

ORIGINAL RESEARCH

A Study of Clinical Profile and Outcome of Laboratory-Confirmed COVID-19 Cases Admitted in Intensive Care Unit (ICU) at Tertiary Health Care Center

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ABSTRACT

Introduction: Coronavirus is a family of viruses that can cause illnesses such as the common cold, Severe Acute Respiratory Distress Syndrome & Middle East Respiratory Syndrome. In 2019 new coronavirus was identified, originating in China. The emergence of COVID-19 disease has led to high demand for intensive care services worldwide. **Materials And Methods:** It is a cross-sectional hospital-based observational study of the clinical profile and outcome of laboratory-confirmed COVID-19 cases admitted in the intensive care unit (ICU) at C.U. Shah Medical College and hospital between October 2020 to March 2021. We have taken a detailed clinical history of patients regarding symptoms of COVID-19 according to the predefined COVID-19 questionnaires. Allied history from the patient's relatives was taken regarding contact with COVID-19-positive patients and recent travel history. Emphasis was also made on comorbidities, past medications, and past medical events like ischemic heart disease (IHD), stroke, diabetes mellitus, thyroid disorders, and hypertension. **Result:** In the present study, the most common symptom of COVID-19 disease is breathlessness, followed by fever and cough. Peak incidence was noted in the older age group. Diabetes and hypertension are associated with a more severe form of COVID-19 disease. Most patients have been admitted due to severe acute hypoxemia and tachypnoea. Most patients required mechanical ventilation, although most died due to severe acute respiratory syndrome. **Conclusion:** In a hospital-based cross-sectional study of laboratory-confirmed COVID-19 patients, males and females are at equal risk of COVID-19 infection, and there was no significant difference in severity among them. Hypertension and diabetes, and old age are the most common risk factors for severity and ICU admission in covid-19 patients. Proper

strategies regarding covid-19 management and practical training of healthcare personnel with adequate health resources can dramatically reduce mortality in COVID-19 patients.

Keywords: COVID-19, SARS-COV-19, CORONAVIRUS

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INTRODUCTION

Coronavirus forms a large family of viruses that can infect humans and animals. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) belongs to the family of Coronaviridae and causes COVID-19 disease. This respiratory illness can cause the common cold and severe acute respiratory syndrome [1]. Older people have a higher risk of severe disease from COVID-19, and the risk increases with age. People with an existing chronic medical condition also may have a higher risk of serious illness [1].

In 2019, a new coronavirus was identified as the cause of the disease outbreak in China. The World Health Organisation (WHO) declared the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak a pandemic due to the constantly increasing number of cases [2]. An increase in outbreaks results in the implementation of a nationwide lockdown. Efforts to contain the virus failed, and it began to spread worldwide. The pandemic has resulted in severe global, social, and economic disruption, including the most significant global recession [3]. However, SARS-CoV-2 allegedly originated from an animal host with further human-to-human transmission. Other potential and expected routes would be associated with the transmission, as in other respiratory viruses, by direct contact, such as shaking contaminated hands or by direct contact with contaminated surfaces.

SARS-CoV-2 invades the lung parenchyma, resulting in severe interstitial inflammation of the lung. This is evident in computed tomography (CT) images as ground-glass opacity in the lungs [4]. This lesion initially involves a single lobe but later expands to multiple lung lobes. The histological assessment of lung biopsy samples obtained from COVID-19-infected patients revealed diffuse alveolar damage, cellular fibromyxoid exudates, hyaline membrane formation and desquamation of pneumocytes, indicative of acute respiratory distress syndrome [4]. It was also found that infected patients often have lymphocytopenia with or without leukocyte abnormalities. Pregnant women are at higher risk of getting infected by COVID-19 [4].

Ribonucleic acid (RNA) tests can confirm the diagnosis of SARS-CoV-2 cases with real-time polymerase chain reaction (RT-PCR) or next-generation sequencing. At present, nucleic acid detection techniques, like RT-PCR, are considered an effective method for confirming the diagnosis [5]. Providing respiratory support at an early stage improved the disease prognosis and facilitated recovery. Acute respiratory distress syndrome (ARDS) in COVID-19 is due to cytokine storms that result in exaggerated immune response, immune regulatory network imbalance and multiple-organ failure [5]. So, we have done this study to describe the clinical profile and their outcomes in laboratory-confirmed COVID-19 cases.

