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Cigarrillos electrónicos (CE): Consideraciones sobre las complicaciones pulmonares y cardiológicas asociadas a su consumo

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EDITORIAL

Currently, the consumption of smoking devices, considered by society as "vapers," is becoming increasingly common among the younger population, with its use being noted even in the face of legal prohibitions established in society. Some of its attractions can be attributed to various factors, among which stand out its design considered more modern, characterized by presenting innovative and practical engineering for consumption, as well as the possibility of inhaling sweeter aromas and having a more pleasant breath, making its consumption more acceptable with all these strategies for the diverse groups within society.[1,2,3]

Considered a technological novelty and, given the diversity of flavors and models, electronic cigarettes (ECs), in addition to the various compositions in their constituent structure, the aerosols generated by the heating of these devices, when inhaled, tend to provoke "inflammations" and "hyper-responsiveness" in the airways, posing a risk of developing pulmonary and cardiac diseases. With this new form of addiction, society has been strongly challenged by the paradox of smoking, where on one hand public policies favor campaigns to reduce the consumption of conventional cigarettes, while on the other hand, the popularity of ECs is rising, without proper oversight, leading to indiscriminate use among the younger population.[6,7,8]

This dangerous practice has been favoring not only the emergence of pulmonary and cardiac complications but also sociocultural and socioeconomic harm, since its users usually begin using ECs before the age of twenty, directly interfering with their personal financial expenses.[6–8] According to some researchers, and given the enormous growth of this consumer public, who use ECs daily, a higher record of acute respiratory and cardiac complications has been identified, as well as damage to the immune system, in addition to variations in the severity of body-related disorders.[7–9]

Knowing that the main system affected by EC exposure is the pulmonary system, and considering the complexity of the anatomy and physiology involved in respiration, it normally undergoes oxidative stress promoted by prolonged consumption, since their composition contains some harmful substances to the body.[6–9] In this context, among the substances identified in this dangerous process are formaldehyde (CH_2O), acetaldehyde (C_2H_4O), heavy metals such as lead (Pb), copper (Cu), silver (Ag), mercury (Hg), and cadmium (Cd), all of which are considered by the International Agency for Research on Cancer (IARC) to be carcinogenic substances.[6 8 9 23]

Also within this context, propylene glycol ($C_3H_8O_2$) and glycerin ($C_3H_8O_3$) can be found, with concentrations ranging from 16 to 22 mg/ml. They constitute a concerning factor due to their toxicity, associated with the presence of nicotine ($C_{10}H_{14}N_2$) and flavoring agents, the latter being one of the main forms of attraction for the younger population.[8 9 23] In the case of propylene glycol ($C_3H_8O_2$), it is considered a toxic product and, besides having high chemical content, it is commonly used in the production of polyester resins, food products, liquid detergents, and antifreeze products.[9 23]

Biochemically, it is also used as a solvent, humectant, and emulsifier in cosmetic products. When combined with glycerin, it is identified as a solvent for nicotine ($C_{10}H_{14}N_2$), forming the base of the liquid to be vaporized, in which these contents in liquid form are converted into aerosols.[7–9 23] Given the uncontrolled consumption of ECs, researchers report that some findings in radiological exams were able to demonstrate the presence of characteristic pulmonary alterations due to their consumption, based on the symptoms identified in these individuals.[7–10]

Among the known alterations are difficulty breathing (dyspnea), coughing, expectoration of blood from the lower respiratory tract, lungs, trachea, or bronchi (hemoptysis), as well as gastrointestinal involvement, evidenced by nausea, vomiting, and abdominal pain.[5–10] In more severe cases, increased heart rate (tachycardia) and rapid breathing, i.e., a respiratory rate above normal (tachypnea), are also verified.[10]

In this sense, and in addition to these symptoms, recent studies point out that medium- and long-term continuous use of ECs may lead to the emergence of adverse cardiovascular problems, since nicotine ($C_{10}H_{14}N_2$) present in these devices activates the sympathetic nervous system (SNS).[11 12] With this activation, this complex phenomenon physiologically causes an increase in heart rate, blood pressure (↑BP), and oxidative stress. Thus, the chemical components of which they are composed favor the formation of atherosclerotic plaques and increase the risk of developing a stroke.[11 12]

