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Original Research Article

A RETROSPECTIVE STUDY OF RESPIRATORY VIRUSES AND ASSOCIATED CLINICAL FACTORS IN SARI PATIENTS ADMITTED THE TERTIARY CARE HOSPITALS AT MUMBAI, INDIA FROM FEBRUARY 2026-MAY 2026

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ABSTRACT

Background: In ongoing hospital-based surveillance of respiratory viruses at Mumbai's tertiary care hospital from November 2025- January 2025, none of the Severe Acute Respiratory Infection (SARI) patient reported positivity for Influenza, SARS-CoV-2 and Adenoviruses. Although patients had relevant signs and symptoms. Therefore, from February 2026 onwards, a viral spectrum testing was expanded.

Materials and Methods: A total of 419 participants were enrolled after taking consent, including 263 ARI and 156 SARI cases between February 2026-May 2026. Participants aged 5-64 years were tested for Influenza A, B, SARS-CoV-2, and Adenovirus. Participants <5 years and >65 years were tested with an expanded respiratory virus panel including Influenza A/B, SARS-CoV-2, Adenovirus, RSV A/B, Parainfluenza 1-4, Rhinovirus, Enterovirus, Bocavirus, Parechovirus, and Human metpneumovirus (HMPV). Viral positivity was associated with collected clinico-epidemiology. Variables with greater percentages of positive response and $p<0.05$ were considered significantly and positively associated.

Results: Infection was recorded predominantly in SARI patients. None of the participants was positive for Influenza A, B, or SARS-CoV-2 during this period. Rhinovirus (28%) and Enterovirus (27%) were most common, followed by Parainfluenza-3 (15%), HMPV (8%), Bocavirus (7%), and Adenovirus (5.7%). Respiratory Syncystial Virus (RSV) B (1%) and Parechovirus (1%) were also detected. Co-infection was frequent, with Rhinovirus + Enterovirus in 29.41% of SARI cases. Other co-infections ranged from 1-5%. Significant positive associations were found with age <5 years (73.33%, $p<0.001$), wheezing (64.29%, $p<0.001$), infectious/inflammatory diagnosis (50.62%, $p<0.001$), bronchodilator use (30.87%, $p=0.034$), ward admission (39.32%, $p=0.001$), and hospital stay of 5-7 days (34.55%, $p=0.010$).

Conclusion: Influenza and SARS-CoV-2 were not detected, but other respiratory viruses circulated widely and contributed to infection, particularly in children. Wheezing and prolonged hospitalization had key positive associations. The findings support expanded multiplex testing beyond influenza and SARS-CoV-2 for better diagnosis and surveillance throughout the year.

Keywords: SARI, clinico-epidemiology, Respiratory viruses, Tertiary care hospital, Mumbai.

INTRODUCTION

Acute respiratory infections (ARIs) are a leading cause of morbidity and mortality worldwide, accounting for a substantial burden on healthcare systems. While most Acute Respiratory Infection (ARIs) are self-limiting, a proportion progress to Severe Acute Respiratory Infection (SARI) requiring hospitalization, particularly among children <5 years, adults >65 years, and individuals with underlying respiratory or inflammatory diseases. Respiratory viruses are among the most important etiological agents of both ARI and SARI, and their epidemiology varies by season, geography, and population.[1,2] Globally, influenza viruses and Respiratory Syncytial Virus (RSV) have traditionally been recognized as the primary viral causes of severe respiratory illness. In India, a 50-year review reported Respiratory Syncystial Viruses (RSV) as the most common pathogen in lower respiratory tract infections, followed by influenza A/B, parainfluenza viruses, rhinovirus, and human metapneumovirus (HMPV). However, the landscape of respiratory viruses has evolved, especially in the post-COVID-19 era, with increased use of multiplex Polymerase Chain Reaction (PCR) enabling detection of a broader range of respiratory pathogens.[2,3,4] Emerging and less commonly reported viruses such as rhinovirus, enterovirus, bocavirus, parechovirus, and parainfluenza viruses are now increasingly detected in hospitalized patients. Human rhinovirus is the most frequent cause of upper respiratory infection and is also associated with exacerbations of asthma and Chronic Obstructive Pulmanary Disorders (COPD). Enteroviruses, historically linked to gastrointestinal and neurological disease, are now recognized as respiratory pathogens. Human bocavirus and parechovirus have been implicated in both upper and lower respiratory infections, often in the setting of co-infection. Parainfluenza virus type 3 and HMPV are well-established causes of bronchiolitis, croup, and pneumonia, particularly in young children and older adults. Co-infections with multiple respiratory viruses have also been reported and may be associated with increased disease severity and prolonged hospitalization.[2,3,4]

Respiratory virus surveillance was initiated in one of the tertiary care hospitals at Mumbai from January 2025. The surveillance is still going on. Between October and December 2025, hospitalized SARI patients presented with clinical features of respiratory infection. However, none of the samples tested positive for Influenza virus, SARS-CoV-2, or Respiratory Syncytial Virus (RSV), including paediatric and geriatric populations. Despite this, cases of bronchitis, bronchiolitis, croup, acute respiratory distress syndrome (ARDS), and Chronic Obstructive Pulmonary Disease (COPD) were documented. Therefore, study aims to investigate other potential or emerging respiratory viruses, from February 2026 onwards. The present study provides real time insights into emerging respiratory viral infections and co-infections in Mumbai and correlates with clinico epidemiology for the duration February 2026 and May 2026.

