Original Article

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Impact of Certain Socio-clinical Factors on COVID-19 Preventive Measures among Patients with Chronic Respiratory Diseases: A Cross-sectional Study at a Tertiary Care Centre in Southern India

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ABSTRACT

Introduction: Chronic respiratory diseases are known risk factors for Coronavirus Disease-2019 (COVID-19) associated morbidity and mortality. With the fourth wave of COVID-19 looming in India, it is crucial to prioritise preventive measures at both individual and community levels. However, following the third wave of COVID-19, adherence to preventive measures has declined.

Aim: To assess the socio-clinical factors affecting COVID-19 preventive behaviour among patients with chronic respiratory diseases.

Materials and Methods: This cross-sectional observational study was conducted at the outpatient department of Respiratory Medicine, Narayana Medical College Hospital, Nellore, a tertiary care centre in Andhra Pradesh, India from March to April 2022. The estimated sample size was 600 patients. Data was collected using a validated questionnaire, and analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 28.1 {International Business Machines (IBM) Corporation}. The association between independent and dependent variables was assessed using binary logistic regression.

Results: A total of 671 patients' data were analysed. The mean age was 51.45 (±14.397) years, with 390 (58.1%) being male. Among the participants, the prevalence of wearing face masks in workplaces was 47.8%, wearing face masks in public places was 43.6%, frequent hand sanitisation was 39.9%, and maintaining physical distance in public areas was 35.2%. The main factors associated with non adherence were women, rural dwellers, non smokers, patients with co-morbidities, those who had not experienced a detrimental impact of COVID-19 on themselves, and the perception that COVID-19 was a mild disease.

Conclusion: Among patients with chronic respiratory diseases, the practice of COVID-19 preventive measures was inadequate. Factors that positively influenced COVID-19 behaviour were being married, having a high school education level or above, and being a smoker. The impact of age varied depending on the type of preventive measure. Socio-economic status had no significant impact.

Keywords: Adherence, Co-morbidities, Risk assessment, Socio-economic status

INTRODUCTION

The COVID-19 pandemic has been ongoing since December 2019 worldwide. Despite active vaccination efforts, India has experienced the third wave of the COVID-19 pandemic and is now anticipating the fourth wave. Since there is no specific treatment, strict adherence to preventive measures, such as wearing a face mask, sanitising hands, and maintaining physical distance, can help reduce further waves of COVID-19. India, being a developing country, has low affordability for hospital expenses [1]. Hence, prevention is better than cure.

The World Health Organisation (WHO) has suggested that non pharmaceutical preventive behaviour is the most efficient strategy to control the spread of COVID-19 while waiting for herd immunity [2]. Korea and China successfully mitigated the spread of COVID-19 through the active participation of citizens in non pharmaceutical interventions [3].

Understanding the level of awareness about COVID-19 and relevant preventive measures is crucial for implementing targeted interventions to overcome significant obstacles [4,5]. Gender, education, Socio-economic status, risk perception, attitudes, and government communication play a vital role [6].

Several studies have reported the influence of Socio-economic status on adherence to COVID-19 preventive measures among the general public [7-10]. High levels of COVID-19 knowledge and risk perception have influenced the practice of preventive behaviour among specific groups, such as college students, medical students, and healthcare workers [3,8,11-15].

Smoking and associated co-morbidities have increased the risk of COVID-19 [16]. The most prevalent co-morbidities among patients with COVID-19 include Hypertension (HTN) (21.1%), diabetes (9.7%), cardiovascular disease (8.4%), and respiratory system disease (1.5%) [16]. The COVID-19 pandemic has direct and indirect effects on patients with chronic diseases [17].

Chronic lung diseases affect hundreds of millions of people of all ages and their socio-economic status [18]. According to the Global Burden of Diseases (GBD) study 2017, there were 3.2 million deaths due to Chronic Obstructive Pulmonary Disease (COPD) and 495,000 deaths due to asthma [19]. Subjects with pre-existing respiratory diseases are known risk factors for COVID-19-associated morbidity and mortality. COVID-19-related lung injury leading to Acute Respiratory Distress Syndrome (ARDS) remains the leading cause of mortality worldwide [16].

Due to the high risk of morbidity and mortality, COVID-19 precautionary measures are essential for patients with chronic respiratory diseases [17]. The effectiveness of personal preventive

measures heavily depends on adherence, which varies significantly across countries. Understanding the factors affecting adherence to these measures is key to successfully promoting behaviour that controls the spread of COVID-19 [15].

Hence, in the present study, authors aimed to identify the socio-clinical factors influencing COVID-19 preventive measures among patients with chronic respiratory diseases.

MATERIALS AND METHODS

This cross-sectional observational study was conducted from March 1 to April 30, 2022, for a duration of two months, at the outpatient department of Respiratory Medicine, Narayana Medical College Hospital, Nellore, a tertiary care centre in Andhra Pradesh, India. The study protocol was approved by the Institutional Ethics Committee with the number IEC/NMC/02/02/2022_3.

