almost a quarter (24.3%; $n=234$) had two comorbidities. Frequent comorbidities among infected persons included diabetes mellitus (14.8%; $n=520$), hypertension (13.2%; $n=465$), asthma (8.3%; $n=292$), and cardiac disease (2.5%; $n=87$).

Table 2 Distribution of comorbidities among COVID-19 cases in primary care in Qatar (N=3515)

Variable	Frequency (%)
Presence of any comorbidities	
Yes	961 (27.3)
No	2554 (72.7)
Number of comorbidities (n=961)	
One	618 (64.3)
Two	234 (24.3)
Three or more	109 (11.3)
Diabetes mellitus	520 (14.8)
Hypertension	465 (13.2)
Asthma	292 (8.3)
Cardiac disease	87 (2.5)
Chronic kidney disease	44 (1.3)
Cancer/immunodeficiency	25 (0.7)
Chronic lung disease*	9 (0.3)

*Includes chronic lung diseases other than asthma: chronic obstructive pulmonary disease, interstitial lung disease and bronchiectasis.

Almost one-third of patients with COVID-19 (33.1%; n=1163) reported a history of contact with suspected or confirmed COVID-19 cases. As shown in [table 3](#), most patients with COVID-19 (81.8%; n=2875) reported having COVID-19-related symptoms while the remaining cases (18.2%; n=640) reported no symptoms. Of those who had symptoms, about 40% (n=1157) reported one symptom, 35.5% (n=1022) reported two symptoms and about a quarter (24.2%; n=696) reported three or

Table 3 Frequency of reported symptoms of COVID-19 cases in primary health settings in Qatar (N=3515)

Variable	Frequency (%)
Presence of symptoms	
Yes	2875 (81.8)
No	640 (18.2)
Number of symptoms (n=2875)	
One	1157 (40.2)
Two	1022 (35.5)
Three or more	696 (24.2)
Fever	1874 (46.7)
Cough	1318 (37.5)
Sore throat	1112 (31.6)
Headache	497 (14.1)
Runny nose	345 (9.8)
Shortness of breath/dyspnoea	197 (5.6)
Myalgia/arthritis	102 (2.9)
Diarrhoea	73 (2.1)

more symptoms. Fever was the most frequently reported symptom (46.7%; n=1874) followed by cough (37.5%; n=1318), sore throat (31.6%; n=1112), headache (14.1%; n=497) and runny nose (9.8%; n=345).

On diagnosis of COVID-19, the majority of patients (87%; n=2913) were placed in quarantine/isolation facilities and the remaining cases were hospitalised (13%; n=433).

[Table 4](#) describes the relationship between the patients' background characteristics and the presence of symptoms. On bivariate analyses, adult patients (19–64 years old) were more likely to report symptoms compared with children or elderly patients. Furthermore, non-Arabs were more likely to have symptoms compared with Arabs (83.5% vs 79.6%, p=0.003). Also, hospitalised patients were significantly more likely to have symptoms compared with their counterpart group.

[Table 5](#) displays the vital signs and laboratory results of patients with COVID-19 according to the treatment setting. Most patients had normal vital signs readings at presentation, although the mean respiratory rate (RR) and heart rate (HR) were at the upper limits of normal (mean RR 19.5±2.2 SD, mean HR 94.0±15.5 SD). In addition, hospitalised patients had a higher median temperature than non-hospitalised patients (37.7°C, IQR: 37.0°C–38.4°C, and 37.2°C, IQR: 36.8°C–37.8°C, respectively) ([table 5](#)).

