Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Clinical Characteristics and Treatment Outcomes of Mild to Moderate COVID-19 Patients at Tertiary Care Hospital, Al Baha, Saudi Arabia: A Single Centre Study

Mohammad Albanghali, Saleh Alghamdi, Mohammed Alzahrani, Bassant Barakat, Abdul Haseeb, Jonaid Ahmad Malik, Sakeel Ahmed, Sirajudheen Anwar

Objective: Since the severity of symptoms affects the treatment option for Coronavirus Disease 2019 (COVID-19) patients, the treatment pattern for mild to moderate non-ICU cases must be evaluated, particularly in the current scenario of mutation and variant strain for effective decision making.

Methods: The objective of retrospective analysis was to assess clinical and treatment outcomes in mild to moderate symptoms in non-ICU patients with COVID-19 who were admitted to major tertiary care hospitals in Al Baha, Saudi Arabia, between April and August 2020.

Results: A total of 811 people were admitted for COVID-19 treatment, age ranging from 14 to 66, diabetes mellitus (31%, n = 248) and hypertension (24%, n = 198) were the most common comorbid conditions. The hydroxychloroquine (HCQ) treated group (G1 n = 466) had an MD of 8 and an IQR of 5–13 for time in hospital with a 4.3% mortality rate, while the non-HCQ group (G2 n = 345) had an MD of 6 and an IQR of 3–11 for time in hospital with a 3.2% mortality rate. A combination of antiviral and antibiotic treatment was found to be effective, other most frequent intervention was analgesics 85.7%, anticoagulant 75%, minerals (Zinc 83% and Vit D3 82%).

Conclusions: The therapy and clinical outcomes from the past will be the guiding factor to treat the COVID variants infection in the future. Patients treated with HCQ had a higher mortality rate, whereas those who were given a non-HCQ combination had a greater clinical outcome profile.

Data Availability: Data available on request due to ethical restrictions. The anonymized data presented in this study are available on request from the corresponding author. The data are not publicly available to maintain privacy and adhere to guidelines of the ethics protocol.

© 2022 The Author(s). Published by Elsevier Ltd on behalf of King Saud Bin Abdulaziz University for Health Sciences.

ARTICLE INFO

Article history:
Received 12 June 2021
Received in revised form 29 January 2022
Accepted 1 February 2022

Keywords:
COVID-19
Mild infection
Hydroxychloroquine
Antibiotics
Saudi Arabia

ABSTRACT

Objective: Since the severity of symptoms affects the treatment option for Coronavirus Disease 2019 (COVID-19) patients, the treatment pattern for mild to moderate non-ICU cases must be evaluated, particularly in the current scenario of mutation and variant strain for effective decision making.

Methods: The objective of retrospective analysis was to assess clinical and treatment outcomes in mild to moderate symptoms in non-ICU patients with COVID-19 who were admitted to major tertiary care hospitals in Al Baha, Saudi Arabia, between April and August 2020.

Results: A total of 811 people were admitted for COVID-19 treatment, age ranging from 14 to 66, diabetes mellitus (31%, n = 248) and hypertension (24%, n = 198) were the most common comorbid conditions. The hydroxychloroquine (HCQ) treated group (G1 n = 466) had an MD of 8 and an IQR of 5–13 for time in hospital with a 4.3% mortality rate, while the non-HCQ group (G2 n = 345) had an MD of 6 and an IQR of 3–11 for time in hospital with a 3.2% mortality rate. A combination of antiviral and antibiotic treatment was found to be effective, other most frequent intervention was analgesics 85.7%, anticoagulant 75%, minerals (Zinc 83% and Vit D3 82%).

Conclusions: The therapy and clinical outcomes from the past will be the guiding factor to treat the COVID variants infection in the future. Patients treated with HCQ had a higher mortality rate, whereas those who were given a non-HCQ combination had a greater clinical outcome profile.

Data Availability: Data available on request due to ethical restrictions. The anonymized data presented in this study are available on request from the corresponding author. The data are not publicly available to maintain privacy and adhere to guidelines of the ethics protocol.