It is verified that the "false perception of safety" generated among EC users leads many consumers to indiscriminate use, considering that some

research indicates that replacing conventional cigarettes with ECs reduces exposure to certain toxic substances.[13 14] However, catecholamines (CA) are also identified as hormones and neurotransmitters that control the central nervous system (CNS) and the autonomic nervous system (ANS). Their levels tend to increase, leading to higher cardiac load and cumulative damage to cardiovascular health.[13 14]

Among these data, the early development of arrhythmias can be pointed out when these users already have a genetic predisposition for the emergence of cardiovascular diseases.[13 14] In this context, the "E-cigarette or Vaping product use-Associated Lung Injury" emerged in mid-2019, better known as "EVALI," also called "VAPI" (vaping-associated lung injury). It is classified as an acute or subacute disease that can be severe and life-threatening, characterized by a set of respiratory and gastrointestinal symptoms.[15–17]

In this sense, and according to some researchers, the causes and mechanisms leading to the diagnosis of "EVALI" are still not precise; however, histopathological findings have identified the presence of diffuse alveolar damage associated with bronchiolocentric pneumonia and/or acute fibrinous and organizing pneumonia (AFOP).[16–18] In addition, diagnosed cases may progress to respiratory failure, requiring oxygen (O_2) support, orotracheal intubation (OTI), and in more severe cases, treatment with mechanical ventilation (MV).[16–18]

Regarding the gastrointestinal system, the development of inflammatory processes tends to alter its microbiota, causing fragility of the intestinal membrane and, consequently, favoring the onset of several chronic, inflammatory, and cardiovascular diseases.[8–10 19 20] In this context, changes in microbial balance and diversity are verified. These findings are of great importance for medical and clinical analysis, as they corroborate the identification of harmful effects related to the indiscriminate use of these devices.[9 10 19 20]

Still in this context, and considering a pulmonary pathology that does not present specific symptoms for an accurate diagnosis, such as "EVALI," it is necessary to correlate the findings with those identified in computed tomography (CT) scans.[21 22] Thus, it is important to correlate imaging exams with verified clinical signs and symptoms, such as cough, malaise, difficulty breathing, as well as the history of continuous medium- or long-term EC use, making these findings essential for a positive and unquestionable result.[9 10 21 22]

When radiographic examinations reveal "diffuse or multifocal ground-glass opacities," these become indicative of pulmonary tissue inflammation and edema, especially in the lung lobes. This characterizes a possible positive diagnosis for "EVALI" and allows for the adoption of appropriate therapeutic approaches for proper treatment.[20–22] In this context, it is important to highlight Collegiate Board Resolution (RDC) No. 46/2009 of the Brazilian Health Regulatory Agency (ANVISA), which "prohibits the commercialization, importation, and advertising of electronic smoking devices, identified as ECs."[23–25]

In contrast, the commercialization and importation of the fourth (4th) generation of ECs has already been identified, with acquisition values ranging from approximately R$ 60.00 to R$ 680.00. However, many adherents of this new smoking modality declare permission for the use of these devices, claiming that inhalations do not carry smoke but rather "vapor," since there is no burning of tobacco and tar. This demonstrates consumers' lack of awareness regarding the

risks of their consumption.[26–28] In this context, it is possible to understand that the indiscriminate emergence and consumption of ECs stimulated a "false perception" of a "safe consumption habit," in addition to a "positive image" when compared to conventional cigarettes and the numerous smoking products currently commercialized.[24–28]

Despite the existence of bans on the commercialization of ECs in Brazil, health policies for the prevention of smoking product consumption, ANVISA Resolution No. 46/2009, among other efforts, there is still a high demand for the acquisition and consumption of ECs, mostly by new consumers belonging to younger age groups who are unaware of the direct and indirect risks posed by these devices.[24–28]

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