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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/20002

DOI URL: <http://dx.doi.org/10.21474/IJAR01/20002>



RESEARCH ARTICLE

"VAPING AND THE SKIN: UNVEILING DERMATOLOGICAL MANIFESTATIONS LINKED TO E-CIGARETTE USE"

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Manuscript Info

Manuscript History

Received: 05 October 2024

Final Accepted: 07 November 2024

Published: December 2024

Abstract

E-cigarettes, often perceived as a safer alternative to traditional smoking, have rapidly gained popularity worldwide. While much attention has been focused on their respiratory and cardiovascular effects, the dermatological implications of e-cigarette use remain underexplored. This article delves into the potential skin-related manifestations associated with vaping, drawing attention to conditions such as contact dermatitis, exacerbation of pre-existing skin disorders, and delayed wound healing. Additionally, we examine the role of chemical components in e-cigarette aerosols, such as propylene glycol, glycerin, and flavoring agents, which may contribute to skin irritation and inflammation. Emerging evidence also suggests a possible link between vaping and systemic effects that impact skin health, including altered immune responses and microvascular changes. By shedding light on these dermatological concerns, this review underscores the need for increased awareness among dermatologists, clinicians, and e-cigarette users. Further research is essential to establish definitive causal relationships and develop targeted interventions for managing these conditions.

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Introduction:-

E-cigarettes made their debut in the U.S. market in 2007 and have experienced a significant surge in usage. Between 2010 and 2013, e-cigarette use among U.S. adults increased from 3.3% to 8.5%. By 2016, approximately 3.2% of adults in the U.S. were regular e-cigarette users, while 15.4% had tried them at least once. In comparison, 15.5% of U.S. adults were cigarette smokers during the same year. Additionally, research in 2016 revealed that approximately 2 million middle and high school students in the U.S. were using e-cigarettes.[1,2]

Electronic cigarettes (e-cigarettes) are hand-held devices that vaporize a liquid, most often containing nicotine, propylene glycol, glycerine, and flavourings, producing an aerosol that when inhaled is meant to mimic smoking regular cigarette products [1]. They were invented in China in 2003, launched in 2004, and have been gaining worldwide popularity since then, making vaping a major alternative to regular tobacco smoking. They are widely regarded as a safer and healthier substitute for nicotine-containing products, and useful in the process of quitting conventional smoking.

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The use of e-cigarettes has increased dramatically in recent years by both smokers and previous non-smokers. Although e-cigarettes were considered a safer option, their negative effects on health, including dermatological conditions, have been reported.

Pathology

E-Cigarettes and Their Health Impacts Mechanism of Bodily Harm Research has identified that one of the key mechanisms through which e-cigarettes cause harm is the generation of reactive oxygen species (ROS) in endothelial cells.[2,3] These ROS can lead to DNA damage, programmed cell death (apoptosis), and necrosis. The resulting endothelial dysfunction is believed to be a central cause of e-cigarette-related skin damage. A healthy endothelium, essential for maintaining skin homeostasis, relies on proper vascular function and blood flow. However, the free radicals produced by e-cigarettes disrupt these functions, increasing plasma viscosity and impairing normal blood flow. Nicotine further complicates this process by promoting unregulated angiogenesis, as evidenced by elevated vascular endothelial growth factor (VEGF) levels in smokers.[4]

Allergic Contact Dermatitis

Cases of allergic contact dermatitis from e-cigarettes have been linked primarily to nickel exposure from the devices. This reaction may also result from spilled e-liquid containing allergens such as menthol, hydroxycitronellal, iodopropynyl butyl carbamate, and polyethylene glycol. These substances are known to trigger contact dermatitis. Symptoms often manifest on the palms (dominant hand) due to prolonged contact with the device, and sometimes on the face and neck. [5]Clinical signs include itchy, red, scaly patches that may become thickened over time. Flavoring agents in e-cigarettes, including compounds like cinnamaldehyde and eugenol, are also recognized skin sensitizers. These substances can impair the innate immune response, promote oxidative stress in keratinocytes, and disrupt the skin barrier, increasing susceptibility to allergic contact dermatitis. Dermatologists should consider vaping as a potential cause when diagnosing unexplained cases of contact dermatitis, especially in younger patients.[1,5]