MATERIALS AND METHODS

Respiratory virus surveillance was initiated in Mumbai in January 2025. For this purpose, 25 patients were enrolled per week from the tertiary care government hospital in Mumbai. Of these, 15 patients presenting to community centres with Acute Respiratory Infection (ARI) and 10 hospitalized patients meeting the Severe Acute Respiratory Infection (SARI) criteria were included.[5,6]

Case Definitions and Enrolment

Acute Respiratory Infection (ARI) was defined as the acute onset of respiratory symptoms such as cough, sore throat, or shortness of breath, or a clinician's diagnosis of a short-term infection affecting any part of the respiratory tract. A case of Severe Acute Respiratory Infection (SARI) was defined as a patient with reported or measured fever ≥38°C and cough, with symptom onset within the last 10 days, and requiring hospitalization. Patients who met the ARI and SARI case definition and provided consent were enrolled in the study.[7,8]

Sample collection Laboratory Testing

After collection, Nasopharygeal /Orppharyngeal (NP/OP) swabs were placed in Virus Transport Medium (VTM) and transported to the Virus Research and Diagnostic Laboratory (VRDL) at Kasturba Hospital for Infectious Diseases, Mumbai, under cold chain conditions within 12 hours of collection. Nucleic acid was extracted on the same day using an automated extraction system (HiMedia Mag32, India). The extracted nucleic acid was then tested by real-time Polymerase Chain Reaction (HiMedia InstaQ96, India) using validated commercial kits. Test reports were sent to the study hospital within 24 hours of testing.

Besides Clinico epidemiology data was collected after taking appropriate consent. The surveillance is ongoing. The study incorporated all age group population covering paediatric, adults and geriatric. Individuals aged 5-65 years (non-vulnerable population) were tested for influenza A, influenza B, SARS-CoV-2 and adenovirus using PCR. The vulnerable population covering paediatric population (<5 years) and geriatric population (>65 years) were screened for RSV A/B, parainfluenza virus types 1-4, rhinovirus, enterovirus, bocavirus, parechovirus, and human metapneumovirus (HMPV) along with influenza A, influenza B, SARS-CoV-2 and adenovirus.[9] The study took ethical approval from the Institutional ethics committee of the tertiary care hospital, Mumbai.

Statistical Analysis

Statistical analysis was performed using STATA version 18. Categorical variables were expressed as frequencies and percentages. Pearson's chi-square

test with a 95% confidence interval was used to assess associations between respiratory viral positivity and clinico-epidemiological parameter.[9]

RESULTS

In a span of 4 months, 419 participants enrolled of which 263 were from community health centere classified as Acute Respiratory Infection (ARI) whereas 156 were Sever Acute Respiratory Infection cases hospitalized in wards and ICUs (Figure 1A). Among ARI participants, two tested positive for Influenza A and one tested positive for adenovirus (Figure 1B). Most positive detections were reported from SARI participants (Figure 1C). Therefore, the present study focuses on the clinico-epidemiology of emerging respiratory viruses among SARI patients

Among SARI patients, positivity was reported for Rhinovirus (28%), Enterovirus (27%%), Parainfluenza 3 (15%), Human metapneumovirus (8%, Bocavirus (7%), Parainfluenza 1 (3.4%), Parainfluenza 4 (2%), RSV B (1%) and Parechovirus (1%) (Figure 1C). All other respiratory viruses viz. parainfluenza, human metapneumovirus, bocavirus, parechovirus, adenovirus showed coinfection with Rhinovirus + Enterovirus. The combination of Rhinovirus + Enterovirus was detected with higher percentages (29.41%). Besides parainfluenza, human metapneumovirus, bocavirus, parechovirus, adenovirus showed coinfection among themselves with low percentages (1-5%) (Figure 1D).

Statistical analysis was performed for participants classified into two groups Non vulnerable population with age group 5-65 years (Table 1) and vulnerable population (<5 years and >65 years (Table 2).