© 2022 The Author(s). Published by Elsevier Ltd on behalf of King Saud Bin Abdulaziz University for Health Sciences.

CC_BY_4.0

Introduction

A new form of viral pneumonia case of unknown origin was identified in Wuhan, China, in late December 2019, and was later labelled as novel coronavirus disease [1,33,34]. COVID-19 is still affecting over 213 countries worldwide, including Saudi Arabia, owing to this spread [2]. COVID-19 patients were categorized into mild, moderate, severe, and asymptomatic categories depending on the severity of the disease. Mild to moderate patients with COVID-19 have mild clinical symptoms that, if left untreated for a long time, can progress to serious cases [3,4]. Furthermore, the incidence of the disease tends to vary across populations due to detectable comorbid conditions, demographic attributes, and immune system responses. Pneumonia is the most common potential manifestation that has the potential to escalate into Acute Respiratory Distress Syndrome (ARDS) [5]. Septic shock, arrhythmias, and multi-organ
failure were among the other potentially serious complications reported [6,7]. The white blood cell count that has been reported varies as leukocytosis, lymphopenia and leukopenia, which can predict the COVID-19 patient outcomes [8,9]. Furthermore, there has been no irrefutable clinical evidence that cross immunity will occur due to prior exposure to identical strains of virus [10]. COVID-19 patients presented most probably with, dry cough, fever, and fatigue. Fever is the most common symptom in other infections as well [36]. A less abundant symptoms also reported such as hypogeusia, anosmia, headache and diarrhea. Moreover, the patients may have dyspnea, chest pain and loss of movement [7,11]. The large proportion of infected individuals with COVID-19 are asymptomatic which can transmit SARS-CoV-2 to other individuals and it is the most challenging issue [7]. The current scenario of immunization and vaccination is highly predicted to be end of the pandemic, but mutation, particularly the D614G mutation in the viral S-protein, which is now the most pervasive worldwide, has curtailed this hope [12,13,35]. Despite the fact that many antiviral drugs have been licensed for the care of COVID-19 patients, the lack of a scientifically validated successful treatment indicates that COVID-19 patient management is largely supportive, with the main aim being to reduce mortality [13]. In our previous publication we demonstrated the efficacy of hydroxychloroquine and other medications in the care of COVID-19 ICU patients using a cohort observational method [14]. The current retrospective study aims to evaluate the clinical and treatment outcomes in mild to moderate non-ICU COVID-19 patients in Saudi Arabia.

Materials and methods

Study design

We adopted single center, retrospective cohort study design for this instant study. The study was conducted on the non-ICU patients admitted in the tertiary care hospitals, Al Baha, Saudi Arabia between April 2020 to August 2020. All COVID-19 positive patients tested with RT-PCR test were included in the study. We used the retrospective cohort study design to assess the clinical and treatment outcomes in mild to moderate non-ICU COVID-19 patients in Saudi Arabia.

Data collection

A unified and predesigned data collection form was designed to collect data from non-ICU patient’s electronic medical records which have pre-specified data variables. The collected data was only used for the benefits of this study. The demographics, clinical signs or symptoms, comorbidities, therapies received, outcomes and laboratory findings were obtained through data collection form. Moreover, the patients were divided into two groups as well. Group one patients were those who were receiving hydroxychloroquine therapy and group two patients were without hydroxychloroquine therapy. The privacy and integrity of collected data was ensured.

Data analysis

Data analysis was conducted by using the Statistical Package for Social Sciences program version 24 (SPSS-24). The descriptive statistical analysis was used to describe the baseline clinical characteristics and demographical data respectively. The categorical variables are expressed as counts, percentages and 95% confidence interval, on the other hand the continuous variables are expressed as means and standard deviations when data were normal or as interquartile ranges (IQRs) and medians (MDs) otherwise.

Ethical approval

The Scientific and Research Committee at King Fahad Hospital in Al Baha, Saudi Arabia, provided the approval (Protocol number 42193626 dated 09/09/2020) to this study. The details and information gathered is kept confidential. This study do not contain any personal details. This is a secondary analysis of routine monitoring data that has been anonymized.

