Annals of Medical Case Reports

ISSN: 2689-5927

Research Article

Clinical Findings of 104 Hospitalized COVID-19 Patients from Khyber Pakhtunkhwa Province of Pakistan: A Multi-Centre Case Series

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Abstract

Introduction: The Coronavirus disease-2019 (COVID-19) pandemic affected the world including the Khyber Pakhtunkhwa (KPK) province of Pakistan. The objective of this study is to report the various clinical characteristics of hospitalized COVID-19 patients across the various Khyber Pakhtunkhwa hospitals.

Methods: This is a descriptive case series of 104 polymerase-chain-reaction-confirmed COVID-19 patients admitted to four major hospitals of KPK (Hayatabad Medical Complex Peshawar, Khyber Teaching Hospital Peshawar, Ayub Teaching Hospital Abbottabad and Qazi Medical Complex Nowshehra) between December, 2020 and February, 2021. Data were analyzed using STATA Corp 15.1 (Stata Corp, LLC, College Station, TX).

Results: A total of 104 COVID-19 patients have been reported, 27 have been admitted to the Intensive Care Unit (ICU), and 77 were admitted to the general ward. The mean age was 52.6 years (standard deviation, 13 years; range: 23 to 85 years). Of the COVID-19 patients, 27% had positive contact with someone infected with the severe acute respiratory syndrome-coronavirus-2. We found that 24% had mild disease, 34% had severe disease, and 21% had critical illness. Most patients (81%) had onset of first symptoms within five days. Dyspnea (80%), fever (80%), cough (71%), fatigue (66%), and nausea (63%) were among the most common clinical concerns. Of the COVID-19 population, 13% required invasive ventilation, and 15% did not survive. The case fatality rate for patients aged 65 to 85 years age was highest at 22.22%, followed by the 55 to 64-year age group at 15.38% and the 20 to 54 year age group at 11.53%. Hypertension was the most common comorbidity, followed by obesity. D-dimers were lower in patients admitted to the ICU were statistically insignificant. Acute respiratory distress syndrome was more prevalent in ICU COVID-19 patients (74.07%) than non-ICU (3.9%). Age, hypertension, presence of Bacillus Calmette-Guérin scar, oxygen saturation, total leukocyte count, lymphocyte count, C-reactive protein, platelet count, Lactate Dehydrogenase (LDH), Prothrombin Time (PT), international normalized ratio, and chest x-ray findings were all independently associated with ICU status.

Conclusion: Along with age, laboratory values, and oxygen saturation, we found BCG vaccination to be associated with severity of COVID-19 infection. Further studies with larger sample sizes are needed in Pakistani population to explore the association of BCG vaccination and severity of COVID-19 infection. Our overall mortality rate was three times that reported from the outbreak in China but lower than that reported from USA. Further studies are needed to make comparisons between the provinces of Pakistan. Studies are also needed to determine the factors contributing to higher mortality in Pakistani population from KPK.

Keywords: COVID-19; Khyber Pakhtunkhwa; Coronavirus; Peshawar; Case fatality rate; Intensive care unit

Citation: Masud S, Ahmad Z, Khan AW, Khan F, Irfan M, Khan SU, et al. Clinical Findings of 104 Hospitalized COVID-19 Patients from Khyber Pakhtunkhwa Province of Pakistan: A Multi-Centre Case Series. Ann Med Case Rep. 2021;3(2):1027.

Publisher Name: Medtext Publications LLC

Manuscript compiled: Jul 05th, 2021

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Introduction

In December 2019, coronavirus disease-2019 (COVID-19) emerged as a lower respiratory tract infection of unknown etiology [1]. The first case of COVID-19 was reported in Wuhan, China [2,3], which evolved into an epidemic across China [4]. Multiple countries across the world were involved over several weeks. The outbreak was declared a Public Health Emergency of International Concern on January 30, 2020, by the World Health Organization (WHO) [5].