Non-vulnerable population

When the non-vulnerable population was analysed, among exposure variables, none of the variable viz. similar illness in family, exposure to bird, travel abroad in past, smoker in family, exposure farm animals family members, sleeping in same room showed positive association with viral infection (Table 1). In case of signs and symptoms, cough was recorded in a greater number of positive patients (48%). In clinical signs, wheeze (64%), O_2 saturation <95 was recorded in 28.21 % (Table 1). Positive associations were observed with age (p = 0.000), wheezing (Yes= 64.29%, p = 0.000), infectious and inflammatory respiratory diseases (Yes=50.62%, *p* = 0.000), bronchodilator use (Yes= 30.87%, *p* = 0.034), hospitalization in ward (Yes=39.32%, *p* = 0.000), and hospital stay 5-7 days (Yes=34.55%, *p* = 0.010). [Table 1]

Conversely, negative associations were found with sputum production (No=31.85%, p = 0.027), chest pain (No=30.91, p = 0.003), hemoptysis (No=28.98, *p* = 0.046), headache (No=32.62, *p* = 0.005), diarrhoea (No=29.41, p = 0.047), respiratory rate >24 breaths/min (45.05%, *p* = 0.000), oxygen supplementation (No=47.76%, *p* =0.000), CPAP (No=24.29%, *p* =0.000) and ICU admission (No=41.41%, *p* = 0.000).

Vulnerable population

In the vulnerable population, which included paediatric and geriatric age groups, statistically significant positive associations were observed with age <5 years and >65 years (<5 yrs=73.33%,>65 yrs=15.38 yrs, *p* <0.001), wheezing (Yes=75%, *p* <0.001), infectious and inflammatory respiratory disease diagnosis (69.49%, *p* <0.001), bronchodilator use (Yes=51.72, *p* = 0.034), oxygen saturation (Yes=71.11%, *p* <0.001), ward hospitalization (Yes=63.89, *p* =0.001), and hospital stay 5-7 days (73.68, *p* = 0.010) [Table 2].

In the vulnerable population, a significant negative association was observed with history of a smoker in the family (No=57.69%, *p* = 0.006), chest pain (No=53.19%, *p* = 0.020), Continuous Positive Airway Pressure /CPAP (No=100%, *p* =0.003) and admission to the intensive care unit/ICU (No= 66.13%, *p* <0.001) [Table 2].

a) Viral distribution in combined SARI and ARI patients (N=419)

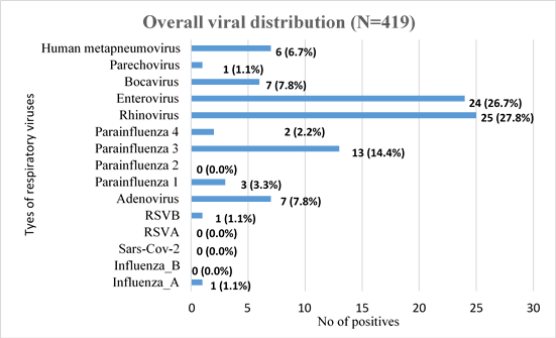
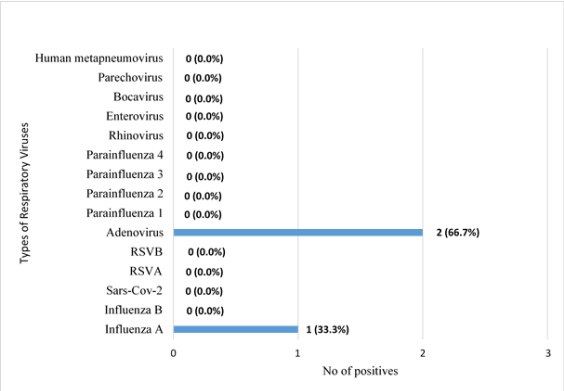
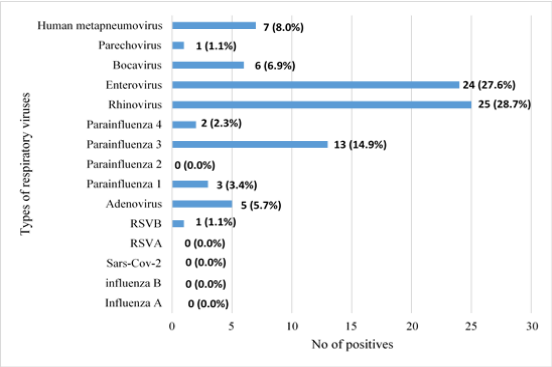


Figure 1: Viral positivity distribution among enrolled patients

b) Viral distribution in ARI patients (n=263)



c) Viral distribution in SARI patients (n=156)