Results

Demographics

The total 811 COVID-19 non-ICU patients were included in the study. Demographical data has been shown in Table 1 and Fig. 1. The ages of patients range from 14 up to 66 years old respectively. The

Fig. 1. Shows the (A) Percentage of the patients with the symptoms of COVID-19 and (B) Vital signs.
major age group of patients were 46–55 years old (19%, n = 152). Moreover, the elder patients had age of more than 66 years were (14%, n = 138) respectively. Furthermore, the majority of the patients were females (50.3%, n = 408) and males were (49.7%, n = 403). The major patients were Saudi national (84%, n = 618) and minority of patients were non-Saudi nationals (16%, n = 130). Furthermore, majority of patients were non-smokers (68%, n = 533) and some of them were smokers (32%, n = 258).

Comorbidities

The patients included in study have different comorbidities as well. The patients with diabetes mellitus were (31%, n = 248), hypertension (24%, n = 198), pulmonary disease (7%, n = 54), asthma (2.2%, n = 18) and renal failure (1%, n = 7) respectively. Shown in Tables 1a and 1b, (Table 2).

Clinical characteristics and symptoms

The majority of the patients were symptomatic (77%, n = 621), and some of them were asymptomatic (23%, n = 190). Furthermore, the clinical characteristics of the patients were fever (55%), cough (43%), shortness of breath (61%), myalgia (28%), headache (27%), sore throat (15%) and GI symptoms (17%) respectively. Clinical characteristic details are shown in Table 3, Figs. 1 and 2.

Vital signs

The vital signs were recorded in the patients including temperature with MD and IQR of (37, 37–37), heart rate (1.9%) with MD and IQR (81, 70–90), respiratory rate (11.6%) with MD and IQR (24.5, 20–82), Oxygen SAT 26% with MD and IQR (90, 21–94). Vital signs are shown in Table 3, Figs. 1 and 2.

Laboratory findings

The laboratory test findings were also assessed which includes several important lab interventions. The WBC count was recorded to be less than 4 × 10^9/l (15.7%, n = 127), normal range was recorded in majority of patients 4–12 × 10^9/l (71%, n = 576) and more than 12 × 10^9/l (13.3%, n = 108). The neutrophils count had MD and IQR (60, 48–72) with majority of cases 38.6% having less than 55% count, 32.4% cases have 55–70% count and 29% have more than 70% count respectively. Lymphocytes had MD and IQR (30, 19–41) with 29% of cases have less than 20% of lymphocytes, major cases 45.1% have 20–40% count and 26% cases have greater than 40% lymphocyte count. d-dimer was also recorded having MD and IQR (661, 403–1170) with 17% of cases having less than 80, 36.7% of cases having 80–583 d-dimer, and majority 46.3% of cases have greater than 583 d-dimer respectively. PTP, APTT, AST, ALT and ALP levels were also assessed with MD and IQR (12, 11–13), (30, 27–33), (25, 18–35), (24, 16–40) and (69, 54–92) respectively. Moreover, the MD and IQR of creatinine along with recorded levels are also shown in Table 3. The levels of basophils and monocytes were also recorded to assess immune response of patients and depicted in Table 3, Figs. 1 and 2.

Therapy Interventions

The patients were divided into two groups. The one group was receiving therapy of hydroxychloroquine and other group was not
Table 3
Clinical Characteristics and Symptoms.

| Symptoms                  | (n=811) | %       | 95% CI |
|---------------------------|---------|---------|--------|
| Fever                     | 442     | 55      | 51.06 – 57.90 |
| Cough                     | 349     | 43      | 39.67 – 46.47 |
| Shortness of Breath       | 325     | 40      | 36.76 – 43.40 |
| Myalgia                   | 202     | 25      | 22.05 – 28.00 |
| Runny nose                | 158     | 20      | 16.90 – 22.35 |
| Headache                  | 135     | 17      | 14.24 – 19.37 |
| Sore throat               | 117     | 15      | 12.18 – 17.01 |
| GI symptoms               | 84      | 17      | 8.44 – 12.64 |

