

BY LATHA DAVDA

ORAL NICOTINE POUCHES A SCOPING REVIEW

1½ Hours
eCPD
PER PAPER**AIM**

A review of the literature was conducted to collate the latest evidence on oral nicotine pouches (ONPs) and their relevance to oral health professionals.

LEARNING OUTCOMES

This review paper will help the readers to give evidence based information and advice to their patients who may be using oral nicotine pouches.

LEARNING OBJECTIVES

The review will enable the readers to:

- Understand the contents of ONPs and the variations in the sale of ONPs in UK
- Understand the effects of nicotine on oral and general health
- Appreciate the changes in the oral tissues in ONP users
- Gather relevant information from ONP users and tailor their advice

Aligned to GDC development outcome: *A and C*

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**ABSTRACT**

Oral health professionals are required to give smoking cessation advice to patients, mainly to reduce their potential risk of developing mouth and oropharyngeal cancers. A recent trend has been for patients to use alternatives such as: oral nicotine pouches (ONPs) with or without tobacco; e-cigarettes, nicotine gums; lozenges; sprays; or sublingual tablets to avoid the harmful carcinogens released during smoking tobacco. ONPs appear to provide a convenient, alternative 'nicotine hit' in environments where smoking is not permitted. This review of the literature on oral nicotine pouches informs

the readers of the contents and the variety of ONPs available in the UK and highlights the lack of legislation around their sales. ONPs appear to reduce the risk of cancer, however, the non-regulated, nicotine content of the pouches makes them highly addictive. ONPs cause histopathological changes in the oral mucosa and the long-term effects are unknown. ONP users should be informed of the risks to their health and signposted to approved smoking cessation services for alternative therapy until more research on ONPs is available.

KEY WORDS

Oral nicotine pouches, white patches

Background

Smoking tobacco increases the risk of developing cancer, including oropharyngeal cancer, cardiac diseases and pulmonary diseases.¹ Oral health care professionals have a duty of care to offer smoking cessation advice, along with advice about other lifestyle changes that reduce the burden of oral diseases in the population. In an effort to reduce the harm caused by cigarette smoking, some users have switched to smokeless tobacco products such as snuff, chewing

tobacco and pouches placed in the buccal or labial sulcus. Dental professionals should encourage patients to switch to tobacco free products such as: vapes; nicotine patches; nicotine gum; lozenges; nasal sprays; and sublingual tablets.

A recent trend has been the use of intra oral nicotine pouches (ONPs), with or without smokeless tobacco (tobacco containing ONPs are known as Snus). These are useful in environments where smoking is prohibited or as an aid to quit smoking. ONPs currently do not form part of smoking

cessation strategies in UK.² Although ONPs may suggest they pose no potential harm they do contain nicotine which is highly addictive. Studies have demonstrated that regular use of ONPs increases the risk for diseases such as: cancers; Parkinson's; birth defects; oral submucosal fibrosis; periodontal diseases; cardiovascular disease; and type 2 diabetes.³ In the UK, use of ONPs is an emerging problem.

Nicotine is a strong alkaloid drug that can be absorbed through the oral mucosa, lungs, skin or gut.¹ It is a major active molecule released from the tobacco leaves along with more than a thousand other chemicals in a cigarette smoke. It is highly addictive and can lead to nicotine poisoning resulting in sweating, vomiting, mental confusion, reduced pulse rate and difficulty in breathing.⁴

Only 2.7% of past, or present smokers, or e-cigarettes users, are currently aware of ONPs as an alternative to smoking, while 4.4% are actively consuming these products.⁵ Moreover, ONPs fall outside the remit of Tobacco and Related Products Regulations (TRPR) 2016,⁶ as they do not contain tobacco. They are not regulated by the Medicines and Healthcare Products Regulatory Agency (MHRA)⁷ and currently come under General Product Safety Regulation (GPSR). However, in the USA, in late 2020, the US Food and Drug Association (FDA) did regulate ONPs and classified them as 'tobacco-free nicotine' (TFN) under the definition of: "...any product made or derived from tobacco or containing nicotine from any source, that is intended for human consumption."⁸ This was because the reports stated that adolescents displayed a high interest in ONPs due to their resemblance to food products and flavourings. There are significantly more producers and distributors of Snus and ONPs in Europe than the USA.³ The lack of regulation, marketing strategies - which use fruit flavourings targeting younger populations - easy online access and a lack of knowledge among health care professionals about these products may lead to an increase in the use of ONPs.