d) Respiratory viral positivity combinations in SARI patients

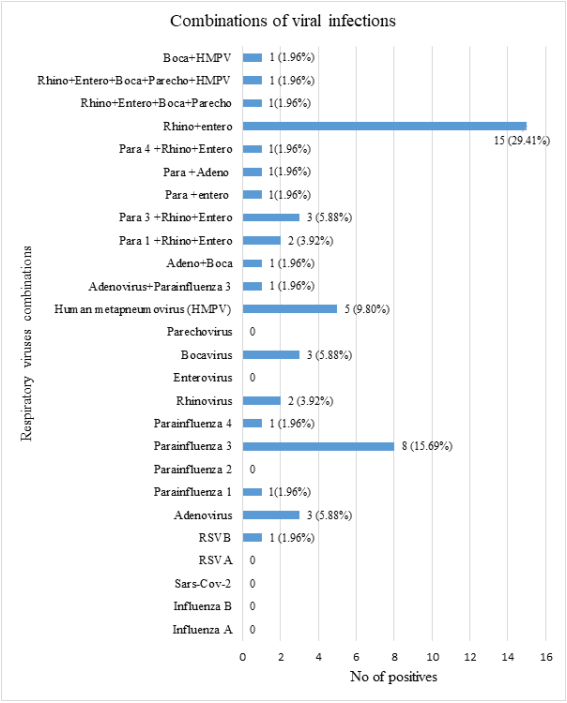


Table 1: Analysis of Symptoms and Signs in all types of SARI Patients (pediatric +adult +Geriatric)

Background Variable	Negative	Positive	Total	Chi Square Test *P* Value
	N(%)	N(%)	N(%)	
Age Group				
<5	16(26.67)	44(73.33)	60(100)	0.000
5-17	4 (100)	0 (0.0)	4(100)	
18-64	82(98.80)	1 (1.20)	83(100)	
65+	33(84.62)	6(15.38)	39(100)	
Gender				
Male	68(78.16)	19(21.84)	87(100)	0.110
Female	67(67.68)	32(32.32)	99(100)	
Exposure to variable				
similar_illness_family				
No	132 (72.53)	50 (27.47)	182 (100)	0.913
Yes	3 (75.00)	1 (25.00)	4(100)	
exposure_to_bird				
No	134 (72.43)	51 (27.57)	185(100)	0.538
Yes	1(100)	0(0.0)	1(100)	
travel_abroad_in_past				
No	130 (73.03)	48 (26.97)	178 (100)	0.514
Yes	5 (62.50)	3 (37.50)	8 (100)	
smoker_in_family				
No	103 (69.59)	45 (30.41)	148(100)	0.072
Yes	32 (84.21)	6 (15.79)	38(100)	
exposure_farm_animals				
No	135 (72.58)	51 (27.42)	186 (100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
family_members_sleeping in same room				
No	15 (83.33)	3 (16.67)	18(100)	0.282
Yes	120 (71.43)	48 (28.57)	168(100)	
Symptomatic profile				
rigors				
No	135 (72.58)	51 (27.42)	186 (100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
sputum				
No	92 (68.15)	43 (31.85)	135(100)	0.027
Yes	43 (84.31)	8 (15.69)	51(100)	
sore_throat				
No	76 (67.86)	36 (32.14)	112(100)	0.076
Yes	59 (79.73)	15 (20.27)	74(100)	
ear_discharge				
No	135 (72.58)	51 (27.42)	186(100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	

body_ache				
No	97 (70.80)	40 (29.20)	137(100)	0.363
Yes	38 (77.55)	11 (22.45)	49(100)	
chest_pain				
No	114 (69.09)	51 (30.91)	165(100)	0.003
Yes	21 (100.00)	0(0.0)	21(100)	
vomiting_nausea				
No	111 (72.55)	42 (27.45)	153(100)	0.983
Yes	24 (72.73)	9 (27.27)	33(100)	
breathlessness_difficulty				
No	43 (65.15)	23 (34.85)	66(100)	0.092
Yes	92 (76.67)	28 (23.33)	120(100)	
chills				
No	113 (70.63)	47 (29.38)	160(100)	0.138
Yes	22 (84.62)	4 (15.38)	26(100)	
cough				
No	10 (76.92)	3 (23.08)	13(100)	0.716
Yes	125 (72.25)	48 (27.75)	173(100)	
haemoptysis				
No	125 (71.02)	51 (28.98)	176(100)	0.046
Yes	10 (100)	0(0.0)	10(100)	
nasal_discharge				
No	106 (75.18)	35 (24.82)	141(100)	0.160
Yes	29 (64.44)	16 (35.56)	45(100)	
headache				
No	95 (67.38)	46 (32.62)	141(100)	0.005
Yes	40 (88.89)	5 (11.11)	45(100)	
malaise_fatigue				
No	135 (72.58)	51 (27.42)	186(100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
abdominal_pain				
No	132 (72.13)	51 (27.87)	183(100)	0.283
Yes	3 (100)	0(0.0)	3(100)	
diarrhea				
No	120 (70.59)	50 (29.41)	170(100)	0.047
Yes	15 (93.75)	1 (6.25)	16(100)	
seizures				
No	135 (72.58)	51 (27.42)	186(0.0)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
taste				
No	135 (72.58)	51 (27.42)	186(100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
smell				
No	135 (72.58)	51 (27.42)	186(100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
other_symptoms				
No	112 (74.17)	39 (25.83)	151(100)	0.312
Yes	23 (65.71)	12 (34.29)	35(100)	
Respiratory rate				
>24	50 (54.95)	41 (45.05)	91(100)	0.000
<24	77 (91.67)	7 (8.33)	84(100)	
Pulse				
>100	48 (90.57)	5 (9.43)	53(100)	0.849
<100	65 (91.55)	6 (8.45)	71(100)	
O2 saturation				
>95	18 (81.82)	4 (18.18)	22(100)	0.321
<95	112 (71.79)	44 (28.21)	156(100)	
Temperature				
>38	5 (83.33)	1 (16.67)	6(100)	0.594
<38	109 (90.08)	12 (9.92)	121(100)	
wheeze				
No	115 (88.46)	15 (11.54)	130(100)	0.000
Yes	20 (35.71)	36 (64.29)	56(100)	
nasal_flaring				
No	135 (72.58)	51 (27.42)	186(100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
stridor_in_calm_patient				
No	135 (72.97)	50 (27.03)	185(100)	0.103
Yes	0(0.0)	1(100)	1(100)	
crepitation				
No	50 (72.46)	19 (27.54)	69(100)	0.978
Yes	85 (72.65)	32 (27.35)	117(100)	
lower_chest_in_drawing				

