Original Article

Clinical symptoms of COVID-19 among tobacco users in Moradabad city, India: A retrospective observational study

Naved Alam[1]* , Warisha Mariam[2] , Ravishankar Lingesha Telgi[1] , Prashant Rajput[3]

[1]Kothiwal Dental College & Research Centre, Moradabad, India
[2]Maulana Azad Medical College, New Delhi, India
[3]National Tobacco Control Program, Moradabad, India

Abstract

Background: Tobacco is one of the leading risk factors for many respiratory infections and is linked to the clinical severity of the disease. COVID-19 primarily infects the lungs and causes severe pneumonia-like illness. Tobacco consumption may thus, increase the risk for developing COVID-19. However, this study was planned to assess the tobacco consumption among COVID-19 patients and determine the relationship between SARS CoV-2 and tobacco use among COVID-19 patients.

Methods: Lists of laboratory-confirmed COVID-19 positive patients aged 18-70 years were obtained from District Government Hospital on November 2020 and were interviewed telephonically after taking informed consent. A total of 470 patients under home isolation for the past one month after getting diagnosed with SARS CoV-2 were recruited in this study. Data was entered in MS Excel 2019 (Microsoft Corp.) and analysis was done using SPSS 25 (IBM Inc.). Chi-square and Fisher's exact test were used and significance level was set 0.05 with 95% confidence interval.

Results: In the present study, the mean (standard deviation) age of participants was 37.8 (12.1) years. Among the COVID-19 patients, 21% of participants were tobacco users. Clinical symptoms such as fever, severe acute respiratory illness (SARI), acute respiratory illness (ARI), loss of taste/smell, and other symptoms such as body-ache, myalgia, nasal secretion and flu like symptoms were presented; of which most common symptoms were fever (26.8%) followed by SARI or ARI (11.5%) and significantly presented more among tobacco users (66.3%) than non-tobacco users (55.6%) ($P = 0.036$). Nonetheless smokers, these symptoms also affected significantly SLT users (64.8%) ($P = 0.029$) and dual tobacco users (100%) ($P = 0.010$).

Conclusion: Tobacco use may worsen COVID-19 disease symptoms among COVID-19 patients.

Keywords: COVID-19, Tobacco, Coronavirus, Smoking, SARS-CoV-2

Introduction

SARS-CoV-2 or 2019-nCoV (novel coronavirus) causes pneumonia like disease in humans through contamination by zoonotic origin. COVID-19 was first detected from lung tissues of two infected patients in Wuhan Central hospital by doctors and scientists of Chinese Centre for Disease Control (CDC) on 31st December 2019.[1] The World Health Organization (WHO) announced a pandemic crisis when the virus was isolated in all of its worldwide regions.[2] In India, Government advised maintaining social distancing, wearing mask, hand hygiene and avoiding crowded places to prevent transmission of SARS CoV-2. After massive vaccination among population, COVID-19 cases were reported to be declined.[3] Due to continuously changing nature of SARS CoV-2 variants of concern must be monitoring.[3]

Coronaviruses refer to a family of enveloped, positive-sense, single-stranded, and highly diverse RNA viruses which cause severe acute respiratory syndrome.[4] Fatality rate of SARS-CoV-2 strain type D614 (2.3%) is lesser than other types of respiratory viruses causing outbreaks such as SARS-CoV (9.5%) and Middle East respiratory syndrome (MERS-CoV) (34.4%); However, SARS-CoV-2 spreads easily in community than others.[5] The B.1.617.2 (Delta) variant of SARS-CoV-2 that caused second wave of COVID-19, was identified in India in late 2020.[6]

Although during and after pandemic, there has been an observed hike in tobacco consumption in recent past years.[7] The comorbid conditions like cardiovascular or respiratory diseases has been reported more in chronic smokers and have been linked to a worse prognosis in patients infected with COVID-19.[8] The angiotensin converting enzyme (ACE2) receptor is a pulmonary gene receptor mainly used by SARS CoV-2 to gain entry into host mucosa in lung tissues. In an experimental literature, up-regulation of ACE2 was observed more in

smokers than non-smokers.[9] Smokers might be more vulnerable to COVID-19 as the act of smoking means that fingers are in contact with lips that increase the possibility of transmission of virus from hands to mouth. Tobacco consumption also might be a risk factor for disease progression and lowers function of the immunity cells. It indirectly puts its users at risk of being affected by COVID-19. This may pose a risk by accelerating the transmission of SARS-CoV-2 because the virus spreads primarily through droplets of saliva when an infected person coughs or sneezes.[10] On the other hand, chewing tobacco products (Khaini, Gutkha, Paan, Zarda) increases the urge to spit. Spitting in public places increases health risks especially those of spreading the infectious and contagious diseases like, COVID-19.[11]

