Original Article

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Microbiology Section

Clinicoepidemiological Profile and Diagnosis of Severe Acute Respiratory Syndrome Coronavirus-2 and Influenza Viruses in Patients with Severe Acute Respiratory Illness by Real-time Reverse Transcription Polymerase Chain Reaction: A Cross-sectional Study

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ABSTRACT

Introduction: Severe Acute Respiratory Illness (SARI) caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and influenza viruses represent a significant global public health concern. The disease spectrum ranges from mild to life-threatening conditions. Surveillance of hospitalised SARI patients is an essential public health tool used to identify cause of the disease, track changes in circulating viruses and serve as an alert mechanism for potential pandemic viruses.

Aim: To determine the rate of SARS-CoV-2 and influenza virus positivity among SARI cases and to investigate the epidemiological and clinical characteristics of the patients.

Materials and Methods: A cross-sectional study was conducted on 400 SARI patients admitted to Guru Nanak Dev Hospital, Amritsar, Punjab, India between February 2021 and June 2022. The clinical, demographic, and epidemiological data, as well as co-morbidities of all patients were recorded. Oropharyngeal and nasopharyngeal samples were collected and tested for SARS-CoV-2, Influenza A, Influenza A (H3N2), Influenza A (H1N1) pdm09-pandemic 2009, and Influenza B using real-time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 23.0 for Windows.

Results: Out of the 400 SARI patients, 117 (29.25%) tested positive for SARS-CoV-2, 14 (3.5%) for Influenza A, 7 (1.75%) for Influenza A (H1N1) pdm09, and 4 (1%) for Influenza A (H3N2). The majority of cases in both SARS-CoV-2 and influenza were in the 41-60 years age group (47.86% and 57.14%, respectively). Males were predominantly infected in SARS-CoV-2 positive patients (62/117, 52.99%), while females were more infected in influenza positive cases (9/14, 64.28%). The most common presenting symptoms were fever, cough, dyspnoea, and sore throat in both cases. Hypertension, diabetes mellitus, Chronic Obstructive Pulmonary Disease (COPD), and coronary artery disease were the most common co-morbidities observed.

Conclusion: Evaluation of clinical and epidemiological profiles of SARI patients can aid in better understanding and management of outbreaks. Close monitoring and quarantine measures will be necessary to prevent extensive transmission within the community.

Keywords: Co-morbidities, Influenza virus, Respiratory viruses, Severe acute respiratory infection

INTRODUCTION

Acute Respiratory Infections (ARIs) have been increasingly recognised as major contributors to hospitalisations and mortality in all age groups worldwide. SARS-CoV, SARS-CoV-2, avian influenza viruses (H5N1, H7N7, and H7N3), and swine flu viruses (H1N1, H3N2) are emerging pathogens that cause pandemic or fatal respiratory infections [1]. SARI case is defined as a case of an ARI with a history of fever of ≥38°C, cough, onset within the last 10 days, and requiring hospitalisation [2]. SARI caused by viruses like SARS-CoV-2 and Influenza is the leading cause of hospitalisations and deaths worldwide.

In December 2019, a cluster of patients was admitted to hospitals with a diagnosis of pneumonia, and they were found to have epidemiological links with a wet animal and seafood market in Wuhan, China. On January 7, 2020, the Chinese Centre for Disease Control and Prevention (China CDC) identified a novel coronavirus from lower respiratory tract samples of these patients, which was later named SARS-CoV-2 by the International Committee on Taxonomy of viruses [3]. On March 11, 2020, SARS-CoV-2 was declared a pandemic by World Health Organisation (WHO) [4]. The most common symptoms include cough, rhinitis, myalgia, fever, dyspnoea, and less widely documented symptoms such as headache, vomiting, and haemoptysis. Severe cases have been reported to suffer from progressive respiratory failure due to alveolar damage, which can lead to death. Risk factors for SARS-CoV-2 include being aged 60 years or older, and co-morbidities such as hypertension, diabetes mellitus, cardiovascular disease, chronic pulmonary disease, and malignancy [5]. RT-PCR assay for the detection of viral ribonucleic acid (RNA) is the test of choice for SARS-CoV-2 diagnosis. Viral RNA has been found in both upper and lower respiratory tract secretions, serum, stool, and urine specimens. The most common detection targets are *E*, *N*, *S*, and ORF1ab/RdRp genes [6]. The WHO has reported 75,43,67,807 confirmed cases of COVID-19 so far, with 68,25,461 deaths globally as of February 6, 2023. In India, a total of 4,46,83,454 confirmed cases have been found to be positive as of February 6, 2023, with 5,30,745 deaths occurring [7].