No	135 (72.58)	51 (27.42)	186 (100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
grunting				
No	135 (72.58)	51 (27.42)	186 (100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
apnea				
No	135 (72.58)	51 (27.42)	186 (100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
accessory				
No	135 (72.58)	51 (27.42)	186 (100)	Fail (no category)
Yes	0(0.0)	0(0.0)	0(0.0)	
Type of respiratory diseases				
Obstructive Lung Diseases	66 (90.41)	7 (9.59)	73(100)	
Restrictive Lung Diseases	8(100)	0(0.0)	8(100)	0.000
Infectious and Inflammatory Diseases	40 (49.38)	41 (50.62)	81(100)	
Pulmonary Vascular Diseases	15 (88.24)	2 (11.76)	17(100)	
Treatment				
Antibiotic				
No	5 (55.56)	4 (44.44)	9(100)	0.241
Yes	130 (73.45)	47 (26.55)	177(100)	
Antiviral				
No	39 (81.25)	9 (18.75)	48(100)	0.118
Yes	96 (69.57)	42 (30.43)	138(100)	
Bronchodialators				
No	32 (86.49)	5 (13.51)	37(100)	0.034
Yes	103 (69.13)	46 (30.87)	149(100)	
Steroids				
No	59 (75.64)	19 (24.36)	78(100)	0.427
Yes	76 (70.37)	32 (29.63)	108(100)	
Oxygen				
No	35(52.24)	32(47.76)	67(100)	0.000
Yes	100(84.03)	19(15.97)	119(100)	
CPAP				
No	134 (75.71)	43 (24.29)	177(100)	0.000
Yes	1 (11.11)	8 (88.89)	9(100)	
Hospitalization				
Ward				
No	64 (92.75)	5 (7.25)	69 (100)	0.000
Yes	71 (60.68)	46 (39.32)	117(100)	
ICU				
No	58 (58.59)	41 (41.41)	99(100)	0.000
Yes	77 (88.51)	10 (11.49)	87(100)	
Days of hospitalization				
less than 5	19 (57.58)	14 (42.42)	33(100)	0.010
5-7	36 (65.45)	19 (34.55)	55(100)	
>7	80 (81.63)	18 (18.37)	98(100)	
Total Sample	135 (72.58)	51 (27.42)	186 (100)	

Table 2: Analysis of Symptoms and Signs in vulnerable population of SARI Patients (paediatric + Geriatric)

Background Variable	**Negative**	**Positive**	**Total**	**Chi Square Test P Value**
	N(%)	**N(%)**	**N(%)**	
Age Group				
<5	16(26.67)	44(73.33)	60(100)	0.000
5-17				
18-64				
65+	33(84.62)	6(15.38)	39(100)	
Gender				
Male	29(48.33)	31(51.67)	60(100)	0.774
Female	20(51.28)	19(48.72)	39(100)	
Exposure to variable				
similar_illness_family				
No	47(48.96)	49(51.04)	96(100)	0.546
Yes	2(66.67)	1(33.33)	3(100)	
exposure_to_bird				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
travel_abroad_in_past				
No	47(50.00)	47(50.00)	94(100)	0.663
Yes	2(40.00)	3(60.00)	5(100)	
smoker_in_family				

