Evaluating of the Clinical Profile, Laboratory Parameters and Outcome of Covid-19 Patients in Najran City - Saudi Arabia: A Descriptive Analysis

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The unprecedented pandemic has been causing devastating damage to the human life and livelihood. The SARS CoV-2 viral strains are currently responsible for the serious of infection waves and high mortality rate. The management of disease requires well developed medical infrastructure such as central oxygen suction, ventilator facility to support the patients with severe complications.

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Therefore, early diagnosis and monitoring are mandatory in order to control the disease progression and its clinical complications. Current study, we retrospectively analyzed the clinical parameters of the COVID-19 positive patients, and found that the body mass index ratio, oxygen saturation level and the neutrophil, lymphocyte ratio were continuously monitored. Any significant increase in the above said parameters may be correlated with adverse disease progression and patient mortality rate. In this way, developing countries could cut down the necessity for medical infrastructure.

1. INTRODUCTION

The recent Outbreak of the novel coronavirus disease 19 (COVID 19), caused by highly contagious virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. This unprecedented pandemic has been causing devastating loss of human life as the disease shows high infectivity and moderate to severe mortality as depending on the person's co-morbidity profile. As this virus gains entry through nasopharyngeal route, it has been reported globally it is transmitted through aerosols released from infected persons. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment [2]. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness [3]. So far there is no clinically approved antiviral drug or vaccine available to treat or prevent the disease. Nevertheless, limited broad-spectrum antiviral medications have been evaluated and repurposed against COVID-19 in clinical trials resulted in clinical recovery. Studies have shown that viral RNA mutates at a higher rate and often resulting in the emergence of highly aggressive and infectious viral strain could even cause high mortality irrespective of the patient'sage andco-morbidity status [4].

The mode of infection in COVID 19 is through contact and respiratory droplets or aerosols released by the infected person [5]. Similarly, it gains its entry to the host via naso-oral route via the droplets or aerosols released by the COVID 19 positive patients. In many cases, these aerosols may transmit *via* air in places such as crowded and poorly ventilated and it further increase the threat of transmission. Worldwide, the COVID-19 pandemic has caused incomparable damage on both health and economic fronts. As at date, there are more than 37 million confirmed cases and 1 million deaths attributed to the virus. In this critical situation, it is highly beneficial to study about the clinical parameters individual patients who have been positive for COVID-19 [4]. Earlier studies documenting the clinical parameters plotted against epidemiological profiles were very crucial in understanding the targeted sector of the subjects and its prevalence [4,6]. Categorizing and severity assessment helps in deciding the requirement for a hospital stay and ICU admission for COVID-19 which can easily be done using clinical and laboratory parameters [7]. An approach with defined criteria and treatment guidelines will help in prudent operation of health-care resources, especially for developing countries.

Significant evaluation of clinical parameters and their correlation with epidemiology are mandated to understand the nature of the disease outbreak, manifestation of the disease pathology and its combating modalities [8]. The patients COVID-19 positivity was initially confirmed with the gold standard qRT-PCR method from the oro-nasopharyngeal swab obtained from the patient [9]. The clinical parameters will be critically analyzed for understanding the COVID-19 compliances and complication during the course of infection and in post-COVID-19 phase. In this aspect, we performed the critical clinical evaluation via employing the clinical findings of 205 positive COVID-19 patients. Current study evaluated the variable factors such as demographic factors, clinical characteristics, laboratory parameters, and the outcomes were analyzed and correlated.

2. METHODS

2.1 Data Mining from Pre-Recorded Medical Files

Current study was designed and performed in similar manner as published earlier with few modifications [10]. The study was investigated at King Khaled Hospital. COVID-19 suspected

patients were confirmed by qRT-PCR analyzing the fold change expression of SARS-CoV-2 viral specific genes such as N gene and E gene in patient's oro-nasal throat swab. The strong positive patients whose cycle threshold valued ranging from 20-25 were exclusively consented to enroll for this study. Nearly 205 strong COVID-19 positives have volunteered for these clinical investigations. This study included the patients' complete data from the date of admission till the date of discharge or death that were available with the hospital administrative records.