All subjects above 18 years with chronic respiratory diseases were recruited for the study during March and April 2022.

Sample size calculation: The estimated sample size was 600, with a prevalence of acceptance of COVID-19 preventive measures at 50% in India, with 95% confidence and 4% precision.

Sample size (n)=Z^2 *P*q/d^2.

Z=1.96 for 95% confidence.

P=standard deviation.

q=1-p.

d=margin of error.

Inclusion and Exclusion criteria: All eligible subjects who attended the outpatient department of Respiratory Medicine from March to April 2022 were recruited for the study. Patients with acute respiratory symptoms and those who did not answer all the questions were excluded from the study.

Study Procedure

A questionnaire was used to collect data. It was developed in the English language by the investigators of the study. It comprised three sections. Section one was about socio-demographic details of patients, including 20 questions such as name, age, gender, education, occupation, monthly income, marital status, Socio-economic status (according to Kuppuswamy classification), place of residence, smoking habit, chronic respiratory disease, name of the disease, co-morbid condition, type of co-morbidity, previous COVID-19 infection, vaccination status, impact of COVID-19, perception about preventive measures, disease, and immunity. Section two contained two questions about knowledge of COVID-19 transmission and pandemic guidelines of local health authorities. Section three was about adherence to COVID-19 preventive measures, such as frequency of wearing a mask in workplaces and public places, physical distancing, and hand hygiene. A pilot study of 20 patients validated the questionnaire, and data of those patients were excluded from the final analysis of the study.

All participants were clearly explained the confidentiality, purpose, and procedure of the study. After obtaining informed consent, each participant was interviewed separately without affecting their privacy, and the questions were explained in the local Telugu language. The self-reported responses to the questionnaire were collected. Study subjects were stratified into asthma, Chronic Obstructive Pulmonary Disease (COPD), Bronchiectasis, Interstitial Lung Diseases (ILD), and Post Tuberculosis Lung Disease (PTLD) based on their clinical history, physical examination, chest imaging, and spirometry. The study assessed the knowledge of participants about COVID-19 transmission routes. COVID-19 spreads through droplets, fomites, direct contact, and living in the same house. Patients who mentioned all transmission routes were assumed to have 100% knowledge, while patients who did not mention any transmission route were considered to have 0% knowledge. After the interview, all participants were provided with explanations about COVID-19 preventive measures and the proper way to follow them.

STATISTICAL ANALYSIS

The data were analysed using SPSS version 28.1 (IBM Corporation). Continuous variables, such as age, were expressed as mean and standard deviation. Categorical variables, including socio-demographic parameters, smoking status, co-morbidities, chronic respiratory conditions, and previous COVID-19 infection, were expressed as numbers and percentages. Binary logistic regression analysis was conducted to determine the association between the dependent variables (consistent facemask wearing at work and other public places, hand sanitisation after returning from a public place, and following physical distancing at public places) and COVID-19 preventive measures, along with odds ratios. A p-value of less than 0.05 was considered significant.

RESULTS

The study included a total of 692 patients, of whom 671 answered all the questions. The mean age of the study subjects was 51.45 (±14.397) years. Of the participants, 390 (58%) were males, and 281 (42%) were females. A total of 343 (51.2%) individuals had a high school education level or lower. 454 (67.7%) residents were from rural and semi-urban areas. 499 (74.4%) patients were from the lower middle class or below, and 405 (60.4%) were smokers [Table/Fig-1].

Regarding the routes of COVID-19 transmission, 122 (18.1%) participants mentioned all four routes, 324 (48.3%) mentioned three routes, 144 (21.5%) mentioned two routes, and 57 (8.5%) mentioned at least one route. Only 24 (3.6%) could not mention any route of transmission for COVID-19.

The participants had the following co-morbidities in descending order: hypertension (382, 56.9%), diabetes mellitus (295, 44%), coronary artery diseases (210, 31.3%), obesity (209, 31.1%), hypothyroidism (89, 13.3%), and chronic kidney diseases (84, 12.5%).

Vaccinated patients had 2.3 times higher odds [Odds Ratio (OR) 2.31, 95% Confidence Interval (CI) 1.44-3.71; p<0.001] of wearing face masks in workplaces. Obese patients and patients with hypothyroidism had significant odds of adhering to wearing face masks in public places [Table/Fig-2]. Participants who perceived the current preventive guidelines as sufficient to control the COVID-19 pandemic and those who experienced a high impact of COVID-19 on their lives had significant odds of sanitising their hands every time they returned from a public place [Table/Fig-2]. Among all the participants, 313 (46.7%) had COPD, 281 (41.9%) had asthma, 52 (7.7%) had PTLD, 16 (2.4%) had bronchiectasis, and 9 (1.3%) had ILDs.