No	33(42.31)	45(57.69)	78(100)	0.006
Yes	16(76.19)	5(23.81)	21(100)	
exposure_farm_animals				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
family_members_sleeping				
No	6(66.67)	3(33.33)	9(100)	0.280
Yes	43(47.78)	47(52.22)	90(100)	
Symptomatic profile				
fever				
No	13(59.09)	9(40.91)	22(100)	0.307
Yes	36(46.75)	41(53.25)	77(100)	
rigors				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
sputum				
No	35(44.87)	43(55.13)	78(100)	0.076
Yes	14(66.67)	7(33.33)	21(100)	
sore_throat				
No	33(48.53)	35(51.47)	68(100)	0.776
Yes	16(51.61)	15(48.39)	31(100)	
ear_discharge				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
body_ache				
No	41(51.25)	39(48.75)	80(100)	0.474
Yes	8(42.11)	11(57.89)	19(100)	
chest_pain				
No	44(46.81)	50(53.19)	94(100)	0.020
Yes	5(100)	0(0.0)	5(100)	
vomiting_nausea				
No	44(51.76)	41(48.24)	85(100)	0.266
Yes	5(35.71)	9(64.29)	14(100)	
breathlessness_difficulty				
No	20(46.51)	23(53.49)	43(100)	0.603
Yes	29(51.79)	27(48.21)	56(100)	
chills				
No	44(48.35)	47(51.65)	91(100)	0.443
Yes	5(62.50)	3(37.50)	8(100)	
cough				
No	2 (40.00)	3 (60.00)	5 (100.00)	0.663
Yes	47 (50.00)	47 (50.00)	94 (100.00)	
haemoptysis				
No	46 (47.92)	50 (52.08)	96 (100.00)	0.076
Yes	3 (100.00)	0 (0.00)	3 (100.00)	
nasal_discharge				
No	41 (54.67)	34 (45.33)	75 (100.00)	0.069
Yes	8 (33.33)	16 (66.67)	24 (100.00)	
headache				
No	39 (46.43)	45 (53.57)	84 (100.00)	0.149
Yes	10 (66.67)	5 (33.33)	15 (100.00)	
malaise_fatigue				
No	49 (49.49)	50 (50.51)	99 (100.00)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
abdominal_pain				
No	49 (49.49)	50 (50.51)	99 (100.00)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
diarrhea				
No	47 (48.96)	49 (51.04)	96 (100.00)	0.546
Yes	2 (66.67)	1 (33.33)	3 (100.00)	
seizures				
No	49 (49.49)	50 (50.51)	99 (100.00)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
taste				
No	49 (49.49)	50 (50.51)	99 (100.00)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
smell				
No	49 (49.49)	50 (50.51)	99 (100.00)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
other_symptoms				
No	42(52.50)	38(47.50)	80(100)	0.220
Yes	7(36.84)	12(63.16)	19(100)	
Respiratory rate				

>24	23(35.94)	41(64.06)	64(100)	0.000
<24	23(79.31)	6(20.69)	29(100)	
Pulse				
>100	10(71.43)	4(28.57)	14(100)	0.566
<100	23(79.31)	6(20.69)	29(100)	
O2 saturation				
>95	37(46.25)	43(53.75)	80(100)	0.082
<95	10(71.43)	4(28.57)	14(100)	
Temperature				
>38	0(0.00)	1(100.00)	1(100)	0.094
<38	33(75.00)	11(25.00)	44(100)	
wheeze				
No	37(72.55)	14(27.45)	51(100)	0.000
Yes	12(25.00)	36(75.00)	48(100)	
nasal_flaring				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
stridor_in_calm_patient				
No	49(50.00)	49(50.00)	98(100)	0.320
Yes	0(0.00)	1(100.00)	1(100)	
crepitation				
No	14(42.42)	19(57.58)	33(100)	0.320
Yes	35(53.03)	31(46.97)	66(100)	
lower_chest_in_drawing				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
grunting				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
apnea				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
accessory				
No	49(49.49)	50(50.51)	99(100)	Not Applicable
Yes	0(0.0)	0(0.0)	0(0.0)	
Type of respiratory diseases				0.000
Obstructive Lung Diseases	25(78.13)	7(21.88)	32(100)	
Restrictive Lung Diseases	1(100.00)	0(0.00)	1(100)	
Infectious and Inflammatory Diseases	18(30.51)	41(69.49)	59(100)	
Pulmonary Vascular Diseases	5(83.33)	1(16.67)	6(100)	
Treatment				
Antibiotic				
No	2(33.33)	4(66.67)	6(100)	0.414
Yes	47(50.54)	46(49.46)	93(100)	
Antiviral				
No	11(55.00)	9(45.00)	20(100)	0.581
Yes	38(48.10)	41(51.90)	79(100)	
Bronchodialators				
No	7(58.33)	5(41.67)	12(100)	0.514
Yes	42(48.28)	45(51.72)	87(100)	
Steroids				
No	17(47.22)	19(52.78)	36(100)	0.732
Yes	32(50.79)	31(49.21)	63(100)	
Oxygen				
No	13(28.89)	32(71.11)	45(100)	0.000
Yes	36(66.67)	18(33.33)	54(100)	
CPAP				
No	49(53.85)	42(46.15)	91(100)	0.003
Yes	0(0.00)	8(100.00)	8(100)	
Hospitalization				
Ward				
No	23(85.19)	4(14.81)	27(100)	0.000
Yes	26(36.11)	46(63.89)	72(100)	
ICU				
No	21(33.87)	41(66.13)	62(100)	0.000
Yes	28(75.68)	9(24.32)	37(100)	
Days of hospitalization				
less than 5	5(26.32)	14(73.68)	19(100)	0.014
5-7	14(42.42)	19(57.58)	33(100)	
>7	30(63.83)	17(36.17)	47(100)	
Total Sample	49(49.49)	50(50.51)	99(100)	