The first case of COVID-19 in Pakistan was reported on February 26, 2020, in Karachi, Sindh province of Pakistan. On the same day, another case was confirmed in the capital city of Islamabad [6]. As of April 24, 2021, the total confirmed cases in the world are 145,293,628 with 3,083,527 fatalities [7]. A total of 790,016 people have been

affected in Pakistan according to the latest figures, with 16,999 deaths. Of those 112,140 belong to the province of Khyber Pakhtunkhwa (KPK), making KPK the third largest province in terms of the number of people affected by COVID-19 [8]. The virus that causes COVID-19 belongs to the Betacoronaviridae family of the viruses. The severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) is similar to the SARS-CoV and the Middle East Respiratory Syndrome (MERS)-CoV, which also belong to the same family. It infects both humans and animals. Bats have been reported to be the natural reservoir for coronaviruses [9]. The first outbreak of SARS occurred 18 years ago. Since then, many SARS-related Coronaviruses (e.g., SARSr-COVs) have been reported [10,11]. SARS-CoV-2 shares 79.6% of its genome with SARSr-COVs and uses the Angiotensin-Converting Enzyme receptor (ACE)-2 for its entry into host cells [12].

Studies that have looked at the clinical characteristics of COVID-19 have stated that fever, nonproductive cough, myalgia, diarrhea, lymphopenia, raised Lactate Dehydrogenase (LDH) levels, and elevated C-Reactive Protein (CRP) levels are the defining features of the disease [13,14]. Rare presenting features of the disease, such as stroke, have also been reported [15]. However, our understanding of the disease is still evolving. Currently, no study has been published from KPK regarding the clinical features of COVID-19. Therefore, the goal of this study was to report the clinical characteristics from a retrospective case series of COVID-19 patients in KPK, Pakistan.

Materials and Methods

This is a descriptive case series of 109 Polymerase-Chain-Reaction (PCR) positive COVID-19 patients [16]. Sample size was not calculated for this study. Patients were included based on convenience and availability of results. The data were collected by a retrospective review of medical records from five major hospitals across the KPK province of Pakistan. Medical record review was conducted at the medical unit and the Intensive Care Units (ICUs). There were five hospitals included in the study, consisting of the Khyber Teaching Hospital Medical Training Institute (n=24 COVID-19 patients), Hayatabad Medical Complex Medical Training Institute (n=45), Hangu District Head Quarter Hospital (n=5), Qazi Hussain Ahmad Medical Complex (n=23), and Ayub Teaching Hospital (n=10). All adult (i.e., those aged 18 years or older) PCR-positive COVID-19 patients hospitalized between March to May 2020 were included in the study. Patients were categorized into three age groups: 20 to 54 years, 55 to 64 years and 65 to 85 years, based on the CDC categories [17]. The Case Fatality Rate (CFR) was manually calculated through the following formula.

(Deaths in each category)/(Total number of COVID-19 cases in each category) × 100. Healthcare workers at the selected hospitals collected the data through retrospective medical records review. A data collection form was designed and used for abstracting information from medical records. We collected data on demographics, travel history, comorbidities, history, medical and surgical history, and contact with COVID-19 patients, treatment regimen, and outcomes of mortality and severity of symptoms. Dates of admission, the onset of symptoms, admission into ICU were also recorded.

Operational definitions

Acute Respiratory Distress Syndrome (ARDS) was diagnosed through chest x-ray and chest Computed Tomography (CT) findings and was classified as mild, moderate, and severe according to the Berlin definition of ARDS based on the degree of hypoxia. ARDS is mild if a patient's ratio of arterial oxygen partial pressure (PaO_2) to fractional inspired oxygen (FiO_2; abbreviated asPaO_2/FiO_2) is ≤ 300 mmHg but ≥ 200 mmHg, moderate if the patient's PaO_2/FiO_2 is ≤ 200 but ≥ 100 mmHg, and severe if the patient's PaO_2/FiO_2 is <100 mmHg [18].

Cardiac injury was identified through an elevated level of cardiac biomarkers such as troponin I above the 99th percentile of the upper limit of the healthy reference range [19]. Acute Kidney Injury (AKI) was identified according to recommendations by the Kidney Disease: Improving Global Outcomes group and consists of rapid (i.e., within hours) elevation of serum creatinine with or without a decrease in urine output [20].

Patients were considered COVID-19 positive based on a PCR test of a nasal swab taken as a diagnostic and confirmatory test for SARS-CoV-2 infection [21,22]. The diagnosis was made according to WHO diagnostic criteria.

Data analysis

Data were analyzed using STATA Corp 15.1 (Stata Corp, LLC, College Station, TX). Continuous variables were checked for normality using histograms and the Shapiro-Wilk test. Normally distributed variables were reported as mean, while nonparametric variables were reported as a median and inter-quartile range. Categorical variables have been reported as frequency and proportion.

