

## A STUDY TO ASSESS PRESENTING FEATURES AND EFFECTS OF PREVENTIVE MEASURES DURING THE COVID-19 THIRD WAVE IN RURAL PART OF DISTRICT LUDHIANA, INDIA: A CASE CONTROL STUDY

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### ABSTRACT

**Background:** COVID-19 was declared a pandemic by the World Health Organization (WHO) on 11th March 2020. The SARS-CoV-2 virus has mutated over time, which has resulted in genetic variation among population of circulating viral strains over the course of the COVID-19 pandemic. Preventive measures like vaccination, social distancing, using of face mask and hand hygiene practices played a vital role in mitigating the spread of this pandemic. But were these measures effective enough to curtail this pandemic. **Purpose:** To assess the presenting features of COVID 19 in the third wave and to assess the effectiveness of preventive measures against COVID 19 during the third wave. **Methods:** This is a hospital based prospective study where participants were regularly followed up till 14 days, conducted in rural part of North of India. **Results:** A total of 239 participants were included in this study. The study found that 95% of these participants received first dose of COVID vaccine as compared to 49.8% who received second dose. Some of the participants (39.7%) were not obeying the norms of social distancing. 52.1% of the subjects were using masks, which has been proven to be one of the effective measures for prevention of transmission of COVID 19. 71.1% were practicing hand hygiene measures. **Conclusion:** Vaccination and using face mask were significantly associated with mitigating the spread of COVID-19 among rural population who visited the health care facility.

**Keywords:** prevention, third wave, COVID-19, pandemic, signs and symptoms, covid vaccine

## INTRODUCTION

Globally, people from around the globe have been affected by coronavirus disease 2019 (COVID-19), which is the fifth pandemic after the 1918 flu pandemic. Wuhan City, Hubei Province, China, was ravaged by a series of atypical acute respiratory events in December 2019. The pathogen responsible was found to be a novel coronavirus belonging to the family Coronaviridae and was named as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Parasher, 2021). The second meeting of the Emergency Committee convened by the World Health Organization (WHO) Director-General under the International Health Regulations (IHR) (2005) regarding the outbreak of the novel coronavirus occurred on 30<sup>th</sup> January 30, 2020, and the (WHO) officially declared the COVID-19 epidemic as a public health emergency of international concern. (Statement on the twelfth meeting of the International Health Regulations 2005, WHO) Speaking at the COVID-19 media briefing, the WHO Director-General characterized COVID 19 a pandemic on 11<sup>th</sup> March 11, 2020, and by 13<sup>th</sup> March 13, 2020, Europe became the epicenter of the disease (WHO, 2020).

SARS-CoV-2 has mutated over time, resulting in genetic variation among populations of circulating viral strains over the course of the COVID-19 pandemic. Various Variants of Concern (VOC) were identified globally. These included the Alpha variant with the B.1.1.7 lineage which was first identified in the United Kingdom. The beta (B.1.351) variant was identified in South Africa in May 2020, followed by gamma (P.1) and delta (B.1.617.2) variants identified in Brazil and India, respectively. The Omicron variant (B1.1.529) was identified in November 2021 in multiple countries with a rapid rate of infectivity and was responsible for the third wave. (WHO, 2023).

The third COVID wave due to Omicron presented with various presenting features like fever, normal or dry cough, headache, pharyngalgia, dyspnea, diarrhea, myalgia, vomiting, sputum or expectoration, anxiety or chest pain, fatigue, nausea, anorexia, abdominal pain, rhinorrhea, runny nose or nasal congestion, dizziness, chills, systemic pain, mental confusion, hemoptysis, asthma, taste disorder, smell disorder, belching and

tachycardia (Sousa Neto *et al.*, 2021). These symptoms vary from country to country, and it is difficult for everyone to associate any particular symptom with this disease.

With the availability of only supportive treatment and the absence of any specific management, the WHO insisted on using preventive measures to reduce the transmission of viral infection. People were advised to get vaccinated, maintain a distance of 1 m, avoid crowded places, wear properly fitted face masks, and practice hand hygiene (WHO, 2023). To date, very few studies have analyzed the effectiveness of these measures in the prevention of COVID.