Influenza virus is another common human pathogen that has caused serious respiratory illness and death over the past century, and SARI resulting from influenza virus infection is a major cause

of morbidity and mortality worldwide [8,9]. Influenza virus is an enveloped virus of the *Orthomyxoviridae* family and is classified into four genera: Influenza virus A to D (IAV, IBV, ICV, and IDV). Currently, Influenza A (H1N1), Influenza A (H3N2), and Influenza B cause most epidemic diseases in humans [10]. Influenza virus is transmitted at a short range (1-2 meters) from person to person through large (≥5 μm) droplets and small particles (<5 μm) droplet nuclei (aerosols) that are expelled by coughing. Following an incubation period of 1 to 2 days, influenza virus infection begins with a sudden onset of symptoms, which include fever, headache, myalgia, dry cough, sore throat, and nasal discharge [11]. Pneumonia, Acute Respiratory Distress Syndrome (ARDS), and death can occur in high-risk patients. Several risk factors or complications have been identified, including individuals aged >65 years or <6 months, pregnancy, metabolic disorders like obesity, diabetes, kidney disease, cardiovascular conditions like hypertension, congenital heart disease, coronary artery disease, and COPD [12]. Nasopharyngeal specimens have the highest yield for influenza viruses. In patients hospitalised with respiratory failure, lower respiratory tract specimens should be tested if upper respiratory specimens are negative [13]. Nucleic acid testing of influenza by RT-PCR has widely replaced traditional virus culture due to shorter turnaround time and increased sensitivity [14].

Both diseases share common symptoms and clinical features. However, the clinical manifestations of SARS-CoV-2 are more concealed, with fewer underlying diseases and milder respiratory symptoms compared to influenza [5]. Mortality in patients with SARS-CoV-2 is higher (63%) than in patients with influenza (55%) [15]. The higher morbidity and mortality with SARS-CoV-2 compared to influenza can be attributed to the lack of basic immunity in the population and the absence of vaccination and medication [16].

This study was needed to emphasise the fact that more seasons of surveillance are required for the respiratory pathogens causing severe respiratory diseases. The aim of the study was to diagnose SARS-CoV-2, Influenza A virus, Influenza A (H1N1) pdm09, Influenza A (H3N2), and Influenza B virus among SARI patients. The primary objective of the study was to assess the clinical profile, laboratory parameters, and diagnosis of patients with SARS-CoV-2 and influenza virus, and the secondary objective was to study the associated co-morbidities.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Microbiology, Government Medical College, Amritsar, Punjab, India. The study group included patients admitted due to SARI at Guru Nanak Dev Hospital, Amritsar, Punjab, India. Four hundred respiratory samples were collected during the period of February 2021 to June 2022 after approval from the Institutional Ethics Committee (IEC) (IEC Number 3350/D-26/2020).

Inclusion criteria: All subjects who were admitted due to SARI and gave consent were included in the study.

Exclusion criteria: All subjects who denied consent to participate in the study were excluded from the study.

All available samples during the study duration were considered. Demographic details such as the patient's name, age, gender, address, medical history including co-morbidities, symptoms, vital signs, baseline laboratory parameters such as Total Leukocyte Count (TLC), D-dimer, C-Reactive Protein (CRP), prothrombin time, platelet count, alkaline phosphatase, and clinical details were collected. Patients admitted as SARI were defined as hospitalised patients with an acute onset of fever of 38ºC or higher in the previous 10 days and atleast one sign or symptom of acute respiratory illness, including cough, shortness of breath, tachypnoea, abnormal breath sounds on auscultation, sputum production, haemoptysis, chest pain, or chest radiograph consistent with pneumonia [17].