We compared data from ICU and non-ICU admitted patients. Categorical variables were compared using the Chi-square test. Continuous variables were compared using independent t-test or Wilcoxon Rank Sum test. P-values for the two-tailed hypothesis were reported, with $p<0.05$ considered significant. Multivariate analysis was not conducted.

Besides age, continuous, serum sodium level, serum potassium level, and dyspnea onset time from the first symptom, all other continuous variables were nonparametric. The demographic variables of age and sex were included. Data on race were not gathered, as all patients were native to the Khyber area. Clinical history including fever, loss of appetite, loss of smell, dyspnea, cough, myalgia, fatigue, nausea, vomiting, sputum, hypertension, diabetes, cancer, cardiovascular illness, obesity, hepatitis B, hepatitis C, tuberculosis, and smoking were taken as nominal. Laboratory values of Total Leukocyte Count (TLC), neutrophils, lymphocytes, Erythrocyte Sedimentation Rate (ESR), CRP, Prothrombin Time (PT), Activated Partial Thromboplastin Time (aPTT), platelet count, LDH, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT) were taken as continuous. Chest CT and X-ray findings were taken as categorical normal, unilateral, or bilateral. Many patients had missing laboratory values and X-ray findings. The level of severity of disease was taken as categorical (mild, severe, critical, or none: not meeting criteria). The outcome variables of mortality were binomial. Age categorical data were created from age continuous data. Case fatality rates for age categories were calculated manually, and age categorical data were not included in the overall analysis. The epidemic curve was created through a frequency histogram plot of onset of the first symptom in days. Data are available from the corresponding author upon reasonable request.

Results

A total of 109 adult patients were included in the analysis with a confirmed diagnosis of COVID-19, of whom five patients had missing

ICU status, leaving a total of 104 patients. The mean age of the patients was 52.6 years (standard deviation, 13.6 years; range: 23 to 85 years). Most patients were men, and a majority did not have a travel history. Of those included, 27% had positive contact with a COVID-19 patient, 5% had a group infection, 13% were smokers, 66% were admitted to the isolation unit, and 26% were admitted to the ICU (Table 1).

The median time of onset of the first symptom was shorter for the ICU patients (nine days) *vs.* the non-ICU patients (14 days). Median days to onset of dyspnea was approximately five days. The median length of stay was 13 days. Of the study population, 13% required invasive ventilation, and 15% did not survive.

Dyspnea (80%) and fever (80%) were the most frequent clinical symptoms, followed by cough (71%), fatigue (66%), loss of appetite (56%), and myalgia (43%). Loss of smell occurred in 21% of patients, and sputum was the least common clinical symptom (4%). Nausea was the most common gastrointestinal symptom (63%), followed by loss of taste (29%), diarrhea (27%), and vomiting (24%).

Hypertension was the most common comorbidity, present in 37% of patients. Other comorbidities recorded were obesity (body mass index > 31 kg/m^2; 27%), diabetes mellitus (29%), coronary artery disease (14.4%), chronic liver disease (10%), malignancy (4%), hepatitis C (4%), and hepatitis B (1%). One patient tested positive for the human immunodeficiency virus. We noted that 4% had a history of tuberculosis, and 7% had a history of stroke. Almost half of the total patients had Bacillus Calmette-Guérin (BCG) scars (49%). Interestingly, those with a BCG scar were more significantly less likely to be admitted to the ICU ($p<0.05$).

There were 27 patients admitted to the ICU, and 77 non-ICU admitted patients. Besides age, other demographic variables including gender were not statistically significant. Among comorbidities, hypertension was significantly associated ($p=0.001$) with ICU status (Table 1). Age was significantly associated with ICU status ($p<.001$); ICU patients were, on average, 10 years older than non-ICU patients (mean, 60 years *vs.* 50 years, respectively; Table 2).

ICU patients had higher incidences of fever ($p=0.015$) and loss of appetite ($p<0.001$) compared to non-ICU patients. ICU patients also had non-statistically significantly higher rates of cough, fatigue, anosmia, loss of appetite, and loss of taste. While ACE inhibitor use was nearly three times as prevalent in ICU patients as non-ICU patients (14.81% *vs.* 5.19%, respectively), the difference was not statistically significant ($p=0.124$).