Smokers, patients with asthma, PTLD, bronchiectasis, ILDs, and obesity had significant odds of maintaining a physical distance [Table/Fig-3].

DISCUSSION

The study found that the practice of COVID-19 preventive measures among patients with chronic respiratory diseases was low. The most commonly followed preventive measure was wearing face masks in workplaces (47.8%) and public areas (43.6%), followed by frequent hand sanitisation (39.9%) and maintaining physical distance (35.2%). However, previous studies have reported that hand hygiene was the most common preventive measure followed [4,20-22].

Similar studies from the United States of America, India, Ethiopia, and Egypt reported higher adherence to COVID-19 preventive behaviour [4,20-22]. [Table/Fig-4] depicts the key features of these studies. This variation could be attributed to regional, cultural, educational,

		Regularly wearing face mask in work places		Wearing face mask in public place regularly		Following physical distance		Hand sanitisation	
Number		Yes	No	Yes	No	Yes	No	Yes	No
Age group (years)									
18-34	90 (13.4%)	49 (54.4%)	41 (45.6%)	64 (71.1%)	26 (28.9%)	25 (27.8%)	65 (72.2%)	41 (45.6%)	49 (54.4%)
35-50	220 (32.8%)	89 (40.5%)	131 (59.5%)	111 (50.5%)	109 (49.5%)	74 (33.6%)	146 (66.4%)	88 (40%)	132 (60%)
51-66	260 (38.7%)	132 (50.8%)	128 (49.2%)	87 (33.5%)	173 (66.5%)	100 (38.5%)	160 (61.5%)	101 (38.8%)	159 (61.2%)
>66	101 (15.1%)	51 (50.5%)	50 (49.5%)	31 (30.7%)	70 (69.3%)	37 (36.6%)	64 (63.4%)	38 (37.6%)	63 (62.4%)
Gender									
Male	390 (58.1%)	196 (50.3%)	194 (49.7%)	200 (51.3%)	190 (48.7%)	138 (35.4%)	252 (64.6%)	144(36.9%)	246 (63.1%)
Female	281 (41.9%)	125 (44.5%)	156 (55.5%)	93 (33.1%)	188 (66.9%)	98 (34.9%)	183 (65.1%)	124 (44.1%)	157 (55.9%)
Marital status									
Married	495 (73.8%)	232 (46.9%)	263 (53.1%)	230 (46.5%)	265 (53.5%)	180 (36.4%)	315 (63.6%)	199 (40.2%)	296 (59.8%)
Unmarried	70 (10.4%)	34 (48.6%)	36 (51.4%)	47 (67.1%)	23 (32.9%)	18 (25.7%)	52 (74.3%)	26 (37.1%)	44 (62.9%)
Divorced or widow	106 (15.8%)	55 (51.9%)	51 (48.1%)	16 (15.1%)	90 (84.9%)	38 (35.8%)	68 (64.2%)	43 (40.6%)	63 (59.4%)
Place									
Rural	255 (38%)	129 (50.6%)	126 (49.4%)	65 (25.5%)	190 (74.5%)	85 (33.3%)	170 (66.7%)	98 (38.4%)	157 (61.6%)
Semi-urban	199 (29.7%)	95 (47.6%)	104 (52.4%)	94 (47.2%)	105 (52.8%)	69 (34.7%)	130 (65.3%)	81 (40.7%)	118 (59.3%)
Urban	217 (32.3%)	97 (44.7%)	120 (55.3%)	134 (61.8%)	83 (38.2%)	82 (37.8%)	135 (62.2%)	89 (41%)	128 (59%)
Education									
Middle-school or less	91 (13.6%)	36 (39.6%)	55 (60.4%)	3 (3.3%)	88 (96.7%)	33 (36.3%)	58 (63.7%)	35 (38.5%)	56 (61.5%)
High-school	252 (37.6%)	129 (51.2)	123 (48.8%)	40 (15.9%)	212 (84.1%)	94 (37.3%)	158 (62.7%)	95 (37.7%)	157 (62.3%)
Intermediate	174 (25.9%)	89 (51.1%)	85 (48.9%)	103 (59.2%)	71 (40.8%)	53 (30.5%)	121 (69.5%)	78 (44.8%)	96 (55.2%)
Graduation or more	154 (23%)	67 (43.5%)	87 (56.5%)	147 (95.5%)	7 (4.5%)	56 (36.4%)	98 (63.6%)	60 (39%)	94 (61%)