Study Procedure

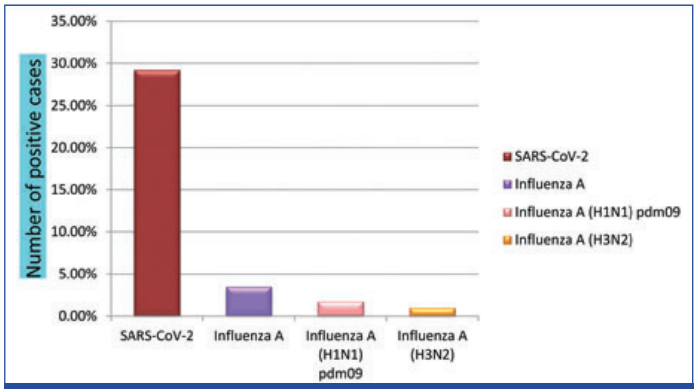
Oropharyngeal and nasopharyngeal samples collected from patients were transported in viral transport medium under a proper cold chain conditions to the Viral Research and Diagnostic Laboratory. The samples were handled and processed in a biosafety level 2 facility following the WHO protocol [18]. RNA was extracted from the clinical samples using an automated viral extraction technique (KingFisher Flex Thermo Fisher Scientific). The extracted nucleic acid was further processed for the detection of SARS-CoV-2, Influenza A, Influenza A (H1N1) pdm09, Influenza A (H3N2), and Influenza B. Amplification was carried out in a QUANTSTUDIO PCR machine. The PCR amplification kit used for SARS-CoV-2 was CoviPath COVID-19 RT-PCR kit (Applied Biosystems). The PCR amplification kit used for influenza virus was TRUPCR H1N1/H3N2 with Inf-B kit. The results were analysed by reading the Cycle threshold (Ct) values and graphs of amplification. Data were entered into Microsoft Excel sheets.

STATISTICAL ANALYSIS

Discrete variables were presented as frequency counts and percentages, while continuous variables were expressed as mean±Standard Deviation (SD). The Chi-square test was used to compare variables between the two groups. A p-value <0.05 was considered significant. Statistical analysis was performed using the "SPSS 23.0" statistical package for Windows.

RESULTS

A total of 400 patient samples were collected, prevalence of SARS-CoV-2, Influenza A, Influenza A (H1N1) pdm 09, and Influenza A (H3N2) is shown in [Table/Fig-1]. No cases of influenza B or co-infection of SARS-CoV-2 and Influenza were reported.



[Table/Fig-1]: Prevalence of SARS-CoV-2, Influenza A, Influenza A (H1N1) pdm09, Influenza A (H3N2) in SARI patients.

Among the 117 SARS-CoV-2 positive cases, males accounted for a higher number, with 62 (52.99%) compared to females with 55 (47.00%). The most commonly affected age group was 41-60 years, comprising 56 (47.86%) cases. Among the 14 Influenza positive cases, females were more affected with 9 (64.28%) cases compared to males with 5 (35.71%). The most common age group affected by Influenza was 41-60 years, with 8 (57.14%) cases [Table/Fig-2].

Age group (years)	*SARS-COV-2 (n=117)			Influenza virus (n=14)		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
0-20	01 (1.61)	01 (1.82)	02 (1.71)	2 (40)	1 (11.11)	3 (21.43)
21-40	19 (30.65)	09 (16.36)	28 (23.93)	1 (20)	0	1 (7.14)
41-60	25 (40.32)	31 (56.36)	56 (47.86)	2 (40)	6 (66.67)	8 (57.14)
>60	17 (27.42)	14 (25.46)	31 (26.50)	0	2 (22.22)	2 (14.29)
Total	62 (100)	55 (100)	117 (100)	5 (100)	9 (100)	14 (100)

[Table/Fig-2]: Age and gender distribution of cases.
*Mean±SD=50.94±15.55

The mean age of SARS-CoV-2 positive patients was 50.94±15.55 years. The most common clinical symptoms observed in SARS-CoV-2 positive patients were fever (117, 100%), cough (95, 81.19%), dyspnoea (85, 72.64%), sore throat (69, 58.97%), and body aches (53, 45.29%). Among the positive influenza cases, the most common symptom observed was fever (14, 100%), followed by cough (13, 92.85%), dyspnoea (11, 78.57%), body aches (11, 78.57%), and sore throat (7, 50%) [Table/Fig-3].

