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ORIGINAL ARTICLE

Clinical characteristics of COVID-19 patients admitted to the intensive care unit of the largest public-sector hospital in Karachi: A retrospective, observational study.

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ABSTRACT… Objective: To characterize the clinical features of critically ill COVID-19 patients admitted to COVID-ICU and describe their outcomes. **Study Design:** Retrospective Observational study. **Setting:** Dr. Ruth K. M. Pfau Civil Hospital Karachi, Pakistan. **Period:** May 2020 to September 2021. **Methods:** The study aimed to investigate the clinical characteristics and outcomes of patients with confirmed or suspected COVID-19 who were admitted to the ICU. Patients in the study period confirmed or suspected COVID-19, admitted to the ICU for more than 24 hours, and committed to full treatment were included this study. Patients with COVID-19 discharged or died within 24 hours of admission were excluded. **Results:** The most commonly observed symptoms among the patients were shortness of breath (92.5%), fever (91.2%), cough without sputum (39.2%), altered consciousness (11.9%), and muscle aches (8.8%). Acute respiratory distress syndrome (ARDS) was identified as the most prevalent complication among COVID-19 patients, impacting 40.8% of the study population. A significant proportion of COVID-19 patients required mechanical ventilation and cardiac support. Specifically, (41.4%) of the patients required invasive mechanical ventilation, (47.4%) required non-invasive ventilation, and (26.3%) received cardiac support. Laboratory assessment showed that platelet counts varied significantly between survivors and non-survivors, with non-survivors exhibiting lower platelet counts. Gender differences were also observed among COVID-19 patients by age, with males having a higher mean age than females in all age categories, and the difference was statistically significant ($p < 0.001$) in all age categories except for the 30-44 years age category ($p = 0.087$). Age-wise recovery and mortality rates were analyzed, and the results showed that among both deceased and recovered patients, the proportion of deceased patients increased with age, while the proportion of recovered patients increased until the age range of 45-59 years for both males and females. The study found that 136 of the patients survived while 275 of the patients succumbed to the disease. Among the survivors, (31.3%) were male, and (36.2%) were female. **Conclusion:** The study emphasizes the importance of monitoring patients for potential complications and providing them with supportive care. Early detection and management of severe cases of COVID-19 are critical in preventing complications and improving patient outcomes.

Key words: COVID-19, Clinical Characteristics, Complications.

INTRODUCTION

Coronavirus disease (COVID-19) is a highly infectious respiratory illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] It was first identified in Wuhan, China in December 2019. To take action for the detection and prevention of disease spread, World Health Organization (WHO) declared the disease a public health emergency of international concern and classified it as a pandemic.[2] Clinically, the disease manifests most commonly as fever, cough, shortness of breath, fatigue, and loss of taste or smell. The disease spectrum ranges from asymptomatic to severe COVID, with primary pneumonia requiring intensive care.[3] Early screening, diagnosis, isolation, and treatment are necessary to halt the disease's spread. It has also highlighted the importance of preparedness for public health emergencies and the need for ongoing research and efforts to prevent and mitigate the spread of infectious diseases.[4]

The global outbreak of the disease has exerted a profound and unparalleled influence on the

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global community, affecting every aspect of life, from public health and the economy to social and political systems. There have been over 220 million confirmed cases of COVID-19 and over 4.5 million deaths worldwide.[5,6] The impact of COVID-19 has been notably severe in low- and middle-income nations, where the health systems are typically under-resourced, and access to healthcare is limited. This has resulted in a disproportionate burden of the disease in these countries, with a higher number of reported cases and fatalities. Many of these countries have struggled to implement effective public health measures due to challenges such as weak governance, inadequate infrastructure, and limited financial resources.[6]

South East Asia faced a significant challenge with the COVID-19 pandemic as the lack of testing and contact tracing capabilities made it difficult to identify and isolate infected individuals, further exacerbating the spread of the virus.[7] During the peak of the pandemic, these countries struggled to cope with the sheer volume of patients requiring hospitalization, leading to a shortage of essential medical supplies and personnel. The situation was further compounded by the lack of funding and resources for public health measures, which made it challenging to implement effective prevention and control measures.[8]