Socio-economic status									
Lower	40 (6.0%)	19 (47.5%)	21 (52.5%)	0 (0%)	40 (100%)	18 (45%)	22 (55%)	16 (40%)	24 (60%)
Upper-lower	162 (24.1%)	79 (48.8%)	83 (51.2%)	39 (24.1%)	123 (75.9%)	52 (32.1%)	110 (67.9%)	66 (40.7%)	96 (59.3%)
Lower-middle	297 (44.3%)	146 (49.2%)	151 (50.8%)	100 (33.7%)	197 (66.3%)	106 (35.7%)	191 (64.3%)	119 (40.1%)	178 (59.9%)
Upper-middle	157 (23.4%)	66 (42%)	91 (58%)	139 (88.5%)	18 (11.5%)	51 (32.5%)	106 (67.5%)	57 (36.3%)	100 (63.7%)
upper	15 (2.2%)	11 (73.3%)	4 (26.7%)	15 (100%)	0 (0%)	9 (60%)	6 (40%)	10 (66.7%)	5 (33.3%)
Smoking									
Yes	405 (60.4%)	197 (48.6%)	208 (51.4%)	194 (47.9%)	211 (52.1%)	153 (37.8%)	252 (62.2%)	167 (41.2%)	238 (58.8%)
No	266 (39.6%)	124 (46.6%)	142 (53.4%)	99 (37.2%)	167 (62.8%)	83 (31.2%)	183 (68.8%)	101 (38%)	165 (62%)
Co-morbidities									
Yes	505 (75.3%)	237 (46.9%)	268 (53.1%)	191 (37.8%)	314 (62.2%)	180 (35.6%)	325 (64.4%)	192 (38%)	313 (62%)
No	166 (24.7%)	84 (50.6%)	82 (49.4%)	102 (61.4%)	64 (38.6%)	56 (33.7%)	110 (66.3%)	76 (45.8%)	90 (54.2%)
Previous COVID-19									
Yes	254 (37.9%)	117 (46.1%)	137 (53.9%)	107 (42.1%)	147 (57.9%)	92 (36.2%)	162 (63.8%)	107 (42.1%)	147 (57.9%)
No	417 (62.1%)	204 (48.9%)	213 (51.1%)	186 (44.6%)	231 (55.4%)	144 (34.5%)	273 (65.5%)	161 (38.6%)	256 (61.4%)
Completed 2 doses of vaccination									
Yes	555 (82.7%)	282 (50.8%)	273 (49.2%)	238 (42.9%)	317 (57.1%)	188 (33.9%)	367 (66.1%)	222 (40%)	333 (60%)
No	116 (17.3%)	39 (33.6%)	77 (66.4%)	55 (47.4%)	61 (52.6%)	48 (41.4%)	68 (58.6%)	46 (39.7%)	70 (60.3%)
Trust in Government guidelines									
Yes	398 (59.3%)	191 (48%)	207 (52%)	185 (46.5%)	213 (53.5%)	141 (35.4%)	257 (64.6%)	157 (39.4%)	241 (60.6%)
No	273 (40.7%)	130 (47.6%)	143 (52.4%)	108 (39.6%)	165 (60.4%)	95 (34.8%)	178 (65.2%)	111 (40.7%)	162 (59.3%)
Knowledge of COVID-19 transmission									
0%	24 (3.6%)	12 (50%)	12 (50%)	1 (4.2%)	23 (95.8%)	7 (29.2%)	17 (70.8%)	8 (33.3%)	16 (66.7%)
25%	57 (8.5%)	27 (47.4%)	30 (52.6%)	7 (12.3%)	50 (87.7%)	25 (43.9%)	32 (56.1%)	21 (36.8%)	36 (63.2%)
50%	144 (21.5%)	70 (48.6%)	74 (51.4%)	31 (21.5%)	113 (78.5%)	55 (38.2%)	89 (61.8%)	62 (43.1%)	82 (56.9%)
75%	324 (48.3%)	153 (47.2%)	171 (52.8%)	143 (44.1%)	181 (55.9%)	108 (33.3%)	216 (66.7%)	123 (38%)	201 (62%)
100%	122 (18.2%)	59 (48.4%)	63 (51.6%)	111 (91%)	11 (9%)	41 (33.6%)	81 (66.4%)	54 (44.3%)	68 (55.7%)
Current measures are sufficient to control COVID-19									
Yes	393 (58.6%)	189 (48.1%)	204 (51.9%)	176 (44.8%)	217 (55.2%)	125 (31.8%)	268 (68.2%)	160 (40.7%)	233 (59.3%)
No	278 (41.4%)	132 (47.5%)	146 (52.5%)	117 (42.1%)	161 (57.9%)	111 (39.9%)	167 (60.1%)	108 (38.8%)	170 (61.2%)
Had impact of COVID-19 on life									
Yes	549 (81.8%)	266 (48.5%)	283 (51.5%)	242 (44.1%)	307 (55.9%)	196 (35.7%)	353 (64.3%)	246 (44.8%)	303 (55.2%)
No	122 (18.2%)	55 (45.1%)	67 (54.9%)	51 (41.8%)	71 (58.2%)	40 (32.8%)	82 (67.2%)	22 (18%)	100 (82%)