Symptoms	*SARS-CoV-2 (n=117)		Influenza virus (n=14)
	n (%)	p-value	n (%)
Fever	117 (100)	0.798	14 (100)
Cough	95 (81.19)	0.325	13 (92.85)
Dyspnoea	85 (72.64)	0.029	11 (78.57)
Sore throat	69 (58.97)	0.011	07 (50)
Bodyaches	53 (45.29)	0.011	11 (78.57)
Anosmia	47 (40.17)	0.343	0
Chills and rigors	47 (40.17)	0.431	11 (78.57)
Sputum	30 (25.64)	0.308	02 (14.28)
Nausea	25 (21.36)	0.321	0
Diarrhoea	17 (14.52)	0.452	0
Nasal discharge	15 (12.82)	0.871	0
Vomiting	14 (11.96)	0.060	0
Chest pain	11 (9.40)	0.065	0
Haemoptysis	10 (8.54)	0.234	0
Pain abdomen	04 (3.41)	0.903	0
Loss of appetite	12 (10.25)	0.061	0
Ocular symptoms	0	0.912	0
Co-morbidities observed in positive patients			
Hypertension	59 (50.42)	0.024	06 (42.85)
Diabetes mellitus	45 (38.46)	0.0001	02 (14.28)
COPD	27 (23.07)	0.065	08 (57.14)
Heart disease	11 (9.40)	0.091	05 (35.71)
Chronic kidney disease	11 (9.40)	0.231	01 (7.14)
Smoking	11 (9.40)	0.871	02 (14.28)
Obesity	12 (10.25)	0.612	01 (7.14)
ICU admission	50 (42.73)	0.761	06 (42.85)

[Table/Fig-3]: Clinical symptoms and co-morbidities observed in positive cases.
COPD: Chronic obstructive pulmonary disease; ICU: Intensive care unit
*Significant association was seen between dyspnoea, sore throat, bodyaches and SARS-CoV-2 positivity. (p-value <0.05)
*Significant association was seen between hypertension and SARS-CoV-2 positivity. (p-value <0.05). Diabetes mellitus was highly significant (p-value <0.001)
Using chi-square test. P-0.05 statistically significant, p<0.001 statistically highly significant

The most common associated co-morbidities seen in SARS-CoV-2 positive patients were hypertension (59, 50.42%), diabetes mellitus (45, 38.46%), COPD (27, 23.07%), and heart disease (11, 9.40%). In influenza positive patients, the most common associated co-morbidities were COPD (8, 57.14%), hypertension (6, 42.85%), diabetes mellitus (2, 14.28%), and heart disease (5, 35.71%). Out of 117 SARS-CoV-2 positive patients, 50 (42.73%) required ICU admission, while in influenza positive cases, 6 (42.85%) patients required ICU care [Table/Fig-3].

The most common laboratory parameters observed in SARS-CoV-2 positive patients were leucocytosis (115, 98.29%), raised D-dimer (104, 88.88%), raised CRP (51, 43.58%), raised Serum Glutamic Pyruvic Transaminase (SGPT) (50, 42.73%), raised Serum Glutamic Oxaloacetic Transaminase (SGOT) (53, 45.29%), raised blood urea (46, 39.31%), and raised prothrombin time (25, 21.36%). Furthermore, 104 (88.88%) patients showed a raised respiratory rate, 31 (26.49%) showed decreased oxygen saturation, 10 (8.54%) were on invasive ventilator support and 8 (6.83%) were on non-invasive ventilation.

The most common laboratory parameters observed in Influenza positive patients were raised CRP (10, 71.42%), leukopenia (8, 57.14%), raised SGPT (9, 64.28%), raised SGOT (8, 57.18%), anaemia (5, 35.71%), and thrombocytopenia (4, 28.57%). Out of 14 influenza positive patients, 6 (42.85%) showed a raised respiratory rate, 5 (35.71%) showed decreased oxygen saturation, none were on invasive ventilation, and 3 (21.42%) were on non invasive ventilator support [Table/Fig-4].

