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Research Article

Impact of Nicotine Pouches on Periodontal Tissues and its Relevance in Saudi Arabia. A Narrative Review

**Suhael Ahmed^{1*}, AlAnood Naif Bin Saedan², Bader Ibrahim Suliman Alshehri²,
Hajer Saeed Alserhani³, Hind Ahmed Ali Almassaud³, Ghaida Abdullah Mohammed
Sabr³, Asma Ali Abdullah Alkurbi³, Hadeel Ali Saeed Alashram³, Abdullah
Abdulrahman Almathmi³, Sahar Jaber Ali Alshamrani³, Arwa Ali Addus Assiri³,
Rakan Abdullah Aleisa⁴**

^{1*}Assistant Professor, College of Medicine and Dentistry Riyadh Elm University Riyadh, Saudi Arabia

²Riyadh Elm University, Riyadh, Saudi Arabia

³King Khalid University, Abha, Saudi Arabia

⁴King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

Abstract

Nicotine pouches are rapidly gaining popularity as an alternative to traditional smoking across the global market. These smokeless products are designed to deliver nicotine without the need for combustion, offering users a different way to satisfy their nicotine cravings. However, their increasing use has sparked concerns about their potential effects on oral health, especially with regard to periodontal tissues. The primary aim of this review is to evaluate the impact of nicotine pouches on periodontal health, focusing specifically on their relevance in Saudi Arabia, where tobacco use, including smokeless products like nicotine pouches, has become more prevalent. By examining and synthesizing the most current research on the subject, this review seeks to explore the ways in which nicotine pouches may contribute to the development or exacerbation of periodontal disease. Furthermore, it will emphasize the importance of public health initiatives to address these concerns and promote awareness of the potential risks associated with these products within the context of Saudi Arabia. Given the increasing adoption of smokeless nicotine products, this review aims to provide valuable insights into their oral health implications and the need for targeted health policies.

Keywords- Nicotine pouches, Periodontium, Oral health, smoking

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Introduction

The use of nicotine pouches has become increasingly popular worldwide, driven by their perception as a safer alternative to traditional smoking and other forms of smokeless tobacco. These small, discreet pouches contain nicotine salts, which are absorbed through the mucous membranes in the mouth, allowing users to experience the effects of nicotine without the need for combustion. Although nicotine pouches are marketed as

a less harmful option compared to smoking or other smokeless tobacco products like snuff and chewing tobacco, concerns have emerged about their impact on oral health. Specifically, there is growing evidence that nicotine, regardless of the delivery method, can adversely affect periodontal tissues, leading to inflammation, tissue damage, and an increased risk of periodontal diseases.

The detrimental effects of smoking on periodontal health are well-established. Numerous studies have demonstrated that tobacco smoke impairs blood flow to the gums, suppresses the immune response, inhibits collagen synthesis, and promotes inflammation—all factors that contribute to the development and progression of periodontal diseases like gingivitis and periodontitis (Brunsvold & Pihlstrom, 1996; Tomar & Asma, 2000). However, while there is a considerable body of research on the impact of smoking and smokeless tobacco products like chewing tobacco, there is a lack of specific studies on the effects of nicotine pouches on periodontal tissues. This knowledge gap is concerning, given the increasing use of these products, particularly among younger populations who may perceive them as a safer option.

Nicotine, the primary addictive substance in these pouches, has long been known to have harmful effects on oral tissues. It causes vasoconstriction, which reduces blood flow to the gums and periodontal ligaments, impairing tissue repair and increasing the susceptibility of periodontal tissues to infection and disease. Additionally, nicotine inhibits the function of immune cells such as neutrophils and macrophages, which are essential for fighting off the bacterial pathogens that contribute to periodontal disease (Van der Velden, 2009). The chronic use of nicotine, therefore, can compromise the body's ability to maintain healthy periodontal tissues and prevent or mitigate the progression of periodontal diseases.

Saudi Arabia, like many countries in the Middle East, has witnessed a rise in tobacco consumption in recent years, despite public health efforts aimed at curbing smoking rates. According to a 2018 survey, the prevalence of smoking among Saudi men is approximately 12%, while a smaller percentage of women report smoking regularly (Al-Hoqail et al., 2018). Along with traditional smoking, the use of smokeless tobacco products, including nicotine pouches, has become more common, particularly among younger adults. In Saudi Arabia, there is also a strong cultural emphasis on maintaining good oral hygiene, with widespread use of miswak (a natural teeth-cleaning stick) and other traditional oral care practices. However, this cultural focus on oral hygiene may be undermined by the rising use of nicotine products, which pose a potential risk to the oral health of the population.

The increasing popularity of nicotine pouches in Saudi Arabia presents a unique public health challenge. The perception that these products are safer than cigarettes may lead many individuals to overlook their potential risks, particularly in relation to periodontal health. As nicotine pouches are used directly in the oral cavity, their impact on periodontal tissues may be more significant than the effects of smoking, which primarily affects the respiratory system. Given the growing prevalence of nicotine pouch use among young people in Saudi Arabia, it is essential to understand how these products might contribute to the development of periodontal diseases and whether additional public health measures are needed to raise awareness of the risks they pose.