COVID-19 is a mild disease									
Yes	423 (63%)	189 (44.7%)	234 (55.3%)	169 (40%)	254 (60%)	147 (34.8%)	276 (65.2%)	166 (39.2%)	257 (60.8%)
No	248 (37%)	132 (53.2%)	116 (46.8%)	124 (50%)	124 (50%)	89 (35.9%)	159 (64.1%)	102 (41.1%)	146 (58.9%)
Perception of risk of contracting COVID-19									
Low	364 (54.2%)	168 (46.2%)	196 (53.8%)	78 (21.4%)	286(78.6%)	132(36.3%)	232 (63.7%)	144 (39.6%)	220 (60.4%)
Medium	251(37.4%)	125(49.8%)	126(50.2%)	162(64.5%)	89 (35.5%)	88 (35.1%)	163 (64.9%)	104 (41.4%)	147 (58.6%)
High	56 (8.4%)	28 (50%)	28 (50%)	53 (94.6%)	3 (5.4%)	16 (28.6%)	40 (71.4%)	20 (35.7%)	36 (64.3%)

[Table/Fig-1]: Characteristic features of study participants and their COVID-19 preventive behaviour. (n=671).

Characteristic feature	Face masks in workplaces		Face masks in public places		Physical distance		Hand sanitisation	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Age group								
18-34 years	-Reference-							
35-50 years	0.50 (0.24-1.04)	0.065	0.30 (0.11-0.85)	0.024	0.45 (0.15-1.38)	0.165	1.03 (0.42-2.48)	0.948
51-66 years	0.92 (0.30-2.80)	0.888	0.16 (0.03-0.83)	0.030	3.78 (0.63-22.64)	0.145	0.42 (0.11-1.64)	0.216
>66 years	0.63 (0.17-2.30)	0.491	1.01 (0.14-7.19)	0.991	2.46 (0.31-19.31)	0.391	0.39 (0.08-1.86)	0.241
Male gender	1.61(1.00-2.59)	0.047	1.38 (0.70-2.72)	0.346	0.93 (0.45-1.95)	0.864	0.56 (0.31-1.00)	0.052
Marital status								
Married	-Reference-							
Unmarried	0.59 (0.28-1.26)	0.176	2.19 (0.73-6.57)	0.160	0.45 (0.15-1.35)	0.157	0.78 (0.30-1.97)	0.601
Divorced/widow	1.43 (0.83-2.46)	0.190	0.18 (0.07-0.47)	0.000	0.56 (0.22-1.46)	0.241	1.52 (0.79-2.90)	0.202
Place								
Rural	-Reference-							
Semi-urban	0.88 (0.55-1.42)	0.618	1.52 (0.78-2.97)	0.216	1.18 (0.53-2.62)	0.684	0.88 (0.50-1.55)	0.675
Urban	0.74 (0.44-1.24)	0.262	1.48 (0.70-3.15)	0.300	1.37 (0.58-3.23)	0.469	0.78 (0.42-1.44)	0.442
Education								
Middle school or less	-Reference-							
High-school	4.45 (1.71-11.55)	0.002	12.76 (1.60-101.66)	0.016	5.41 (1.46-20.05)	0.012	0.39 (0.14-1.08)	0.072
Intermediate	3.45 (1.10-10.75)	0.032	89.877 (9.664-835.831)	0.000	0.67 (0.12-3.72)	0.648	0.79 (0.23-2.71)	0.709
Graduation or more	1.38 (0.27-6.86)	0.692	*	0.000	1.48 (0.12-17.73)	0.756	0.12 (0.02-0.79)	0.028
Socio-economic status								
Lower	-Reference -							
Upper lower	0.41 (0.15-1.11)	0.081	*	0.997	0.09 (0.01-0.44)	0.003	2.54 (0.80-8.00)	0.111
Lower-middle	0.44 (0.14-1.35)	0.155	*	0.997	0.28 (0.05-1.60)	0.155	1.30 (0.36-4.70)	0.681
Upper-middle	0.56 (0.13-2.32)	0.431	*	0.997	0.59 (0.06-5.79)	0.658	2.40 (0.45-12.69)	0.303
Upper	2.95 (0.44-19.53)	0.260	*	0.997	1.77 (0.08-37.01)	0.711	7.56 (0.82-69.53)	0.074
Smoking	0.90 (0.57-1.43)	0.682	0.95 (0.48-1.88)	0.887	2.72 (1.31-5.63)	0.007	1.29 (0.74-2.27)	0.363
Co-morbidities	0.90 (0.45-1.80)	0.787	0.30 (0.11-0.83)	0.021	0.37 (0.12-1.09)	0.071	1.18 (0.50-2.78)	0.693
HTN	0.81(0.34-1.92)	0.633	1.16 (0.32-4.25)	0.813	0.38 (0.08-1.71)	0.209	1.21 (0.43-3.38)	0.707
DM	1.10 (0.65-1.86)	0.715	1.73 (0.75-3.98)	0.195	1.93 (0.83-4.50)	0.126	1.18 (0.62-2.22)	0.602
CKD	0.84 (0.49-1.44)	0.541	2.09 (0.90-4.83)	0.083	0.56 (0.22-1.45)	0.237	0.72 (0.36-1.41)	0.341
Obesity	0.88 (0.58-1.34)	0.556	2.64 (1.37-5.06)	0.004	3.85 (1.94-7.65)	0.000	0.54 (0.32-0.92)	0.024
CAD	0.94 (0.60-1.46)	0.785	1.24 (0.61-2.51)	0.549	0.99 (0.49-1.99)	0.985	1.24 (0.72-2.12)	0.424
Hypothyroidism	0.78 (0.47-1.31)	0.359	2.33 (1.06-5.13)	0.035	1.06 (0.45-2.50)	0.880	0.97 (0.52-1.79)	0.931
Previous COVID-19	0.81 (0.57-1.14)	0.234	0.91 (0.53-1.54)	0.730	1.05 (0.61-1.81)	0.853	1.23 (0.81-1.87)	0.312
Vaccination (2 doses)	2.31 (1.44-3.71)	0.000	0.56 (0.28-1.11)	0.100	0.45 (0.21-0.98)	0.046	1.20 (0.69-2.10)	0.502
Knowledge of COVID-19 transmission								
0%	-Reference -							
25%	0.66 (0.22-1.93)	0.453	0.38 (0.02-6.00)	0.494	2.41 (0.32-17.94)	0.389	1.00 (0.27-3.66)	0.990
50%	0.29 (0.09-0.96)	0.044	0.06 (0.00-1.27)	0.071	0.92 (0.12-6.71)	0.935	2.05 (0.52-8.05)	0.300
75%	0.23 (0.06-0.79)	0.020	0.09 (0.00-1.91)	0.123	0.69 (0.08-5.46)	0.725	1.84 (0.44-7.58)	0.398
100%	0.40 (0.10-1.65)	0.210	0.05 (0.00-1.46)	0.084	0.13 (0.01-1.39)	0.092	6.40 (1.26-32.46)	0.025
Have trust in Government updates on COVID-19								
	0.89 (0.63-1.25)	0.504	1.67 (0.97-2.85)	0.060	1.71 (0.95-3.07)	0.070	0.73 (0.48-1.11)	0.150
Current preventive measures are sufficient								
	0.84 (0.60-1.19)	0.343	1.29 (0.77-2.18)	0.327	0.42 (0.24-0.74)	0.003	1.54 (1.01-2.33)	0.041