Vital Signs

| (n=811) | %       | 95% CI |
|---------|---------|--------|
| Temperature (Median, IQR) | 37, 37-37 | 35.79 – 42.29 |
| Cases < 38 | 317     | 39      |
| Heart rate (Median, IQR)  | 81, 70-90 | 1.22 – 3.18 |
| Cases < 100 | 16      | 1.9     |
| Respiratory rate (median, IQR) | 24.5, 20-82 | 9.57 – 13.98 |
| Cases < 24 | 94      | 11.6    |
| Oxygen SAT (median, IQR)   | 90, 21-94 | 23.12 – 29.14 |
| Cases with SAT > 90%       | 211     | 26      |

Lab results

| (n=811) | %       | 95% CI |
|---------|---------|--------|
| WBC (median, IQR) 6, 4-8 | 127 | 15.7 | 13.32 – 18.32 |
| < 4 | 576 | 71 | 67.81 – 74.04 |
| > 12 | 108 | 13.3 |
| Neutrophils (median, IQR) | 30, 48-72 | 35.31 – 41.99 |
| > 55% | 263 | 32.4 | 29.30 – 35.73 |
| > 70% | 235 | 29 | 25.96 – 32.19 |
| Lymphocytes (median, IQR) | 20, 19-41 | 25.84 – 32.07 |
| > 20% | 234 | 28.9 |
| > 40% | 366 | 45.1 | 41.74 – 48.57 |
| < 40% | 211 | 26 | 23.12 – 29.14 |
| D-dimer (median, IQR) | 403, 1170-1606 | 14.47 – 19.63 |
| > 80 | 298 | 36.7 | 33.50 – 40.12 |
| > 583 | 376 | 46.3 | 42.96 – 49.89 |
| PTP (median, IQR) 12, 11-13 | 466 | 57 | 54.03 – 60.82 |
| > 12 | 278 | 34 | 31.09 – 37.61 |
| > 14.6 | 67 | 8 | 6.56 – 10.36 |
| APTT (median, IQR) | 30, 27-33 | 20.52 – 26.34 |
| > 27 | 189 | 23 |
| > 27-44 | 577 | 71 | 67.93 – 74.16 |
| > 44 | 45 | 5.5 |
| AST (median, IQR) | 25, 18-35 | 8.33 – 12.51 |
| > 15 | 382 | 57.1 | 68.57 – 74.75 |
| > 41 | 146 | 18 | 15.51 – 20.80 |
| ALT (median, IQR) | 24, 16-40 | 73.54 – 79.36 |
| > 0 | 621 | 76.6 |
| > 43 | 190 | 23.4 |
| ALP (median, IQR) | 69, 54-92 | 5.68 – 9.27 |
| > 40 | 59 | 7.2 |
| > 129 | 655 | 80.8 | 77.91 – 83.33 |
| > 129 | 97 | 12 | 9.90 – 14.38 |
| Creatinine (median, IQR) | 68, 54-85 | 8.22 – 12.38 |
| > 41.2 | 82 | 10.1 |
| > 41.2-52.4 | 115 | 14.2 |
| < 52.4 | 614 | 75.7 |
| BUN (median, IQR) | 4, 3-6 | 5.79 – 9.41 |

Table 3 (continued)

| 2.5-6.3 | 573 | 70.6 | 67.43 – 73.68 |
| < 6.3 | 178 | 22 | 19.24 – 24.93 |
| > 1 | 428 | 53 | 49.33 – 56.19 |
| > 1-4 | 321 | 39.6 | 36.27 – 42.99 |
| < 4 | 62 | 76 | 6.01 – 9.68 |
| > 0.5 | 430 | 53 | 49.58 – 56.41 |
| 0.5-1 | 284 | 35 | 31.81 – 38.37 |
| < 1 | 97 | 12 | 9.90 – 14.38 |
| > 2 | 27 | 3.3 | 2.30 – 4.80 |
| 2-8 | 395 | 48.7 | 45.28 – 52.14 |
| < 8 | 389 | 48 | 44.54 – 51.41 |
| > 8 | 14, 13-15 | 13.32 – 18.32 |
| > 12 | 127 | 16 |
| 12-16 | 575 | 71 | 67.68 – 73.92 |
| < 16 | 109 | 13 | 11.26 – 15.96 |

