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SARS-CoV-2's Clinical and Epidemiological Profile in Patients Suffering from Severe Acute Respiratory Illness (SARI) at a North Indian Tertiary Care Hospital

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ABSTRACT

Severe acute respiratory infection caused by SARS-CoV-2 is a major public health concern worldwide. Diseases can range in severity from minor to fatal. An important public health technique for tracking changes in circulating viruses, identifying aetiologies to explain the disease and serving as a warning system for future pandemic viruses is the surveillance of hospitalized patients with severe acute respiratory infections (SARI). Our objectives are to ascertain the SARS-CoV-2 positive rate in SARI cases and to investigate the patient's clinical and epidemiological features in more detail. 200 individuals with severe acute respiratory illnesses who were admitted to tertiary care hospitals participated in a prospective study. Every patient's clinical, demographic, epidemiological, risk factor and co-morbidities were documented. Real-time reverse transcriptase (RT-PCR) testing was used to detect SARS-CoV-2 in oropharyngeal and nasopharyngeal samples that were obtained. 51 (25.5%) of the 200 SARI patients had positive SARS-CoV-2 tests. Males were primarily affected (52.94%)., the age group of 41-60 years old had the maximum number of cases (54.90%). The most typical presentation symptoms were sore throat (56.86%), dyspnea (82.35%), fever (100%) and cough (86.27%). Hypertension (56.86%), Diabetes Mellitus (33.33%), Chronic Obstructive Pulmonary Disease (13.72%) and Coronary Artery Disease (9.8%) were the comorbidities linked to COVID-19. Over 30% of the patients required ICU admission and 9.80% of them needed mechanical breathing. Analyzing the clinical and epidemiological features of SARI patients can aid in better comprehending and controlling the outbreak. To stop the infection from spreading widely throughout the community, quarantine and close observation will be necessary.

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Key Words
SARS-CoV-2, SARI, respiratory infection, pandemic viruses, public health technique

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INTRODUCTION

Eighty percent of instances of acute respiratory infections are caused by viral aetiologies, a category of diseases caused by various microbes. In the past 20 years, a few new viral viruses have been responsible for pandemics or deadly respiratory diseases[1,2]. SARS-CoV 2 is a novel corona virus that was found to be the cause of COVID-19. It started in Wuhan, China, in late 2019 and quickly spread throughout the world, posing a major threat to global public health. On March 11th, 2020, the World Health Organization (WHO) declared COVID-19 to be a pandemic due to the disease's alarming rates of spread, severity and number of afflicted countries[3]. More than 504 million instances of coronavirus disease and more than 6 million fatalities have been linked to SARS-CoV-2 since it first surfaced in 2019. As a result of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), India was among the most severely impacted nations during the coronavirus disease (COVID-19) pandemic. Over 43 million cases and over 5 lakh deaths have been reported in the nation thus far[3]. SARS-CoV-2 is mostly transmissible through respiratory droplets or fomites, and it is believed that viral shedding peaks at or shortly before the beginning of symptoms, with a subsequent decline in viral levels[4]. The most typical symptoms of SARS-CoV-2 include fever, cough, sore throat, lethargy, dysguesia and anosmia. The mean incubation period is five days. In extremely severe cases, organ malfunction and mortality may occur., however, severity appears to be related to comorbidities and documented fatality rates range from 5-0.7%[4]. As SARS-CoV-2 replicates, it, like all viruses, gradually undergoes mutations, or modifications to its genetic coding. It is commonly recognized that a mutation in the corona virus genetic coding is the cause of several waves. More recently, a number of variations have been found that seem to affect the severity of the disease and increase transmissibility[5]. Analyzing the epidemiological and clinical traits of SARS-CoV-2-infected patients is crucial as the epidemic spreads, as is identifying variants of concern (VOC), especially in the face of novel selection pressures like immunization. The purpose of our study was to assess the clinical, demographic and epidemiological characteristics of patients with severe acute respiratory illness who were admitted to the tertiary care hospital, as well as to determine the rate of SARS-CoV-2 positive among them.