The vital signs and laboratory values for the patients are shown in Table 3. Several patients had missing laboratory findings. Median fever (102°F) and diastolic blood pressure (BP; 80 mmHg) were similar across ICU and non-ICU patients. Differences in blood pressures have also been presented graphically in Figure 1 as box plots. Median systolic BP was higher for ICU patients (130 mmHg) compared with non-ICU patients (120 mmHg), but the difference was not statistically significant ($p=0.2196$). Median oxygen saturation was significantly lower for ICU patients (78%) compared to non-ICU patients (89%; $p <.001$).

Laboratory investigation values, including white blood cell count ($p=0.018$), neutrophil count ($p=0.002$), and LDH ($p=0.001$) were significantly higher for ICU patients compared to non-ICU patients. Lymphocyte count and D-dimers were lower in ICU patients, but not significantly lower than non-ICU patients. The differences in white cell counts of patients have also been presented as box plots in Figure 2. Serum bicarbonate was higher for ICU patients than non-ICU patients, but the difference was not significant. ALT ($p=0.14$) and AST levels ($p=0.30$) were higher for ICU patients than non-ICU patients, as were inflammatory markers of ESR ($p=0.22$) and CRP ($p<0.001$). ICU patients had significantly higher PT ($p<0.001$), International Normalized Ratio (INR) ($p<0.001$) compared to non-ICU patients. Differences in PT and aPTT are presented as box plots in Figure 3. Also, aPTT, serum potassium, and hemoglobin differed slightly across ICU and non-ICU patients.

Two ICU patients had CT available, and both had bilateral opacities. For chest x-rays, 77% of ICU patients had bilateral opacities, while 14% had ground-glass appearance. Clinical scorings like the Glasgow coma scale or sequential organ failure assessment scores were not done conducted. Therefore, the analytics are not included in our study.

The treatment and outcomes for patients are shown in Table 2 and Table 4. Of the total 104 patients, 24% had mild disease, 34% had severe disease, and 21% had critical illness. Among the ICU patients, one had mild disease, nine had severe disease, and 17 had critical disease. ARDS was higher in ICU patients (74.07%) compared to non-

Table 1: History and baseline characteristics.

Characteristics	Non-ICU, n (%)	ICU, n (%)	Total, n (%)	p-value
Sex				
Male	64 (74.4)	22 (25.5)	86(82.6)	0.847
Female	13 (72)	5(28)	18(17.3)	
Symptom/condition				
Fever	56(74.67)	26(96.30)	82(80.4)	0.015
Fatigue	50(64.94)	19(70.37)	69(66)	0.607
Cough	52(67.53)	22(81.48)	71(71)	0.169
Loss of appetite	36(61.02)	23(38.98)	59(56.73)	0.001
Myalgia	30 (66.67)	15(33.33)	45(43.27)	0.134
Dyspnea	56(67.47)	27(32.53)	83(79.81)	0.002
Nausea	45(78.05)	18(21.95)	63(39.42)	0.452
Diarrhea	22(78.57)	6(21.43)	28(26.92)	0.522
Vomiting	20(80.00)	5(20.00)	25(24.27)	0.417
Loss of taste	19(24.68)	10 (37.04)	29(27.88)	0.218
Loss of smell	15 (19.48)	7(25.93)	22(21.15)	0.48
Sputum	3(3.90)	1(3.70)	4(4)	0.964
Travel history	7(87.5)	1(12.5)	8(7)	0.398
Hypertension	21(27)	17(63)	38(37)	0.001
ACEI use	4 (5.19)	4 (14.81)	8(7.69)	0.124
Diabetes	22(28.57)	8(29.63)	30 (28.8)	0.917
Cardiovascular disease	9(11.69)	6 (23.08)	15(14.4)	0.155
Chronic kidney disease	1(1.30)	1(3.70)	2(2)	0.434
Malignancy (n=103)	4(5.26)	0	4(4)	0.224
Chronic liver disease	6(60)	4(40)	10(9.6)	0.297
BMI >30 kg/m^2	19(25.33)	9(33.33)	28(27)	0.424
Hepatitis B	1(1.30)	0	1(1)	0.2
Hepatitis C	3(3.90)	1(3.70)	4(4)	0.964
HIV	1(1.30)	0	1(1)	0.552
Stroke	5(6.49)	2(7.41)	7(6.73)	0.87
Tuberculosis history	4(5.19)	1(3.70)	5(4.81)	0.755
BCG	46(59.74)	7(25.93)	53(50.96)	0.002
Isolation ward admission	49(71)	20(29)	69(66)	0.336
COVID-19contact history	23(82)	5(17.8)	28(26.9)	0.192
Group infection	6(100)	0	6(5.7)	0.135
Smoking history	12(85.7)	2(14.3)	14(13.5)	0.275