receiving any hydroxychloroquine therapy. The group one (G1 n = 466) had MD 8 and IQR 5 – 13 for time in hospital along with 4.3% mortality rate. However, on the other hand group two (G2 n = 345) had MD 6 and IQR 3 – 11 for time in hospital along with 3.2% mortality rate. The P value was estimated for both time of hospital stay and mortality rates by using t-test and implementing Mann-Whitney U test for utilizing independent samples. The length of hospital stay for various age groups are shown in Table 4a and therapy outcomes shown in Table 4b and Fig. 3.

Treatment therapy

Antiviral/antimalarial/antibiotic medication was given to the patients alone or in combination with analgesics/antacids/anticoagulant/antithrombotic/ corticosteroids / vitamins/minerals based on the symptoms listed in Table 3. The patients (n = 6) were provided with antiviral treatment having mortality rate of 17% and odd ratio of 5.12, 0.59–45.6. Furthermore, the patients treated with antimalarial (n = 125), antibiotics (n = 133) therapy having mortality rate of 3% and 4% respectively along with odd ratios 0.8, 0.28–2.3 for antimalarial and 0.98, 0.37–2.6 for antibiotics. However, many patients were treated with combination therapies as well the mortality rates along with P-values and Odd ratios are shown in Table 5. Moreover, some patients (n = 173) categorized as asymptomatic with mild symptoms or no symptoms were treated with only analgesics/antacids/vitamins/minerals without any antiviral, antibiotic, or antimalarial treatments.

Drug category

The different drug categories were provided for the treatment of patients. The important drug categories provided to the patients are shown in Table 6 provided as supplement. The analgesics 85.7%, anticoagulant 75%, antimalarial (Hydroxychloroquine 57.5%), minerals (Zinc 83%), Vit. D3 82%, antibiotics (Ceftriaxone 43% and Azithromycin 35%), corticosteroids (Methylprednisolone 18% and Dexamethasone 14%), antivirals (Favipiravir 6.5%, Oseltamivir 14%, Lopinavir/Ritonavir 2% and Ribavirin 2%) antithrombotic 22% and immunomodulators (Interferon beta – 1B 1%) were the most important drug categories provided as the treatment interventions to the patients.
Discussion

COVID-19 is a global pandemic that has been sweeping the world since December 2019. This study was the single-centre retrospective cohort study that was conducted to summarizing the demographies, clinical characteristics and outcomes of mild to moderate COVID-19 patients admitted in tertiary care hospitals in Saudi Arabia. The clinical features of COVID-19 are highlighted in this study was done on all age groups. Certain studies suggested that age is the primary risk factor for the severity of COVID-19 disease, as it has been mentioned in some studies that over the age of 50 is known to be at high risk, whilst others claim that over the age of 60 is at high risk [15,16]. In our findings, male and female covid 19 patients were identified in almost equal proportions, but three studies from Riyadh

![Lab results](image)

**Clinical Characteristics**

Fig. 2. Shows percentage of clinical characteristics of patients.

| Outcome                | G1 (n = 466) | G2 (n = 345) | P-value |
|------------------------|--------------|--------------|---------|
| Time in hospital       | Mean         | SD           | Median  | IQR    | Mean | SD | Median | IQR | P-value  |
|                        | 9.9          | 8.4          | 8       | 5–13   | 7.8  | 8.3 | 6      | 3–11 | < 0.001 * |
| Mortality rate (Death) | N            | %            | N       | %      | 11   | 3.2 |        |      | 0.422     |

