Clinical Features, Laboratory Variants, and Outcome of Patients Admitted with COVID-19 Infection; A Single-Center Experience

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Abstract

Objective: To determine the clinical features, laboratory variants, and outcome of patients with Corona virus Disease-2019 (COVID-19) infection.

Methods: A descriptive, single-center case series was conducted between October to December 2020. It included patients diagnosed with COVID-19 infection via Polymerase Chain Reaction (PCR). Patients were recruited through non-probability convenience-based sampling. After history and detailed examination of the patients, their demographic and clinical characteristics, including complete blood count (CBC), renal & electrolytes profile, inflammatory markers like C-reactive protein (CRP), lactate dehydrogenase (LDH), ferritin, and D-dimers were recorded using a structured questionnaire. Patients were managed according to the severity of the disease and disease progression was monitored regularly. Treatment offered to these patients was based on their presentation and severity of the disease.

Results: Out of 1092 patients, 77% were males. Most of them were diabetic (71.0%) and aged between 51-70 years (58.97%). Furthermore, 1051 of the total enrolled cases were symptomatic and had shortness of breath (94.32%), dry cough (91.20%), anorexia (91.20%), fatigue (90.65%), and etc. Among the laboratory parameters, raised C-reactive protein (CRP) was found in 96.24% of patients while leukocyte count, Alkaline phosphatase (ALP), D-dimers, ferritin and lactate dehydrogenase (LDH) levels were elevated in 89.37%, 71.61%, 68.77%, 56.86%, and 44.04% respectively. Hyponatremia was also observed in 53.75% patients. Most patients (32.60%) had oxygen saturation between 80 to 89%, while it was $\leq$80% among 20.42% patients. Moreover, 31.05% patients were categorized as having mild disease, 23.68% had moderate severity, and 24.84% had severe disease on the basis of clinical criteria. About 20.42% were critical and had respiratory failure. The recovery rate was high (96.0%), and the mortality rate was only 4.0%.

Conclusion: We observed dynamic changes in the clinical and laboratory features of the COVID-19 patients admitted at District Health Quarter in Charsada, highlighting the significance of each of these parameters for individual patient's recovery and survival.

Keywords: COVID-19, Disease Progression, Oxygen Saturation, SARS-CoV-2

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Introduction

In December 2019, Wuhan, Hubei province of China experienced clusters of pneumonia-like illnesses. The pathogen was identified in January 2020 as Novel Coronavirus, which was named 2019 nCoV[1].The infection spread from china to other countries within a short duration of time and was declared a pandemic on 11 March 2020[2].Till 29th April 2022, 510,270,667 laboratory-confirmed cases of COVID-19 with 6,233,526 deaths have been reported globally, as per the surveillance data of World Health Organization (WHO)[3]. On 26th february 2020, the first two cases of 2019-nCoV were identified in Karachi, Pakistan. Both Patients had recently returned from Iran[4], the number of cases quickly escalated in few months with total confirmed cases of 1,527,956 and 30,369 deaths to date. Khyber Pakhtunkhwa, a province of Pakistan, reported its first 15 cases on March 16, 2020. Since then, a total of 219,460 cases have been reported in the p-

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rovince,with 6,324 deaths[5].

The typical symptoms of coronavirus infection include fever, sore throat, fatigue, cough or dyspnea[6]. Based on the clinical manifestations of COVID-19, it can be classified as symptomatic, mild, moderate, and severe. Patients with mild infection display consistent symptoms, may require oxygen, and have mild or no pneumonia. Moderate COVID-19 patients suffer hypoxia (Oxygen Saturation < 94% and > 90%) while severe disease combines dyspnea, respiratory frequency "≥30/min, blood oxygen saturation (SpO2)≥93%, PaO_2/FiO_2 ratio or P/F [the ratio between the blood pressure of the oxygen (partial pressure of oxygen, PaO2) and the percentage of oxygen supplied (fraction of inspired oxygen, FiO2)] < 300, and/or lung infiltrates > 50% within 24 to 48 hours. The critical COVID-19 patients usually suffer acute respiratory distress syndrome (ARDS), respiratory failure, septic shock, and/or multiple organ dysfunction (MOD) or failure (MOF)[7].

