

COVID-19 and Current Smoking: Worse Outcome from a Surveillance Analysis

Abstract

Background: Few studies have shown that smokers are more likely than non-smokers to have coronavirus disease 2019 (COVID-19), whereas some reports indicate that smokers are under-represented among those requiring hospital treatment for this illness. This study was designed and implemented for investigating the severity and outcome of COVID-19 based on smoking. **Materials and Methods:** This was a cross-sectional study implemented in Tehran and Ahvaz with all COVID-19 hospitalization patients from February to June 2021. Four categories selected for severity and worst outcomes. They are admission in the intensive care unit (ICU), lung involvement more than 50%, using more than three medications, and death. A check list of demographic data and smoking history was completed and analyzed. **Results:** A total of 11,112 patients were male (61.1%), and the mean age was 47.9 ± 11.3 . A total of 1508 smokers (8.3%) were seen with any type of tobacco consumption. The frequency of ICU admission in the smokers is significantly higher than that in non-smokers (23.9% vs. 18.8%). A total of 668 (44.3%) smokers had more than 50% ground glass opacity in lungs, whereas 5340 non-smokers (32.1%) had so. Use of more than three medications in the smokers was significantly higher (70.6% vs. 52%). A comparison between patients based on smoking indicates that the death rate was significantly higher in smokers (31.6% vs. 25.6%). **Conclusions:** Although smoking rates in COVID-19 patients are lower than those in the general population, the consequences and mortality are higher in smokers.

Keywords: COVID-19, severity, outcome, smoking

Implication

We know that people with bad health conditions caused by tobacco use are at a higher risk of developing severe respiratory symptoms, some reports advised that nicotine and smoking may prevent coronavirus disease 2019 (COVID-19) because of a fewer smokers in COVID-19 patients. This study with a large sample indicates that although the number of smokers in COVID-19 patients is significantly lower than that in the general population and can lead to the misconception that smoking is a protective factor in this disease, these people had more severe and worse consequences.

Background

COVID-19 is a coronavirus outbreak that initially appeared in Wuhan, China, in December 2019, but it has already a pandemic worldwide.^[1,2] This pandemic is still unfortunately under progression with

221,543,021 confirmed cases, 4,581,749 deaths, and 198,044,400 recovered cases till September 6, 2021.^[3] COVID-19 can harm cardio-vascular and respiratory systems, and the damage caused to the lungs by smoking makes patients more susceptible to pulmonary viral infections.^[4] We know that people with bad health conditions caused by tobacco use are at a higher risk of developing severe COVID-19 symptoms.^[5]

Tobacco use may increase the risk of suffering from serious symptoms because of COVID-19 illness. Early research indicates that compared to non-smokers, having a history of smoking may substantially increase the chance of adverse health outcomes for COVID-19 patients, including being admitted to intensive care, requiring mechanical ventilation, and suffering severe health consequences.^[6,7]

Smoking is already known to be a risk factor for many other respiratory infections, including colds, influenza, pneumonia, and tuberculosis.^[8] The effects of smoking on the respiratory system make it more likely that smokers get these diseases, which could be

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more severe.^[9,10] Smoking is also associated with increased development of acute respiratory distress syndrome, a key complication for severe cases of COVID-19,^[11] among people with severe respiratory infections.^[12,13]

Any kind of tobacco smoking is harmful to bodily systems, including the cardio-vascular and respiratory systems.^[14,15] COVID-19 can also harm these systems. Evidence from China, where COVID-19 originated, shows that people who have cardio-vascular and respiratory conditions caused by tobacco use, or otherwise, are at higher risk of developing severe COVID-19 symptoms.^[16] Research on 55,924 laboratory-confirmed cases show that the crude fatality rate for COVID-19 patients is much higher among those with cardio-vascular disease, diabetes, hypertension, chronic respiratory disease, or cancer than among those with no pre-existing chronic medical conditions.^[17] This demonstrates that these pre-existing conditions may increase the vulnerability of such individuals to COVID-19. Early in the COVID-19 pandemic, it was reported that smokers were less likely to develop COVID-19 or experience a weaker, milder form, with lower hospitalizations and even less mortality.^[18] There seemed to be hidden efforts by tobacco companies to increase their deadly business during this pandemic.^[19]