Group 1 (G1): Patient’s treatment regimens include Hydroxychloroquine.
Group 2 (G2): Patient’s treatment regimens DO NOT include Hydroxychloroquine.
city hospitals reported more male patients than female patients. This difference is due to the characteristic of a metropolitan city with a large percentage of male foreigner population [17–19]. The COVID-19 have incubation period of 1–14 days and majority of studies reported the patients presented with cough, fever, sputum, dyspnoea and fatigue [16,20,21]. Recently, the median incubation period of SARS-CoV-2 reported in Saudi Arabia is 6 days [21]. In our study the most common symptoms of COVID-19 were fever, cough and dyspnoea which has been compared with the percentage of another single centre study conducted in Wuhan (China). The patients with fever 52.3%, cough 70.40% and dyspnoea 18.39% respectively [22]. When compared to other most afflicted nation, the majority of Saudi Arabians had mild-moderate symptoms [23]. It has been noted that in our study the majority of patients presented with dyspnoea. Moreover, the GI symptoms were also present in our patients. Furthermore, the comorbidities also contributed into the risk factor for COVID-19 infection. In our study the high number of patients were diabetic, it has been cited in the study that diabetes contributes in COVID-19 infection due to elevated ACE-2 receptors and furin proprotein [24,25]. The study reported 8% COVID-19 fatality rate in patients with diabetes [26]. Moreover, the risk for ICU admissions with diabetic comorbidity is 14.2% higher than the individuals who are without diabetes [27]. The comorbidity of hypertension was also present in patients included in our study. We need to be vigilant frequently due in Italy the 73.8% of deceased patients had hypertension [15]. HCQ use by COVID-19 patients hospitalized in the United States did not increase the probability of survival, according to a major study published in the United States [11]. Our findings are consistent with observations in the literature that the use of an HCQ-containing regimen for the care of COVID-19 patients did not have therapeutic benefits [28]. Our data shows that the patients treated HCQ had a higher mortality rate, whereas those who were given a non-HCQ combination had a greater clinical outcome profile. In a study conducted at King Salman Hospital (KSH) in Riyadh, Saudi Arabia, patients treated with HCQ had a lower death rate than those who were not [18]. This study does not specify if it was taken alone or in conjunction with another medicine. The data in our study clearly show that taking HCQ with antiviral and antibacterial drugs increased mortality when compared to taking HCQ alone. This is in line with other studies that have been published [14,28], Alsuwaidan et al. found that HCQ improved fever symptoms in COVID-19 patients with no comorbidities, however they did not look at mortality rates [29]. Alotaibi et al. compared favipiravir to HCQ in COVID-19 patients and found that favipiravir patients had slightly greater mortality, which differs from our findings. This could be attributed to the higher percentage of comorbidity in the investigated patients. In contrast, they identified a

Table 4b
Percentage of mortality in male and female patients, with age.

| Age   | Male  | Female |
|-------|-------|--------|
| < 50  | 503   | 408    |
| 50–70 | 72    | 12     |
| > 70  | 9     | 12     |

| Mortality | 4.71% | 2.94% |
|-----------|-------|-------|
| 95% CI    | 2.33–6.65 | 1.76–4.21 |
| P value   | P < 0.001 ** |

**P-value estimated using t-tests and confirmed utilizing independent-samples Mann-Whitney U test.

| Age   | Male  | Female |
|-------|-------|--------|
| < 50  | 503   | 408    |
| 50–70 | 72    | 12     |
| > 70  | 9     | 12     |

| Mortality | 0.36% | 2.02–0.58 |
|-----------|-------|-----------|
| 95% CI    | 0.02–0.58 | 0.12–1.21 |
| P value   | 0.2321 (> 0.05) |

Fig. 3. Represents percentage of mortality and hospital stay time in patients treated with hydroxychloroquine and non-hydroxychloroquine.