DISCUSSION

The respiratory virus surveillance was initiated in Virus Research Diagnostic Laboratory (VRDL) from January 2025 and extended till date. The study findings from January 2025 – August 2025 were published.[5] Ingole et al, 2026 suggested sore throat and wheeze were found to be influenza predictors among enrolled 302 SARI patients.[5] The study continued till date.

Between November 2025- January 2026, although ARI and SARI patients were enrolled, none of them showed positivity for Influenza A, B, SARS CoV2 and RSVA/B (unpublished data). These patients reported fever, sore throat, breathlessness. In case of SARI the patients were diagnosed with multiple respiratory conditions including Chronic Obstructive Pulmonary Disorder (COPD), Lower Respiratory Tract Infection (LRTI), viral pneumonia, bronchopneumonia, bronchitis (data unpublished). This demanded the search for wider spectrum of respiratory pathogens. This 4-month surveillance from February to May 2026 provides recent data on the viral etiology of respiratory illness in Mumbai. A total of 419 participants were enrolled, including 263 ARI and 156 SARI cases (Figure 1,A,B,C, D). Among 263 ARI patients, only two cases of Influenza A and 1 case of Adenovirus was detected (Figure 1B). Among SARI patients, rhinovirus (28%) and enterovirus (27%) were the most frequently detected viruses, followed by parainfluenza virus type 3 (15%), HMPV (8%), bocavirus (7%), parainfluenza virus type 1 (3.4%), parainfluenza virus type 4 (2%), RSV B (1%), and parechovirus (1%)(Figure 1C). The probable reason of lack of majority respiratory viruses among ARI patients may be because any geriatric and paediatric population visited community centre.

The high proportion of rhinovirus and enterovirus differs from historical Indian data where RSV and influenza A/B were the leading causes of LRTI.[4] Globally, rhinoviruses are recognized as a major cause of both mild URTI and severe LRTI exacerbations, particularly in patients with underlying respiratory disease.[2] Enteroviruses are also increasingly reported in respiratory disease and can cause severe illness in infants and immunocompromised hosts.[3] The low detection of RSV B (1%) and absence of influenza/SARS-CoV-2 during this period may reflect seasonal variation. In India, influenza and RSV often peak during monsoon and winter months,[4] while our study covered late winter to pre-monsoon months. Parainfluenza virus type 3 (15%) was the third most common pathogen. PIV-3 is a well-established cause of croup and pneumonia in young children.[4] HMPV (8%) and bocavirus (7%) were also notable. HMPV is known to cause disease severity comparable to RSV in children and older adults.[10,11] Human bocavirus and parechovirus (1%) are emerging pathogens whose clinical significance is still being defined, but their detection in hospitalized SARI cases suggests they may contribute to respiratory morbidity.[3]

The rhinovirus + enterovirus combination was detected in 29.41% of SARI patients, which was higher than any single virus. Other viruses including parainfluenza types 1-4, HMPV, bocavirus, parechovirus, and adenovirus were also found in co-infection with Rhinovirus +Enterovirus. Additional low-frequency co-infections of 1-5% occurred among these viruses. Co-detection of multiple viruses has been reported to be associated with increased disease severity, prolonged hospitalization, and higher healthcare utilization.[4] The predominance of Rhinovirus +Enterovirus co-infection in our cohort warrants further studies on viral interaction, viral load, and impact on clinical outcomes.

Recent multiplex PCR surveillance from a Mumbai tertiary care hospital (July 2022–June 2025) tested 2,860 upper respiratory samples: Influenza A: 22.55% positivity – the dominant pathogenSARS-CoV-2: 6.95% – declining but still circulating Influenza B: 3.35%RSV: 3.0% overall, but 10.3% in children vs 2.1% in adult. Other common viruses in Western India include rhinovirus, adenovirus, human metapneumovirus, and parainfluenza viruses. Co-infections occur but are relatively uncommon – only 18 cases over 3 years in the Mumbai study.

In the present study RSV was not detected in vulnerable population including paediatrics. However, Chheda et al, 2026 et al highlighted that Lower respiratory tract infections are rising in Mumbai children, mainly due to RSV. RSV causes bronchiolitis and viral pneumonia needing oxygen/ICU care. Globally, RSV causes ~33 million acute LRTIs and 26,300 in-hospital deaths in <5y annually. Influenza remains the top cause of ARI/SARI hospitalizations in India.[10]

Positive associations were observed with age ($p < 0.001$), wheezing ($p < 0.001$), infectious and inflammatory respiratory diseases ($p < 0.001$), bronchodilator use ($p < 0.034$), ward admission ($p < 0.001$), and hospital stay >7 days ($p = 0.010$) against viral positivity. This is consistent with literature showing that extremes of age and chronic respiratory conditions are major risk factors for severe viral respiratory illness.[1] Wheezing and bronchodilator use likely reflect virus-induced bronchial hyper-reactivity. The association with prolonged hospital stay highlights the burden of viral SARI on hospital resources.