ICU: Intensive Care Unit; ACEI: Angiotensin-Converting Enzyme Inhibitor; BMI: Body Mass Index; HIV: Human Immunodeficiency Virus; BCG: Bacillus Calmette-Guérin; COVID-19: Coronavirus Disease-2019

Table 2: Other variables.

Characteristics	Non-ICU	ICU	Total	p-value
Mean age in years (IQR)	50	60	52.58	0
Median body temperature, °F (IQR)	102(100.7-102)	102(101-102)	102(101-102)	0.2196
Median pack years of smoking, (IQR)	13.5(5-30)	7(4-10)	11(4.5-22.5)	0.332
Median onset of first symptom, days (IQR)	14(7.5-18)	9(5-16)	12(7-17)	0.0537
Median treatment days, n= 54, (IQR)	12(8-14)	12(5-15)	12(7-14)	0.8305
Median ICU days (IQR)	-	3(3-6)	263(2-6)	0.0914
Median days on ventilator, n=18 (IQR)	-	3(2-8)	3(1.5-6)	0.0367
Median time to onset of ARDS since first symptom in days, n=21 (IQR)	11(9-13)	8(6-10)	8(6-12)	0.1277
Mean time to dyspnea since first symptom in days, n=85 (IQR)	4.89	4.88	4.87	0

ICU: Intensive Care Unit; IQR: Interquartile Range; ARDS: Acute Respiratory Distress Syndrome

Table 3: Laboratory and radiological findings.

Characteristics	Non-ICU, Median(IQR)	ICU, Median(IQR)	Total, Median(IQR)	p-value
Body temperature	102 (100.7-102)	102 (101-102)	102(101-102)	0.2196
Systolic blood pressure (mmHg)	120(110-130)	130 (120-140)	120(110-130)	0.1138
Diastolic blood pressure (mmHg)	80 (70-80)	80 (80-90)	80(70-90)	0.1631
Oxygen saturation (%)	89 (88-94)	78(71-87)	88(81-93)	<0.001
Length of hospital stay	14 (9-16)	12(5-15)	13(8-16)	0.1941
Hemoglobin (g/dl)	13.8(12.7-14.8)	13.1(12-14.8)	13.7(12.4-14.8)	0.3407
White blood cell count	9050(6860-11900)	13700(7800-16000)	9515(7240-14550)	0.0187
Neutrophil count	7020(4580-9352)	11907(6800-14000)	7780(4695-11703.5)	0.0022
Lymphocyte count	1238(751-1816)	970(600-1310)	1138.5(747- 1550)	0.1471
Platelet count+	212508	187812.5	1726.682	<0.001
Serum bicarbonate	21.35(20.7-24.75)	28(19-28)	23.5(21-28)	0.2506
Serum sodium+	135	136	135.1	0.4357
Serum potassium+	4.35	4.33	4.3	0.905
Aspartate aminotransferase (U/L)	42(36-64)	71(43-97)	46(36-76)	0.3084
Alanine aminotransferase (U/L)	43.5(31-63)	61.15(30-83)	46.7(30-70)	0.1458
Lactate dehydrogenase (U/L)	467.5(310-573)	720(502-941)	538(368-679)	0.001
D-Dimer (mg/l)	378 (219-2200)	164(2.9-1590)	378(6.1-1590)	0.1602
CRP (µmol/L)	7.25(4.1-16.37)	21(14.7-50)	13(5.1-21.7)	0.0006
PT	12(12-14)	15.1(13.5-18)	13(12-15.6)	0.0003
INR	1(1-1.2)	1.4 (1.1-1.5)	1.1(1-1.4)	0.0014
ESR	32(25-45)	45 (30-65)	40(30-47)	0.2221
Activated partial thromboplastin time	30(28-32)	31(28-38)	30(28-34)	0.1937
Chest CT findings			n=5	0.361
Bilateral opacities	2(50)	2(50)	4(80)	
Unilateral opacities	1(100)	0	1(20)	
Chest x-ray findings			n=92	0.001
Bilateral	51(70.8)	21(29.1)	72(78.26)	
Ground glass	0	4(100)	4(4.35)	