The epidemic of COVID-19 in Iran, which was in ten countries to report the disease, started from mid-February 2020, and based on the official report, there were 3,028,717 confirmed cases, 82,098 deaths, and 2,652,792 recovered cases till June 14, 2021.^[20] As the smoking rate in Iran was about 15% (27% male and 4% female),^[21-23] we would like to be aware of finding this status among COVID-19 patients in Iran. This study was designed and implemented for investigating the severity and outcome of COVID-19 based on smoking.

Methods

This was a cross-sectional study that was implemented with all COVID-19 cases with positive PCR test admitted in two hospitals in Tehran and Ahvaz from February to June 2021. We tried to determine the frequency of smoking and compare it with the treatment outcome. In the expert panel, four categories were selected for

severity and worst outcomes: admission in the intensive care unit (ICU), lung involvement more than 50%, using more than three medications, and death. These four were compared based on smoking. The definition of a smoker was current smoking as daily and occasionally using any amount and type of tobacco before hospitalization. A written consent form was signed by patients or accompanying persons, and a check list of variables was completed. The data were analyzed by SPSS 20. Data normality was examined by Kolmogorov–Smirnov test. Numerical variables were tested by t-test, and for categorical variables, Chi-square was used. A *P* value of <0.05 was considered significant.

Finding

Among all 18200 patients, 11,112 (61.1%) were male. The mean age of the subjects was 47.9 years. Current smoking was seen in 1508 subjects (8.3%), which included 1130 cigarette smoking (74.9%), 285 hookah smoking (18.8%), and 93 cigarette and hookah smoking (6.1%). No history of e-cigarettes or pipe smoking was reported. Besides, no one mentioned an experience of substance abuse.

The following results were obtained based on the Chi-square test in terms of tobacco consumption, which is reflected in Table 1.

A total of 360 (23.9%) smoking patients were admitted to the ICU, whereas 3136 (18.8%) non-smoking patients were admitted to the ICU ($p = 0.000$).

A total of 1064 (70.6%) smokers took more than three medications, whereas this trend was found in 8672 (52%) non-smokers ($p = 0.000$).

A total of 668 (44.3%) smokers had more than 50% ground glass opacity in lungs, whereas 5340 non-smokers (32.1%) had so ($p = 0.000$).

A total of 476 smokers (31.6%) and 4280 non-smokers (25.6%) died ($p = 0.000$).

Table 2 shows the multi-variate regression model; it was found that the probability of disease severity was shown in the ratio of the more hospitalization days to the more

Table 1: Comparing of four categories of severity of COVID-19 patients based on smoking

4 categories for severity and worst outcome	Smokers		Non-smokers		Total	Sig
	No.	%	No.	%		
ICU hospitalized in hospitalized in the ward	360	23.9	3136	18.8	3496	0.000
More than 3 drugs up to 3 drugs	1148	76.1	13556	81.2	14704	0.000
50% and more lung infiltration less than 50% lung infiltration	1064	70.6	8672	52	9736	0.000
Mortality discharge	444	29.4	8020	48	8464	0.000
	1036	68.7	10436	62.5	11472	0.000
	472	31.3	6254	37.5	6728	0.000
	476	31.6	4280	25.6	4756	0.000
	1032	68.4	12412	74.6	13444	

medication consumption, and smoking was the second indicator after mortality as a specific and effective factor with 1.7 times ($p = 0.000$).

In Figure 1, survival analysis of mortality over time, according to consumption, age, and sex smokers were more likely to die during the entire treatment period, and just on the seventh days of hospitalization, this likelihood was lower than in non-smokers. However, the likelihood was significantly higher on other days ($p = 0.000$).