2.2 Reviewing Parameters

The analyzing parameters were taken into consideration for drawing significant disease combating strategy. Therefore, we chose to include parameters of variables such as demographic profiles such as age, gender, also other profiles like basal metabolic index (BMI), WBC profiling, other hematologic parameters such as Hematocrit, MVC, MCHC, platelet counts etc. These basic profiling is the usual administrative procedure that will be operating as standard at most of the multi-specialty hospital. Yet analyzing the above parameters will guide us better in the times of managing disease of no specific treatments has not been reported so far. The case files of the patients were retrospectively reviewed, and the required information was extracted, and exclusion criteria co-morbidity patients excluded. Treatment with azithromycin, hydroxychloroquine (HCQ), lopinavir–ritonavir, steroid or oxygen support was considered as depend upon the patients' requirements. For asymptomatic patients, multivitamins and zinc tablets were given. The sample size was determined by the time window of the study.

2.3 Statistical Analysis

The data representations were given in the form of tabulation. The continuous variables were concised as mean (SD) andmedian. Categorized variables were summarized ascount and percentages. Missing data were not includedin the analysis.

3. RESULTS

The study population included 205 hospitalized patients with confirmed COVID-19. The age range between 20 to 99 were taken as the cut-off since the complete data were available for these set of patients only. The data was then tabulated with sub-grouping the age, patient numbers and percentage (Table 1). In the above said range patients, the highest incidence percentage were observed in the age groups between 51-60 which accounted for 52 patients around 25%. This followed by second highest in 41-50 age groups with 21% around 43 patients. The least disease incidence range was observed in age group ranging between above 80 with 2.9%, and also 20-30-year age group also showed little less incidence of disease around 6.3%. Therefore, it is well understood that age group ranging from 40-60 were the most vulnerable and sensitive group of people with the incidence of disease occurrence.

The high incidence of disease prevalence is more among in male accounted for 73% compared to the female which was around 27% only (Table 1). This data was almost consistent with all other reported data. The rationale may be due to their personal isolation at homes since most society males were generally left home for managing the socio-economic status of the family. Patients with high weight range from 70-80 showed highest incidence of infection with percentage of 33%, however, less than 60 years of age were less susceptible for infection (5%) Further, on analyzing the body mass index ratio, around a mean of 28 becomes ideal host for corona infection to occur having the little less value of SD (Table 2).

The availability of Oxygen O2 was also considered as the important factor determines the lung damage indirectly. The lung with extensive damage will be observed with very less O2 around 40-70 saturation values, signifies the severe infection and disease condition, which might be correlated with the mortality of the disease. The normal range of the oxygen saturation should be around 95-100 for both healthy and asymptomatic carriers. These patients required no hospitalization emergency however, the patient with lower saturation levels of oxygen should be hospitalized with proper isolation and put on with drugs as per their symptoms. In the current study, almost around 47% of the patients showed oxygen insufficient state (Table 3).

With respect to the symptoms recorded in the patients, almost 68% of patients were reported with shortness of breath showing mild infection extended up to lung. Besides, fever also considered as secondary factor which is more

prevalent in positive patient with 23% (Table 4). Remaining other clinical factors may or may not appear as they were considered for least consistent symptoms of the disease.

Analyzing the WBC profiling of the 205 patients, most of the patients showed high elevation of neutrophil (>60) around 71% and Lymphocytes (>14) around 57%. (Table 5). Therefore, this data showed a high sensitization and production of neutrophils and lymphocytes were resulted after the infection. Further, both innate and specific immune response have been elicited during the course of infection while the body was trying to respond. The other blood parameters such as RBC, Hemoglobin, Hematocrit, MCV, MCHC, and Platelets were also compared in the 205 patients, however not much significant elevation was observed and most of the positive patients' profile showed values within the normal reference limits (Table 6).

Table 1. Demographics and Baseline clinical variables of patients with COVID-19

Variables	No. of patients (n=205)	Percentage (%)
Age in years		
20-30	13	6.3
30-40	36	17.6
41-50	43	21.0
51-60	52	25.4
61-70	33	16.1
71-80	22	10.7
>80	6	2.9
Gender		
Female	56	27.3
Male	149	72.7
Weight (kg)		
<60	11	5.4
60-70	68	33.2
70-80	55	26.8
81-90	49	23.9
>90	22	10.7
Height (cm)		
<160	32	15.6
160-170	137	66.8
171-180	32	15.6
>180	4	2.0
BMI (kg/m^2)		
<18.5	0	0.0
18.5-25	61	29.8
25-30	88	42.9
>30	56	27.3

Table 2. Descriptive statistics of patients with COVID-19 on admission to hospital

	Min	Max	Mean	SD
Age in years	20.00	99.00	52.74	15.31
Weight (kg)	52.00	150.00	77.25	14.02
Height (cm)	125.00	189.00	165.58	7.71
BMI (kg/m^2)	19.30	56.30	28.23	5.53