Negative associations were found with sputum production ($p < 0.027$), chest pain ($p < 0.003$), hemoptysis ($p < 0.046$), headache ($p < 0.005$), diarrhea ($p < 0.047$), respiratory rate >24/min ($p < 0.001$), and ICU admission ($p < 0.001$). These features are more commonly described in bacterial pneumonia or severe non-viral illness.[10] This suggests that patients with productive cough, chest pain, and ICU requirement may need evaluation for bacterial co-infection rather than isolated viral etiology.

The association of respiratory viral positivity with extremes of age highlights the continued vulnerability of pediatric and geriatric populations to severe respiratory infections. The strong correlation with wheezing and infectious/inflammatory respiratory diagnoses suggests that viruses such as rhinovirus, enterovirus, HMPV and parainfluenza-3 contribute significantly to bronchospasm and lower respiratory tract involvement in these age groups. The positive association with bronchodilator use and prolonged ward stay >7 days further indicates the clinical burden imposed by these viruses, even in the absence of influenza or SARS-CoV-2 circulation.[2,3,4,11,12] Conversely, the negative association with smoking exposure, chest pain, oxygen requirement, and ICU admission in the vulnerable group was unexpected. This may suggest that the SARI cases in our cohort were primarily managed at the ward level with supportive care and did not progress to severe hypoxemia requiring intensive care. Alternatively, it is possible that bacterial co-infections or non-viral etiologies were driving the most severe presentations requiring oxygen and ICU support. The inverse association with household smoking warrants further investigation, as tobacco smoke exposure is a well-established risk factor for respiratory illness.[11] Overall, these findings emphasize that clinical severity markers differ between non-vulnerable and vulnerable groups and that respiratory viruses continue to be an important cause of hospitalization and prolonged stay in children and older adults.[2,4]

5. Limitations

The use of an expanded respiratory panel and detailed clinical data are key strengths of this study. However, the single-center design, short surveillance duration, and lack of bacterial testing are limitations. Multi-center, year-round surveillance is needed to confirm seasonal trends and the role of co-infections.

CONCLUSION

From February -May 2026 in Mumbai, Rhinovirus, Enterovirus, and Parainfluenza virus type 3 were the dominant viruses among SARI patients, with Rhinovirus +Enterovirus co-infection being most common. The associations with age, wheezing, and prolonged hospitalization underscore the clinical burden. These results emphasize the importance of broad respiratory virus surveillance to guide clinical management and public health preparedness in India. The study highlighted viral respiratory are observed in the summer season though climatic conditions are not favourable. This indicates congestion, overpopulation and pollution can be the drivers of respiratory viral infection.

1. Authors Contribution

Nayana Ingole (**NI**)-Principal Investigation, Conceptualisation, Resource management, Analysis of data, Manuscript writing, Rutuja Dhawde (**RD**)-Investigator, Conceptualisation, Analysis of data, Manuscript writing, **Dilip Turbadkar (DT**)- Site Principal investigator, resource management, critical review, **Anjali Swami (AS)**- investigator, resource management, critical review, **Jairaj Nair (JN)**- investigator, conceptualization, resource management, critical review, **Pallavi Shelke (PS)**- investigator, resource management, critical review, **Trupti Trivedi (TT)**- investigator, resource management, critical review, **Mahadev Bhise (MB)**- Conceptualization, Analysis of data, Manuscript writing, **Sadhana Zope (SZ)**- Investigator, coordination, critical review, **Priyanshu Shah (PS)**- Investigator, coordination, critical review, **Swapnil Thorve (ST)**- Investigator, coordination, critical review, **Prachi Karnik (PK)**- Investigator, coordination, critical review, **Ayushi Thaker (AT)**- Investigator, coordination, critical review, **Mayuri Raul (MR)**- Investigator, coordination, critical review, **Shegufta Khan (SK)**- Data collection, reporting, **Amol Borse (AB)**- Laboratory analysis, reporting, **Mayuri Kale (MK)**- Laboratory analysis, reporting **Akshaya Kadam (AK)**- Laboratory analysis, reporting, **Manogat Tatkare (MT)**- Laboratory analysis, reporting, **Mahesh Sangar (MS)**- Laboratory analysis, reporting, **Snehal Bhosale (SB)** Laboratory analysis, reporting, **Madhusudan Rajput (MR)** Laboratory analysis, reporting, **Siddhi Jadhav (SJ)**, Laboratory analysis, reporting

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