Discussion

This study showed that the severity and worse outcome of COVID-19 according to ICU admission, lung involvement, and using more medication were significantly higher in smokers. Besides, the mortality rate was significantly higher in these subjects (31.6% vs. 25.6%).

As few studies were available, the number of smokers with COVID-19 was thought to be lower than that of the general population,^[17,24] so the misconception emerged that smoking was a preventative factor for

COVID-19.^[25] The World Health Organization immediately stated its opposition, challenging this in statements^[26] and pointing out the fallacy in order to provide more scientific evidence.

Smoking, to date, has been assumed to be possibly associated with adverse disease prognosis as extensive evidence has highlighted the negative impact of tobacco use on lung health and its causal association with a plethora of respiratory diseases. Smoking is also detrimental to the immune system and its responsiveness to infections, making smokers more vulnerable to infectious diseases.^[8,11,13]

We clearly saw that tobacco smoking in any form (cigarettes, hookah, cigarettes, e-cigarettes, etc.) was lower than that in the general population^[23,27] (8.3% vs. 13.4%). However, this amount had worse outcomes than non-smokers with COVID-19 as Table 1 shows this comparison. These cases were not seen in some studies^[2] but are reported in others.^[4]

However, the important point in the present study was the higher mortality rate in smokers, which was significantly determined in the Cox regression for survival analysis. Smokers were more likely to die within a 20-day period in accordance with age, sex, and taking medication [Figure 1]. Of course, this rate was significantly lower in smokers on the seventh and eighth days, but it was higher again on the ninth day onward. This can be considered in further studies. Moreover, in the multinomial regression model of Table 2, it was shown that the effect of smoking was more effective in causing death than in other cases. This fact, which clearly shows the adverse effects of tobacco on COVID-19 and has been mentioned in fewer studies,^[28,29] could pave the way for further research studies in future surveys.

Although further research is warranted as the weight of the evidence increases, with the limited available data, and although the above results are unadjusted for other factors that may impact disease progression, smoking is most likely associated with the negative progression and adverse outcomes of COVID-19.

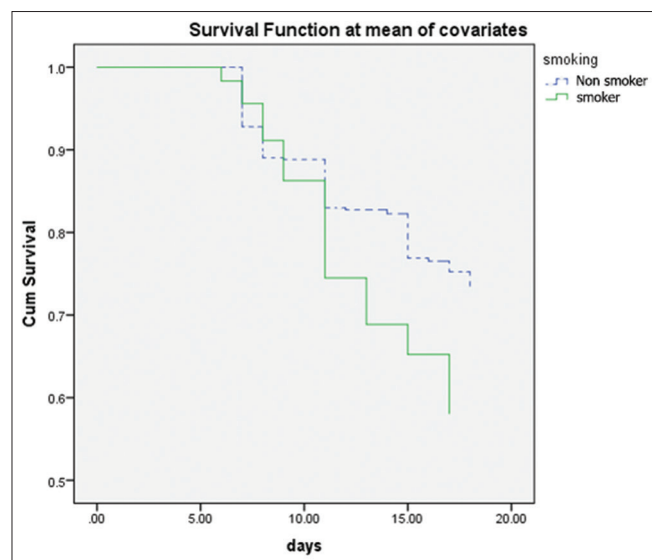


Figure 1: Survival analysis of COVID-19 patients based on smoking, sex, and three medications

	B	Std. error	Wald	df	Sig	Exp(B)	95 CI %	
							Lower bound	Upper bound
interception	-0.841	0.037	519.999	1	0.000			
Sex	0.370	0.038	96.207	1	0.000	1.448	1.344	1.559
Smoking	0.572	0.064	80.774	1	0.000	1.772	1.564	2.007
ICU	-3.393	0.136	622.309	1	0.000	0.034	0.026	0.044
Drugs	-0.374	0.036	110.353	1	0.000	0.688	0.642	0.738

Conclusion

Although smoking rates in COVID-19 patients are lower than in the general population, the consequences and mortality are higher in smokers.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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