Similarly, Pakistan was severely impacted by the COVID-19 pandemic, particularly during the early stages of the outbreak. The country's health system faced significant challenges due to limited resources and poor infrastructure. The number of cases rose rapidly, leading to a high mortality rate among COVID-19 patients.[9] Pakistan has had 1,280,000 confirmed cases of the disease, and 28,668 deaths have been attributed to the disease. To better understand the impact of COVID-19, a study was conducted to examine the clinical characteristics and outcomes of patients with COVID-19 at the largest tertiary care, public sector hospital, Dr. Ruth K. M. Pfau Civil Hospital located in Karachi, Pakistan. To improve the management and treatment of COVID-19 patients in Pakistan, it is essential to understand the clinical characteristics and outcomes of critically ill patients, especially those admitted to the intensive care unit (ICU). However, there is currently limited information on the clinical features and outcomes of COVID-19 patients admitted to ICUs in Pakistan. Therefore, this retrospective observational study aims to fill this knowledge gap by characterizing the clinical features of critically ill COVID-19 patients admitted to the COVID-ICU at the largest public-sector hospital in Karachi and describing their outcomes in terms of ICU length of stay, need for mechanical ventilation or vasopressor support, and mortality. The findings of this study will provide valuable insights into the management and treatment of critically ill COVID-19 patients in Pakistan, which could help inform clinical practice and improve patient outcomes.

METHODS

A retrospective observational study was conducted at Dr. Ruth K. M. Pfau Civil Hospital Karachi, Pakistan, between May 2020 and September 2021. The study aimed to investigate the clinical characteristics and outcomes of patients with confirmed or suspected COVID-19 who were admitted to the ICU. The study received ethical approval from the Institutional Review Board of the Dow University of Health Sciences (IRB-2047/DUHS/Approval/2022/889). To ensure patient confidentiality, no identifying information was included in the final report.

Inclusion Criteria

Patients in the study period with (i) confirmed or suspected COVID-19, (ii) admitted to the ICU for more than 24 hours, and (iii) committed to full treatment.

Exclusion Criteria

Patients with COVID-19 discharged or died within 24 hours of admission

Data was collected on paper CRF prepared using the International Severe Acute Respiratory and Emerging Infections Consortium (ISARIC) and World Health Organization (WHO) recommended templates freely available on ISARIC website (https://isaric.org/research/covid-19-clinical-research-resources/

The statistical analysis for this study was conducted using SPSS (Statistical Package for the Social Sciences) version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics is used to summarize the data, and results presented in percentages. The length of ICU stay was calculated in days and reported as a median value with an interquartile range (Q3-Q1). Additionally, inferential statistics were used to identify significant associations between the variables of interest.

RESULTS

The study sample consisted of 411 patients, with a gender distribution of 259 males (62.9%) and 152 females (37.2%).

The most prevalent signs and symptoms of COVID-19 among the patients in the study were shortness of breath (92.5%), fever (91.2%), and cough with no sputum (39.2%). Other common symptoms included altered consciousness (11.9%), muscle aches (8.8%), and abdominal pain (8.3%). Less common symptoms were observed to be vomiting or nausea (5.4%), diarrhea (4.6%), chest pain (4.1%), and headache (3.4%). A small percentage of patients experienced seizures (1.5%), bleeding (1.0%), and cough with bloody sputum (0.7%) (Figure-1).

The most common complication observed among COVID-19 patients in this study was acute respiratory distress syndrome (ARDS), which affected (40.8%) of the patients. Other potential complications included acute renal failure (18%), sepsis (8%), pleural effusion (6%), myocardial infarction (4%), and pancreatitis (3%). Meningitis, myocarditis, and seizure were observed as rare complications with a low incidence rate of (1%) and (0.5%) in the patients. (Figure-2)

Patients with severe COVID-19 illness were more likely to require ventilation and cardiac support due to the severity of their illness. During ICU stay, it was observed that a total of 195 (47.4%) patients received non-invasive ventilation, while 170 (41.4%) patients received invasive mechanical ventilation. In addition, 108 (26.3%) COVID-19 patients required cardiac assistance (Figure-3).

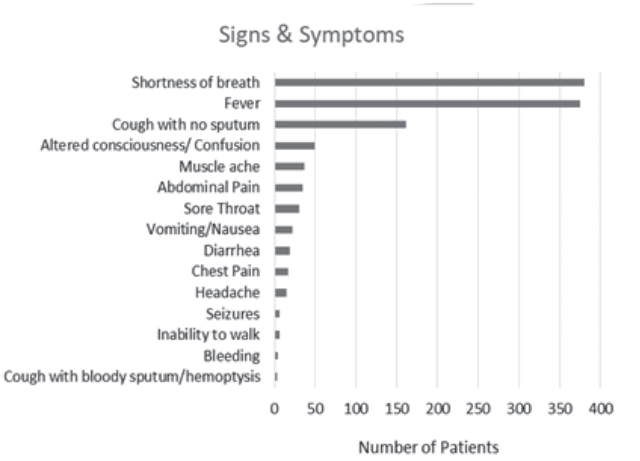

Figure-1. Signs and symptoms of infected Covid-19 patients.