Had impact of COVID-19 on life								
	1.11 (0.70-1.74)	0.650	0.90 (0.46-1.79)	0.782	0.67 (0.30-1.52)	0.349	4.76 (2.53-8.93)	0.000
Risk of contracting COVID-19								
Low risk	-Reference-							
Medium risk	1.42 (0.86-2.33)	0.162	1.55 (0.76-3.16)	0.220	3.14 (1.34-7.37)	0.008	0.78 (0.43-1.42)	0.426
High risk	1.26 (0.56-2.81)	0.570	3.96 (0.70-22.42)	0.120	1.24 (0.34-4.53)	0.740	0.531 (0.20-1.40)	0.202
COVID-19 is a mild disease	0.69 (0.48-0.99)	0.046	1.01 (0.59-1.70)	0.969	0.82 (0.46-1.44)	0.493	0.96 (0.62-1.47)	0.865

[Table/Fig-2]: Association between socio-clinical factors and COVID-19 preventive measures.
HTN: Hypertension; DM: Diabetes; CKD: Chronic kidney disease; CAD: Coronary artery disease
p-value <0.05 considered as significant. *values were too high

Respiratory condition number (%)	Wearing face mask in work places regularly			Wearing face mask in public place regularly			Following physical distance			Hand sanitisation		
	Number (%)	Odds ratio (95% CI)	p-value	Number (%)	Odds ratio (95% CI)	p-value	Number (%)	Odds ratio (95% CI)	p-value	Number (%)	Odds ratio (95% CI)	p-value
COPD												
313 (46.7%)	157 (50.2%)	1.38 (0.37-5.11)	0.62	124 (39.6%)	3.66 (0.42-31.50)	0.23	95 (30.4%)	3.62 (0.52-25.23)	0.19	118 (37.7%)	0.58 (0.12-2.68)	0.48
Asthma												
281 (41.9%)	127 (45.2%)	1.39 (0.35-5.47)	0.63	146 (52%)	1.04 (0.11-9.73)	0.96	105 (37.4%)	7.73 (1.01-58.78)	0.04	120 (42.7%)	0.59 (0.12-2.92)	0.51
PTLD												
52 (7.7%)	27 (51.9%)	1.426 (0.64-3.13)	0.37	14 (26.9%)	0.62 (0.16-2.37)	0.48	21 (40.4%)	3.68 (1.19-11.34)	0.02	19 (36.5%)	0.67 (0.26-1.72)	0.40
Bronchiectasis												
16 (2.4%)	6 (37.5%)	1.34 (0.34-5.31)	0.67	5 (31.3%)	1.24 (0.12-12.03)	0.85	9 (56.3%)	7.68 (0.93-63.24)	0.05	8 (50%)	0.38 (0.07-1.99)	0.25
ILD												
9 (1.3%)	4 (44.5%)	2.199 (0.42-11.31)	0.34	4 (44.5%)	5.68 (0.54-59.23)	0.14	6 (66.7%)	20.38 (1.30-317.62)	0.03	3 (33.3%)	0.31 (0.04-2.48)	0.27