Regarding laboratory results, most patients had normal full blood count and renal and liver function tests. However, the median value for neutrophils count ($2.9 \times 10^3/\mu\text{L}$ vs $2.6 \times 10^3/\mu\text{L}$), alanine aminotransferase (31.7 U/L vs 27.0 U/L) and aspartate aminotransferase (35.0 U/L vs 27.6 U/L) was higher in the hospitalised group. In addition, some laboratory results differed significantly between the two groups; the median absolute lymphocyte count in hospitalised patients was lower than in non-hospitalised patients ($1.5 \times 10^3/\mu\text{L}$, IQR: $1.1 \times 10^3/\mu\text{L}$ – $2.1 \times 10^3/\mu\text{L}$, and $1.8 \times 10^3/\mu\text{L}$, IQR: $1.3 \times 10^3/\mu\text{L}$ – $2.4 \times 10^3/\mu\text{L}$, respectively). Also, hospitalised patients had a significantly higher CRP value (median CRP: 20 mg/L, IQR: 5.0–61.2 mg/L) than non-hospitalised patients (median CRP: 4.6 mg/L, IQR: 1.7–11.50 mg/L) ([table 5](#)).

[Table 6](#) describes the relationship between the patients' background characteristics and the treatment setting. On bivariate analyses, increasing age was significantly associated with hospital admission. Also, males were more likely to be hospitalised than females (14.1% vs 10.8%, p=0.008). Moreover, hospitalisation was higher among patients who had a higher number of comorbidities. As well, symptomatic patients were more likely to be hospitalised than asymptomatic patients (14.1% vs 7.9%, p<0.001).

All factors tested in the bivariate analysis were included in the logistic regression analysis. Adjusted OR (AOR) and the 95% CI for predictors of hospital admission are presented in [table 7](#). Patients aged 50–64 years and ≥65 years were 2.6 times and 3.9 times more likely to be hospitalised than those who were aged 18 years or less,

Table 4 Relationship between the characteristics of COVID-19 cases and the presence of symptoms (N=3515)

Variable	Symptomatic, n (%)	Asymptomatic, n (%)	P value
Age (years)			<0.001*
≤18	309 (73.0)	114 (27.0)	
19–49	2090 (83.0)	428 (17.0)	
50–64	403 (84.0)	77 (16.0)	
≥65	73 (77.7)	21 (22.3)	
Gender			0.311
Female	995 (80.9)	235 (19.1)	
Male	1880 (82.3)	405 (17.7)	
Nationality			0.003*
Arab	1212 (79.6)	311 (20.4)	
Non-Arab	1663 (83.5)	329 (16.5)	
Occupation (n=2675)			0.006*
Service workers	545 (82.3)	117 (17.7)	
Office staff	507 (85.8)	84 (14.2)	
Technical professional	249 (87.1)	37 (12.9)	
Students	140 (74.5)	48 (25.5)	
Healthcare professionals	69 (78.4)	19 (21.6)	
Housewife	195 (86.3)	31 (13.7)	
Unemployed	314 (82.2)	68 (17.8)	
Others	207 (82.1)	45 (17.9)	
The presence of any comorbidities			0.558
No	2083 (81.6)	471 (18.4)	
Yes	792 (82.4)	169 (17.6)	
Treatment setting			<0.001*
Quarantine/isolation facility	2355 (80.8)	558 (19.2)	
Hospital admission	385 (88.9)	48 (11.1)	

*Statistically significant.

respectively. Also, hospital admission was higher among patients who had two or more comorbidities (AOR: 2.62; 95% CI 1.80 to 3.83) compared with patients who had no chronic health condition. Also, patients who had symptoms were about two times more likely to be hospitalised compared with patients who had no symptoms (AOR: 1.98; 95% CI 1.34 to 2.92).

DISCUSSION

This is a retrospective cross-sectional study that described the clinical characteristics and laboratory investigations of 3515 patients with confirmed COVID-19 who were diagnosed in the primary care in Qatar during the early stages of the pandemic. The majority of patients were males with a median age of 35.5 years, and most of them were symptomatic but with normal vital signs and laboratory investigations. Increasing age, the presence of symptoms and having two or more comorbidities were predictors of hospitalisation.