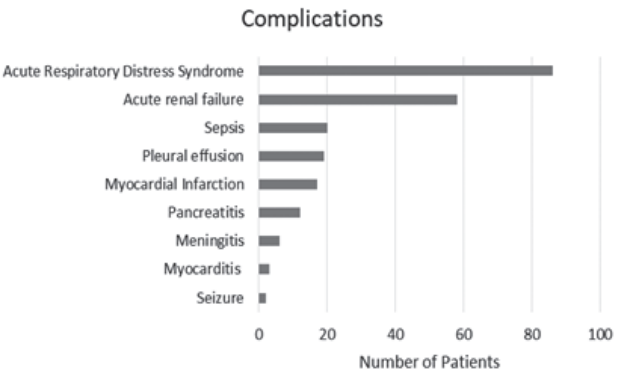

Figure-2. Complications of infected Covid-19 patients.

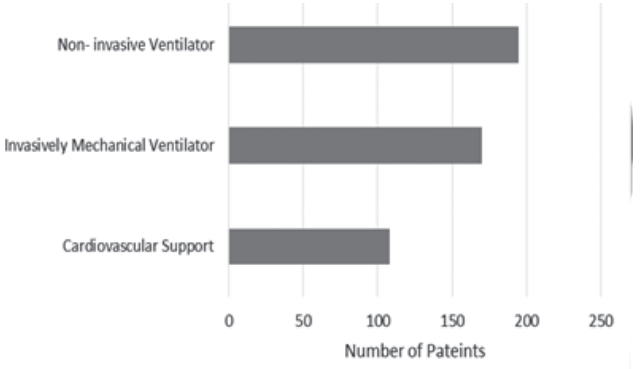

Figure-3. Ventilation and Cardiac Support among COVID-19 Patients in the ICU.

The median length of ICU stay for all patients was 3 days (range 6-20 days). Male patients had a slightly shorter median length of ICU stay, with a median of 3 days (range 6-2 days), compared to female patients with a median of 4 days (range 7-1.5 days). Of the total of 136 patients who survived the study, the patient outcome analysis revealed that (31%) of these surviving patients

were male, while (36.3%) were female (Table-I, Figure-4).

Based on the analysis of the laboratory parameters in COVID-19 patients, the only significant difference found between survivors and non-survivors was in the platelet counts. The results showed that platelet counts varied significantly among the two groups, with non-survivors exhibiting lower platelet counts than survivors (Table-II).

	Total Number of Patients (n=411)	Males (n=259)	Females (n= 152)
Length of ICU stay in days, median(Q3-Q1)	3(6-20)	3(6-2)	4(7-1.5)

Table-I. Duration of ICU Stay of COVID-19 Patients.

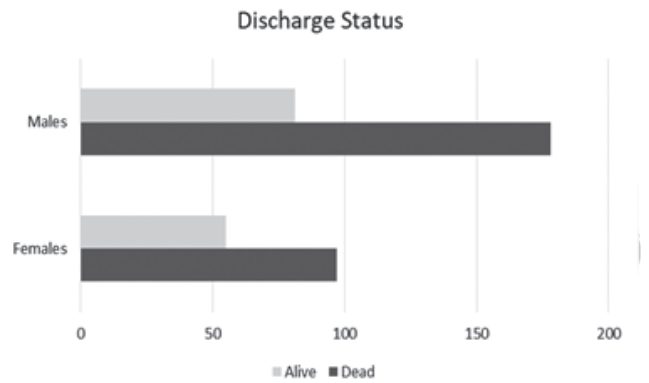

Figure-4. Gender-specific analyses of ICU discharge status among individuals with COVID-19.

The study included 259 (63.95%) males and 152 (36.05%) females with COVID-19. Among males, the highest proportion of COVID-19 cases was found in the 60-74 years age category, with a mean of 6.4 ± 4.89 cases, followed by the 75 years and above age category, with a mean of 6 ± 6.01 cases. In contrast, for females, the highest proportion of COVID-19 cases was found in the 45-59 years age category, with a mean of 5 ± 5.28 cases. The lowest proportion of COVID-19 cases among males was found in the 14-29 years age category, with a mean of 2.33 ± 1.43 cases, while the lowest proportion among females was found in the 75 years and above age category, with a mean of 2.33 ± 0.97 cases. The mean age of COVID-19 patients was higher among males than females in all age categories, and the difference was found to be statistically significant ($p < 0.001$) in all age categories except for the 30-44 years age category ($p = 0.087$) (Table-III).

