Original Article

# COVID-19 and smoking: More severity and death – An experience from Iran

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## ABSTRACT

**Background:** Few studies have shown that smokers are more likely than nonsmokers to contract COVID-19, while others report that smokers are underrepresented 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 underlying smoking status. **Materials and Methods:** This was a case–control study that was implemented in Tehran and Ahvaz with all COVID-19 patients from February to July 2020. Patients were divided into two groups of COVID-19 positive (1044 cases) and negative (1231 controls) randomly based on entrance number. **Results:** The frequency of smokers in the case group is significantly lower than the control group (15.4% vs. 28%). However, the number of days of hospitalization and the use of more than 3 medications in the group of smokers were significantly higher. A comparison between groups of case and control based on smoking indicates that the death rate was significantly higher in smokers with COVID-19. **Conclusions:** The results of this study showed that although the number of smokers in COVID-19 patients is significantly lower, smokers run an aggresive  curse and have higher mortality.

**KEY WORDS:** COVID-19, death, severity, smoking

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## INTRODUCTION

COVID-19 is a coronavirus outbreak that initially appeared in China, in December 2019, but it is already a pandemic worldwide.[1,2] COVID-19 can harm cardiovascular and respiratory systems while the damage caused to the lungs by smoking makes patients more susceptible to pulmonary viral infections.[3] We know that people with bad health conditions caused by tobacco use are at a higher risk of developing severe COVID-19 symptoms.[4]

The pandemic is still unfortunately under progression; there are limited data with regard to the clinical characteristics of the patients.[5] Smoking has been granted to be associated with damaging disease prognosis, as evidence has highlighted the negative impact of tobacco use on lung health.[6] Smoking is also detrimental to the

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immune system and its responsiveness to infections, making smokers more vulnerable to infectious diseases.[7] Many studies have shown that smokers are twice more likely than nonsmokers to contract influenza and have more severe symptoms, while smokers were also noted to have higher mortality in the previous MERS-CoV outbreak.[8,9]

The effect of cigarette smoking further raises the question of whether this also applies to people who use waterpipe[10] or have switched over to safer alternatives such as electronic cigarettes and heated tobacco products which are supported by tobacco industry now. It is important to note here that regardless if they produce vapor or smoke, they can still produce infectious lung damage as traditional cigarettes do and therefore they cannot be considered as safer options.[11-13] As we know that smoking cessation by any means should be a priority among smokers with comorbidities, it is very important to focus on that with COVID-19 patients.[14,15] However, few data suggest that smokers are less among those hospitalized with COVID_19.[16]

The epidemic of COVID-19 in Iran, which was in ten countries to report the disease, started since mid-February 2020, and based on official report, there were 259,652 confirmed cases, 13,032 deaths, and 222,539 recovered cases till July 14, 2020.[17] As the smoking rate in Iran was about 15% (27% – male and 4% – female),[18,19] we would like to aware of finding this status among COVID-19 patients for the first time in Iran. This study was designed and implemented for investigating the severity and outcome of COVID-19 based on smoking.

## MATERIALS AND METHODS

This was a case–control study that was designed and implemented to determine the frequency of smoking and compare it with the treatment outcome. The definition of smoker was using any type of tobacco at any time during 1 month before hospitalization. All cases admitted in two

hospitals in Tehran and Ahvaz from February to July 2020 were examined and divided into two groups of COVID-19 positive (case) and negative (control) randomly based on entrance number. A written consent form was signed by patients or accompanying persons. Exclusion criteria included history of trauma, refusal of consent, admission of less than 3 days, and end stage patients. Demographic data, data on smoking history (past, present, type, number a day, willingness to quit, and nicotine dependency), and COVID-19-related data (polymerase chain reaction and complete blood count tests, lung computed tomography scan, admission to intensive care unit [ICU], medications used, duration of hospitalization, and information on the outcome, i.e., recovery or death) were collected and recorded on a predefined proforma. The data were analyzed by SPSS 20. Data normality was examined by Kolmogorov–Smirnov test. The significance of the difference between the numbers of days of hospitalization based on smoking in the groups was tested by $t$-test, and for categorical variables, Chi-square was used. A $p$ value of <0.05 was considered significant.

## RESULTS

2275 patients recruited were divided into two groups of COVID-19 positive (1044 case) and negative (1231 control). The demographic characteristics and information in the case and control groups are given in Table 1. There is no significant difference between the two groups in the variables of sex and age and history of chronic diseases and symptoms. The frequency of smokers in the case group is significantly lower than the control group (15.4% vs. 28%). The comparison of the course of the disease and its manifestations and the results of treatment in smokers and nonsmokers are shown in Table 2. The frequency of lung involvement, transfer to ICU, number of days of hospitalization, and use of more than 3 medications in the group of smokers were significantly higher, but the mortality rate in the two groups of smokers and nonsmokers was not significantly different. Table 3 shows after dividing of death rate between groups of

**Table 1: Characteristics of patients in case-control groups**

| | Case COVID-19 positive, $n$ (%) | Control COVID-19 negative, $n$ (%) | Significance |
|---|---|---|---|
| $n$ (%) | 1044 (45.8) | 1231 (54.2) | - |
| Sex | | | |
| Male | 585 (56) | 704 (57) | 0.85* |
| Female | 459 (44) | 527 (43) | |
| Age, mean (SD) | 50.1 (15.1) | 48.2 (14.3) | 0.43** |
| Smoking | | | |
| Yes | 161 (15.4) | 345 (28) | 0.00* |
| No | 883 (84.6) | 886 (72) | |
| Symptom | | | |
| Cough | 407 (39) | 613 (43.8) | 0.18* |
| Dyspnea | 405 (38.8) | 608 (42.1) | |
| Fever | 566 (54.2) | 435 (35.3) | |
| History of disease+ | | | |
| Yes | 966 (86.8) | 1094 (88.9) | 0.138* |
| No | 138 (13.2) | 137 (11.1) | |

*Chi-square test, **$t$-test, +Having at least one of chronic diseases such as diabetes, hypertension, heart disease, and lung disease. SD: Standard deviation

case and control based on smoking which the death rate was significantly higher in smokers with COVID-19. The comparison of day hospitalization in the case and control groups by independent sample *t*-test which indicated that smokers had more admission is showed in Table 4. A multivariate regression analysis was done, and there was no support for a statistically significant difference.