MATERIALS & METHODS

Study design and ethical approval

It is an observational descriptive hospital-based study done at C.U. Shah Medical College and Hospital, Surendranagar, for October 2020 to March 2021. Ethical approval was taken from the institutional ethics committee of C. U. Shah Medical College with reference no. CUSMC/IEC(HR)/PUB-53/2022/FINAL APPROVAL/200/2022.

Inclusion and exclusion criteria

This study has enrolled all the laboratory-confirmed cases of COVID-19 who were admitted to the COVID-19 Intensive care unit (ICU) at C. U. Shah Medical College and Hospital during

the study period. After getting approval from the ethics committee, written informed consent was obtained from all participants. We have excluded patients under 18 years of age and those discharged against medical advice during admission.

Methodology

We have taken a detailed clinical history of patients regarding symptoms of COVID-19 according to the predefined COVID-19 questionnaires. Allied history from the patient's relatives was taken regarding contact with COVID-19-positive patients and recent travel history. Emphasis was also made on comorbidities, past medications, and past medical events like ischemic heart disease (IHD), stroke, diabetes mellitus, thyroid disorders, and hypertension. A systemic examination was conducted to detect associated systemic diseases and establish health status.

All patients were subjected to routine blood investigations like complete blood count, serum glucose level, serum creatinine, serum C-reactive protein, serum ferritin, and serum D-dimer level. Chest X-ray and High-resolution Computed tomography (HRCT) were made in all patients. A diagnosis of COVID-19 was made based on either real-time polymerase chain reaction (RT-PCR) testing positive or COVID-19 rapid antigen testing positive.

Statistical analysis

Data were entered in Microsoft Excel (Microsoft Corporation, Redmond, WA), and results were analysed using Epi info (version 7.1.5) from the Centers for Disease Control and Prevention (CDC, Atlanta, USA).

RESULTS

Based on our inclusion and exclusion criteria, we have included 102 patients with Covid-19 infection who required intensive care unit admission within the study duration from October 2021 to March 2022 at our hospital.

In our study, most patients were more than 55 years old, while the lowest number was in the age group of fewer than 40 years. Male patients were significantly higher affected than female patients. Our study's ratio of male to female patients who required ICU admission was 1.43 (Table 1).

Table 1: Age and gender-wise distribution of the study population.

Age Group	Male		Female	
	No.	Percentage (%)	No.	Percentage (%)
< 40 years	5	4.9	2	1.9
40-55 years	20	19.6	12	11.8
>55 years	35	34.3	28	27.5
Total	60	58.8	42	41.2

No. = number of patients

In our study, most patients presented with breathlessness (94.11%) followed by fever and cough in 84.3% and 83.3%, respectively, at the time of admission in a COVID-19 intensive care unit (Table 2).

Table 2: Symptoms at the time of admission among the study population.

Symptoms	No.	Percentage (%)
Breathlessness	96	94.11
Fever	86	84.3
Cough	85	83.3
Weakness	84	82.4
Sore Throat	64	62.7
Bodyache	35	34.3

Diarrhoea	18	17.6
Other	12	11.8

No. = number of patients

This study showed that diabetes was the most common comorbidity among the study population (87.3%). Hypertension and chronic kidney disease were also observed in 79.2% and 3.9 % of patients who required intensive care unit admission among the covid-19 patients (Table 3).

Table 3: Comorbidities among the patients in our study population.

Comorbidities	Male (n)	Female (n)	Total (n)	Total (%)
Diabetes	53	36	89	87.3
Hypertension	51	30	81	79.2
Chronic Kidney Disease	3	1	4	3.9
Other	5	2	7	6.86
None	3	5	8	7.84

n= number of patients, % = percentage

The most common reason for ICU admission in our study was hypoxia (SPO₂ <90%) in 99.01%, followed by tachycardia, tachypnoea, high-grade fever, and hypotension in 96.07%, 94.11%, 49.01% and 26.47%, respectively (Table 4).