ICU: Intensive Care Unit; IQR: Interquartile Range; CRP: C-Reactive Protein; PT: Prothrombin Time; INR: International Normalized Ratio; ESR: Erythrocyte Sedimentation Rate; CT: Computed Tomography

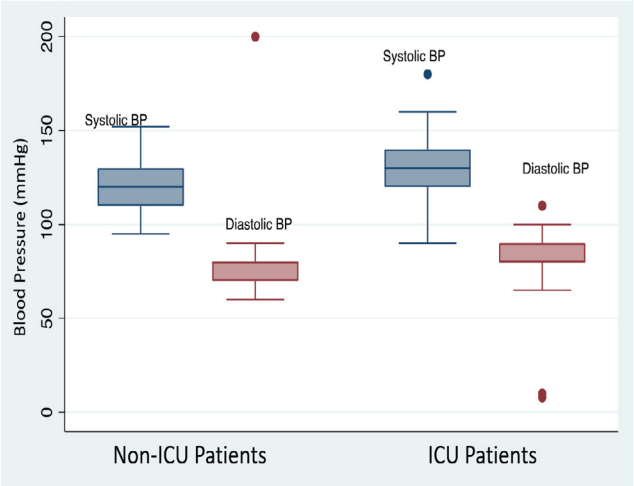

Figure 1: Blood pressure box plots.
BP: Blood Pressure; ICU: Intensive Care Unit

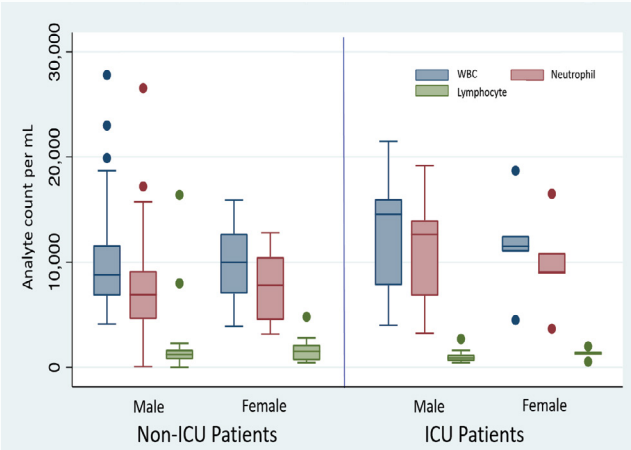

Figure 2: Total leukocyte count, neutrophils, and lymphocytes box plots.
WBC: White Blood Cells; ICU: Intensive Care Unit

Table 4: Treatment complications and outcomes.

Characteristics	Non-ICU, n (%)	ICU, n(%)	Total, n (%)	p-value
Level of Severity				
Mild	24(31.58)	1(3.70)	25(24.27)	
Severe	27(35.53)	9(33.33)	36(34.95)	<0.001
Critical	5(6.58)	17(62.96)	22(21.36)	
ARDS	3 (38)	20(74)	23(22.12)	<0.001
Invasive ventilation (n=103)	0	13(48.15)	13(12.62)	<0.001
Non-invasive ventilation (n=96)	17(24.29)	17(65.38)	34(35.42)	<0.001
Antibiotics (n=104)	70 (90.90)	26(96.30)	96(92)	0.366
Steroid Use (n=104)	21(27.27)	22(81.48)	43(41)	<0.001
Antiviral Use (n=104)	1(1.30)	0	1(1)	<0.001
Shock (n=74)	4(7.27)	4(21.05)	8(11)	<0.001
Secondary Infection (n=103)	8(10.53)	6(22.22)	14(14)	0.128
Acute Kidney Injury (n=104)	6(7.79)	13(48.15)	19(19)	<0.001
Acute Cardiac Injury (n=103)	0	3(11.11)	3(3)	0.003
Mortality (n=104)	4(5.19)	11(40.74)	15(15)	<0.001

