Research Article

Smoking, vaping and hospitalization for COVID-19

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The study presents an analysis of the current smoking prevalence among hospitalized patients with COVID-19 in China, compared to the population smoking prevalence in China (52.1% in males and 2.7% in females). We identified 5 studies examining the clinical characteristics of hospitalized COVID-19 patients that presented data on the smoking status. The expected number of smokers was calculated using the formula Expected smokers = (males x 0.521) + (females x 0.027). An unusually low prevalence of current smoking was observed among hospitalized COVID-19 patients (10.2%, 95%CI: 8.7-11.8%) compared to the expected prevalence based on smoking prevalence in China (31.3%, 95%CI: 29.0-33.6%; z-statistic: 17.89, P < 0.0001). This preliminary analysis does not support the argument that current smoking is a risk factor for hospitalization for COVID-19, and might suggest a protective role. The latter could be linked to the downregulation of ACE2 expression that has been previously known to be induced by smoking. No studies recording e-cigarette use status among hospitalized COVID-19 patients were identified. Thus, no recommendation can be made for e-cigarette users. Keywords. SARS-CoV-2, COVID-19, ACE2, expression, susceptibility, smoking, hospitalization, electronic cigarette.

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Introduction

There is a lot of speculation about the effects of smoking on Corona Virus Disease 2019 (COVID-19). Smoking increases susceptibility to respiratory infections and media reports suggest that it may increase the risk of being infected with acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus responsible for COVID-19. SARS-CoV-2 is known to use the angiotensin converting enzyme 2 (ACE2) as a receptor for cell entry, and there is evidence that smoking downregulates ACE2 expression in the lung

and other tissues.[1] China has a high prevalence of smoking (27.7%), much higher among males (52.1%) than females (2.7%).[2]

Methods

To examine how the prevalence of smoking among hospitalized COVID-19 compares to the smoking prevalence of the population, we searched the literature and identified 5 studies examining clinical features of hospitalized COVID-19 patients in China with data about the smoking status.[3-7] Prevalence of smoking among hospitalized patients was compared with the expected prevalence that was calculated based on the population smoking prevalence and gender of hospitalized cases using the formula: Expected smokers = (males x 0.521) + (females x 0.027).

Results

Findings are presented in Table 1. From a total 1546 hospitalized COVID-19 cases analyzed in the 5 studies included, 58.0% were males and 42.0% were females. The prevalence of current smoking was 10.2% (95%CI: 8.6–11.7%). However, the calculated expected prevalence of current smoking, considering the population prevalence in China was 31.3% (95%CI: 29.0–33.6%). The difference was statistically significant according to z-test (z-statistic: 17.89, P < 0.0001).

Table

	Hospitalized cases	Males	Females	Expected current smokers (1)	Expected current smokers	Hospitalized Current smokers	Hospitalized Current smokers
	N	n	n	n	% (95%CI)	n	% (95%CI)
Guan et al.	1096	637	459	344	31.4 (28.7–34.1)	137	12.5 (10.5–14.5)
Zhou et al.	191	119	72	64	33.5 (26.8–40.2)	11	5.8 (2.5–9.1)
Zhang et al.	140	71	69	39	27.8 (20.4–35.2)	2	1.4 (0.0–3.3)
Liu et al.	78	39	39	21	27.4 (17.5–37.3)	5	6.4 (0.1–11.8)
Huang et al.	41	30	11	16	38.8 (16.9–45.3)	3	7.3 (0.0–15.3)
Total	1546	896	650	484	31.3 (29.0–33.6)	158	10.2 (8.6–11.7)

Table 1. Gender and smoking prevalence among hospitalized COVID-19 patients, and expected number of smokers based on population prevalence of smoking in males (52.1%) and females (2.7%) in China.

z-statistic: 17.89, P < 0.0001. (1) Expected number of smokers was calculated based on the prevalence of smoking in China, using the formula:Expected smokers = (males x 0.521) + (females x 0.027)

Discussion

The current study examined for the first time the prevalence of current smoking among hospitalized patients with COVI-19 in China and compared it with the expected prevalence based on the population smoking prevalence. Care was taken to consider the large difference between genders, with current smoking being substantially more prevalent among Chinese males than females. An unusually low prevalence of current smoking among hospitalized COVID-19 cases in China was observed when considering the population smoking prevalence. The true prevalence of current smoking among

hospitalized COVID-19 cases presented in 5 studies was approximately one-third the expected prevalence. This preliminary analysis, assuming that the reported data are accurate, does not support the argument that current smoking is a risk factor for hospitalization for COVID-19, and might even suggest a protective role. The latter could be linked to the downregulation of ACE2 expression that has been previously known to be induced by smoking. However, other factors, such as socioeconomic status, should be considered in examining the access of smokers with COVID-19 to hospital care. Furthermore, disease progression, complications and death among hospitalized COVID-19 patients who are current smokers need to consider other comorbidities, such cardiovascular disease, which are risk factors for adverse COVID-19 outcomes and are more prevalent among current smokers. Currently available evidence does not allow for a multivariate analysis adjusted for such factors. It remains unclear whether smoking per se or other factors related to comorbidities may be responsible for an adverse outcome. No studies recording e-cigarette use status among hospitalized COVID-19 patients were identified. Thus, no recommendation can be made for e-cigarette users.

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