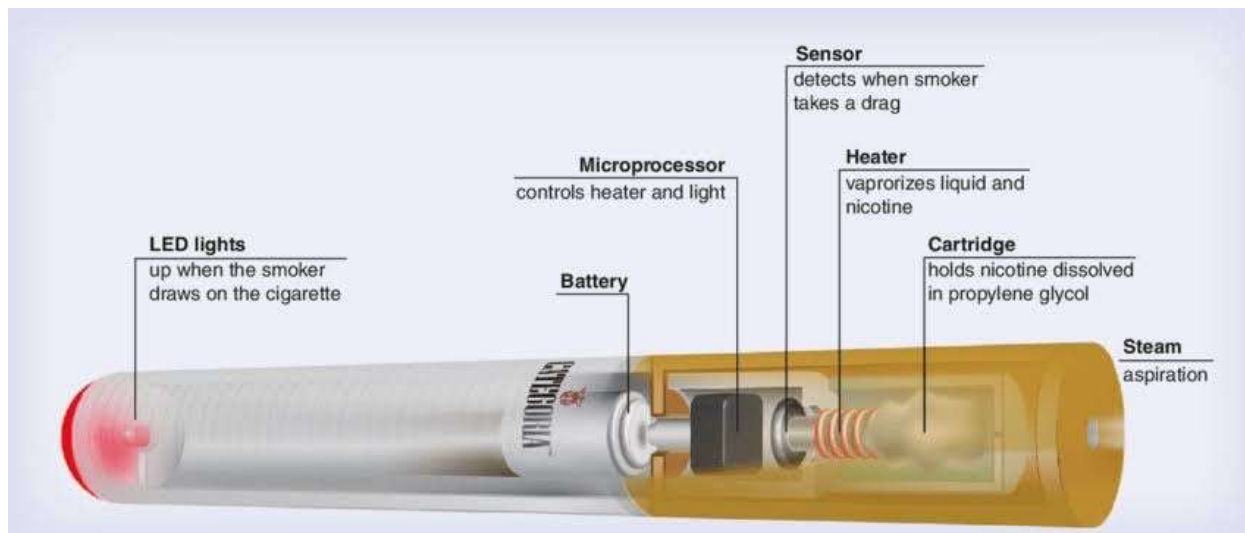
Atopic Dermatitis

Smoking has been associated with an increased risk of atopic dermatitis (AD), and preliminary evidence suggests e-cigarettes may have similar effects. Adolescents who vape are at higher risk for the "atopic march," which includes asthma, AD, and allergic rhinitis. The proposed mechanism involves aerosol inhalation sensitizing the skin and triggering systemic immune responses. This can activate T cells, eosinophils, and mast cells, contributing to the progression of allergic diseases. Physicians should be aware of this risk, particularly in adolescents presenting with new-onset AD and related symptoms.[6]



Burns

Burns caused by e-cigarettes are often the result of lithium-ion battery malfunctions or device short-circuiting, typically when the device comes into contact with metallic objects like keys or coins. These burns, commonly affecting the lower limbs, can range from superficial to deep and sometimes require surgical intervention. Complications such as sepsis and acute respiratory distress syndrome may arise in severe cases.[4,6]



Wound Healing Impairment

Though traditional cigarettes are well-documented to impair wound healing, emerging evidence indicates that e-cigarettes have similar effects. Studies on animal models have shown that e-cigarettes hinder angiogenesis, decrease nitric oxide availability, and increase endothelial cell apoptosis, all of which contribute to poor wound healing. Clinicians should consider these factors when managing patients who use e-cigarettes, especially those undergoing surgical procedures.[7]

Oral Mucosal Lesions

The oral cavity, being the first point of contact for e-cigarette vapor, is particularly vulnerable. Users may develop conditions such as nicotine stomatitis, hyperplastic candidiasis, and black hairy tongue (BHT).[3,6,7]

- **Nicotine Stomatitis:** Characterized by white or gray patches in the mouth, this condition may result from heat exposure or direct cytotoxic effects of e-cigarette ingredients.
- **Hyperplastic Candidiasis:** This presents as white patches, often linked to an acidic shift in oral pH caused by e-cigarette chemicals.
- **Black Hairy Tongue:** This benign condition results from elongation of taste buds and proliferation of chromogenic bacteria, often reversible upon cessation of vaping. Other mucosal issues include lichenoid reactions and, in rare cases, acute epiglottitis. Dermatologists should monitor patients for these symptoms and counsel them on the risks.

Palmoplantar Psoriasis and Pustulosis

A strong correlation exists between smoking and palmoplantar pustulosis (PPP), with nearly all cases reported among smokers or former smokers. E-cigarettes may contribute to this condition through increased keratinocyte cornification and neutrophil-induced inflammation. Additionally, the chemical composition of e-cigarettes may alter the skin microbiome, promoting the growth of *Staphylococcus aureus* and exacerbating symptoms.[8,9,10]

Conclusion:-

The rapid rise in e-cigarette usage, particularly among adolescents, has emerged as a significant public health concern, with growing evidence of its harmful effects extending beyond the respiratory and cardiovascular systems to the skin. Dermatological consequences linked to vaping are diverse and include allergic contact dermatitis and atopic dermatitis, which may arise from exposure to chemical components like propylene glycol, glycerin, and flavoring agents. Additionally, burns from device malfunctions, delayed wound healing due to nicotine-induced vasoconstriction, and oral lesions from aerosol exposure highlight the multifaceted impact of e-cigarettes on skin

and mucosal health. Conditions such as palmoplantar psoriasis may also be triggered or exacerbated by the systemic effects of vaping, further complicating management.

Given these potential risks, it is imperative for dermatologists and other healthcare professionals to proactively educate patients about the dermatological dangers of vaping. Adolescents and young adults, who constitute a significant portion of e-cigarette users, are particularly vulnerable and require targeted awareness campaigns. Advocacy for comprehensive smoking cessation programs that address both traditional tobacco products and e-cigarettes is essential. Additionally, healthcare providers must remain vigilant in recognizing vaping-related skin conditions and incorporate them into patient evaluations. Collaborative efforts between clinicians, policymakers, and public health experts are crucial to mitigate the growing burden of vaping-associated health issues, ensuring a healthier future for vulnerable populations.

Legends To Figure:

Figure 1:- Components of electronic cigarette.

Figure 2:- Dermatological manifestations of e-cigarettes and vaping.

Conflicts Of Interest:

Nil.

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