There is some evidence available about the various types of nicotine pouches, their use and impact on the oral mucosa, but none relevant to the clinical practice of dentistry. Some of the published research has been funded by the tobacco industry which manufactures these pouches. The aim of this scoping review⁹, therefore, was to conduct a review of the literature on oral nicotine pouches (ONPs) with or without tobacco and collate its relevance to oral health professionals.

Material and methods

A literature search was conducted on the data bases of PubMed Central and Google Scholar in March, 2025. The search words used were "oral nicotine pouches", "oral health", "dental health" with search criteria set to full texts and publications from 2020 to 2025. The search resulted in 329 and 35 publications respectively. After reading the titles, 21 articles were selected and full texts read. Most literature was around harm reduction of ONPs in comparison with other nicotine products in the market. Only articles specific to ONPs and their oral impact, and nicotine and its oral impact, were selected. Some articles were hand searched from citations. A total of 11 articles were included in this review. Three older

articles published in 2012, 2013 and 2015 were included from the reference lists as being relevant to understanding the impact of nicotine on the human body.

Results

There is very little published literature about ONPs and their relevance to the practice of dentistry. Most publications focused on the toxicity analyses of the ONP's content, including nicotine and the added flavourings, and the use of ONPs as part of tobacco harm reduction strategies. There were few studies on either ONP users' experiences and preferences, and any oral changes in users, or their addictive nature and lack of regulation.

ONPs: composition

Oral nicotine pouches (ONPs) were sold initially as smokeless tobacco products by tobacco companies.³ They were particulate or powdered tobacco bagged in pouches called Snus, that could be placed under the lip or in the buccal sulcus. The ONP released nicotine and other chemicals that were absorbed by the oral mucosa. The current formula is tobacco-free, but may have nicotine mined from tobacco leaves or contain synthetically produced nicotine. The ONPs produced by the British American Tobacco (BAT) company are made up of a permeable outer pouch material, usually viscose fibres, and the content is mainly composed of water and microcrystalline cellulose matrix holding a filling agent, salt, taste additives, flavourings and pharmaceutical grade nicotine.¹⁰

ONPs: user characteristics and motivation

A survey of a representative adult population in Great Britain between 2020-2021 (n=25,698), found that one in 400 adults used nicotine pouches, and the prevalence was rising. Prevalence was greater in young and middle-aged men who also used other nicotine products and had a history of smoking.⁶ A cross-sectional web survey of 118 (66% female) current users of ONPs¹¹ reported that the flavourings, such as mint and tobacco, were key factors in their selection of brand. The users reported adverse effects including: soft tissue abnormalities (48%); loss of taste (41%); stomach upset (39%); sore mouth (37%); sore throat (21%); and nausea (9%). Moreover, 74% of ONP users also smoked cigarettes while 53% used E-cigarettes.

ONPs: variations

ONPs have been marketed in the USA since 2016 and in Europe and the UK since 2019.⁶ They are sold as individual pouches in colourful containers displaying the flavours and strength (Fig.1). ONPs with tobacco (Snus) are prohibited in several countries including the UK. The key differences and similarities of Snus and ONPs are listed in Table 1.

