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COVID-19 and smoking: a high-risk association

COVID-19 e tabagismo: uma relação de risco

COVID-19 y tabaquismo: una relación de riesgo

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SARS-CoV-2, the novel coronavirus that causes COVID-19, emerged in China in late 2019 and rapidly reached pandemic status. The virus displays tropism for the respiratory system, causing symptoms that range from an acute respiratory syndrome, manifested in mild form in the vast majority of cases, and progressing in some cases to an extremely severe and rapidly developing type of pneumonia with major respiratory failure, evolving to death [1].

The following are known risk factors for more severe outcomes, including the need for admission to intensive care and/or mechanical ventilation and death: age 65 years or older; long-term institutional care; chronic obstructive pulmonary disease; moderate to severe asthma and oxygen-dependent; severe or decompensated cardiac disease; decompensated hypertension; chromosomal diseases or suppressed immune status; end-stage renal disease; high-risk pregnancy; severe obesity at any age (BMI > 40); and other clinical conditions such as liver disease [2,3]. COVID-19 may also involve endothelial dysfunction, potentially leading to severe coagulopathies and thromboses [4].

However, it is possible that an important risk factor for COVID-19 has not been included thus far in the global guidelines for control of the pandemic, namely smoking.

Smokers are part of the risk group for COVID-19. One can infer the group's increased risk of infection to the extent that smokers tend to hold smoking products to their mouths (whether conventional cigarettes or electronic smoking devices – ESDs) without adequate prior hand hygiene.

Waterpipes, which are highly popular in the younger population (who generally share the mouthpieces), facilitate SARS-CoV-2 transmission [5]. The World Health Organization (WHO) expressed concern over the potential spread of COVID-19 through the use of tobacco products [5]. The literature indicates that diseases such as influenza, oral herpes, and tuberculosis are transmitted through waterpipe mouthpieces [6]. The characteristics of electronic smoking devices allow shared use, and the ESDs should thus also be classified as products that contribute to SARS-CoV-2 infection.

Another relevant factor is the risk of smokers suffering burns when lighting a cigarette or handling a waterpipe after hand hygiene with alcohol in gel, a highly flammable product.

As for the harms from COVID-19 infection, smoking increases the risk of lung damage. Smoking is related to bronchiolitis (generally asymptomatic), various types of pneumonia, chronic bronchitis, pulmonary emphysema, tuberculosis, and lung cancers, leading to decline in lung function [7].

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Studies in animal and human cells suggest that tobacco increases the severity of infectious diseases such as influenza, increasing viral replication through suppression of antiviral mechanisms and alterations in cytokine patterns in cells with a central role in innate mucosal immunity [5]. Smoking also increases the expression of angiotensin converting enzyme-2 (ACE-2), a known SARS-CoV-2 receptor [8].

Smoking is related to endothelial dysfunction and elevated concentrations of free radicals, just as microbial infections like COVID-19 [9]. It is plausible that COVID-19 damages a smoker's previously injured endothelium. However, smoking cessation significantly improves impaired endothelial function [10].

COVID-19 patients display high C reative protein (CRP) and D-dimer levels [6,7]. These diagnostic markers of thrombosis are also altered in smokers [11,12]. One study found disseminated intravascular coagulation in 71% of fatal cases of COVID-19 compared to 0.4% in survivors [13]. High D-dimer levels (> 1μg/L) at hospital admission increase the odds of evolution to death by 18 times [14,15]. The mechanism of these complications is still unknown, but they suggest the relevance of smoking's impact on the endothelium and COVID-19.

Although one metanalysis found no association between smoking and more serious outcomes of COVID-19 [14], the most robust study with the largest sample found a relationship between smoking and worse progression of the disease [15]. Preprint articles have suggested that smoking is a risk factor for severe manifestations of COVID-19 [13,16]. A more recently published meta-analysis also indicates that smoking is a risk factor for worse prognosis in COVID-19 [17].

Smokers with COVID-19 have 3.25 higher odds of developing severe forms of the disease when compared to non-smokers [18].

Despite the plausibility that these complications are due to the impacts of smoking, some studies have failed to report a relationship between smoking and progression of COVID-19.

The possible explanations for these conflicting findings may be found in the article by Szklo [19], including incorrect identification of smokers, economic vulnerability, heightened attention to exposure to the virus, and less presence due to tobacco-free environments laws. Additional factors could be the definition of smokers used in the studies (e.g., defining users of electronic cigarettes as non-smokers and time since last tobacco use) and information bias, considering that verbal communication is limited between health professionals, family members, and patients with more serious cases of COVID-19.

There is no study correlating progression of COVID-19 and use of ESDs. However, animal studies with electronic cigarettes have demonstrated altered lipid homeostasis in alveolar macrophages and epithelial cells, besides decreased immunity to viral agents [20].

Human study, reported that electronic cigarette users showed changes in protein profile linked to innate immune defense in airway secretions, inducing changes similar to those observed in conventional cigarettes smokers [21].

Independent studies suggest that the byproducts of heated tobacco lead to alterations in lung cell homeostasis [22] and endothelial injury [23]. Both conventional and electronic cigarettes may also increase the expression of the ACE-2 viral receptor [8].

Thus, the alterations and lung damage caused by tobacco products and ESDs can be considered risk factors for the more severe manifestations and progression of COVID-19.

With the arrival of the COVID-19 pandemic, uncertainties concerning the future and social isolation measures are associated with preoccupation towards the disease. In this scenario, people may develop emotional responses that interfere negatively in their self-efficacy, since they feel emotionally vulnerable to face a real threat, being able to appeal to inappropriate strategies, such as smoking, in an attempt to reduce emotional imbalance [24].

Although there are no data on smoking and relapse during epidemics, studies have suggested that smokers exposed to natural disasters tend to smoke more than unexposed smokers [25] and that former smokers are more likely to relapse [26].

During social isolation and stay-at-home orders, active smokers expose non-smokers to secondhand smoke. Secondhand smoke can cause smoking similar damage [27], including increased ACE-2 expression [8]. One cannot rule out the emission of aerosols containing the virus, especially in ESDs,

which operate at lower temperatures. More studies are necessary to determine the extent of impacts of secondhand smoke on COVID-19 transmission and progression.

Gas exchange, lung function, and blood circulation, processes directly affected in COVID-19, improve quickly after smoking cessation [10]. Quitting smoking and avoiding exposure to tobacco smoke and vapors can have a positive impact, reducing the risk involved in COVID-19 and smoking.

Contributors

All the authors collaborated in the writing and final revision of the manuscript.

Additional informations

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