There have been some preliminary studies on the role of vaccines in the prevention of COVID 19 in the general population. A study conducted by Andrews *et al.* showed that primary immunization with two doses of AstraZeneca (Covishield in India) or BNT162b2 (Pfizer–BioNTech) vaccine provided limited protection against symptomatic disease caused by the omicron variant. The effectiveness of the two doses of this vaccine at two–four weeks was approximately 65.5% (63.9% to 67%). The effectiveness decreased by 8.8% (7% to 10.8%) at 25 weeks or more (Andrews, N *et al.*, 2022). The effectiveness of these vaccines in the human population is debatable, as many believe these vaccines were introduced sooner as an emergency preventive measure.

A study conducted by Alexandra Teslya *et al* suggested that individual adoption of hand washing, mask-wearing, and social distancing, can be an effective strategy to mitigate and delay the epidemic. It was seen that government imposed social distancing and self imposed preventive measures like handwashing ranged from 30% to 60% (Teslya A *et al.*, 2022). Systematic review conducted by Imen *et al* also suggested that travel restrictions, borders measures, quarantine of travelers arriving from affected countries, city lockdown, restrictions of mass gathering, isolation and quarantine of confirmed cases and close contacts, social distancing measures, compulsory mask wearing, contact tracing and testing, school closures and personal protective equipment use among health workers were effective in controlling the spread of COVID-19 (Ministry of Health & amp).

The state of art and novelty of the article is although many symptoms have been associated with this disease, nothing specific has been identified. The present study assessed the duration of all signs and symptoms among the positive cases so that some clarity could be obtained regarding the disease. There were lockdowns across the globe, and preventive measures of social distancing, face mask, and hand hygiene were advocated to curtail transmission. However, the effectiveness of such preventive measures has not been thoroughly analyzed. Moreover, confronted with such large-scale epidemics, governments of various countries and policymakers are seeking solutions on how to delay and/or flatten the peak of such diseases. Thus, it is of utmost importance to raise awareness of self-imposed restrictions and preventive measures, such as handwashing and wearing face masks, to control the spread of such diseases. It also becomes imperative to know about the effectiveness of every preventive measure so that more stress can be focused on one measure that has the highest chance of curtailing the disease.

Thus, this study aimed to assess various presenting features of COVID 19 in the third wave and evaluate the effectiveness of various preventive measures against COVID 19 during the third wave.

## METHOD

This was a single hospital-based prospective study in which suspected COVID-19 cases were identified, Rapid Antigen Testing (RAT) was performed, and the patients were regularly followed up until 14 days after their visit to the hospital at Mata Kaushalya Devi Pahwa Charitable Hospital, a unit of Christian Medical College and Hospital, Hambran, District Ludhiana, Punjab.

Research and ethical clearance were obtained from the hospital for conducting this study (RHOP/Hambran/240821-KK). No experiments were conducted on any of the patients. COVID test was conducted on patients, and written consent was obtained from the patients for participation in the study.

The following case definitions for suspected cases were used in this study: acute onset of two or more of the following symptoms: fever with or without chills ; Cough

; Loss of taste ; loss of smell ; general weakness/fatigue ; headache ; myalgia ; sore throat ; running nose/nasal congestion; shortness of breath; loss of appetite in adults/poor feeding in infants and young children ; nausea/vomiting ; diarrhea ; and altered mental status (Mahajan *et al.*, 2020).

All patients who were defined as suspected cases more than 18 years of age as per the definition by the National Centre for Disease Control (NCDC) and who gave consent to participate in the study were included in the study. The minimum sample size was calculated to be 193, as per the study conducted by Mahajan *et al.*, where the majority (85%) of the participants were symptomatic (Punjab CM launches COVID Fateh kit for Covid Patients In Hospital & Home Isolation, 2017).

The study samples who fulfilled the inclusion criteria for the time frame of 27<sup>th</sup> September 27, 2021, to 04<sup>th</sup> March 4, 2022, were included in the study. A total of 239 respondents participated in this study.