Lab parameters	SARS-CoV-2 (n=117)	Influenza virus (n=14)
	n (%)	n (%)
TLC (>11000/µL)	115 (98.29)	08 (57.14)
D-dimer (>0.4 mcg/mL)	104 (88.88)	01 (7.14)
SGPT (>80 IU/mL)	50 (42.73)	09 (64.28)
SGOT (>80 IU/mL)	53 (45.29)	08 (57.14)
Blood urea (>24 mg/dL)	46 (39.31)	02 (14.28)
CRP (>10 mg/L)	51 (43.58)	10 (71.42)
Prothrombin time (>13.5 sec)	25 (21.36)	01 (7.14)
Creatinine (>1.5 mg/dL)	14 (11.96)	01 (7.14)
S.Bilirubin (>2 mg/dL)	19 (16.23)	03 (21.42)
Haemoglobin (<10 g/dL)	10 (8.54)	05 (35.71)
Alkaline phosphatase (>147 IU/mL)	21 (17.94)	02 (14.28)
Platelet count (<100000/µL)	05 (4.27)	04 (28.57)
Clinical parameter		
Respiratory rate (>16 breaths/min)	104 (88.88)	06 (42.85)
Oxygen saturation (<92%)	31 (26.49)	05 (35.71)
On ventilator support (Invasive)	10 (8.54)	0
On ventilator support (Non invasive)	08 (6.83)	03 (21.42)

[Table/Fig-4]: Laboratory and clinical parameters observed in positive cases.
TLC: Total leukocyte count; SGPT: Serum glutamic pyruvic transaminase; SGOT: Serum glutamic oxaloacetic transaminase; CRP: C-reactive protein

DISCUSSION

The SARI caused by viruses such as SARS-CoV-2 and Influenza are the leading causes of hospitalisation and deaths worldwide. The clinical manifestations of these infections range from mild to moderate symptoms to severe symptoms that require hospitalisation. These infections are also associated with a wide range of co-morbidities and risk factors, which have resulted in poorer clinical outcomes.

This study was conducted on 400 patients admitted with SARI at a tertiary care hospital. Out of the 400 admitted SARI patients, 117 (29.25%) tested positive for SARS-CoV-2 by real-time PCR. In a similar study conducted by Aggarwal A et al., 39% of SARI patients were found to be SARS-CoV-2 positive [17]. Another study conducted by Sharma A et al., on SARI cases reported a 17.6% SARS-CoV-2 positivity rate in patients [19]. Agarwal N et al., also found a 33.8% SARS-CoV-2 positivity rate among SARI patients [20]. In the present study, out of the 400 SARI patients, only 3.5% were found to be Influenza A positive; 1.75% were Influenza A (H1N1) pdm09 positive, and 1% were Influenza A (H3N2) positive. However, a study conducted by Drăgănescu AC et al., detected a 41.2% Influenza positivity rate, with 57.2% for H1N1 and 29.3% for H3N2 [21]. Pariani E et al., showed in their study that Influenza A H1N1 was detected in 58.3% and Influenza A H3N2 was detected in 20% of SARI cases [22]. No cases of co-infection with SARS-CoV-2 and influenza virus were observed in the present study. The decrease in the prevalence of influenza viruses during this period may be attributed to the SARS-CoV-2 pandemic.