A longitudinal analysis was conducted on 411 records containing information on COVID-19 status (survivors/non-survivors), gender, and age of patients. The results showed that among both deceased and recovered patients, the proportion of deceased patients increased with age, while the proportion of recovered patients increased until the age range of 45-59 years for both males and females (Figure-5).

Variables	F	t	Sig (2-tailed)
Hemoglobin Survivors	1.674	.95	.342
Non-Survivors		1.045	.297
Serum Sodium Survivors	1.690	.095	.925
Non-Survivors		.099	.921
Serum Potassium Survivors	.157	1.344	.180
Non- Survivors		1.366	.173
Serum Creatinine Survivors	.814	-.056	.955
Non- Survivors		-.048	.962
Platelets Survivors	.010	3.057	.002
Non- Survivors		3.017	.003
White Blood Cells Survivors	2.382	-1.335	.183
Non- Survivors		-1.766	.078
Blood Urea Survivors	.452	-1.188	.236
Non- Survivors		-1.134	.258

Table-II. Statistical analysis of variables between COVID-19 survivors and non-survivors, including F-value, t-value, and significance level (Sig) for each variable.

Age Category/ Gender	Male Mean ± S.D./N (%)	Female Mean ± S.D./N (%)	Total Mean ± S.D./N (%)	P-Value
14-29 years	2.33 (1.43)	1.64 (1.27)	2 (1.51)	<0.001
30-44 years	2.92 (1.69)	3.3 (2.82)	3.08 (1.92)	0.087
45-59 years	3 (7.23)	5 (5.28)	5.6(6.06)	<0.001
60-74 years	6.4 (4.89)	4.3 (5.02)	6.6 (6.002)	<0.000
75 years and above	6 (6.01)	2.33 (0.97)	2.4(3.04)	<0.001

Table-III. Comparison of Mean Age of COVID-19 Patients by Gender and Age Group.

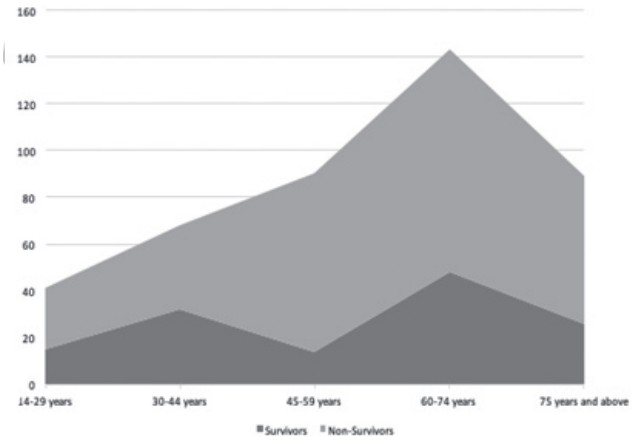

Figure-5

DISCUSSION

COVID-19 is an infectious disease that has become a major public health concern globally. It has had a significant impact on countries worldwide, including Pakistan, where the first case was reported in February 2020. This study provides a comprehensive overview of the clinical findings and outcomes of patients with COVID-19 at Civil Hospital Karachi, Pakistan.

The study found that shortness of breath, fever, and cough were the most common symptoms among COVID-19 patients, consistent with previous studies.[10] Other symptoms such as altered consciousness, muscle aches, and abdominal pain were also reported in a substantial number of patients. In terms of complications, ARDS was the most common respiratory complication as a major cause of morbidity and mortality in COVID-19 patients. Acute renal failure, sepsis, pleural effusion, and myocardial infarction were also observed in some patients. The study found that patients with severe COVID-19 illness were more likely to require ventilation and cardiac support. Regarding patient outcomes, the study found that the majority of patients were deceased, and only a small proportion were discharged alive. The study examined laboratory parameters of COVID-19 patients and discovered a significant difference in the platelet counts among COVID-19 survivors and non-survivors, with non-survivors exhibiting lower platelet counts than survivors. This finding aligns with previous studies that have reported a link between COVID-19 severity and thrombocytopenia. The underlying mechanism for this association is unclear, but it could be due to the virus's effect on the immune system and coagulation pathways.

In addition to the clinical characteristics and outcomes of critically ill COVID-19 patients, the study also investigated the gender and age distribution of COVID-19 patients in Pakistan. The findings revealed that the proportion of male patients with COVID-19 was higher than female patients, consistent with global trends. The highest proportion of COVID-19 cases in males was found in the 60-74 years age category, while in females, the highest proportion was found in the 45-59 years age category. Interestingly, the mean age of COVID-19 patients was higher among males than females in all age categories, and the difference was statistically significant in most age categories. Furthermore, the study conducted a longitudinal analysis of recovery and mortality rates among males and females of different age groups. The results showed that both the proportion of deceased patients and the proportion of recovered patients increased with age. For both males and females, the proportion of

recovered patients increased until the age range of 45-59 years, beyond which the proportion of deceased patients increased. The findings suggest that older age is a significant risk factor for COVID-19 mortality, and that females are more likely to recover than males. However, further studies are needed to explore the underlying reasons for these differences.