According to GATS-India, 2017 (Global Adult Tobacco Survey-India), there are 28.6% average adult tobacco users of which 10.7% were smokers and 21.4% are smokeless tobacco users.[12] Smokers have been identified as a group more vulnerable to infection and its associated complications.[13] However, early data has not provided plentiful evidences whether tobacco users are more likely to suffer from clinical symptoms or adverse effects of tobacco among COVID-19 patients.[14] So this study was planned to assess the proportion of tobacco users and non-tobacco users among SARS CoV-2 patients and to find its relation with symptoms of SARS CoV-2 and to list out the range of symptoms in COVID-19 patients in Moradabad city, India.

Methods

This present cross-sectional study was conducted to find out tobacco consumption among SARS CoV-2 positive patients aged 18 to 70 years who have been living in Moradabad city, India. A pre-structured questionnaire was used to obtain information regarding sociodemographic factors, clinical conditions, and tobacco habits among COVID-19 patients. Approval for the study was taken from the Institutional Review Board (KDCRC/IERB/10/2020/07). We obtained a list of laboratories confirmed SARS CoV-2 positive patients under home isolation from the District Hospital (Government), Moradabad. From the obtained list of 1400 SARS CoV-2 positive patients, we enrolled 470 patients conveniently who gave informed consent and have spent one month under home isolation after positive diagnosis. Patients were informed about the objectives and study procedures. Data were collected from December 2020 to February 2021 through telephonic interview using a pre-structured questionnaire which includes socio-demographic status, comorbid conditions, signs and symptoms, treatment taken, tobacco use, time duration of tobacco use in years, frequency and types of tobacco consumption (Smoking/Smokeless tobacco [SLT] users/ both). Smoking status was recorded as (never-smoker, former-smoker and current smoker)[15] self-reported by COVID-19 patients.

All those participants who were former and current tobacco users in their lifetime and consumed tobacco in past a year were considered as current tobacco users as they both have consumed tobacco and exposed to nicotine. Subjects who were pregnant, lactating women, mentally compromised patients, hospitalized COVID-19 patients and those who did not have access to mobile or telephone at the time of interview were excluded from the study.

The collected data were entered and cleaned in MS Excel. Statistical Package for Social Sciences (SPSS) version 25 was used for statistical analysis. Continuous variables were expressed in mean values with standard deviation (SD) and categorical variables have been presented in proportions. For comparison between qualitative variables chi-square test and Fisher's exact test were applied. $P < 0.05$ was considered as statistically significant.

Results

A total of 470 COVID-19 positive patients were recruited in the study. The mean age (SD) of subjects was 37.8 ($\pm$12.1) years. Results showed 322 (68.5%) were male and 148 (31.5%) were female participants. Among the COVID-19 patients 98 (20.9%) were tobacco users. The mean age (SD) at initiation of tobacco use (n = 98) was 28.7 ($\pm$9.6) years and time duration of tobacco use was 10.6 ($\pm$10) years. Out of the 98 tobacco users 39 (39.8%) were smokers, 54 (55.1%) were SLT users while 5 (5.1%) were consuming both type of tobacco as dual users.

Among the COVID-19 patients, 308 (65.5%) participants were between 18 to 40 years of age among which majority of tobacco users (38%) were 31-40 years old. Among the male participants, 96 (30%) are tobacco users and 226 (70%) non-tobacco users ($P < 0.001$). Among the male tobacco users, 39 (40.6%) were smokers and 52 (54.2%) were SLT users. Only 19 (4%) COVID-19 participants were known to have comorbid conditions of which 5 (26.3%) were tobacco users (Table 1).

Of the total number of COVID-19 patients, 272 (57.9%) had clinical symptoms during the study period. Compared with non-tobacco users, clinical symptoms were present significantly more among tobacco users 65 (66.3%) ($P = 0.05$). Out of the 98 tobacco users, 75 (76.5%) were active smokers, and 23 (23.5) were former smokers. The majority of former tobacco users (n = 16, 69.6%) were suffering from clinical symptoms. There was no significant difference between presence of symptoms among study participants with respect to gender, age, frequency of tobacco use, and comorbidity. These symptoms significantly affected not only smokers, but also SLT users (64.8%) ($P = 0.029$) and dual tobacco users (100%) ($P = 0.010$; Table 2).