Several existing literature reports have documented the increased prevalence rate of SARS-CoV-2 among male patients. In the present study, there was also a slight male preponderance, with a positivity rate of 52.99%, which was relatively higher than the positivity rate among females at 47.00%. A study by Khan M et al., also showed a mainly male (70.25%) population being infected by SARS-CoV-2 [23]. These results were consistent with the study conducted by

Aggarwal A et al., which reported that 59.3% of positive cases were males [17]. The higher incidence in male patients can possibly be explained by their increased exposure outside the home and a higher concentration of Angiotensin-Converting Enzyme-2 (ACE-2) in males compared to females. ACE-2, which is expressed in multiple organ systems, enables the binding of SARS-CoV-2 to cell membranes and its subsequent entry [17]. Furthermore, genetic factors such as the X chromosome and sex hormones like oestrogens, predominantly found in females, provide significant protection against SARS-CoV-2 by playing important roles in innate and adaptive immunity [23]. Among the positive influenza cases, females (64.28%) were found to be in higher numbers than males (35.71%). This finding was in accordance with a study conducted by Drăgănescu AC et al., which showed that females (53.3%) outnumbered males (46.7%) [21]. Prasad S et al., also detected a slight female preponderance of 55.36% in a similar study [24]. However, Mehta K et al., observed that males (54%) were more affected than females (46%) [25]. This predominance in females can be explained by the fact that females generate higher proinflammatory cytokine and chemokine responses, making them more susceptible to influenza viruses [26].

In the present study, patients in the age group of 41 to 60 years had the highest positivity rate (47.86%) for SARS-CoV-2. Similar studies have also reported the 41-60 age group as the most commonly infected [8,23]. The most common age group affected by influenza was also 41-60 years (57.14%), followed by 0-20 years (21.42%) in this study. Raut S et al., reported that the maximum number of positive cases were seen in the age group of 41-60 years (24%) in their study [27]. A study conducted by Prasad S et al., also showed the 41-60 age group as the most commonly infected [24]. This finding was alarming because people in this age group are the young, income-generating, mobile population of the country. Therefore, the fact that they are more affected suggests that lockdown measures, social distancing, personal hygiene, and other preventive measures to combat these viruses should have been more strictly followed [28].

The most common clinical symptom found in SARS-CoV-2 positive SARI patients in the present study was fever (100%), followed by cough (81.19%), dyspnoea (72.64%), sore throat (58.97%), and body aches (45.29%). Yang L et al., also reported fever (85.5%) as the most common symptom, followed by cough (58.0%) [29]. However, in a study conducted by Aggarwal A et al., on SARI patients, dyspnoea (90.6%) was the most common symptom, followed by cough (84.4%) and fever (68%) [17]. Although the nasopharynx is theoretically the first organ infected with SARS-CoV-2, a recent study showed that infected individuals rarely show upper respiratory symptoms at the onset of the infection. This suggests that the virus mostly targets the cells of the lower respiratory tract [30]. In reference to a study by Huang C et al., increased amounts of proinflammatory cytokines in the serum were associated with pulmonary inflammation and extensive lung damage [31].

Among the positive influenza cases in this study, the most common symptoms observed were fever (100%), cough (92.85%), dyspnoea (78.57%), body aches (78.57%), and sore throat (50%). In a similar study, Zayet S et al., also reported fever (92.6%) as the most common symptom, followed by cough (81.5%), body aches (70.4%), dyspnoea (59.3%), and sore throat (44.4%) [32]. Tong X et al., also detected fever (75.3%) and cough (56.9%) as the most common symptoms in influenza patients, followed by body aches (33.3%) and dyspnoea (29.2%) [33]. Headache, myalgia, and fever are important determinants of the severity of the disease. Myalgia is prominent in the calf muscle and the paravertebral and back muscles. In the early days, the patient has a high-grade fever, which decreases and diminishes gradually on the 2nd and 3rd days [11].

In the present study, there was an increased incidence of SARS-CoV-2 disease manifestations in patients with underlying chronic diseases. Hypertension (50.42%) and diabetes mellitus (38.46%) were the top two co-morbidities among the positive SARS-CoV-2 patients, followed by COPD (23.07%). Sharma A et al., reported hypertension (31.8%), diabetes (12.5%), and COPD (4.5%) as common co-morbidities in SARS-CoV-2 positive patients with SARI [19]. The most common associated co-morbidities seen in influenza positive patients were COPD (57.14%) and hypertension (42.85%), followed by heart disease (35.71%), diabetes mellitus (14.28%), and CKD (7.14%). A similar study was also conducted by Tong X et al., which showed that influenza was associated with co-morbidities such as hypertension (44.8%), diabetes mellitus (14.9%), COPD (7.5%), cardiovascular diseases (4.5%), malignancy (4.5%), and CKD (1.5%) [33]. This association of COVID-19 and influenza with co-morbidities could be due to a lowered immune status because of impairment of macrophage and lymphocyte function [23].