Several studies have been conducted globally to characterize the clinical presentation and outcomes of COVID-19 patients. A study carried out in China found that fever and cough were the most common symptoms of COVID-19, which is in line with the results of our study. However, the study also reported sore throat, fatigue, and diarrhea as frequent symptoms, which differ from the findings of the present study.[11] In contrast, a study conducted in the United States identified shortness of breath, fever, and cough as the most prevalent symptoms, which is consistent with our study.[12] In terms of complications, a study conducted in Italy found that acute respiratory distress syndrome (ARDS) was the most common complication, consistent with our study. The Italian study also reported myocardial injury and acute kidney injury as common complications compared to our study. These differences in clinical findings and outcomes may be due to several factors, including variations in patient demographics, comorbidities, and healthcare systems.[13] Another study examined the relationship between baseline platelet counts and disease severity among COVID-19 patients. The study found that patients with severe disease had significantly lower baseline platelet counts compared to those with the non-severe disease. The study's findings are consistent with ours and suggest that low platelet counts may be a marker of disease severity in COVID-19.[14]

Our study found that patients with severe COVID-19 illness were more likely to require ventilation and cardiac support. This is consistent with previous research, which has also shown that severe cases of COVID-19 are associated with an increased risk of respiratory failure and the need for mechanical ventilation.[15]

A study found that patients with severe COVID-19 were more likely to have elevated levels of cardiac biomarkers, which are indicators of heart damage.[16,17] This indicates that COVID-19 can cause direct damage to the heart muscle, which may result in cardiac complications and the need for cardiac support. Another study conducted in China found that patients with severe COVID-19 were more likely to have pre-existing cardiovascular disease, which may increase their risk of developing severe illness and requiring cardiac support.[18] The findings of these studies are consistent with the results of our study, which also found that patients with severe COVID-19 illness were more likely to require cardiac support.

The results of this study suggest that gender differences exist in the age distribution of COVID-19 cases. The findings reveal that males had a higher proportion of cases in the older age categories, while females had a higher proportion of cases in the 45-59 years age category. This observation is consistent with prior studies, which have also identified that males are more susceptible to severe COVID-19 outcomes than females, particularly in the older age groups. Furthermore, the mean age of COVID-19 patients was higher among males than females in all age categories, except for the 30-44 years age category. This is also consistent with prior research demonstrating that COVID-19 severity increases with age and is more prevalent in males than females.

Moreover, the age-wise recovery and mortality rates among males and females in this study showed that the proportion of deceased patients increased with age, while the proportion of recovered patients increased until the age range of 45-59 years for both males and females. This finding suggests that older age is a risk factor for COVID-19 mortality, which is consistent with previous research. The age group of 45-59 years was associated with the highest proportion of recovered patients in this study. This finding suggests that this age group may have better immunity against the virus or may have better access to healthcare services that improve their chances of recovery.

In contrast, a study conducted in India[16], COVID-19 cases found that male gender was associated with a higher risk of mortality than female gender, and that the case fatality rate increased with age for both genders. The study also found that comorbidities such as hypertension and diabetes were associated with a higher risk of mortality. These observations suggest that comorbidities and other factors such as access to healthcare services may play a significant role in COVID-19 outcomes in different regions of the world.

CONCLUSION

The study conducted in Pakistan sheds light on the clinical characteristics and outcomes of COVID-19 in a similar setting, providing healthcare professionals with important insights into the diagnosis and management of the disease. By identifying the common symptoms and potential complications associated with COVID-19, healthcare professionals can develop effective treatment plans that improve patient outcomes. The study emphasizes the importance of monitoring patients for potential complications and providing them with supportive care. Early detection and management of severe cases of COVID-19 are critical in preventing complications and improving patient outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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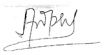
AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Muhammad Tanveer Alam	Conception and design, Statistical expertise, Critical revision of the article for important intellectual content.	
2	Aasma Khan	Writing and drafting manuscript.	
3	Arjan Kumar	Data collection, Critical revision of the article for important tntellectual content.	
4	Muhammad Rehan	Drafting of the article.	
5	Imran Sarwar Shaikh	Statistical expertise, Critical revision of the article.	
6	Nazia Azam Yousfani	Drafting of the article.