Original Article

A Cross-Sectional Study on Clinical Course And Outcomes of Patients Admitted To Covid-19 Intensive Care at A Tertiary Care Hospital In Islamabad

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Abstract

Objective: To investigate different clinical and demographic parameters among COVID-19 patients admitted to the intensive care unit and to correlate these parameters with survival outcomes.

Methods: This cross-sectional study was conducted at the COVID-19 ICU of the Pakistan Air Force Hospital in Islamabad, Pakistan, from January 2021 to December 2022. Ethical review was obtained. Calculated sample size was 340. Patients aged > 18 years with COVID-19 who were admitted to the ICU were enrolled. Data related to sociodemography, HRCT chest score, need for mechanical ventilation, duration of ICU stay, and survival outcomes were collected. The data were collected, entered, and analysed using SPSS version 22.0. Statistical significance was set at P <0.05.

Results: This study includes 186 males and 154 females. Mean age was 55.8 ± 14.5. 82.6 % patients were RT-PCR positive. 59.7 % had >15 HRCT chest score. 77.9% needed mechanical ventilation. 50.9% had 4-7 days of ICU stay. 40.6% patients had co-morbidities. Mortality was 62.9 %.

Conclusion: This study concludes that old age, HRCT score>15, need for mechanical ventilation, prolonged ICU stay, and presence of co-morbidities were associated with increased mortality among COVID-19 ICU-admitted patients.

Keywords: COVID-19, Mortality, Intensive care units, Mechanical Ventilation.

Contributions:
SA MA - Conception, Design
MS AS - Acquisition, Analysis, Interpretation
SA MA - Drafting
MS AS - Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

Conflicts of Interest: None
Financial Support: None to report
Potential Competing Interests: None to report

Introduction

SARS-CoV-2, the virus responsible for COVID-19, emerged in Wuhan, China, in 2019.[1] Its rapid spread led to a global pandemic in 2020, resulting in millions of infections and thousands of fatalities worldwide. [2,3]
The transmission of the coronavirus can occur through various means, including droplets, direct contact, airborne particles, blood-borne contact, contaminated surfaces (fomites), fecal-oral transmission, transmission from mother to child, and zoonotic transmission from animals to humans.[4] To prevent its spread, community vaccination campaigns and adherence to preventive social measures are essential.[5] In clinical settings, RT-qPCR is typically the preferred diagnostic tool for the early detection of the virus in symptomatic patients. Chest computed tomography (CT) scans are frequently employed to identify abnormalities in the lungs.[6]
COVID-19 can manifest asymptomatically or as a life-threatening respiratory disease. Severe COVID-19 requires ICU admission and may require mechanical ventilatory support.[7]
The clinical and demographic characteristics of ICU-admitted patients vary among different countries. COVID-19 has also created an overwhelming ICU admission burden. ICU facilities and resources were also different in different countries. [8,9] In Pakistan, the ICU admission rate of COVID-19 patients ranges from 15 % to 25 %. Various risk factors are associated with mortality. [10,11]
This study was conducted to validate different clinical and demographic parameters among COVID-19 patients admitted to the intensive care unit and to correlate these parameters with survival outcomes.

Materials And Methods

This cross-sectional study was conducted at the COVID-19 ICU of the Pakistan Air Force Hospital, Islamabad, Pakistan, from January 2021 to December 2022. Approval was obtained from the institutional ethical review committee, and informed consent was obtained from all participants. The calculated sample size was 340 using the WHO sample size software by keeping the prevalence of ICU-admitted patients at 33%[5] and absolute precision of 0.05 at a 95% confidence level. All RT-PCR-positive or clinically diagnosed (CT scan findings suggestive of COVID-19) patients in the ICU aged > 18 years were recruited on the day of their admission through convenience sampling. Pregnant patients, patients who could not respond with their attendants absent at the time of data collection, and patients or attendants who did not provide consent were excluded from this study. Patients fitting the inclusion criteria were approached in the Covid-19 ICU, and consent was taken from patients or their attendants before the commencement of the interview by the researcher themselves. Initial data were collected using a structured proforma that was specifically designed for this research after an extensive literature search. The questionnaire was pre-validated on 5% of the sample, the data of which were not included in the final results. The calculated Cronbach's alpha was 7.2, showing good internal consistency. These registered participants were followed up until their death in the ICU or discharge from the ICU, and their outcomes were noted on the day of discharge. The required information was collected from various sources, including treatment sheets, patients, and their attendants. Pertinent data related to sociodemography, HRCT chest score, need for mechanical ventilation, duration of ICU stay, and survival outcome were collected.

The data collected were entered and analyzed in SPSS version 22.0. Mean and standard deviation were calculated for quantitative variables like age. Frequency and percentage were calculated for qualitative variables like gender. Student's t-test and chi-square test were applied to see the association of continuous and categorical data, respectively. Alpha was pre-set at 5%. A p-value of <0.05 was taken as significant.