Baseline characteristics of patients with COVID-19

The mean age of confirmed patients with COVID-19 who were diagnosed in PHCC during the study period was comparable to the mean age for diagnosed patients with COVID-19 in a national study in Kingdom of Saudi Arabia (KSA) (36 years) during the early stages of the pandemic¹⁵ and lower than the median age of 47 years in China¹⁶ and Kuwait.¹⁷ In the current study, males represented (65%) of the total studied population which is a higher percentage than that reported in similar studies in KSA and China (54.3% and 58.1%, respectively) and comparable to the study in Kuwait (63%).^{15–17} This might reflect the unique demographic structure of Qatar, where 88% of the population are expatriate workforce and around three-quarters of them are males with a current median age of 33 years.¹⁸ The rate of comorbidities reported in this study (27.3%) was also similar to what was reported in KSA and China (20.1% and 23.7%, respectively).^{15,16}

In contrast, an earlier epidemiological study by Al Kuwari *et al* on COVID-19 spread in Qatar from 28 February 2020

Table 5 Vital signs and laboratory results of COVID-19 cases according to the treatment setting (N=3515)

Variable	Normal range	Hospitalised (n=433)	Non-hospitalised (n=2913)	P value	All cases (N=3515)
Vital signs					
Temperature, oral (°C) median (IQR)	36.5–37.5	37.7 (37.0–38.4)	37.2 (36.8–37.8)	<0.001*	37.2 (36.8–37.9)
<37.5, n (%)		184 (43.9)	1723 (63.1)		1907 (100)
37.5–38.0, n (%)		90 (21.5)	547 (20.0)		637 (100)
38.1–39.0, n (%)		113 (27.0)	387 (14.2)		500 (100)
>39.0		32 (7.6)	75 (2.7)		107 (100)
HR (beats/min), mean±SD	60–100	96.9 (17.0)	93.5 (15.2)	<0.001*	94.0 (15.5)
RR (breaths/min), mean±SD	12–20	19.7 (2.5)	19.5 (2.1)	0.418	19.5 (2.2)
Systolic blood pressure (mm Hg), mean±SD	90–120	127.4 (15.7)	124.5 (14.6)	0.001*	124.9 (14.7)
Diastolic blood pressure (mm Hg), mean±SD	60–80	80.0 (9.5)	79.7 (9.2)	0.604	79.8 (9.2)
Oxygen saturation (%), mean±SD	95–100	98.1 (1.7)	98.7 (1.0)	<0.001*	98.6 (1.1)
Laboratory results					
Haemoglobin (g/L), mean±SD	138–172	138 (18)	142 (16)	0.006*	141 (16)
Lymphocytes ($\times 10^3/\mu\text{L}$), median (IQR)	1.1–3.2	1.5 (1.1–2.1)	1.8 (1.3–2.4)	<0.001*	1.7 (1.3–2.3)
Neutrophils ($\times 10^3/\mu\text{L}$), median (IQR)	1.8–6.3	2.9 (2.0–4.6)	2.6 (1.9–3.7)	0.035*	2.7 (1.9–3.8)
Platelets ($\times 10^9/\text{L}$), median (IQR)	125–350	215 (184–266)	223 (188–273)	0.196	223 (188–273)
CRP (mg/L), median (IQR)	<3	20.1 (5.0–61.2)	4.6 (1.7–11.5)	<0.001*	5.0 (1.9–13.8)
Sodium (mmol/L), mean±SD	137–147	138.0 (3.1)	139.5 (2.8)	<0.001*	139.4 (2.9)
Potassium (mmol/L), mean±SD	3.5–5.3	4.4 (0.5)	4.3 (0.4)	0.127	4.2 (0.4)
Urea (mmol/L), mean±SD	2.5–7.1	4.2 (1.8)	4.0 (1.4)	0.096	4.0 (1.4)
Creatinine ($\mu\text{mol/L}$), mean±SD	57–111	76.0 (24.0)	74.4 (23.0)	0.474	74.6 (23.0)
ALT (U/L), median (IQR)	9–50	31.7 (23.0–50.0)	27.0 (18.5–42.0)	0.002	27.9 (19.0–43.0)
AST (U/L), median (IQR)	15–40	35.0 (26.0–46.0)	27.0 (21.0–35.0)	<0.001*	27.0 (21.0–36.0)
Total bilirubin ($\mu\text{mol/L}$), median (IQR)	5–21	8.0 (6.2–11.5)	8.0 (5.7–10.9)	0.438	8.0 (5.8–11.0)
Albumin (g/L), mean±SD	40–55	42.3 (4.0)	45.0 (3.4)	<0.001*	44.7 (3.5)
Total protein (g/L), mean±SD	60–83	74.3 (5.7)	76.8 (5.0)	<0.001*	76.5 (5.1)
Vital signs					
Temperature, oral (°C) median (IQR)	36.5–37.5	37.7 (37.0–38.4)	37.2 (36.8–37.8)	<0.001*	37.2 (36.8–37.9)