Aim

The aim of this research is to critically examine the impact of nicotine pouches on periodontal tissues, focusing on their potential to contribute to periodontal disease and oral health complications. Additionally, the study seeks to evaluate the relevance of nicotine pouch use in Saudi Arabia, where tobacco consumption, including smokeless products, is prevalent. By synthesizing existing scientific literature, the research aims to highlight the pathophysiological mechanisms through which nicotine pouches may affect periodontal tissues, identify potential risks specific to the Saudi context, and provide insights into public health strategies that may mitigate the negative effects of nicotine use on oral health in this population.

Materials and method

As a review-based study, the methods employed include a systematic search for peer-reviewed articles, data extraction, and analysis of the findings from various studies. The following outlines the approach used to gather, assess, and evaluate the relevant information:

Search Strategy

A comprehensive literature search was conducted in multiple scientific databases, including PubMed, Scopus, Google Scholar, and ScienceDirect, to identify peer-reviewed articles that investigated the effects of nicotine on periodontal health, particularly those related to nicotine pouches or similar smokeless tobacco products. The search strategy was based on the keywords.

The search was limited to articles published between 2000 and 2023, ensuring that the review reflects the most current research findings. Both animal and human studies were included in the search, as well as in vitro studies that provided insight into the biological effects of nicotine on periodontal tissues.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Studies that assessed the impact of nicotine (including nicotine pouches, smokeless tobacco, or smoking) on periodontal tissues, such as gingiva, periodontal ligament, and alveolar bone.
- Research focused on the pathophysiological mechanisms through which nicotine affects oral health.
- Studies that included human participants, animal models, or cell culture studies.
- Articles published in English, peer-reviewed journals.

Exclusion Criteria:

- Studies not focused on periodontal health (e.g., studies that only investigated nicotine's effects on other tissues or systems without relation to oral health).
- Case reports or studies with insufficient data on the relationship between nicotine and periodontal disease.
- Articles published in non-peer-reviewed sources or grey literature.

Data Extraction

Data was extracted from the selected studies based on the following parameters:

- **Study Design:** Type of study (clinical trials, observational studies, in vitro studies, animal studies).
- **Population:** Characteristics of study participants, including age, gender, and health status (healthy individuals vs. those with pre-existing periodontal conditions).
- **Nicotine Source:** Type of nicotine exposure (nicotine pouches, chewing tobacco, smoking).
- **Periodontal Outcomes:** Measured periodontal parameters such as probing depth, attachment loss, gingival inflammation, alveolar bone loss, and microbial profile.
- **Pathophysiological Mechanisms:** Key mechanisms by which nicotine affected periodontal tissues (e.g., immune response, collagen synthesis, vascular effects).
- **Geographical Focus:** Relevance to Saudi Arabia where tobacco use patterns may differ from Western countries.

Critical Evaluation

A critical evaluation was conducted to assess the quality and relevance of the studies included in the review. The studies were categorized into those with high methodological quality (e.g., randomized controlled trials, well-designed cohort studies) and those with potential limitations (e.g., small sample sizes, cross-sectional studies with limited causal inference). This evaluation helped highlight the most reliable findings and identify gaps in the current research regarding the effects of nicotine pouches on periodontal health.

Data Analysis and Synthesis

The information gathered from the selected studies was synthesized and analyzed to:

- Identify common findings regarding the impact of nicotine on periodontal tissues.
- Evaluate the specific effects of nicotine pouches on oral health, based on studies of similar smokeless tobacco products.
- Examine the potential risks of nicotine pouch use in Saudi Arabia, considering the unique cultural and public health context of tobacco use in the region.

A narrative synthesis approach was used to summarize the findings and present an integrated overview of how nicotine pouches, as a form of smokeless tobacco, might contribute to periodontal disease progression. The discussion section of the review connects the findings from global studies with the context of tobacco use in Saudi Arabia, outlining the public health implications for the country.

Discussion

Nicotine and Its Effect on Periodontal Tissues

Nicotine, whether delivered through smoking, smokeless tobacco, or nicotine pouches, is known to have a detrimental effect on periodontal tissues. Key mechanisms by which nicotine harms periodontal health include:

Reduced Blood Flow: Nicotine causes vasoconstriction, resulting in diminished blood flow to the periodontal

tissues. This hampers the body's ability to repair tissue damage and fight off infection (Løe, 2005). The reduced oxygenation of tissues increases the risk of periodontal diseases, such as gingivitis and periodontitis (Taba et al., 2000).

Immunosuppression: Nicotine suppresses the immune system by impairing neutrophil and macrophage functions, which are critical for defending against periodontal pathogens (Van der Velden, 2009). This makes the gums more susceptible to bacterial invasion and exacerbates inflammation.