[Table/Fig-3]: Respiratory diseases and their adherence to COVID-19 preventive measures (N=671).
COPD: Chronic obstructive pulmonary disease; PTLD: Post tuberculosis lung disease; ILD: Interstitial lung diseases

Author of study	Time of study	Study population	Main characteristic features	Prevalence of COVID-19 preventive measures	Common causes for non adherence
Islam JY et al., [20]	April-June 2020	Patients with chronic diseases (n=10760)	68.3% more than 45 years. 51% females. 60.2% college degree or above. 69% urban residents. 42% employed.	87% wearing face mask. 86% following physical distance. 92% hand hygiene.	High-school degree or below. Employed. Uninsured. Low income. Male gender. Rural residents.
Gautam V et al., [4]	May-August 2020	Patients with chronic diseases (n=412)	62.4% males. 90.3% urban dwellers.	76.3% hand hygiene. 58.6% face mask. 60.9% social distancing. Cough etiquette 38.9%.	Age ≥40 years. Education below secondary level. Rural dwellers. Low health literacy.
Dires A et al., [21]	July-August 2020.	Patients with chronic diseases (n=413)	Mean age 48.2±15.8 years. 52.1% females. 64.9% urban dwellers. 69.5% married. 46.2% no formal education.	85.7% hand washing. 81.9% wearing face mask. 74.6% following physical distance.	Young adults. Male gender. Low literacy. Face mask nonusers.
Mohamed Y et al., [22]	January-March 2021	Patients with chronic diseases (n=250)	Mean age 43.9±12.6 years. 51.2% males. 85.2% married. 81.2% urban dwellers. 62.4% employed. 74.4% had health insurance. 81.2% had previous COVID-19. 55.2% vaccinated.	86.8% wearing face mask. 84% hand hygiene. 62% physical distance.	Taking herbal supplements. Doing regular exercise. Reduced use of public transport.
Present study	March- April 2022	Chronic respiratory diseases (n=671)	53.8% >50 years. 58.1% males. 73.8% married. 38% rural residents. 74.4% lower middle class or below. 60.4% smokers.	47.8% wearing face wearing masks in workplaces. 43.6% wearing face masks in public places. Hand sanitisation 39.9%. Physical distance 35.2%.	Women. Rural dwellers. Non smokers. No impact of COVID-19 on life. COVID-19 is a mild disease. Not trusting government guidelines.

[Table/Fig-4]: Similar studies among patients with chronic diseases and causes of non adherence to COVID-19 preventive behaviour [4,20-22].

and perceptual differences. Moreover, these studies were conducted during or immediately after the first wave of COVID-19, whereas our investigation took place after the third wave of COVID-19 in India.

Age, gender, level of education, Socio-economic status, marital status, risk perception, COVID-19 status, knowledge of infection, underlying chronic diseases, and confidence in health authorities' guidelines have an impact on the practice of COVID-19 preventive measures [6,8,9,12,13,15,23,24]. The relationship between age and adherence to COVID-19 preventive guidelines is conflicting [10]. Some studies reported higher non adherence to COVID-19 preventive behaviour among young adults, particularly regarding social distancing [6,12, 14,15]. This might be due to a low perception of risk or a low perception of the efficacy of preventive measures [21,23,24]. However, in present study, patients above 50 years were less adherent to wearing a face mask in public places and frequent hand sanitisation, whereas young patients were less willing to follow physical distancing.

Previous studies have indicated that women adhere more to preventive measures [6,9,10,12,15,23,24]. In contrast, the present study found higher odds of wearing face masks in workplaces

among men (OR 1.61, 95% CI 1.00-2.59; p=0.047). Marital status has an equivocal association with the adoption of preventive behaviour [10,13]. In the present study, divorced individuals or widows demonstrated higher non adherence to wearing face masks in public places and practicing physical distancing. Low education levels and endorsement of COVID-19 misinformation were associated with non adherence to preventive behaviour [9,19,25]. Participants with a high school education or above had higher odds of adherence to wearing face masks in public places, compliance with physical distancing, and hand sanitisation (OR 5.4, 95% CI 1.46-20.05; p=0.012). However, the present study found non adherence to COVID-19 preventive behaviour even among graduated patients.