Among all SARS CoV-2 positive study participants, 198 (42.1%) were found to be asymptomatic while 272

Table 1. Study participants according to tobacco consumption and prevalence of COVID-19 in tobacco users (N = 470)

Characteristic (%)	Non-tobacco users	Tobacco users	P value	SAT	SLT	Both	P value[a]
Gender							
Male, 322 (68.5)	226 (70.2)	96 (29.8)		39 (40.6)	52 (54.2)	5 (5.2)	
Female, 148 (31.5)	146 (98.6)	2 (1.4)	<0.001*	0	2 (100)	0 (0)	<0.001*
Total 470	372 (79.1)	98 (20.9)		39 (39.8)	54 (55.1)	5 (5.1)	
Age (y)							
18–30 years, 154 (32.8)	129 (83.8)	25 (16.2)		11 (44)	14 (56)	0 (0)	
31–40 years, 154 (32.8)	116 (75.3)	38 (24.7)	0.180	14 (36.8)	22 (57.9)	2 (5.3)	0.217
41–50 years, 84 (17.9)	69 (82.1)	15 (17.9)		7 (46.7)	8 (53.3)	0 (0)	
51–70 years, 78 (16.6)	58 (74.4)	20 (25.6)		7 (35)	10 (50)	3 (15)	
Education							
Illiterate, 30 (6.4)	20 (66.7)	10 (33.3)		7 (70)	3 (30)	0 (0)	
Primary & above, 157 (33.4)	128 (81.5)	29 18.5)	0.185	12 (41.4)	16 (55.2)	1 (3.4)	0.093
Graduate & above, 283 (60.2)	224 (79.2)	59 (20.8)		20 (33.9)	35 (59.3)	4 (6.8)	
Comorbidity							
Known, 19(4)	14 (73.7)	5 (26.3)		3 (60)	2 (40)	0 (0)	
Unknown, 451 (96)	358 (79.4)	93 (20.6)	0.565	36 (38.7)	52 (55.9)	5 (5.4)	0.650

SLT: smokeless tobacco user.
Note: Data are expressed as No. (%).
*Statistically significant, [a] Chi-square test.

Table 2. Distribution of clinical presentation among COVID-19 patients with relation to characteristics (N = 470)

Characteristics	Symptomatic	Asymptomatic	P value
Gender			
Male 322 (68.5)	192 (59.6)	130 (40.4)	0.150
Female 148 (31.4)	80 (54.1)	68 (45.9)	
Age groups			
18-30 years, 154 (32.7)	81 (52.6)	73 (47.4)	
31-40 years, 154 (32.7)	95 (61.7)	59 (38.3)	0.373
41-50 years, 84 (17.8)	48 (57.1)	36 (42.9)	
51-70 years, 78 (16.5)	48 (61.5)	30 (38.5)	
Tobacco users, 98 (20.9)	65 (66.3)	33 (33.7)	0.036*
Non-tobacco users, 372 (79.1)	207 (55.6)	165 (44.4)	
Current status of tobacco use			
Former smokers, 23 (23.4)	16 (69.6)	7 (30.4)	0.457
Active smokers, 75 (76.5)	49 (65.3)	26 (34.7)	
Types of tobacco user			
Smoking, 39 (39.8)	25 (64.1)	14 (35.9)	
SLT, 54 (55.1)	35 (64.8)	19 (35.2)	0.108
Both, 5 (5.1)	5 (100)	0 (0)	
Frequency			
≤3 times/day, 38 (38.8)	22 (57.9)	16 (42.1)	0.289
>3 times/day, 60 (61.2)	43 (71.7)	17 (28.3)	
Co-morbidity			
Known, 19 (4.1)	14 (73.7)	5 (26.3)	0.116
Unknown, 451 (95.9)	258 (57.2)	193 (42.8)	

SLT, Smokeless Tobacco User; SAT, Smoking Attributable Tobacco.
Note: Data are expressed as No. (%).
[a] Chi-square, * Fisher's exact test.

(57.8%) were symptomatic. The most common clinical symptom was fever 126 (26.8%) followed by Severe or Acute Respiratory Illness [SARI/ARI] 54 (11.5%) while 29 (6.1%) had lost the sense of smell or taste (Table 3).