The participants were asked about their symptoms both as open-ended and closed questions, using a predesigned pretested questionnaire, for better accuracy since the time of illness. The symptoms included headache, fever, fatigue, joint pain, body pain, cough, dyspnea, throat pain, nasal congestion, nasal irritation, change in voice, diarrhea, weakness, anxiety, sleep disturbance, loss of smell or taste, and any hair loss, and were followed up regularly for their symptoms. A general physical examination was performed using all preventive measures and PPE kits. Rapid antigen Testing for COVID was done using the RAT kits, and subjects who were negative for RAT but had high clinical suspicion of COVID-19 were confirmed with RT-PCR through the government sector laboratory. All tests were conducted free of cost and the patient did not bear any financial expenditure for any test. The vaccination status of the participants was confirmed on the CoWIN and vaccination certificates issued during vaccination.

Patients who were diagnosed as positive were started on Free Fateh COVID care kits provided by the government of Punjab. The kit consists of 18 items, including a pulse oximeter, digital thermometer, essential medicines, and Kaadha, along with educational

materials and instructions on the use of medicines. Instructions for patients and care givers are provided in the kit, which also contains a self-monitoring log chart (Deutsche Welle, 2022). All suspected cases who were home isolated were regularly followed up by either house visits or telephone for their symptoms and adherence to medicines for 21 days.

The results are presented as means and standard deviations for all quantitative variables. Frequencies and percentages were calculated for all variables, associations were calculated using the Chi square test, and binary logistic regression was used to calculate the adjusted odds ratio.

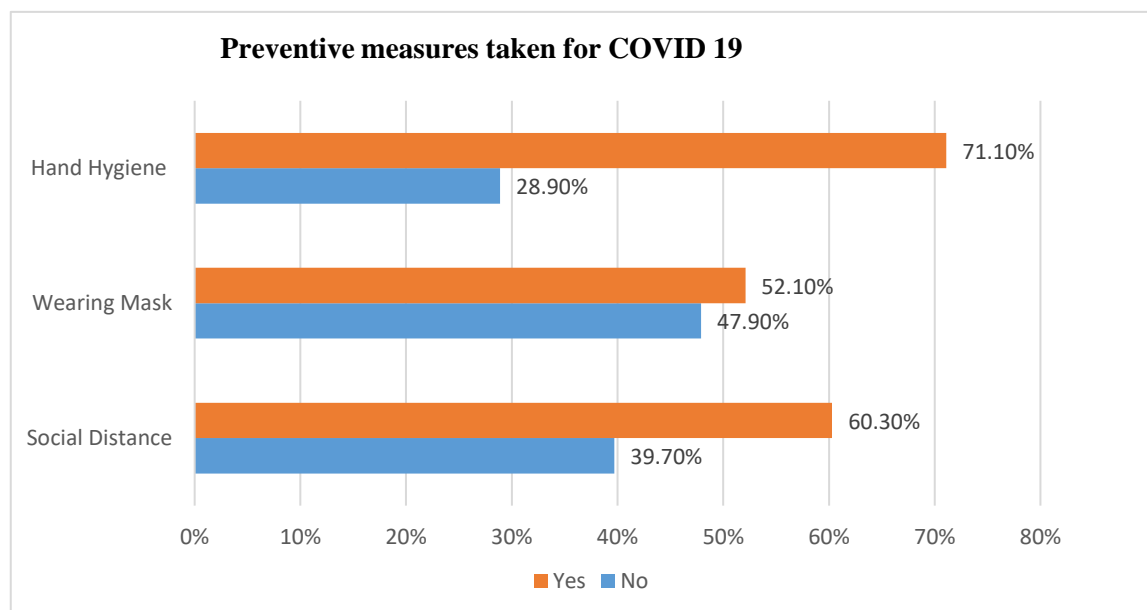
## RESULT

The study included 239 participants (88 females and 151 males). The mean age of the patients was  $39.76 \pm 17$  years. Participants

belonged to the rural part of Ludhiana and had an average family size of  $5.38 \pm 1.7$  members.