Higher Socio-economic position was associated with the practice of COVID-19 preventive behaviour [6,8,9]. Limited access to healthcare, resources, and poor working conditions among low-income groups create obstacles to the practice of preventive measures [10,20]. However, present study did not find a significant impact of Socio-economic status on the practice of COVID-19 preventive guidelines. Residing in rural areas hampers the practice of COVID-19 preventive behaviour, similar to previous studies [20,21]. Smoking and substance abuse were associated with higher adherence to COVID-19 preventive measures [10]. In the present study, smokers had 2.7 times higher commitment to practicing physical distancing.

Patients with underlying chronic diseases tend to comply more with COVID-19 preventive behaviour [12]. The present study found that participants with chronic respiratory disorders had significant adherence to practicing physical distancing in public places. Among these participants, those affected by COVID-19 had 4.7 times higher odds of adherence to hand sanitisation. Having appropriate knowledge of COVID-19 and a high perception of risk were significantly associated with fully adopting all three preventive behaviours [8,10-15,20-22,26]. However, present association significantly differed depending on the type of COVID-19 preventive behaviour [3]. Having complete knowledge of COVID-19 transmission had 6.4 times higher odds of adherence to hand sanitisation in the present study. However, knowledge of COVID-19 transmission did not necessarily translate into adopting COVID-19 preventive behaviour [5,21,27].

Trust in local health authorities was associated with adherence to COVID-19 preventive measures [5,8,10,28]. Similarly, present study reports higher non adherence to preventive procedures among patients who need more faith in government guidelines. In present study, patients with a perception of medium risk of contraction of COVID-19 had three times higher odds of following physical distancing in public places. A significant proportion of patients with chronic diseases had a low perception of the efficacy of COVID-19 prevention measures and a low intention to follow them [21].

Despite ongoing COVID-19 vaccination, the long-term effectiveness of the vaccines is still unknown [5]. Vaccination requires a considerable amount of time to develop herd immunity [26]. At present stage, the best way to deal with this pandemic is a solid adherence to preventive measures by patients with chronic diseases [10]. However, vaccinated patients had higher adherence to wearing face masks in workplaces but not to other COVID-19 preventive measures in the present study.

Health literacy determines the execution of COVID-19 preventive behaviour [21]. Low health literacy is associated with a poor quality of life, non adherence to management protocols, minimal or no self-care, increased health expenditure, morbidity, and mortality among patients [4]. In low- to middle-income countries, compliance with COVID-19 personal preventive measures is necessary [26]. After the outbreak, patients' engagement in COVID-19 prevention measures decreased extensively [21].

Due to the limited health infrastructure in India, patients at risk of contracting COVID-19 have to follow preventive measures. Otherwise, the emergence of a new virulent strain can be devastating. Strong adherence to preventive measures not only controls COVID-19 but also reduces exacerbations of chronic respiratory diseases. Understanding public behaviour and determinants of preventive behaviour, as well as designing health-promoting interventions, are critical for preventing subsequent outbreaks [20,26]. Patients with chronic diseases, who are most vulnerable to COVID-19, should follow the recommended protective measures [4,20-22]. However, present study found that patients with co-morbidities had low adherence to wearing face masks and hand sanitisation.

Providing timely and accurate information and continuing interventions are necessary to improve risk perceptions, correct misperceptions, and successfully address the COVID-19 pandemic [10]. Health authorities addressing the COVID-19 pandemic should be aware that risk communication alone may not meet the goals of prevention programs. Equitable access to resources or opportunities to practice recommended preventive behaviour should be coupled with such programs [10,20].

This study has some strengths. It assessed the practice of COVID-19 preventive guidelines among patients with chronic respiratory diseases, who are at an increased risk of morbidity and mortality due to COVID-19. Advanced age is another risk factor for COVID-19, and the mean age of the participants in this study was above 50 years. Both factors contribute to the relevance of the study. Additionally, the study took place two years after the onset of the COVID-19 pandemic and one year after the launch of mass vaccination, allowing for a realistic assessment of the practice of COVID-19 preventive behaviour.

Limitation(s)

First, as responses were self-reported, there is a possibility of recall, response, and social desirability biases. Second, the study may have overlooked unmeasured variables associated with the practice of COVID-19 preventive behaviour. Third, it could not delve deeper into the reasons for non adherence.

CONCLUSION(S)

The study identified gaps in the practice of COVID-19 preventive measures among patients with chronic respiratory diseases. Factors associated with compliance include age below 50 years, marital status, high school education and above, and smoking. Factors associated with a negative impact were having no previous experience of COVID-19, lack of trust in Government guidelines, and residing in rural areas. Higher Socio-economic status, sufficient knowledge, and risk perception about COVID-19 do not guarantee adherence to preventive behaviour. Health authorities should design effective and targeted interventions at both the individual and community levels to achieve effective control of COVID-19.

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