ICU: Intensive Care Unit; ARDS: Acute Respiratory Distress Syndrome

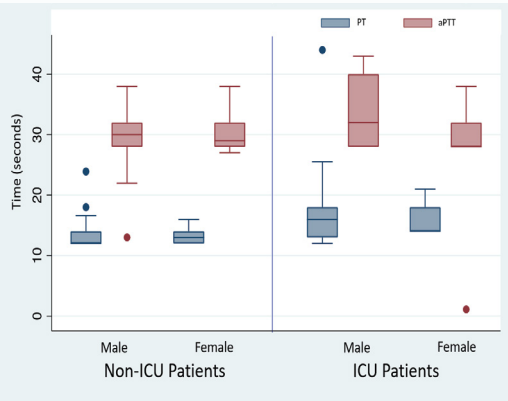

Figure 3: Prothrombin time and activated partial thromboplastin time box plots.
ICU: Intensive Care Unit; PT: Prothrombin Time; aPTT: Activated Partial Thromboplastin Time

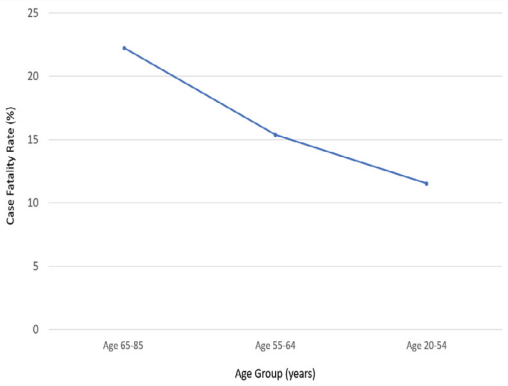

Figure 4: Case fatality rate for age categories.

ICU patients (3.90%), and the ICU patients had median fewer days to onset of ARDS (eight days) compared to non-ICU patients (11 days).

Across all COVID-19 patients, 35% (n=34) required non-invasive ventilation while 12% (n=13) required invasive ventilation. Of the total 104 patients in the study, 92% received antibiotic treatment, 41% received steroids, and 1% received antiviral medication. Azithromycin, ceftriaxone, and amoxicillin were the most common treatments. The most common complications across all patients were ARDS (22%), shock (11%), secondary infections (14%), acute kidney injury (19%), and acute cardiac injury (3%).

The median length of hospital stay was 12 days for ICU patients compared to14 days for non-ICU patients. During the study period, 15 patients died, 11 were in the ICU, and four were non-ICU patients. We found a 22.22% CFR for the 65 to 85-year group (nearly one in four patients died), a 15.38% CFR for the 64 to 55-year age group, and 11.53% CFR for the 20 to 54-year age group (Figure 4). The histogram for the onset of symptoms showed that most patients (81%) experienced the onset of first symptoms in the first five days. Nearly all patients (99%) had had symptoms appear within 11 days. There was one outlier (Figure 5).

Discussion

This is the first multicenter case report from the KPK province of Pakistan, with over 100 COVID-19 patients. A total of 104 COVID-19 patients were reported, of whom 27 (26%) were admitted to the ICU, and 77 were non-ICU patients. This ICU admission rate was similar to the 24% reported across the USA but higher than the ICU admission rates reported in New York (14%) and China (20%) [23]. Of the 104 COVID-19 patients, 16 died, 82 (78%) were discharged in stable condition, and six were still admitted. Overall mortality was 15%, which is three times that reported from the outbreak in China [14]. Mortality was lower compared to the 20% rate reported in Detroit for hospitalized patients [23]. The 15% mortality in our patients could

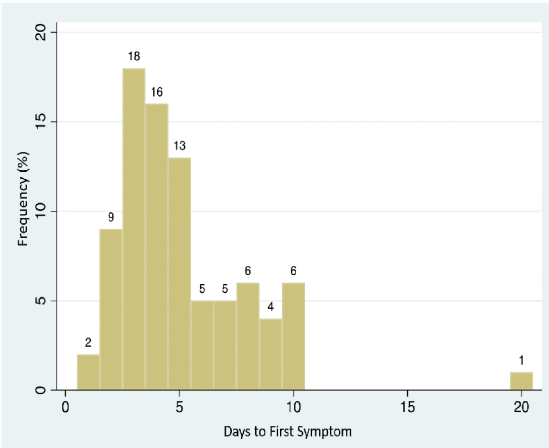

Figure 5: Epidemic curve.

be due to a lack of proper hospital care, lack of ventilator support, or trained staff; however, we cannot confirm this without further evidence. Compared to a report from the USA, our mortality was lower, which cannot be adequately explained at this time. One possible reason may be that nearly 50% of our patients were aged between 20 to 50 years compared to the USA report, where most hospitalized patients were of advanced age. However, in our study, patients aged over 65 years had a mortality of 22%, which was similar to findings from the USA [23].