Missing data: temperature (n=203), HR (n=686), RR (n=1800), systolic blood pressure (n=867), diastolic blood pressure (n=867) and oxygen saturation (n=632).

*Indicates statistically significant value.

ALT, alanine aminotransferase; AST, aspartate aminotransferase; CRP, C reactive protein; HR, heart rate; RR, respiratory rate.

to 18 April 2020 found that the patients initially affected were younger (mean age: 34 years), more frequently males (89%) with less associated comorbidities (6.8% had at least one comorbidity).¹⁰ This might be indicative of the pattern of pandemic spread in Qatar, where initially the largest peak occurred in the expatriate craft and manual workers, who are usually younger and with fewer comorbidities, before transmission to the local community.¹⁰

Asymptomatic infections

Estimating the rate of asymptomatic infection is difficult to perform in most studies, where the definition of asymptomatic cases could be variable, in addition to the fact that most studies do not perform longitudinal follow-up with these initially 'asymptomatic' patients. In PHCC,

Qatar, patients were tested for COVID-19 RT-PCR if they fit the clinical criteria for infection or as contact tracing of confirmed COVID-19 cases, in addition to screening travellers at ports of entry to the country. During the study period, one-third of the cases reported a confirmed contact with an infected person.

The earlier study on COVID-19 in Qatar found that more than 90% of patients diagnosed between 28 February and 18 April were asymptomatic or had milder symptoms that do not necessitate hospitalisation, while the frequency of asymptomatic cases in the current study was 18%, which is close to the rate reported in a meta-analysis by Byambasuren *et al* (16%, 95% CI 12% to 20%),¹⁹ but it was around half of the percentage reported in Kuwait¹⁶ (around 40%) and higher than the percentage reported in KSA (9%).¹⁵

Table 6 Relationship between the patients' background characteristics and the treatment setting (χ^2 test) (N=3515)

Variable	Hospital admission, n (%)	Quarantine/ isolation facility, n (%)	P value
Age (years)			<0.001*
≤18	21 (5.3)	377 (94.7)	
19–49	270 (11.3)	2122 (88.7)	
50–64	108 (23.2)	357 (76.8)	
≥65	34 (37.4)	57 (62.6)	
Gender			0.008*
Female	125 (10.8)	1031 (89.2)	
Male	308 (14.1)	1882 (85.9)	
Nationality			0.225
Arab	177 (12.1)	1281 (87.9)	
Non-Arab	256 (13.6)	1632 (86.4)	
Occupation (n=2675)			0.001*
Unemployed	60 (16.3)	307 (83.7)	
Service workers	81 (12.6)	560 (87.4)	
Office staff	80 (14.2)	482 (85.8)	
Technical professional	41 (14.7)	237 (85.3)	
Students	6 (3.3)	177 (96.7)	
Healthcare professionals	7 (8.9)	72 (91.1)	
Housewife	34 (15.9)	180 (84.1)	
Others†	25 (10.4)	215 (89.6)	
Number of comorbidities			<0.001*
Zero	223 (9.2)	2200 (90.8)	
One	115 (19.4)	477 (80.6)	
Two or more	95 (28.7)	236 (71.3)	
Presence of symptoms			<0.001*
No	48 (7.9)	558 (92.1)	
Yes	385 (14.1)	2355 (85.9)	

*Statistically significant.

†Includes children and private business.