## DISCUSSION

In this study, it was significantly observed that the use of more medications, which can indicate more aggravation of the disease and higher costs, was more in the smoking group. This was also seen for deaths in the smokers' case group, which could indicate a higher effect of smoking on COVID-19 disease.

Smoking is known to be a risk factor for many respiratory infections.[20] Smoking is also associated with increased development of acute respiratory distress syndrome, a key complication for severe cases of COVID-19.[21] This may have implications for smokers given that the virus that causes COVID-19 primarily affects the respiratory system causing mild to severe respiratory damage.[22]

**Table 2: Comparison of outcomes in patients based on smoking**

|  | Smokers | Nonsmokers | Significance |
| --- | --- | --- | --- |
| *n* (%) | 506 (22.2) | 1769 (77.8) | - |
| Type of medication |  |  |  |
| More than 3 | 309 (72.2) | 908 (49.2) | 0.00* |
| 3 drugs or less | 119 (27.8) | 939 (50.8) |  |
| Days of hospitalization, mean (SD) | 12.1 (3.5) | 9.6 (2.6) | 0.00** |
| Death |  |  |  |
| Yes | 116 (27.1) | 473 (25.6) | 0.540* |
| No (recover) | 312 (72.9) | 1378 (74.4) |  |

*Chi-square test, **t-test. SD: Standard deviation

**Table 3: Comparison of medication and death in case and control groups by smoking**

| Groups | Smoking | Type of medication | *n* (%)* | Death | *n* (%)* |
| --- | --- | --- | --- | --- | --- |
| Case | Smoker | More than 3 | 117 (86) | Yes | 58 (42.6) |
| COVID-19 |  | 3 or less | 19 (14) | No | 78 (57.4) |
| positive | Nonsmoker | More than 3 | 411 (45.3) | Yes | 237 (26.1) |
|  |  | 3 or less | 497 (54.7) | No | 671 (73.9) |
| Control | Smokers | More than 3 | 192 (65.8) | Yes | 58 (19.9) |
| COVID-19 |  | 3 or less | 100 (34.2) | No | 234 (80.1) |
| negative | Nonsmoker | More than 3 | 492 (52.9) | Yes | 236 (25.1) |
|  |  | 3 or less | 442 (47.1) | No | 703 (74.9) |

*Significant, *P*=0.00

In addition to effects of cigarette and according to evidence vaping could be associated with lung injuries, COVID-19 may have implications for e-cigarette users.[23] Many studies have shown that waterpipe use is associated with an increased risk of transmission of infectious agents.[24]

Unexpectedly, the number of smokers in the case group with a positive COVID-19 test was significantly lower than the control group, which can lead to the misconception that smoking is a protective factor against the prevalence of COVID-19 disease which has been erroneously referred to in some studies which indicate that nicotine may be suggested as a potential preventive agent against COVID-19 infection.[25] However, this study showed that deaths in the smokers' case group, were significantly higher. This condition has been observed in some studies,[3,5] but in other studies, it was not mentioned[16] this necessitates a larger study for more convincing and statistically robust evidence.

The finding of this study showed that the transfer to ICU and the use of more than 3 medications in the group of smokers are significantly higher, and smoking significantly increases the number of hospitalization days in the case group [Table 4]. These three new indicators may examine in future studies.

While the science of COVID-19 is evolving, the limited evidence we have shows that smoking worsens outcomes for COVID-19 patients.

## CONCLUSION

The results of this study showed that although the number of smokers in COVID-19 patients is significantly lower and can lead to the misconception that smoking is a protective factor in this disease, these people. As a result, they have more severe and worse consequences.

### Limitations
Hospital-based studies can suffer from several limitations, including poor data quality. Collecting smoking history is challenging in emergency contexts and severity of disease is often not clearly defined and is inconsistent across studies, but we simply include all types and times of smoking in the last month. This study with random sampling tried to cover significant sampling bias. Characteristics of those who are hospitalized will differ by country and context depending on available resources,

**Table 4: Comparison of the mean day hospitalization in case and control groups by smoking, independent sample *t*-test**

| Groups | Smoking | *n* | Mean (SD) | *t* | df | Significance (two-tailed) | 95% CI | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | Lower | Upper |
| Case COVID-19 positive | Smoker | 136 | 13.8 (3.4) | 7.8 | 426 | 0.00 | 2.02 | 3.37 |
|  | Nonsmoker | 908 | 9.91 (2.8) | 2.4 | 1845 | 0.16 | 0.05 | 0.55 |
| Control COVID-19 negative | Smokers | 292 | 11.1 (3.2) | 7.7 | 249 | 0.00 | 2.00 | 3.38 |
|  | Nonsmoker | 939 | 9.6 (2.5) | 2.4 | 1815 | 0.16 | 0.5 | 0.55 |

CI: Confidence interval, SD: Standard deviation

access to hospitals, clinical protocols, and possibly other factors not considered in the studies. Further, in this study, we make statistical adjustments to account for sex, age, and other confounding factors. However, it is important for us to see different smoking rates.

## Conflicts of interest

There are no conflicts of interest.

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