The study found that 95% of these participants received the first dose of the COVID vaccine (Covishield) as compared to 49.8% who received the second dose (Covishield). Only 5.4% of subjects received a third dose of the vaccine (Covishield).

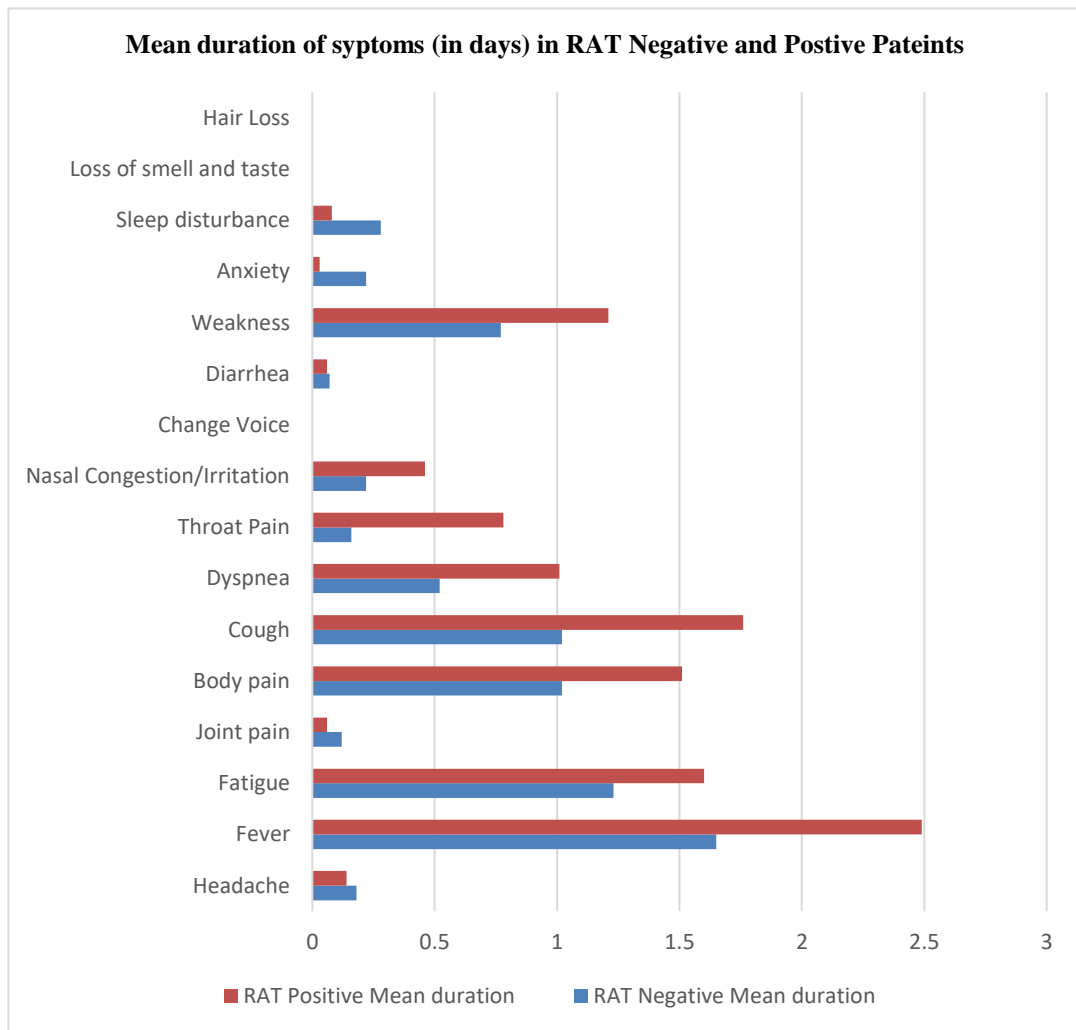
The study found that 12.1% of the participants had a history of one of their family members testing positive for COVID 19 in the last six months. It was also concluded that, despite the atrocities caused by this pandemic, some people were using preventive measures to curb this disease. Some participants (39.7%) did not obey the norms of social distancing. 52.1 Of the participants, 52.1% used masks, which has been proven to be an effective measure for preventing the transmission of COVID 19. Of the participants, 71.1% practiced hand hygiene (Figure 1).