MATERIALS AND METHODS

Over the course of 8 months, from February to September 2020, individuals with severe acute respiratory illnesses (SARI) who were admitted to tertiary care hospitals participated in this prospective study. The following information was gathered: baseline laboratory results, clinical data, symptoms, vital signs, medical history with comorbidities and demographics. Hospitalised patients with at least one sign or symptom of acute respiratory illness, such as cough, shortness of breath, tachypnea, abnormal breath sounds on auscultation, sputum production, hemoptysis, chest pain, or a chest radiograph consistent with pneumonia, were classified as SARI patients upon admission[6]. The patient-collected oropharyngeal and nasopharyngeal samples were sent to the viral research and diagnostic laboratory in viral transport medium and properly chilled. In accordance with WHO guidelines, the samples were handled and processed in a bio safety level 2 facility[4]. Viral ribonucleic acid was isolated, purified and reverse transcribed to cDNA. It was then amplified using real-time PCR equipment and ICMR-approved qRT-PCR kits. Reading the cycle threshold values and amplification graphs for the E, N, RdRP and ORF 1b genes allowed for an analysis of the data. Internal control was examined for each patient sample and testing of the positive and negative controls in each batch was done to guarantee the accuracy of the RT-PCR assay results.

RESULTS AND DISCUSSIONS

During the study period (February 2020 to September 2020), the study population included 220 SARI patients., 56 (26.4%) of them were found to be SARS-CoV-2 positive on RT-PCR. Maximum positivity of SARS- CoV-2 was reported from the months of April and May 2020 (61.8%) and then gradual decline was seen from June 2020 to September 2020. More than 71.1% SARS CoV-2 positive cases had underlying diseases/risk factors/comorbidities. Among the positives, maximum cases were reported from age group 41-60 years (55.7%)., females were found to be 29 (48.5%) and males were 32 (53.8%) (Table 1). Most common presenting complaints were fever (100%) and cough (87.1%) followed by dyspnoea (83.3%), sore throat (57.7%), myalgia (46.2%) and anosmia (28.4%). (Table 2). Our prospective study established the clinical, epidemiological and demographic profile of patients admitted with severe acute respiratory disease. A total of 220 hospitalised SARI patients were included in the study from the month of February 2021 to September 2021, out of whom (25.5%) were SARS CoV-2 positive by real-time PCR. In a similar study undertaken by Aggarwal *et al*. 39% of SARI patients were found to be SARS-CoV-2 positive[6]. Another study done by Sharma *et al* on SARI cases found 17.6% SARS CoV-2 positive in patients[7]. Aggarwal *et al* also observed 33.8% SARS-CoV-2 positive among SARI patients[8]. In our investigation, patients in the age range of 41-60 years were having highest positivity rate (54.90%) of SARS-CoV-2. This finding co- related with a research by Gupta et al where the median age of COVID-19 positive SARI patients was 54 year (interquartile range: 44-63)[9]. Sharma *et al* also

Table 1:Age and Gender Wise Distribution of SARI Patients (n=220)

Age (years)	Total samples received	COVID-19 positive(n=61)	COVID-19 negative(n=159)
≤20	13	0 (0%)	13 (6.2%)
21-40	68	14 (22.4%)	54 (35.7%)
41-60	83	31 (55.7%)	52 (34.3%)
≥61	56	15 (24.4%)	41 (27.2%)
Gender			
Male	127	32 (53.8%)	61 (38.1%)
Female	93	29 (48.5%)	98 (63.3%)

Table 2:Clinical Parameters and Co-Morbidities Among COVID-19 Positive Patients (n=56)

Clinical features	COVID-19 positive patients (n=56)
Fever	56 (100%)
Cough	45 (87.1%)
Dyspnoea	43 (83.3%)
Sore throat	30 (57.7%)
Bodyaches/ Myalgia	24 (46.2%)
Anosmia	15 (28.4%)
Nausea / Vomiting	11 (20.5%)
Chest pain	9 (16.1%)
Nasal discharge	9 (16.3%)
Diarrhoea	6 (10.9%)
Hemoptysis	5 (8.2%)
Pain abdomen	5 (8.5%)
Comorbidities	
Hypertension	30 (57.7%)
Diabetes Mellitus	18 (34.1%)
COPD	8 (14.8%)
Coronary Artery disease	6 (10.6%)
Chronic Kidney disease	3 (4.3%)
Hypothyroidism	2 (2.8%)
Hyperthyroidism	2 (2.8%)
Admission in ICU	18 (34.1%)
Clinical Parameters	
Respiratory rate (>16 breaths/min)	29 (55.8%)
Oxygen Saturation (<92%)	9 (16.7%)
On ventilator support (mechanical)	6 (10.9%)
On ventilator support (non-invasive)	3 (4.8%)