Collagen Synthesis Inhibition: Periodontal tissues rely on collagen for structure and integrity. Nicotine inhibits collagen synthesis, which may result in weakened connective tissue and a greater risk of periodontal breakdown (Wang et al., 2012).

Pro-inflammatory Cytokine Production: Nicotine has been shown to stimulate the production of pro-inflammatory cytokines like interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF- α), and prostaglandin E2, all of which contribute to the inflammation and tissue destruction that characterizes periodontal disease (Brunsvold & Pihlstrom, 1996).

Nicotine Pouches: A New Risk to Periodontal Health?

Nicotine pouches are marketed as a safer alternative to smoking because they do not involve combustion. However, these products still deliver nicotine directly to the oral mucosa, where it can affect the gingiva, periodontal ligament, and alveolar bone. Research on smokeless tobacco products like snuff and chewing tobacco has demonstrated adverse effects on periodontal tissues, including increased pocket depth, attachment loss, and gingival recession (Bergström, 2004). Given that nicotine pouches involve direct contact with the oral cavity, it is plausible that they could have similar, if not greater, adverse effects on periodontal health.

Nicotine pouches contain nicotine in a salt form, which is absorbed more efficiently through the mucous membrane compared to traditional cigarettes (Cox et al., 2019). This increases the potential for systemic nicotine exposure, which can exacerbate the negative effects on the cardiovascular system and the periodontal tissues.

A study by Sampogna et al. (2019) explored the potential risk factors for periodontal disease among users of smokeless tobacco, finding an association between smokeless tobacco products and increased prevalence of periodontal diseases. While this study focused on traditional smokeless products, the findings may be applicable to nicotine pouches as they share similar risks associated with nicotine absorption in the oral cavity.

Impact of Smokeless Tobacco on Periodontal Disease: Comparative Studies

Although the specific effects of nicotine pouches on periodontal tissues are not yet well documented, several studies have examined the impact of smokeless tobacco on oral health. The results of these studies may provide insight into potential risks associated with nicotine pouches:

Snuff and Chewing Tobacco: The use of smokeless tobacco has been shown to lead to gingival inflammation, increased probing depth, attachment loss, and alveolar bone loss (Kaste et al., 2002). The risk of

developing periodontal disease among smokeless tobacco users is elevated, and long-term use can result in severe periodontal destruction (Sampogna et al., 2019).

Nicotine and Periodontal Disease Progression: A review by Tomar and Asma (2000) found that smokers were at a significantly higher risk for developing periodontal diseases, and the same may be true for users of smokeless nicotine products. The review concluded that nicotine impairs blood flow to the gums, reduces immune cell function, and directly damages periodontal tissues.

Relevance of Nicotine Pouches in Saudi Arabia

Saudi Arabia has one of the highest rates of tobacco use in the Middle East, with a significant proportion of the population using both smoked and smokeless tobacco products. A 2018 study by Al-Hoqail et al. highlighted that the prevalence of smoking among Saudi adults is rising, with over 12% of men and nearly 1% of women reporting regular tobacco use. The introduction of nicotine pouches into the Saudi market could represent a growing public health concern, especially considering the perception that these products are less harmful than smoking.

Moreover, Saudi Arabia has a strong cultural emphasis on oral hygiene, with practices like miswak use being deeply ingrained in society. However, the increasing use of nicotine pouches among youth, particularly in urban areas like Riyadh and Jeddah, could pose significant challenges to public health efforts in controlling periodontal disease. Studies in Saudi Arabia have shown a rising prevalence of periodontitis, which could be exacerbated by nicotine use (Amin et al., 2020).

Given these trends, it is essential that public health policies address the potential risks of nicotine pouches and promote oral health awareness. Comprehensive smoking cessation programs that also address the risks of smokeless tobacco use could help mitigate the potential impact of nicotine pouches on the population's periodontal health.

Limitations of the study

The limitations of this review include the scarcity of specific studies on nicotine pouches and periodontal health, as many existing studies primarily focus on smoking or traditional smokeless tobacco products like chewing tobacco and snuff. Furthermore, as most studies on nicotine and oral health do not distinguish between different forms of nicotine delivery, the results are often generalized. The research is also constrained by the available literature on the subject, with some studies providing limited data on long-term effects or specific population groups, such as those in Saudi Arabia.

Conclusion

Although nicotine pouches may be perceived as a safer alternative to smoking, they still pose significant risks to periodontal health due to the presence of nicotine. The vasoconstrictive and immunosuppressive effects of nicotine can lead to inflammation, tissue destruction, and an increased risk of periodontal diseases. The growing popularity of nicotine pouches in Saudi Arabia,

where smoking and smokeless tobacco use are prevalent, makes it crucial for public health campaigns to raise awareness of the potential oral health risks associated with these products. Further research is needed to fully understand the impact of nicotine pouches on periodontal health, and appropriate interventions should be implemented to protect the population from the harmful effects of nicotine use.

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