**Figure 1.** Preventive measures taken for COVID 19

The study revealed that fever, fatigue, body pain, dyspnea, generalized weakness, throat pain, and nasal congestion had a mean duration of approximately 2 days in positive patients during the third wave. Other symptoms,

such as loss of smell, hair loss, sleep disturbances, joint pain, and headache, had the least duration among those found to be positive (Figure 2).



**Figure 2.** Mean duration of symptoms (in days) in RAT Negative and Positive Patients

Fever was the only symptom present in 84.7% of the positive cases and was significantly associated with COVID positive patients (RAT). Other symptoms, such as fatigue, body pain, dyspnea, generalized weakness, throat pain, nasal congestion, loss of

smell, hair loss, sleep disturbances, joint pain, and headache, were not significantly associated with the disease (Table 1).

**Table 1.** Association between various symptoms and COVID 19 during the third wave

		RAT		Total	Chi Square Value	P Value
		Negative	Positive			
Headache	No	146 (87.4%)	67 (93%)	213 (89.1%)	1.645	0.2
	Yes	21 (12.6%)	5 (7%)	26 (10.9%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Fever	No	84 (50.3%)	11 (15.3%)	95 (39.7%)	25.765	<0.001
	Yes	83 (49.7%)	61 (84.7%)	144 (60.3%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Fatigue	No	107 (64.1%)	41 (56.9%)	148 (61.9%)	0.848	0.357
	Yes	60 (35.9%)	31 (43.1%)	91 (38.1%)		
Total		167 (100%)	72 (100%)	239 (100%)		

**Continuation of Table 1.** Association between various symptoms and COVID 19 during the third wave

		RAT		Total	Chi Square Value	P Value
		Negative	Positive			
Joint pain	No	157 (94%)	70 (97.2%)	227 (95%)	1.087	0.472 With Continuity Correction
	Yes	10 (6%)	2 (2.8%)	12 (5%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Body pain	No	122 (73%)	44 (61.1%)	166 (69.5%)	3.382	0.066
	Yes	45 (27%)	28 (38.9%)	73 (30.5%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Cough	No	116 (69.5%)	45 (62.5%)	161 (67.4%)	1.109	0.292
	Yes	51 (30.5%)	27 (37.5%)	78 (32.6%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Throat Pain	No	156 (93.4%)	48 (66.7%)	204 (85.4%)	28.793	<0.001
	Yes	11 (6.6%)	24 (33.3%)	35 (14.6%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Nasal Congestion/Irritation	No	146 (87.4%)	53 (73.6%)	199 (83.3%)	6.889	0.009
	Yes	21 (12.6%)	19 (26.4%)	40 (16.7%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Change Voice	No	167 (100%)	72 (100%)	239 (100%)	NA	NA
	Yes	167 (100%)	72 (100%)	239 (100%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Dyspnea	No	153 (91.6%)	66 (91.7%)	219 (91.6%)	0	0.99
	Yes	14 (8.4%)	6 (8.3%)	20 (8.4%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Diarrhea	No	161 (96.4%)	70 (97.2%)	231 (96.7%)	0.103	0.748
	Yes	6 (3.6%)	2 (2.8%)	8 (3.3%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Weakness	No	131 (78.4%)	49 (68%)	180 (75.3%)	2.92	0.088
	Yes	36 (21.6%)	23 (32%)	59 (24.7%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Anxiety	No	149 (89.2%)	71 (98.7%)	220 (92%)	6.061	0.028 With Continuity Correction
	Yes	18 (10.8%)	1 (1.3%)	19 (8%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Sleep disturbance	No	151 (90.4%)	70 (97.2%)	221 (92.5%)	3.343	0.067
	Yes	16 (9.6%)	2 (2.8%)	18 (7.5%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Loss of smell and taste	No	167 (100%)	72 (100%)	239 (100%)	NA	NA
	Yes	167 (100%)	72 (100%)	239 (100%)		
Total		167 (100%)	72 (100%)	239 (100%)		
Hair Loss	No	167 (100%)	72 (100%)	239 (100%)	NA	NA
	Yes	167 (100%)	72 (100%)	239 (100%)		
Total		167 (100%)	72 (100%)	239 (100%)		