The treatment and management of corona virus infection depends upon the symptoms, and disease severity. It includes control, prevention, and supportive care. Oxygen supplementation and mechanical ventilation (if required) are the provost treatment modalities. Remdesivir is the only Food and Drug Administration (FDA) approved medication for the COVID-19 treatment. Moreover, great improvement in the survival rates has been observed by the Dexamethasone treatment among hospitalized patients with minimal oxygen saturation requiring mechanical ventilation according to the National Institute of Health (NIH) COVID-19 treatment guidelines whereas, the therapeutic efficacy of Convalescent Plasma in case of COVID-19 remains controversial. FDA issued an emergency use authorization (EUA) with reference to the treatment with convalescent plasma without survival or recovery benefits. Similarly in Pakistan, the therapeutic regulation of convalescent plasma is restricted by the Ministry of National Health Services (NHS).

Among the clinical variations, majority of the COVID-19 patients suffer lymphocytopenia, thrombocytopenia, and leukopenia. Furthermore, high levels of C-reactive protein (CRP), alanine transaminase (ALT), aspartate aminotransferase (AST), creatinine kinase (CK), and D-dimers are also frequently observed in these patients[8]. Also, the common observations on computed tomography scans (CT-Scan) of COVID-19 patients are ground-glass opacity, ill-defined margins, smooth or irregular inter-lobular septal thickening, air bronchogram,etc[9]. Although COVID-19 vaccinations have been introduced but due to the slower approach and administration in Pakistan, we still rely on supportive care, including broad-spectrum therapeutic agents inducing antibiotics, antivirals, corticosteroids,oxygen therapy, mechanical ventilation,and convalescent plasma[10].To date 121,677, 88 people are fully vaccinated in Pakistan. Severe cases require intensive care support with non-invasive (NIV) and invasive mechanical ventilation (IMV)[11].

The aim of this study was to present the clinical and biochemical characteristics and disease outcomes among 1092 laboratory-confirmed COVID-19 cases from Khyber Pakhtu-nkhwa, province of Pakistan.

Patients and Methods

This descriptive, retrospective, case series was conducted at District Health Quarter in Charsada and a private pulmonology clinic in Peshawar from October to December 2020. A total of 1092 patients with COVID-19 infection were included in the study, recruited through non-probability convenience-based sampling. As there were no known local data regarding the actual prevalence of the disease and vaccination was not yet available, exact sample size could not be calculated accurately. A large sample size was taken to mitigate any errors. The patients were diagnosed via either nasopharyngeal or oropharyngeal swabs and after performing Polymerase chain reaction (PCR) analysis of the specimens, a written informed consent was taken in all the cas-

es and non-consenting patients were excluded from the study. The patients were monitored for disease progression and outcomes during the course of their illness, till they were either fully recovered and discharged or deceased.

Biochemical estimations including complete blood count (CBC), renal & electrolytes profile, inflammatory markers like C-reactive protein (CRP), lactate dehydrogenase (LDH), ferritin and D-dimers were monitored. The patient's data was collected using a structured questionnaire. The disease outcomes were defined based on COVID-19 infectivity status detected through PCR analysis.

Operational definitions are

PCR: Polymerase chain reaction run on oro-pharyngeal and nasopharyngeal swabs to detect viral RNA.
Recovered: A patient testing negative for covid-19 PCR analysis on 2 separate occasions.
Deceased: any patient giving in during the course of their illness.

The ethical approval was obtained from the ethical review committee of [Ref # 4017/DHQ Hospital CHS; Date 01-10-2020]. The collected data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0. The results were given as frequencies and percentages.

Results

Out of 1092 confirmed COVID-19 patients, the majority were males 841 (77%) and only 23% were females. History of comorbidities was found in 1035 patients (95%). Most of these patients were diabetic 775 (71.0%), followed by cardiac problems as the major comorbidity (16%). Most of the enrolled patients were from 51-70 years age range (58.97%). Other baseline characteristics can be seen in table 1.