Nicotine and its impact on the human body and oral tissues

Nicotine has both local and systemic physiological reactions in humans: it can cause irritation and a burning sensation in

Table 1: Comparison of Snus and ONPs

Property	SNUS	ONP
Content	Air or sun-cured tobacco, salt, water and food-grade flavourings	Plant based fibres with flavourings, pharmaceutical grade nicotine or nicotine extracted from tobacco and other ingredients
Brands	More than 152 brands. Common: top brands Skoal, Camel, Copenhagen, Grizzly, Lundgrens	More than 228 brands. Commonly: ZYN, On!, xQS, Klint
Flavourings	Limited flavours Most liked were mint followed by fruit flavours	Multitudes of flavours such as fruit, dessert, citrus, mint, coffee, berry, wintergreen, increasing the choice for consumer and making it attractive for the young users
Safety	Harm from tobacco-specific nitrosamines, nicotine and flavouring agents such as triacetin, benzyl alcohol, menthol, cooling agent WS-23 are documented	Local oral soft tissue abnormalities and alteration of sensation and taste have been reported, along with addiction to nicotine. No long-term studies available
Nicotine content	Concentration can vary from 3 to 32 mg per pouch	The maximum recommended nicotine per pouch in UK is 20mg, however, this can exceed to 120mg/pouch

Sources: Mallock et al, 2024¹², Miluna-Meldere et al. 2024b¹³, Shaikh et al. 2023³, Azzopardi et al. 2022¹⁰, Salokannel et al. 2021¹⁴, Mishra et al. 2015.¹



Figure 1: Oral nicotine pouches in a container (A). Colourful display of flavours and strength displayed by a brand for online sales (B).

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the mouth and the throat, increased salivation and nausea. It also increases pulse and respiratory rates, and blood pressure and reduces coronary blood flow. Its main impact is on the peripheral and central nervous systems. It releases dopamine in the brain, triggering pleasurable responses.⁷ Severe poisoning can cause tremors, prostration, cyanosis, convulsions, collapse and coma. A lethal dose of 30-60mg of nicotine in adults, and around 10mg in children, may result in death due to paralysis of respiratory muscles and central respiratory failure.¹ Nicotine can promote early cancer cells to grow by causing DNA mutations. It also increases the risk of metastasis in tumours through its property of angiogenesis. It has been shown to induce pancreatic adenocarcinoma, lung cancer and render

tumour cells resistant to chemotherapy in mice.¹ It causes immunosuppression and delayed wound healing by decreasing the migration of fibroblasts and inflammatory cells to the inflamed site and decreased epithelialisation and cell adhesion. Nicotine can modulate cell proliferation and trigger apoptosis in normal cells and in human cancer cell lines and affect most organs, resulting in cancer.

An in vitro study of popular brands of cigarettes and pipe tobacco found that the average amount of nicotine in cigarettes ranged from 6.17 to 28.86 mg: a gram of pipe tobacco contained 30.08 to 50.89 mg.⁴ However, regulations require tobacco companies to label on the pack the amount of nicotine in each cigarette. Unlike cigarettes, because

ONPs are unregulated, only a few brands currently label the nicotine content that a person is likely to absorb.

Analysis, by gas chromatography with flame ionisation and liquid chromatography-tandem mass spectrometry, of the contents of 46 commercially available ONPs showed that the nicotine content ranged from 1.79 to 47.5 mg/pouch.¹² Tobacco-specific nitrosamines (TSNA) which are known carcinogens were found in 26 products. There was a lack of clear labelling of the nicotine content on 29 products and nicotine strength was ambiguous.¹² This study highlighted the lack of quality control and regulation in the labelling of these products. It also demonstrates that if ONPs are used as part of a harm reduction strategy, the patients are still consuming unknown and often higher levels of nicotine than through a cigarette, thereby increasing their addiction.