Vaccination was found to play a vital role prevention of COVID 19 among those who were vaccinated individuals. The second dose

of the vaccine was significantly associated with prevention of this disease in the participants (Table 2). All participants were vaccinated with Covishield.

**Table 2.** Association between preventive measures and COVID 19

		RAT		Total	Chi Square Vale	P Value
		Negative	Positive			
1st Dose	Not received	10 (83.3%)	2 (16.7%)	12 (100%)	1.087	0.472
	Received	157(69.2%)	70 (30.8%)	227 (100%)		
Total		167 (69.8%)	72 (30.2%)	239 (100%)		With Continuity Correction
2nd Dose	Not received	65 (54.2%)	55 (45.8%)	120 (100%)	28.249	<0.001
	Received	102 (85.7%)	17 (14.3%)	119 (100%)		
Total		167 (69.8%)	72 (30.2%)	239 (100%)		
Social Distancing	Yes	103 (72%)	40 (28%)	143 (100%)	0.784	0.376
	No	64 (66.7%)	32 (33.3%)	96 (100%)		
Total		167 (69.8%)	72 (30.2%)	239 (100%)		
Hand Hygiene	Yes	119 (70.4%)	50 (29.6%)	169 (100%)	0.08	0.778
	No	48 (68.6%)	22 (30.2%)	70 (100%)		
Total		167 (69.8%)	72 (30.2%)	239 (100%)		
Mask	Yes	97 (78.8%)	26 (21.2%)	123 (100%)	9.724	0.002
	No	70 (60.3%)	46 (39.7%)	116 (100%)		
Total		167 (69.8%)	72 (30.2%)	239 (100%)		

Preventive measures, such as social distancing, hand hygiene, and wearing face masks, have been proven to be effective for curbing and controlling the transmission of COVID 19. Although the number of cases

among people following social distancing and those practicing hand hygiene measures was low, the study found that wearing face masks was significantly associated with reduced transmission of the disease (Table 2).

**Table 3.** Regression analysis for chances of getting a Negative COVID test

	P value	Odd's Ratio	95% Confidence Interval	
			Lower	Upper
Social Distancing Present	0.399	1.354	0.670	2.740
Wearing Mask	0.666	1.467	0.258	8.326
Practicing Hand Hygiene	0.792	1.352	0.144	12.658
Received 1st Dose of COVID vaccine	0.734	0.751	0.143	3.937
Received 2nd Dose of COVID vaccine	0.000	4.925	2.515	9.647

It has been observed that the 2<sup>nd</sup> dose of the COVID vaccine is significantly helpful in preventing the disease (OR 4.9, CI 2.5 9.6). Other preventive measures, such as social distancing, wearing of masks, and practicing hand hygiene, were also influential in preventing the spread.

## DISCUSSION

Sousa *et al.* found that fever, normal or dry cough, headache, pharyngalgia, dyspnea, diarrhea, myalgia, vomiting, sputum or expectoration, anxiety or chest pain, fatigue, nausea, anorexia, abdominal pain, rhinorrhea, runny nose or nasal congestion, dizziness, chills, systemic pain, mental confusion, hemoptysis, asthma, taste disorder, smell disorder, belching, and tachycardia were the

symptoms associated with COVID-19 during the third wave (Sousa Neto *et al.*, 2021). In contrast to this study, the present study revealed that although many symptoms such as sore throat, runny nose, and body aches were present in suspected cases, only fever was significantly associated with Omicron during the third wave. This may have been related to the severity of infection and viral load in the host. Moreover, the variety of strains that have been identified globally might influence the variation in symptoms.