Table 5
Drug Category.

| Treatment therapy | n | Alive | Died | P value | Odd ratio (95% CI) |
|-------------------|---|-------|------|---------|-------------------|
| Antiviral therapy | 6 | 5 (83%) | 1 (17%) | 0.209 | 5.12, 0.59–45.6 |
| Antimalarial therapy | 125 | 121 (97%) | 4 (3%) | 0.805 | 0.8, 0.28–2.3 |
| Antibiotics therapy | 133 | 128 (96%) | 5 (4%) | 0.976 | 0.98, 0.37–2.6 |
| Antiviral+Antimalarial therapy | 11 | 10 (91%) | 1 (9%) | 0.350 | 2.57, 0.32–20.7 |
| Antiviral+Antibiotics therapy | 33 | 30 (91%) | 3 (9%) | 0.127 | 2.68, 0.78–9.3 |
| Antimalarial+Antibiotics therapy | 212 | 204 (96%) | 8 (4%) | 0.966 | 0.98, 0.43–2.23 |
| Antiviral+Antimalarial+Antibiotics therapy | 118 | 111 (94%) | 7 (6%) | 0.196 | 1.76, 0.74–4.18 |
| Others | 173 | 171 (83%) | 2 (17%) | 0.042 | 4.07, 0.96–17.23 |

*supplemented with analgesics/antacids/anticoagulant/antithrombotic/ corticosteroids / vitamins/minerals as per the symptoms.

**without any antiviral, antibiotics, antimalarial drugs but supplemented with analgesics/antacids/corticosteroids/vitamins/minerals as per the symptoms.
greater rate of mortality in HCQ patients than in our studied patients with lower comorbidity condition [30]. Vitamin D insufficiency has been reported in COVID-19 patients, and it has been linked to severity and death [19,31]. The lack of measurement of vitamin D deficiency was a limitation in our study. All three studies [19,31,32] concluded that vitamin D supplementation reduced hospital stay and mortality, and our investigation confirmed the same results.

Conclusion

In this single center study, mostly death rate was seen in HCQ treated patients, although other variables may be contributed in mortality, an association between these groups and comorbidity needs to be identified. Comorbidity played a significant role in the increased death rate in COVID–19 infected patients. Interestingly, in Saudi Arabia, the effects were not as severe, and there were fewer deaths compared to other major affected countries. Our findings indicate that combination therapy had favorable outcomes, but whether this approach is applicable in future outbreaks from COVID variants remain to be proven.

Conflicts of Interest

The authors declare no conflict of interest.

Author’s contribution

M.Ah. and S.Al. developed conceptualization. M.Az., B.B., A.H. data collection, statistical analysis and writing. J.A.M. and S.A. data curation. S.A. writing, editing, critical review and finalizing.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jiph.2022.02.001.

References

[1] Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet 2020;395:470–3.
[2] Ibrahim S, Memish Z. Saudi Arabia’s measures to curb the covid-19 outbreak: temporary suspension of the Umrah pilgrimage. J Travel Med 2020;27:
[3] Chen Z, Tian Y, Liu L, An J. Production of a monoclonal antibody against non-structural protein 3 of dengue-2 virus by intrasplenic injection. Hybridoma 2008;27:467–71.
[4] Yang Y, Xu X, Xiong L, et al. Clinical characteristics of hospitalized mild/moderate COVID-19 patients with a prolonged negative conversion time of SARS-CoV-2 nucleic acid detection. BMC Infect Dis 2021;21:1–8.
[5] Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395:497–506.
[6] Chen T, Wu D, Chen H, et al. Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. BMJ 2020;368.
[7] Arenz T, Yin E, Klaff L, et al. Characteristics and outcomes of 21 critically ill patients with COVID-19 in Washington State. JAMA 2020;323:1612–4.
[8] Yang J, Zheng Y, Guo X, et al. Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. Int J Infect Dis 2020;94:91–5.
[9] Tan L, Wang Q, Zhang D, et al. Lymphopenia predicts disease severity of COVID-19: a descriptive and predictive study. Signal Transduct Target Ther 2020;5:33.
[10] Severance EG, Rossi I, Dickerson FB, et al. Development of a nucleocapsid-based human coronavirus immunoassay and estimates of individuals exposed to coronavirus in a US metropolitan population. Clin Vaccin Immunol 2008;15:1805–10.
[11] Fu L, Wang B, Yuan T, et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: a systematic review and meta-analysis. J Infect 2020;80:656–65.