Discussion

The prevalence of tobacco use among COVID-19 patients was about 21% as compared to the national prevalence of tobacco use among general population of India (28.6%).[12] Less prevalence of tobacco consumption among COVID-19 patients might be due to discrepancy in self-reported disclosure of personal information by the study participants. In another study conducted among confirmed COVID-19 patients in Rajasthan, India; demonstrated the prevalence of current tobacco users among COVID-19 patients to be as 22% which is reported similar with our study.[16]

Regarding education, the proportion of tobacco users (33.3%) were slightly higher among illiterate participants. 54.2% of tobacco users were found to be SLT users in our study. In lower-middle income countries, prevalence of smokeless tobacco users has been found to be more due to cultural acceptance of betel nut consumption.[17] Also, these countries have higher proportion of SLT users due to fragile health system and little capacity for smokeless tobacco cessation.

This study observed that symptoms were presented in 58% COVID-19 positive patients which coincides with study done by Gupta et al in New Delhi, India and another study done by Gudbjartsson et al in Iceland, UK.[18,19]

Results showed that self-reported symptoms were

Table 3. Characteristic clinical symptoms among COVID-19 patients in Moradabad (N = 470)

Symptoms	Total	Non-Tobacco Users	Tobacco Users	*P* value[a]
Asymptomatic	198 (42.1)	165 (44.4)	33 (33.7)	0.036*
Influenza-like illness	50 (10.6)	39 (10.5)	11 (11.2)	0.478
ARI or SARI	54 (11.5)	34 (9.1)	20 (20.4)	0.003*
Loss of smell/taste	29 (6.2)	24 (6.5)	5 (5.1)	0.414
Fever	126 (26.8)	98 (26.3)	28 (28.6)	0.208
Other symptoms	13 (2.8)	12 (3.2)	1 (1)	0.373
Total	470	372 (87.4)	98 (20.8)	0.029*

ARI, acute respiratory illness; SARI, severe acute respiratory illness.
Note: Data are expressed as No. (%).
*Chi-square, [a] Fisher's exact test.

presented more among tobacco users (66.3%) than non-tobacco users (55%), Tobacco use may deteriorate the immune cell functions and reduces the cell-mediated immunity in the body. This may explain that tobacco users are more likely to have infections. Some previous studies have also observed that lower proportion of immune cells were present in tobacco users which makes them susceptible for infections.[20]

There was statistically significant difference in symptoms among smokers, SLT users and dual users. Smokers and SLT users both are significantly susceptible for COVID-19 infection. Evidences suggest that there has been an association between inflammation and SLT consumption.[21] Inflammatory markers release cytokines in COVID-19 patients as well that may make them susceptible for COVID-19 infection.[22]

The results of the study also show that COVID-19 infection is associated with comorbidity as more numbers of patients with pre-existing comorbid condition were more symptomatic in our study. Males aged 51 years and above were more prone to use of tobacco and might face a greater risk of developing symptoms associated with COVID-19 infection and comorbidities such as hypertension, cardiovascular disease, diabetes or respiratory diseases would have effect on the prognosis of COVID-19. Smoking may likely to be a risk factor for progression of disease as the age increases especially among aged 65 years in men.[23]

We found that the most common symptom was fever and respiratory illnesses such as cough and dyspnoea, while loss of taste and/or smell was less common among COVID-19 patients in Moradabad, India. Similarly, a study done by Gupta et al also found that fever and cough were most common symptoms among COVID-19 patients in New Delhi, India.[18] According to WHO, most common symptom was fever followed by coughing among COVID-19 patients requiring immediate medical intervention symptoms include shortness of breath/difficulty in breathing and less common are loss of taste and/or smell.[22] A study done by Tian et al in Beijing also

reported most common symptoms at the onset of illness were fever and cough among COVID-19 patients.[23]

Strengths and Limitations
Overall, this study has included all COVID-19 positive patients, considering the inclusion of asymptomatic cases which might have missed by rapid antigen cases due to low viral sensitivity. Sample size is smaller, so low external validity can be expected before dissemination of the results. Tobacco status and clinical symptoms were self-reported which might have led to some form of recall bias. Additionally, this is a cross sectional study design; the risk of contracting COVID-19 infection due to tobacco use could not be assessed. Thus, robust study needs to be made like cohort study design to assess the development of COVID-19 disease among the tobacco users.

Conclusion
This study concludes that estimates of clinical symptoms or disease progression presented more among tobacco users and tobacco use is most likely associated with symptomatic COVID-19 infection. However, further research is warranted for providing evidence on adverse outcomes of COVID-19 infection in relation to tobacco use. It is also necessitated that tailored made interventions for tobacco cessation may be designed to decrease the prevalence of tobacco consumption.

Competing Interests
Authors have no conflict of interests.

Data Availability Statement
Data not available due to participant consent. The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research supporting data is not available.

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