Table 1. Baseline characteristics of the study population (n=1092)

Variables		n(%)
Gender	Male	841(77.0)
	Female	251(23.0)
Age groups	≥ 30 years	44(4.02)
	31-50 years	316(28.93)
	51-70 years	644(58.97)
	≤ 71 years	87(7.96)
Comorbidities	TB	5(0.5)
	Asthma	22(2.0)
	COPD	44(4.0)
	Cardiac Problems	175(16.0)
	Diabetes	775(71.0)

TB-Tuberculosis; COPD- Chronic Obstructive Pulmonary Disease

Most patients were symptomatic, while only 41 (3.75%) were asymptomatic. Shortness of breath was the most frequently reported symptom, i.e.,1030 (94.32%), followed by anorexia, dry cough, fatigue, etc. The biochemical estimates were deranged; 1051 (96.24%) and 976 (89.37%) of patients were observed with raised CRP levels and leukocyte count. 356 (32.60%) of patients had oxygen saturation between 80 to 89%, while it was "≥80% among 223 (20.42%) of patients. Out of the total symptomatic patients, 295 (31.05%) were categorized as having mild disease, 225 (23.68%) had moderate severity and 236 (24.84%) had severe disease on the basis of clinical criteria. About 194 (20.42%) were critical and had respiratory failure. They were shifted to tertiary care hospitals. Mortality rate was 4% while 96% made complete recovery.

Table 2. Disease characteristics, progression, and outcomes among the studied subjects

Variables		n(%)
Symptomatology	Fever (at presentation)	495(45.3)
	Fever (past week)	556(50.91)
	Fatigue	990(90.65)
	Dry cough	996 (91.20)
	Cough with expectorate	55 (5.03)
	Anorexia	996 (91.20)
	Chest tightness	105 (9.61)
	Shortness of breath	1030 (94.32)
	Nausea/vomiting	15 (1.37)
	Headache	102 (9.34)
	Pharyngitis	25 (2.28)
Laboratory Estimates	Raised leukocyte count	976 (89.37)
	Lymphopenia	75 (6.86)
	Raised CRP	1051 (96.24)
	Hyponatremia	587 (53.75)
	Raised ALP	782 (71.61)
	Deranged RFT	25 (2.28)
	Raised D dimers	751 (68.77)
	Raised Ferritin	621 (56.86)
	Raised LDH	481 (44.04)
Oxygen Saturatione (symptomatic patients)	$\geq$ 95%	338 (30.95)
	90-94%	134 (12.27)
	80-89%	356 (32.60)
	$\geq$ 80%	223 (20.42)
Disease activity (symptomatic patients)	Mild	295 (31.05)
	Moderate	225 (23.68)
	Severe	236 (24.84)
	Critical	194 (20.42)
Disease outcomes	Discharged	1048 (96.0)
	Deceased	44 (4.0)

CRP - C - reactive protein; ALP- Alkaline phosphatase; RFT- Renal Function Test

The asymptomatic patients were treated with Azithromycin, Panadol, Zinc, and vitamin C supplements given for a period of 10 to 14 days. The symptomatic patients with severe category 236 (24.8%) had deranged ferritin, LDH, D-dimers, decreased oxygen saturation level, presence of ARDS on X-ray.They were managed using Revroxiban, Steroids, Sulbactam/sulfaprazole antibiotic, Hydroxychloroquine, Bronchodilators(salbutamol and corticosteroids, salmeterol) via inhalers in the closed chamber through spacer device was provided as needed. Also, oxygen supplementation through Venturie mask and non-invasive mechanical ventilation was provided to patients with low oxygen saturation.

Discussion

As Coronavirus infection is a newly developing infectious disease, identifying main clinical features is paramount in the early diagnosis and prompt treatment of infected individuals. In our study, the individuals infected from the novel coronavirus infection were mostly 51 to 70 years of age, indicating its predominance in middle-aged and older people than the younger ones. Other studies also support this finding[9,12]. Furthermore, 77.0% of the affected patients were males; similarly, other studies carried out in China and other regional countries showed a high prevalence of COVID-19 among males than females[13].

Comorbidities greatly affect the disease outcome; in the present study, about 95% of the individuals encountered comorbid conditions. Out of all the observed comorbid conditions, the most common was Diabetes Mellitus reported in 71% of the patients, followed by cardiovascular diseases, chronic obstructive pulmonary disease (COPD), and asthma. In contrast, the number of comorbid conditions reported in a Chinese study was low as compared to that observed in this study[14]. Only 20% patients had diabetes, 15% were hypertensive, and 15% had cardiovascular disease. Furthermore, a meta-analysis of the 2019 novel coronavirus including research square data from January to March 2020 reported that the most common comorbid condition was hypertension, followed by cardiovascular conditions and diabetes[15].