Table 4: Initial vital signs at the time of presentation in our study population.

Vital signs	No.	Percentage (%)
Spo ₂ <90 %	101	99.01
Pulse rate >100/min	98	96.07
Respiratory rate > 30/min	96	94.11
Temperature >38°C	50	49.01
SBP < 90 mmHg	27	26.47

No. = number of patients, SBP = systolic blood pressure

Among the study population, most of the patients required steroids (98.04%), antibiotics (97.05%), remdesivir (88.23%), and anticoagulants (88.23%) during their ICU stay. Only two patients (1.96%) were given tocilizumab during their treatment (Table 5).

Table 5: COVID-19 therapy among the study population.

Therapy	No.	Percentage (%)
Steroids	100	98.04
Antibiotics	99	97.05
Anticoagulants	95	93.14
Remdesivir	90	88.23
Tocilizumab	02	1.96

No. = number of patients

Mechanical ventilation (MV) was required in 80.39% of patients admitted to COVID-19 ICU, followed by non-invasive ventilation (NIV) and non-rebreather mask (NRBM) therapy in 14.70% and 4.9%, respectively (Table 6).

Table 6: Intensive care unit (ICU) interventions among the study population.

Intervention	No.	Percentage (%)
Mechanical ventilation	82	80.39
Non-invasive ventilation	15	14.70
NRBM therapy	5	4.9

No. = number of patients, NRBM = non-rebreather mask

In our study, eighty-seven patients (85.3%) patients were expired during ICU stay, and fifteen patients (14.7%) survived (Table 7). The highest number of patients who required mechanical ventilation and the high mortality in our study population was probably because our hospital is a tertiary care centre, and most patients were referred there in critical conditions.

Table 7: Outcome among the study population.

Outcome	No.	Percentage (%)
Alive	15	14.7
Died	87	85.3
Total	102	100

No. = number of patients

DISCUSSION

The Present Study is a hospital-based Cross-Sectional Observational Study done at C. U. Shah Medical College and Hospital Surendranagar Gujarat from October 2021 to March 2022. In this study, 102 critically ill Covid-19 patients who were laboratory-confirmed cases of COVID-19 were admitted to the Intensive Care Unit (ICU) of a Tertiary Health care Hospital in whom known risk factors are to be studied.

Of 102 cases, 58.8% were males, while 41.2 % were females. The majority were older patients, where sixty-three patients were more than 55 Years of age, thirty-two patients were between 40 -55 years & seven patients were less than 40 years of age. In the study by Chavali et al., the median age of the patients was 54 years, and 58% were males [6]. While Bhatraju et al. identified 24 patients with confirmed Covid-19. The patients' mean (\pm SD) age was 64 \pm 18 years, and 63% were men [7].

Breathlessness was the most common symptom in 94.11% of patients, followed by fever and cough in 84.3% and 83.3 %, respectively. Most patients in this study had breathlessness followed by fever and cough. That could be due to late presentation and the limited number of hospital beds during the COVID-19 crisis. In the study by Bhatraju et al., the most common symptoms were cough and shortness of breath; 50% of patients had a fever on admission, and 58% had diabetes mellitus [7]. In the study by Arentz et al., initial symptoms included shortness of breath (76%), fever (52%), and cough (48%). Before presenting to the hospital, the mean onset of symptoms was 3.5 days, and 17 patients (81%) were admitted to the ICU less than 24 hours after hospital admission [8].

Of most patients admitted to ICU in our study, 87.3% patients had diabetes, and 79.2% patients had hypertension. Analysis by Rawshani et al. found that type-2 diabetes was independently associated with a higher risk of hospital and ICU admissions and death from COVID-19 [9]. In a study by Huang et al., most of the infected patients were men (30 [73%] of 41); less than half had underlying diseases (13 [32%]), including diabetes (eight [20%]), hypertension (six [15%]), and cardiovascular disease (six [15%]) [10].