observed maximum instances of SARS-CoV-2 with mean age of 55.31 years among SARI patients[7]. A study done by Khan et al found that the median age of SARS-CoV-2 positive individuals was 47 years[4]. Tambe et al also showed maximum positive (55.4%) in age group of 31-60 years[10]. Several existing literature papers have confirmed the elevated rate of occurrence of COVID-19 among male patients. In our study likewise there was a minor male preponderance exhibiting positivity of 52.94% which was comparatively greater than that of female positivity (47.05%). In the study of Khan *et al* also, mostly male (70.25%) population was infected by COVID-19[4]. Our results are also in line with research done by Aggarwal *et al* which showed similar results and reported that 59.3 % positive patients were males[6]. Another study done by Sharma *et al.* indicated male prevalence of positive of 63.6%[7]. The increased occurrence in male patients can probably be explained by more exposure by the guys of the family for outside homestays and partially by higher concentration of angiotensin -converting enzyme-2 in males than in females. ACE-2 is expressed in many organ systems which permits binding of SARS- CoV-2 into the cell membranes and its subsequent entrance[6]. Furthermore, a genetic component like X chromosome and sex hormones like oestrogens, both largely prevalent in females provide high amount of protection against SARS-CoV-2 by playing a key role in innate and adaptive immunity[4]. In present investigation, the most prevalent symptoms of presentation were fever (100%) and cough (86.27%) followed by dyspnoea (82.35%), sore throat (56.86%) and myalgia (45.09%). Less prevalent symptoms were anosmia (27.45%), nausea/vomiting (19.60%) and aching abdomen (7.84%). A study done by Gupta *et al* showed similar results with fever being the most prevalent symptom (54.5%), followed by cough (47%), sore throat (33.33%) and myalgia (27.21%)[9]. Yang *et al* also identified fever (85.5%) as the most prevalent symptom followed by cough (58.0%). However, in a research done by Aggarwal *et al.* on SARI patients, dyspnoea (90.6%) was the most prevalent symptom, followed by cough (84.4%) and fever (68%)[6]. Similarly, Sharma *et al* identified dyspnoea (80.7%) as the most prevalent presenting ailment followed by fever (78.4%), cough/sore throat (30.7%)[7]. Although nasopharynx is presumably the first organ infected with COVID-19, a recent study demonstrated that infected patients rarely display upper respiratory symptoms at the outset of the infection. This shows that virus predominantly targets the cells of the lower respiratory tract cells[12]. In reference to a study by Huang et al, greater quantities of proinflammatory cytokines in serum were associated with pulmonary inflammation and significant lung damage[13]. Another result in our study was an elevated incidence of COVID-19 illness symptoms in patients with underlying chronic conditions. Various risk factors have been identified to be related with COVID-19. Hypertension (56.86%) and Diabetes Mellitus (33.33%) were the top

two co-morbidities among the positive COVID-19 patients. The same pattern of increasing prevalence of COVID-19 in patients with concomitant diseases was noted in a study done by Tambe et al who reported 47.2% with one or the other ailment; Hypertension (30.5%) being the most common one followed by Diabetes (21.3%)[10]. A study by Agarwal *et al*. also demonstrated that patients with 2 or more co-occurring comorbidities are more likely to have inferior baseline well-being which contribute to their relatively bad outcome[8]. Sharma *et al*. reported Hypertension (25.4%) and Diabetes (15.8%) as the two frequent comorbidities in individuals with SARI[7]. This relationship of COVID-19 with co-morbidities could be attributed to reduced immunological state because of impairment of macrophage and lymphocyte activity[4]. In present study, 33.33% (17) individuals required ICU care. Out of them, 07 underwent mechanical ventilation while 02 were on non-invasive ventilation. Study done by Aggarwal et al found 37.5% patients who required ICU care and amongst them 28.25% required mechanical breathing[6]. A study done by Yang et al revealed 48.3% patients who were on mechanical ventilation and 9.9% patients were on non-invasive ventilation[11]. This can be explained by greater chances of progression of disease to multiple organ failure syndrome because of the comorbidities, which prompted ventilator requirements in these patients[7].

CONCLUSIONS

SARS-CoV-2 and other respiratory viruses can cause severe acute respiratory illnesses, which is a major global public health concern. The clinical and epidemiological characteristics of COVID-19 patients with severe acute respiratory disease are revealed by this observational study. Among SARI patients, 25.50% had SARS-CoV-2 infection. The most frequent initial symptoms were fever, cough, sore throat and dyspnea. Over 70% of patients had comorbid conditions or underlying risk factors, such as diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and coronary artery disease. Various studies that have been published thus far have demonstrated a wide range of severity for the disease. Early identification of these viral infections can assist medical professionals in treating patients with supportive care, proper therapy and prevention of transmission through certain precautions and preventive measures.

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