The national COVID-19 vaccine coverage is 75% for the second dose (Press Information Bureau, Government of India). India's Cumulative COVID-19 Vaccination Coverage exceeds 178 Cr, with a recovery rate of 98.62% (Padmanaban *et al.*, 2021]. The present study found that the first dose of the vaccine was administered to 95% of participants. However, in contrast to the national coverage of 75%, only 49.8% of participants were vaccinated with the second dose. This could be due to a lack of awareness and vaccine hesitancy among the rural population. The present study also revealed that a second dose of COVID vaccination was helpful in preventing the disease, with an odds ratio of 4.9. 85% of the participants tested negative for COVID who had received a second dose of the vaccine. These findings were similar to the study conducted by Andrews *et al.*, in which the second dose of vaccination was helpful in preventing the disease in 65% of the population (Andrews *et al.*, 2022).

A study conducted by Srinivasan *et al.* revealed that 71.0% of participants had a positive attitude towards COVID-19 and 66.7% of them exhibited desirable practices to mitigate COVID-19 (Bhushan, V. and Rai, S 2021). Another study conducted in Bihar revealed that precautions such as covering faces with masks, avoiding shaking hands, and washing hands before touching the eyes, nose, and mouth were undertaken by 34.6% of the total participants (Lindsley *et al.*, 2020). This is in contrast to our findings, where 71.1% were practicing hand hygiene, 52.1% were wearing face masks, and 60.3% were following social distancing norms as established by the government. This percentage is still low in curtailing the spread of COVID-19, and steps need to be taken to increase awareness and bring about behavioral changes among the

general population in order to realize and accept the importance of preventive measures. The present study revealed that 72% of those who followed social distancing, 70% of those using hand hygiene methods, and 79% of those wearing masks tested negative for COVID 19. Use of a mask was found to be more effective than the other two preventive measures. In circumstances of poor ventilation and enclosed indoor spaces, the role of the mask becomes even more significant in reducing transmission. Moreover, wearing a mask would prevent contamination of the hands with oral and nasal secretions. A simple multilayered cloth mask is also sufficient to curtail 50–70% of the exhaled droplets.

Since in India, very few people have been administered a third dose to its population, much work is needed to change people's behavior to overcome vaccine hesitancy. Moreover, work must be done to prevent the spread of hoax news regarding vaccination, and wearing face masks should be made mandatory in public during such outbreaks. The use of face masks should be made compulsory for any outbreak of respiratory infections, which may substantially reduce the disease burden until the population is vaccinated and herd immunity is attained.

#### Limitation

This is a single hospital-based study, and since the symptom identification and use of preventive measures is based on the participants' recall, there might have been some symptoms and recall bias in the use of preventive measures. The study was conducted in a rural setting, where awareness of preventive measures was neglected. The level of awareness may differ among the different strata of society.

#### CONCLUSION

The study concluded that only 49.8% of the rural population who visited the hospital received a second dose of COVID-19 vaccination. Fever (85%) was the most common symptom and was significantly associated with COVID-19 during the third wave. Use of face masks proved to be significantly effective in mitigating the spread of COVID-19. The study also found that the second dose of the COVID-19 vaccine was significantly associated with a reduction in the



number of COVID-19 cases during the third wave.

## SUGGESTION

The government should make it mandatory for all to have at least two doses of the influenza vaccine, as the study found that people who were vaccinated with two doses were four times less likely to have COVID. The face mask is effective in curtailing the transmission chain. Policymakers should enforce stringent laws to enforce vaccination and face masks in any outbreak of influenza. Fever screening, which is associated with 85% of COVID cases should be performed at all public places for screening purposes.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest associated with the materials presented in this paper.

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## AUTHOR CONTRIBUTION

Kavisha Kapoor Lal Conceptualization, Planning, Conduct, Project administration, visualization, supervision, editing, proofreading, writing review, and editing. Dhruvendra Lal Conceptualization and planning, Conduct, Data curation, Statistical Analysis, Methodology, Project administration, Software, Writing the original draft, and visualization.

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