Results

This study includes 186 males and 154 females. Mean age was 55.8 ± 14.5. Age groups 18-40, 41-60, and >60 include 53 (15.6%), 171(50.3%), and 116(34.1%) patients, respectively. Table 1

Table 1: Age and gender distribution of patients (n=340)

Variables	Frequency (percentage)
Age group	
18- 40 years	53 (15.6 %)
41-60 years	171 (50.3 %)
>60 years	116 (34.1 %)
Gender	
Male	186 (54.7%)
Female	154 (45.3%)

Table 2: Frequency of variables of COVID-19 ICU-admitted patients

Variables	Frequency (percentage)
COVID-19 RT-PCR (n=340)	
Positive	281 (82.6 %)
Negative	59 (17.4 %)
HRCT score (n=340)	
< 8	16 (4.7 %)
>8-15	121 (35.6%)
>15	203 (59.7%)
Need for mechanical ventilation (n=340)	
Yes	265 (77.9 %)
No	75 (22.1 %)
Duration of ICU stay (days) (n=340)	
< 3	99 (29.1 %)
4-7	173 (50.9%)
8-14	68 (20%)
Type of Co-morbidity	
Nil	202 (59.4%)
Hypertension	44 (12.9%)
Diabetes	41 (12.1%)
Ischemic heart disease	21 (6.2%)
COPD / asthma	18 (5.3%)
Diabetes + Hypertension	14 (4.1%)
Outcome	
Alive	126 (37.1%)
Dead	214 (62.9%)

281(82.6 %) patients were RT-PCR positive. 203 (59.7 %) patients had an HRCT score of >15. 265(77.9%) needed mechanical ventilation.Most patients 173, 50.9%) had a 4-7 day ICU stay. 202(59.4%) patients had no co-morbidity. Calculated ICU mortality was 62.9 %. Table 2

Patients aged >60 years had an 81.9 % death rate. 97 % patients with HRCT score>15 died. 71.7 % patients on mechanical ventilation expired. 94.1 % patients died having 8-14 days of ICU stay. 92.9% patients died having both diabetes and hypertension. Table 3

Table 3: Association of ICU mortality with patient variables

Characteristic	Alive	Dead	p-value
Age (years)			< 0.001
18- 40 years	26 (49.1%)	27 (50.9%)	
41-60 years	79 (46.2%)	92 (53.8%)	
>60 years	21 (18.1%)	95 (81.9%)	
Gender			0.345
Male	84 (45.2%)	102 (54.8%)	
Female	64 (41.5%)	90 (58.5%)	
Covid -19 PCR			0.798
Positive	105 (37.4%)	176 (62.6%)	
Negative	21 (35.6%)	38 (64.4%)	
HRCT Chest score			< 0.001
< 8	16 (100%)	0 (0%)	
>8-15	104 (86%)	17 (14%)	
>15	6 (3%)	197 (97%)	
Need for mechanical ventilation			< 0.001
Yes	75 (28.3%)	190 (71.7%)	
No	51 (68%)	24 (32%)	
Duration of ICU stay (days)			< 0.001
< 3	49 (49.5%)	50 (50.5%)	
4-7	73 (42.2%)	100 (57.8%)	
8-14	4 (5.9%)	60 (94.1%)	
Type of Comorbidity			< 0.001
Nil	94 (46.5%)	108 (53.5%)	
Hypertension	15 (34.1%)	29 (65.9%)	
Diabetes	6 (14.6%)	35 (85.4%)	
Ischemic heart disease	5 (23.8%)	16 (76.2%)	
COPD / asthma	5 (27.8%)	13 (72.2%)	
Diabetes + Hypertension	1 (7.1%)	13 (92.9%)	

Discussion

In our study, COVID-19 ICU mortality was 62.9 %. Another study from a major tertiary care hospital in Pakistan showed a 58.8 % mortality. [11] A study by Modi et al. from a tertiary care hospital in India showed a 61 % death rate among COVID-19 ICU-admitted patients. [13] However, studies from the Netherlands, Italy, and the UK reported ICU mortality as 24.4 %,34 %, and 35.8 %, respectively. [14-16] This variability may be due to limited ICU resources in developing countries and delays in hospital admission.

In our study, increased mortality was observed among older patients. 81.9 % of patients with an age of>60 years died. Nasir et al. in their study from Pakistan showed increased mortality in patients older than 60 years. [12] Another study from Italy showed 15 % and 36% ICU mortality in patients >64 years and >64 years of age, respectively. [17] One possible explanation is that as individuals age, their immune responses weaken. This includes both the innate and cell-mediated immune systems, leading to uncontrolled viral replication and excessive production of proinflammatory cytokines. [18]

Asfahan et al., [18] and Zhou et al., 19 [19] in their studies that sex was not significantly associated with mortality. Our study had similar findings.

Mechanical ventilation was required in 77.9 % patients in our study. Mechanical ventilation was significantly associated with poor survival. Similarly, a study by Auld et al. showed that 76 % patients required mechanical ventilation, resulting in poor outcomes. [21]

In our study, prolonged ICU stay was significantly associated with increased mortality. Most patients (50.9 %) stayed for 4–7 days. In contrast, Modi et al., [13] and Larsson et al. [20] showed a mean duration of ICU stay of <3 days and 12 days, respectively. This difference may be due to differences in patient demographics and disease severity.

In our study, 40.6 % patients had some comorbidity, and there was a significant mortality association. Hypertension (12.9%) and diabetes (12.1%) were the most common. In a similar study carried out in Sweden, the most common comorbidities were hypertension at 39.6% and diabetes at 26.2% [20]. Auld et al. also found hypertension to be the most prevalent at 61.7%, with diabetes following at 45.6% [21]. Studies have shown poor survival outcomes in patients with comorbidities. [21,22]

The limitation of this study is that it was conducted in a single institute; more studies are required from other institutes to gain more insight into COVID-19 ICU management and patient outcomes.

Conclusions

This study concludes that old age, HRCT score>15, need for mechanical ventilation, prolonged ICU stay, and presence of co-morbidities were associated with increased mortality among COVID-19 ICU-admitted patients.

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