The mechanisms behind this are not fully elucidated, but immunomodulation/ suppression and hyperglycemia are thought to provide a suitable environment for coronavirus to thrive [11]. Hypertension in older patients is also associated with severe COVID-19, especially if the patient has a myocardial injury and an established cardiovascular disease [12,13]. The present study's findings are like reports where diabetes and hypertension were the most common comorbidities for COVID-19 ICU patients [14-16].

Most patients in this study were admitted to the COVID-19 ICU because SpO₂ < 90% in 99.01 % of patients, followed by 96.07 % having a high pulse rate of more than one hundred per minute. 94.11 % of patients with covid-19 had high respiratory rates (>30/min.), 49.01 % of patients had high-grade fever with a temperature of more than 38°C, and 26.47 % had systolic

blood pressure below 90 mm of Hg at the time of admission to covid-19 ICU. In the present study, most patients (69.6%) were admitted to ICU after the onset of symptoms within 24 hours, while patients admitted within 24-48 hours and after 48 hours were 10.8% and 1.9%, respectively. In the study by Richardson et al., the most common comorbidities were hypertension (3026; 56.6%), obesity (1737; 41.7%), and diabetes (1808; 33.8%). At triage, 30.7% of patients were febrile, 17.3% had a respiratory rate greater than 24 breaths/min, and 27.8% received supplemental oxygen [15].

The Treatment protocols for COVID-19 infection in hospital settings have changed dramatically since the onset of the pandemic. The current guidelines suggest several antiviral and other medicines, including Favipiravir, Remdesivir, Tocilizumab, steroids, Anticoagulants etc. [5,17]. In the Present Study, 97.05% of patients were managed with antibiotics, 98.04% with steroids, 88.23% with Remdesivir, 93.14 with Anticoagulants & 1.96% of patients with tocilizumab.

Most patients in this study were admitted to the COVID-19 ICU because of acute hypoxemic respiratory failure that required respiratory support. Endotracheal intubation and invasive mechanical ventilation were needed in 80.39% of the patients, whereas only 14.70% could be managed with Non-invasive ventilation while 4.9 % of patients managed with NRBM. In this study of critically ill patients admitted to ICUs with laboratory-confirmed COVID-19, a substantial proportion required mechanical ventilation and elevated levels of positive end-expiratory pressure (PEEP), and ICU mortality was 85.3%. In a study by Bhatraju et al., the most common reasons for admission to the ICU were hypoxemic respiratory failure leading to mechanical ventilation, hypotension requiring vasopressor treatment, or both. Mortality among these critically ill patients was high [7]. While in the study by Chavali et al., the most common reason for ICU admission was hypoxemic respiratory failure, which responded well to conservative measures such as awake proning and oxygen supplementation. Mortality in their case series was 16.7% [6]. Huang et al. also found that the 2019-nCoV infection caused clusters of severe respiratory illnesses like severe acute respiratory syndrome coronavirus and was associated with ICU admission and high mortality [10].

The evidence for efficacious interventions once a COVID-19-infected person is admitted to a hospital is still emerging. However, the clinical features and parameters of patients at elevated risk of infection, admission and staying longer in hospital are starting to strengthen. Our study adds to the current knowledge of patients at risk of developing severe COVID-19 symptoms and highlights the manifestation of these symptoms to improve resource planning in hospitals treating those patients.

Limited health resources and scarcity of hospital beds are the limitations of our study. Hence, we could only admit those patients in COVID-19 ICU who were critically ill and in severe respiratory distress. It is also responsible for the remarkably high mortality rate in our study. A future longitudinal study with ample health resources and a more substantial number of patients with mild, moderate, and increased severity groups will be more helpful in understanding the covid-19 and planning new strategies regarding its management.

CONCLUSIONS

In a hospital-based cross-sectional study of laboratory-confirmed COVID-19 patients, the peak incidence of ICU admission was significantly higher among elderly patients. Males and females are at equal risk of COVID-19 infection, and there was no significant difference in severity among them. Hypertension and diabetes are the most common risk factors for severity and ICU admission in COVID-19 patients. Proper strategies regarding COVID-19 management and practical training of healthcare personnel with adequate health resources can dramatically reduce mortality in COVID-19 patients.

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