The clinical characteristics of symptomatic versus asymptomatic confirmed COVID-19 cases were examined in a case series study of 78 patients with confirmed COVID-19 and a history of contact or exposure to the infection. Asymptomatic patients were younger and had a higher proportion of women than symptomatic patients; the median age was 37 years and 56 years, respectively ($p < 0.001$), and the percentage of women was 66.7% and 31.1%, respectively ($p = 0.002$).²⁰ Also, women were more likely to be asymptomatic in comparison to males in a single-centre study in KSA (OR: 0.45, 95%CI 0.22 to 0.92, $p = 0.027$).²¹ In the current study, adult patients were more likely to be symptomatic than children and elderly, whereas gender was not correlated with symptoms occurrence.

Table 7 Predictors of hospital admission among patients with COVID-19 (multivariable logistic regression model) (N=3515)

Variable	Adjusted OR	95% CI	P value
Age (years)			
≤18	Reference		
19–49	1.750	0.902 to 3.394	0.098
50–64	2.614	1.281 to 5.332	0.008*
≥65	3.892	1.646 to 9.204	0.002*
Gender			
Female	Reference		
Male	1.303	0.940 to 1.807	0.112
Nationality			
Arab	Reference		
Non-Arab	1.223	0.947 to 1.581	0.124
Occupation (n=2675)			
Unemployed	Reference		
Service workers	0.728	0.481 to 1.101	0.133
Office staff	0.867	0.576 to 1.304	0.492
Technical professional	0.836	0.515 to 1.359	0.473
Students	0.335	0.138 to 0.813	0.016*
Healthcare professionals	0.549	0.235 to 1.286	0.157
Housewife	1.094	0.654 to 1.838	0.726
Others†	0.652	0.385 to 1.099	0.108
Number of comorbidities			
Zero	Reference		
One	2.172	1.614 to 2.922	<0.001*
Two or more	2.628	1.802 to 3.832	<0.001*
Presence of symptoms			
No	Reference		
Yes	1.982	1.342 to 2.928	0.001*

Dependent variable: hospital admission.

*Statistically significant.

†Includes children and private business.

Spectrum of symptoms

Fever and cough were the most reported symptoms in the current study (46.7% and 37.5%, respectively), which were similar to the clinical findings in other studies in the USA,²² China,¹⁵ KSA²¹ and Kuwait.¹⁷ A review of these studies showed that less than half of patients with COVID-19 had fever at presentation; nevertheless, fever might develop later. In Wuhan, China, 44% of patients had fever at presentation, but 89% of patients became febrile during follow-up in hospital.¹⁶ Other studies have shown a higher frequency of dyspnoea with more severe cases of COVID-19. In China, dyspnoea was documented in 38% and 54% of patients with severe disease and with the presence of primary composite end point Intensive Care Unit (ICU) admission, mechanical

ventilation or death), respectively, in comparison to 15% and 16% in patients with the non-severe disease and the absence of primary composite end point, respectively.²³ Similar findings were also found in the study in Kuwait where the frequency of dyspnoea increased with disease severity with 8%, 59% and 82% developing shortness of breath in patients with mild-moderate disease, ICU survivors and ICU deaths.¹⁷ The low percentage of dyspnoea reported in our study might be explained by the fact that patients with milder symptoms tend to present more frequently to primary healthcare.

Although the frequency of ageusia/anosmia was not recorded in the current study, these studies are frequently recorded with active COVID-19 infection. An interesting study by Dini *et al* on a group of medical residents and physicians in Italy (mean age: 39.4±14.1, 50% males) found that the positivity rate of RT-PCR correlated with having specific clinical manifestations, including loss of taste/smell (OR: 10.00, 95% CI 2.80 to 35.69, p<0.001) and myalgia (OR: 3.20, 95% CI 1.00 to 10.26, p=0.046), with age and loss of taste/smell being the only factors independently associated with positive COVID-19 RT-PCR.²⁴