Among comorbidities, we found that hypertension was the most common, followed by obesity and diabetes in COVID-19 patients. This is similar to a study in China where hypertension and diabetes were among the most common comorbidities [14]. Hypertension was also confirmed as the most common comorbidity in a report from the USA, which also reported a substantially higher percentage of CKD (38%) compared to our study population [23]. The percentage of Chronic Kidney Disease (CKD) in our total study population coincides with that reported in China (2%) [14].

The median length of hospital stay for all patients was 13 days, which is higher compared to the 10-day median reported from China [14], and the 8.5-day median reported from the USA [23]. This may be due to increased health care use, expected out-of-pocket expenditure for patients, and impoverishment in an economically disadvantaged country.

The onset of the first symptom, the median time to onset of dyspnea, and the mean time to ARDS in our study were all similar to those found in a study in China [14]. In our study, dyspnea, fever, cough, fatigue, nausea, loss of appetite, and myalgia were the most common concerns of those patients who came to the hospital. Anosmia and productive cough were both uncommon presenting concerns in our study. Gastrointestinal symptoms were present in almost one-third of our patients, which was similar to that reported in the Chinese study [14].

Our report shows age, hypertension, presence of BCG scar, oxygen saturation, TLC, lymphocyte count, CRP, platelet count, LDH, PT, INR, and chest x-ray findings were all independently associated with ICU status. This is similar to the report from China, where age, comorbidities, depressed lymphocytes, prolonged PT, and increase LDH levels were found as risk factors for severe illness [14]. An association of sex and ICU status could not be established, which was similar to the findings from China [14], but contrary to the findings from the USA, where disease severity was more associated with men than women [23]. Most patients were provided with oxygen support, and a minority was given invasive ventilation similar to the report from China [14]. In our population, most patients were treated with antibiotics and steroids, but some antimalarial use was also reported.

At the time of this report, most patients in this study had recovered and were discharged; only a few patients remained in the hospital. All COVID-19-positive cases from hospitals across three different cities of KPK were reported irrespective of the severity of illness. Therefore, the findings are accurate and unbiased. All study participants were local to KPK, meaning the results represent the provincial population, even though many cities in the province are not represented in the sample. The recruitment of cases was not uniform from all KPK hospitals, and therefore, comparisons cannot be made regarding hospital management. Confounders and effect modifiers have not been addressed at the study design or analysis stages. However, our results can serve as a starting point for hypotheses for future analytical studies.

Conclusion

Along with age, laboratory values, and oxygen saturation, we found BCG vaccination to be associated with severity of COVID-19 infection. Further studies with larger sample sizes are needed in Pakistani population, to study the association of BCG vaccination and severity of COVID-19 infection. Our overall mortality rate was higher than reported from the outbreak in China but lower than that reported from USA. Further studies are needed to determine the factors contributing to higher mortality in Pakistani population from KPK. Further comparisons between mortality rates and characteristics of illness are needed among the various provinces of Pakistan.

Ethical Approval

Ethical approval for conducting this study was obtained from the ethical review board at Khyber Teaching Hospital Peshawar. These patients were admitted to these five hospitals between March and May 2020. Patients with SARS-CoV-2 infection were approached. Information about the study was provided in the local language or Urdu based on the preference of the patient. Informed consent was obtained from patients. Cases were identified and observed for variables of interest, including mortality, ICU admission, and laboratory workup. Standard treatment and follow-up were provided to all participants.

Funding and Declaration of Interest

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors and the authors have no declaration of interest to disclose. Sarwat Masud is supported by "Johns Hopkins Afghanistan-Pakistan International Collaborative Trauma and Injury Research Training program" [grant number D43-TW007292] from Fogarty International Center of the United States National Institute of Health (NIH). The content is solely the responsibility of the authors and does not represent the views of Fogarty or NIH.

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