Table 3. O2 Saturation of patients with COVID-19 on admission to hospital

O2 Saturation	No. of patients (n=205)	Percentage (%)
<90	94	45.8
91-95	72	35.1
95-99	37	18
100	2	0.97
Total	205	100.0

Table 4. Clinical findings of patients with COVID-19 on admission to hospital

Clinical Presentation	No. of patients (n=205)	Percentage (%)
Nil	10	4.9
Yes	197	96.1
Shortness of breath	139	67.8
Fever	47	22.9
Cough	5	2.4
Asymptomatic	2	1.0
Shortness of breath, Vomiting	2	1.0
Back and neck pain	1	0.5
Poor oral intake and runny nose	1	0.5

Table 5. Demographics and WBC profiling of patients with COVID-19

Variables	No. of patients (n=205)	Percentage (%)
WBC		
<6	93	45.4
6-12	84	40.5
>12	28	13.7
Neutrophil		
<60	59	28.8
>60	146	71.2
Lymphocytes		
<7	35	17.1
7-14	53	25.9
>14	117	57.1

Table 6. Demographics and hematological parameter of patients with COVID-19

Variables	No. of patients (n=205)	Percentage (%)
RBC		
<4	17	8.3
4-6	179	87.3
>6	9	4.4
Hemoglobin (g/dl)		
<12	32	15.6
12-16	159	77.6
>16	14	6.8
Hematocrit		
<40	67	32.7
40-50	133	64.9
>50	5	2.4

Variables	No. of patients (n=205)	Percentage (%)
MCV		
<70	22	10.7
70-90	163	79.5
>90	20	9.8
MCHC		
<30	12	5.9
30-50	193	94.1
>50	0	0.0
Platelets		
<150	32	15.6
150-300	169	82.4
>300	4	2.0

4. DISCUSSION

Coronavirus disease (COVID-19) has quickly spread around the world, resulting in a worldwide high mortality and morbidity economic recession as well as a health problem in several countries and regions [11]. COVID-19 has emerged as a pandemic in past two years, causing devastating damage to the live and livelihood of the global population. Still, researchers and clinicians were struggling to understand the disease consequences and complications, the virus has become much more aggressive due to its high mutation rate. The viral mutation has a direct implication in disease infectivity and increased mortality rate of the disease. The manifestation of the disease progression is rapid and severely hampers the socio-economic status globally. The disease severity predominately depends on the pattern of clinical factors. Therefore, it is important to record and regularly monitor the clinical features and its co-relation with disease manifestation and consequences should be thoroughly studied. In this retrospective study, we picked up few essential clinical parameters and monitored its progression in small cohorts of subject's positive for COVID-19 infections [12].

Patients with heavy viral load and poor immune state were at higher risk as this virus often cause the host to experience fever and shortness of breath [13]. The oro-nasal route of entry leads to the lung colonization, therefore the primary organ of target is lung followed by pulmonary thrombosis, coagulopathy and finally leading to multi-organ failure and death [14]. Patients with high correlation of clinical features such as shortness of breath, low oxygen saturation rate, heightened immunological profiling often have high mortality and poor prognosis rate [10].

Therefore, early diagnosis and followed by prompt treatment initiation could even save the patient in evading the critical phase of infection due to severe lung irreversible damage and failure.

Normal physical symptoms and white blood cells profiling could be considered as a disease manifestation marker. In our study, we found that out of 205 patients nearly 146 patients showed elevated neutrophil count, and 117 patients showed increased lymphocyte count followed by COVID-19 infection. The neutrophil and lymphocytes count are the two critical clinical factors that can even correlated with the severity of the disease. Since both are falls under innate and specific immune response occurring in the host followed by the infection. The disease severity at the final phase was mainly due to the occurrence of heightened chronic inflammatory response. Thus causing the infiltration of many leukocytes attempting to kill the viral infected cells resulting in cytokine storm [15]. Therefore, early monitoring of disease using these immunological related parameters would help us to identify the patients with more sensitivity and vulnerability of the disease. However, these patients may or may not develop the complications, whereas in case of co-morbid conditions it is highly likely to develop the complications and the mortality and prognosis might be poor.

Further patients with high BMI rate also correlated taken considerations if correlation with high neutrophil and lymphocyte ratio, this needs to be monitored seriously and hospitalization may require instead of home quarantine.

5. CONCLUSION

Our study suggests that the early monitoring of blood parameters mainly neutrophil, and lymphocyte followed by BMI may be considered as marginal marker to be considered for the necessity of COVID-19 patient's hospitalization to manage the disease with minimal health infrastructure.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval was obtained from the hospital ethical committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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