Laboratory abnormalities

In our study, we found minor differences in the laboratory investigations between hospitalised and non-hospitalised patients. Although patients who were hospitalised were more likely to have higher CRP values and lower lymphocytes count. Similar to the current study findings, a cohort study on 401 patients with mild-to-moderate COVID-19 in five private hospitals in Riyadh, KSA, found that patients with mild and moderate disease severities had high CRP levels (28.6 mg/L and 11.1 mg/L, respectively), with mild differences in neutrophil count ($4.0 \times 10^3/\mu\text{L}$ vs $4.4 \times 10^3/\mu\text{L}$), lymphocyte count ($2.6 \times 10^3/\mu\text{L}$ vs $3.3 \times 10^3/\mu\text{L}$), alanine aminotransferase (35.8 U/L vs 39.4 U/L) and aspartate aminotransferase (28.4 U/L vs 34.9 U/L).²⁵

Clinical deterioration might occur in patients who present initially with mild disease. Therefore, it is important to identify this group of patients for close monitoring and early intervention. Wang *et al* analysed clinical and laboratory data of 209 adult patients with non-severe COVID-19 who were admitted to a public health centre in Changsha, China. Similar to our study findings, all patients had normal neutrophils and lymphocyte counts, liver enzymes and serum creatinine levels. However, 7.7% of this cohort of patients progressed to severe cases after admission. Those patients had a lower lymphocyte proportion (median: 23.9% vs 27.7%, p=0.021) and higher levels of CRP (median: 43.8 vs 12.1 mg/L, p=0.000) and aspartate aminotransferase (median: 29.2 vs 23.2 U/L, p=0.010).²⁶

Predictors of hospitalisation

The decision for referral and hospital admission in COVID-19 could be challenging to primary healthcare physicians, which is not only dependent on the clinical characteristics of the individual patients but is also variable among different health systems and countries. Early identification indicators

on COVID-19 severity were studied by Li *et al* and included: older age, fever, dyspnoea, level of lymphocytes, CRP, and aspartate aminotransferase and diabetes.²⁷ This is consistent with some of the findings in this study, where increasing age and the presence of comorbidities were associated with a higher probability of hospital admission. Moreover, patients who were hospitalised in the current study had higher mean temperature, less absolute lymphocyte count, with higher aspartate aminotransferase and CRP.

Strengths and limitations

The current study is subject to certain limitations. Some patients had incomplete documentation of the vital signs and exposure history. In addition, recall bias might have affected symptoms reporting. Symptoms like (ageusia/anosmia) were not among the list of symptoms included in the CDC notification form that was used for data extraction at the time of the study; therefore, we could not include them in the study. Also, information on the COVID-19 variant at the time of the study was not available. Additionally, these data were collected at the time of presentation, which might have changed later with the disease course. Finally, patients with more severe manifestations had probably presented directly to secondary care. Despite that, this study is one of the few studies that were conducted in the primary healthcare setting. Patients were included from all the primary healthcare centres distributed throughout the country who represented different socioeconomic levels and a wide spectrum of disease severity.

Implications of the study findings

Based on the available evidence, primary care physicians should take into consideration the non-specific nature of COVID-19 when managing patients presenting to primary healthcare. Children and the elderly were less likely to be symptomatic, and most patients had normal vital signs and laboratory investigations at presentation. On the other hand, older age, the presence of comorbidities, having dyspnoea or high CRP were all associated with a higher chance of hospitalisation. However, due to the descriptive nature of this study, further studies are needed to guide screening, stratify the risk of infection and manage patients in the primary healthcare setting.

These data results were collected from the early stages of the pandemic in Qatar; therefore, it would be interesting to re-evaluate the pattern of clinical manifestations for patients presenting to primary care almost 2 years after the pandemic in the presence of different variants and with the wide use of COVID-19 vaccines. It is also essential to conduct longitudinal studies to follow-up the clinical and psychological impact of this pandemic on the population of patients managed in primary care.

CONCLUSION

The majority of patients with confirmed COVID-19 diagnosed in primary healthcare in Qatar during the study period were symptomatic, but the majority had normal vital signs and blood investigations at presentation. Fever

and cough were the most common clinical symptoms. Patients who were hospitalised had higher CRP levels and lower lymphocyte count. The most significant predictors of hospitalisation were increasing age, the presence of symptoms and having two or more comorbidities.

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