Only 3.75% of our enrolled cases were asymptomatic, while a large number of cases were symptomatic, i.e., 96.24%. Likewise, Lauer et al. reported that 2.5% of the asymptomatic patients displayed COVID-associated symptoms in 2.2 days while the remaining 97.5% developed symptoms in the following 11.5 days[16]. A few studies and World Health Organization (WHO) also do report a higher number of asymptomatic seropositive, i.e. up to 80%[17,19]. While a meta-analysis reported that the

number of asymptomatic cases was much lower but higher than that reported in the present study, i.e. 27.7%[20]. It is evident that the higher the number of asymptomatic cases, the more will be potential for silent viral transmission.

In the present study, 50.91% of patients reported fever in the past 1 to 2 weeks, and about 45.3% had fever at the time of presentation. Similar patterns were observed in China and United States[21-22]. Most of our patients (91.20%) had a dry cough, and only 5.03% showed sputum production according to reports elsewhere in the world, which shows dry cough to be the commonest symptom. Among all the patients, 94.32% complained shortness of breath, and 91.20% became anorexic. In support, a similar local study from Karachi reported fever in 83% of the COVID-19 patients, followed by dry cough (52%). Other studies also reported, fever (98.6%), fatigue (69.6%), dry cough (59.4%), muscle pain (34.8%), dyspnea (31.2%), dizziness (9.4%), diarrhea (10.1%), nausea (10.1%), vomiting (3.6%), etc[12,23].

Oxygen saturation between 95 to 100% is considered normal; oxygen therapy is recommended for all the patients with SpO_2 < 90%[24]. Out of 1051 symptomatic patients, 30.95% had normal oxygen saturation levels (< 95%), wh-ile 32.60% had saturation levels in the range of 80-89%. All the patients with oxygen saturation below 90% were supplemented with oxygen. A similar study reports median oxygen saturation of < 93% in 59.7% of the COVID-19 patients while 40.3% had > 93% SpO_2[25]. They further reported a higher oxygen saturation among survivors than those deceases[25].

Among the laboratory indicators,the commonest feature was a raised CRP which was observed among all the symptomatic patients. Raised leukocyte counts were observed in 89.37% of patients, while 7% presented with leukopenia. As for the differential count, the commonest abnormality was lymphopenia found in 6.86% of the patients. Other abnormal lab indicators included hyponatremia, raised ALP, D-dimers, ferritin, and LDH, observed in more than 50% of the overall patients enrolled. Asghar et al. also reported that elevated leukocyte, CRP, LDH, and deranged urea/ creatinine are closely associated with COVID-19 severity and mortality[13].

The patients were treated as per local guidelines, the disease progression was monitored, and management was based on the disease severity and likely outcome; 96.0% of the patients made a complete recovery, while 4.0% died during the course of the illness. The recovery rate was remarkably higher in the studied population, and the mortality rate was lower as compared to other similar studies[13,25]. One of the major reasons for this could be the population heterogeneity or better immune status. Further studies are warranted in this direction to find the likely cause.

The limitation of the present study is the presentation of the single-center data. Moreover, the retrospective nature further limits the study scope. Hence, additional multicenter prospective studies with large sample population are required to elucidate the importance of these variants for patient's recovery and survival.

Conclusion

In conclusion, a number of clinical and biochemical features were altered among the enrolled COVID-19 patients, indicating disease severity, and modulating the management accordingly. Breathing difficulty, anorexia, etc. were the commonest symptoms observed in this study. Furthermore, most patients were symptomatic, had elevated CRP, leukocyte count, ALP, and D-dimers. Although many patients had oxygen saturation below 89% and required supplementation, we had a high recovery rate of 96.0% as the treatment included recognized potential therapeutic agents like Azithromycin,Revroxiban, Steroids, and Sul bactam/Sulfaprazole Antibiotic, Hydroxychloroquine, and Bronchodilators, etc.

Conflict of Interests

Authors have no conflict of interests and received no grant/funding from any organization.

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