In the present study, 42.73% (50) of SARS-CoV-2 positive SARI patients required ICU care. Among them, 10 (8.54%) received mechanical ventilation, while 8 (6.83%) were on non invasive ventilation. Ismail K et al., conducted a similar study and found that 40% of patients required ICU care, and among them, 14.5% required mechanical ventilation [34]. This was also in concordance with a study done by Soni SL et al., in which 1.7% required non invasive ventilation and 2.6% were on invasive ventilation [35]. 42.85% of influenza-positive patients in this study required ICU admission, which was in concordance with Choi WI et al., who reported 36.1% of influenza patients requiring intensive care [36]. This can be explained by the increased chances of disease progression to multiple organ dysfunction syndromes due to co-morbidities, which necessitated ICU care and ventilator requirements in these patients [16]. Mechanical ventilation was mainly required due to respiratory failure refractory to oxygen therapy, although it has a poor outcome [17].

The most common laboratory parameters observed in SARS-CoV-2 positive patients were leukocytosis (98.29%), raised D-dimer (88.88%), raised SGPT (42.73%), raised SGOT (45.29%), raised blood urea (39.31%), raised CRP (43.58%), and raised prothrombin time (21.36%). This was in concordance with similar studies [37-39]. D-dimer elevation is often observed in patients with SARS-CoV-2 due to acute lung injury itself or due to thromboembolic complications that occur frequently in SARS-CoV-2. Regular screening and monitoring of D-dimer reflect disease severity and guide anticoagulation therapy [40]. Many authors have shown the possible effect of the SARS-CoV-2 virus on the liver [41,42]. The most common laboratory parameters observed in influenza-positive patients were raised CRP (71.42%), leukopenia (57.14%), anaemia (35.71%), thrombocytopenia (28.57%), raised SGPT (64.28%), and raised SGOT (57.14%), which was in concordance with similar studies [43-45]. CRP is a downstream acute-phase reactant protein that complements the innate immune response. It is produced in influenza infection as a result of the increased synthesis of proinflammatory cytokines to activate the complementary immune response [46].

In the present study, 88.88% of SARS-CoV-2 positive cases were found to have an increased respiratory rate, and 26.49% had hypoxia (SpO_2 <92%). In a similar study by Soni SL et al., 31% showed tachypnoea, and 17% had hypoxia [35]. Out of 14 influenza-positive patients, 35.71% showed decreased oxygen saturation, and 42.85% showed a raised respiratory rate, which was in concordance with similar studies [47-49]. Hypoxia is a result of ventilation-perfusion ratio mismatch due to a vascular pathology. This hypoxia leads to increased respiratory drive, leading to high work of breathing and hence an increased respiratory rate [50]. The clinical implication of this study is that both SARS-CoV-2 and influenza viruses may cause severe forms of respiratory infections with symptoms like dyspnoea, sore throat, and fever leading to hypoxia and tachypnoea, and may complicate to require mechanical ventilation. This study provides

future perspectives for planning appropriate strategies for prevention, control, and treatment modalities to prevent a similar catastrophe in the near future.

Limitation(s)

The study's limitation was that the results cannot be generalised to the entire population since it was conducted in a single centre. Additionally, the study's findings are only applicable to the circulating subtypes during that particular season. Influenza A, Influenza A (H1N1), and Influenza A (H3N2) were reported during the season in which the study was conducted, while Influenza B viruses were not reported during that season.

CONCLUSION(S)

The SARI caused by respiratory viruses such as SARS-CoV-2 and Influenza is a significant public health concern. This study sheds light on the clinical and epidemiological characteristics of patients with SARI caused by SARS-CoV-2 and Influenza. These viral infections have demonstrated a wide range of severity and have been associated with various co-morbidities. Timely and early detection of these viral infections can assist healthcare workers in implementing preventive measures, taking specific precautions to reduce transmission, providing appropriate treatments, and delivering supportive care to patients.

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