

LETTER to the EDITOR

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From Smoke to Vapor: Understanding the Auditory Consequence from Traditional Smoking to Vaping

Asian Pac J Cancer Prev, 25 (3), 719-721**Dear Editor**

We recently read 'The Impact of Cigarette Smoking, Water-Pipe Use on Hearing Loss/Hearing Impairment: A Cross-Sectional Study' by Bener and Colleagues [1]. The study provides valuable insights into the association of smoking habit, comorbidities, and hearing loss. We commend the authors on an interesting piece of research; however, we would like to take this opportunity to discuss a few nuances on tobacco related pathogenesis of hearing impairment and plausible future implications in purview of evolving smoking trends.

Numerous studies have documented the health risks of tobacco smoking and recently, there has been a surge in the number of studies analysing the association between smoking tobacco and hearing impairment [2-4]. Tobacco induced hearing impairment unfolds with the introduction of tobacco smoke in the auditory system. Nicotine acts as a vasoconstrictor, initiating a cascade of molecular events that involves endothelial dysregulation, oxidative stress, and inflammatory reaction. Auditory hair cells and neurons are at risk of getting oxidative damage owing to the minute alterations in the microcirculation. Alterations in the neurotransmitter signalling mechanism can further lead to anomalies in the auditory processing. Data suggests that tobacco combustion products can cause ototoxic effects on the cochlea and auditory nerve which can further lead to impaired hearing sensation. In purview of these complex cascade of events and resonance amplification effects, the auditory tissue is more susceptible to tissue injury. Additionally, the quantum duality of middle ear effusion dynamics along with the complicated physiology can result in a quantum- entropic tinnitus nexus.

Similar pathologic hearing impairment has been observed in patients suffering from Oral Submucous Fibrosis (OSMF), associated with areca nut and smokeless tobacco (SLT) chewing habit. Majority of the OSMF patients suffer from fibrosis of the soft palate which along with the involvement of the palatal muscles can lead to its shortening and eventually atrophy thereby causing decreased patency. As a result, the eustachian tube fails to regulate the air pressure which in due time leads to hearing impairment [5-7].

On the other hand, electronic cigarettes (e-cigarettes) have become the most popular means of electronic nicotine delivery systems (ENDS) that were meant to emulate and aid in the cessation of smoking habit. E-cigarettes were first introduced in 2007 and the consumer market has been

growing ever since. Recent data suggests that e-cigarette usage by adolescents has surged, ranging from 3.3% to 11.8% in many countries [8]. Long term effects of vaping and e-cigarette use on the auditory perception is warranted in the future, particularly given the changing landscape of smoking habits. An e-cigarette or 'vape' comprises of a battery, a vaporising chamber, and an electronic liquid (e-liquid). This e-liquid which contains propylene glycol, vegetable glycerine, and flavouring agents with or without nicotine when heated delivers aerosols which are inhaled. Although, all the components in the e-liquid, except nicotine, are used as food additives and are universally recognised as safe, these notions only relate to ingestion, not inhalation. As there are no laws or manufacturing standards for e-liquid components, there is a growing number of new flavours that are launched in the commercial markets each year. Toxic compounds, including carcinogens and heavy metals that are generally present in e-liquids, have been reported at low amounts in aerosols [9]. Recent studies have also found that e-liquids are cytotoxic to human pulmonary fibroblasts, human embryonic stem cells, and mice brain stem cells [10].

Vape associated hearing impairment can be postulated to begin with the inhalation of e-cigarette aerosols. The e-liquid ingredients are known to cause inflammation and oxidative stress. Disturbances in neurotransmitter signalling may influence the central auditory pathways, altering auditory information processing at the sub-cellular and quantum level. The pathogenic process is further complicated by long term effects of heavy metals. The quantum duality of middle ear effusion and the interplay of components with auditory structures produces a distinct landscape which may lead to neurosensory complications including tinnitus. Vaping being a relatively new phenomenon, continued studies are needed to understand the precise aspect of this novel pathogenesis.

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Reply to the letter to the editor: The Impact of Cigarette Smoking, Water-Pipe Use on Hearing Loss/Hearing Impairment: A Cross-Sectional Study

Dear Editor

We appreciate you and your journal readers' interest in our study entitled: "The Impact of Cigarette Smoking, Water-Pipe Use on Hearing Loss/Hearing Impairment: A Cross-Sectional Study" by Bener et al. [1]. The aim of our research was designed as an epidemiological study was to determine the association between cigarette smoking, waterpipe - Nargileh use, and co-morbidity diseases on hearing loss. We we did not plan to the pathological aspect of cigarette smoking and waterpipe - Nargileh use.

We thank Anand et al. 2024 [2] for their valuable contributions to our study. As mentioned by Anand et al. [2] "From smoke to vapor: understanding the auditory consequence from traditional smoking to vaping". Current smokers are at a higher risk for hearing loss compared to non-smokers and the hearing system is greatly affected by cigarette smoking [3-7]. Several studies have documented the health risks of tobacco smoking and recently, there has been a surge in the number of studies analysing the association between smoking tobacco and hearing impairment [7-9]. Tobacco induced hearing impairment unfolds with the introduction of tobacco smoke in the auditory system. Nicotine acts as a vasoconstrictor, initiating a cascade of molecular events that involves endothelial dysregulation, oxidative stress, and inflammatory reaction which Auditory hair cells and neurons are at risk of getting oxidative damage owing to the minute alterations in the microcirculation [2].

We do agree with this recommendation by Anand et al. [2], electronic cigarettes (e-cigarettes) have become the most popular means of electronic nicotine delivery systems (ENDS) that were meant to emulate and aid in the cessation of smoking habit. Long term effects of vaping and e-cigarette use e produce toxic compounds, including carcinogens and heavy metals that are generally present in e-liquids, have been reported at low amounts in aerosols [10-13]. Recent studies have also found that tobacco and menthol flavored nicotine-free electronic cigarettes are cytotoxic to human pulmonary fibroblasts, human embryonic stem cells, inflammation and dysregulated repair in lung fibroblast and epithelium [11]. Meanwhile, electronic cigarettes (e cigarettes) are widely available, and their use is increasing worldwide. E cigarettes are designed to provide smokers with the desired nicotine dose without burning tobacco [12].

Furthermore, "electronic nicotine delivery system"ENDS users are susceptible to periodontal disease, caries, soft tissue injuries, and changes in tooth and prosthesis coloration [13]. The chemical components in ENDS can induce cellular changes associated with a potential risk of oral cancer. Although, more long-term cohort studies are needed to fully understand the impact of ENDS use on oral health.

Overall, Cigarette smoking and water-pipe nargileh nicotine causes vasospasm of cochlear vascular loops, production of carboxyhaemoglobin, increased blood viscosity, reduced oxygen transport, and difficulty in oxyhemoglobin dissociation leading to ischemia of the cochlea. Thus, damage to the hair cells of organ of Corti takes place due to reduction in blood supply of cochlear vessels.

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