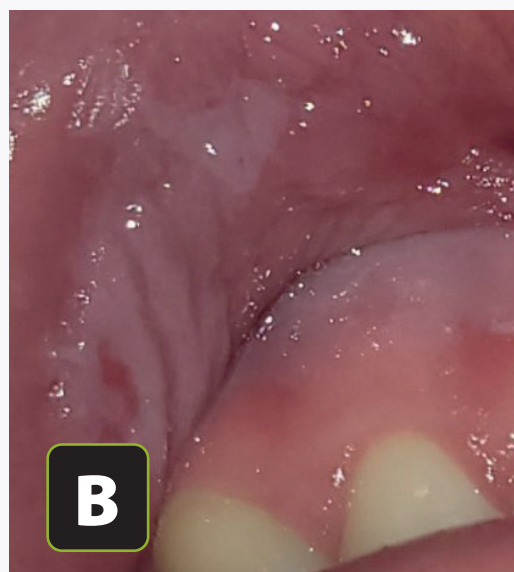
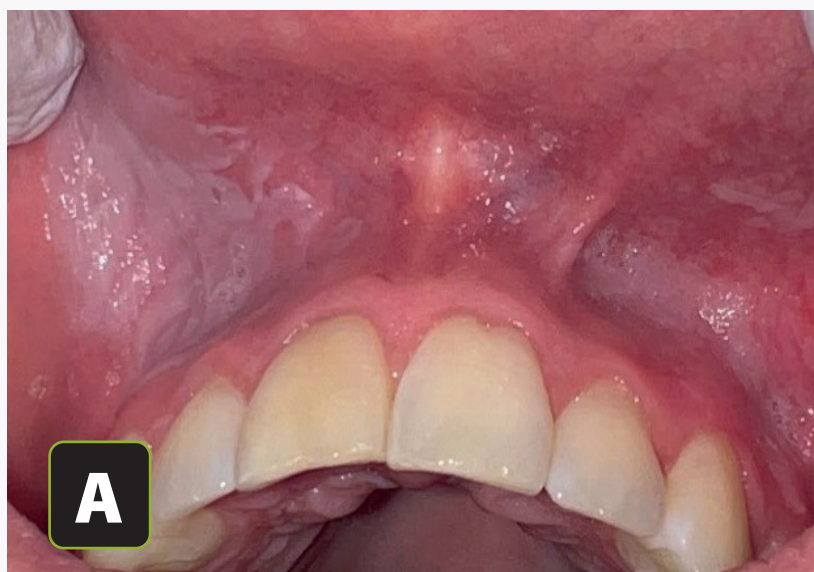
An in vitro study conducted on human gingival fibroblasts found a total of 56 flavourings in five different ONPs, nine of which were known cytotoxins. The results suggest that these agents could cause cytotoxicity, inflammation and

oxidative stress response leading to local abnormalities of the buccal mucosa where the pouch is held.¹⁵

ONPs: role in harm reduction strategies

ONPs that do not combust or contain tobacco leaf have been used as a part of strategies to reduce harm from tobacco, or as part of smoking cessation strategies.¹⁶ These appeared to have the potential to reduce harm from tobacco and its carcinogens as demonstrated by multiple human biomarker studies and in vitro toxicological assessment. However, Nicotine is highly addictive and animal studies have shown that nicotine dependence can be transmitted maternally and grand-maternally by epigenetic mechanisms, casting doubts on the harm reduction strategies suggesting use of ONPs in pregnant women.¹⁷ Traditional nicotine replacement therapies are intended to last short to medium term and ONP users may continue to use them long term and therefore have higher risk for potential side effects.⁷ A protocol for a systematic review of ONPs against other tobacco and nicotine products has just been launched by Cochrane

Figure 2: Oral soft tissue abnormalities in patients using ONPs can range from white irregular patches mimicking leukoplakia (A); wrinkling of mucosa (B); extensive diffuse white patch grid pattern matching the pouch or white gingival margins, inflamed minor salivary gland openings (C); and gingival blisters (D). Image courtesy DPHC.



and the results may further inform health professionals and regulators.¹⁸

ONPs: oral manifestations

A histopathological analyses of the white patches resulting from chronic use of nicotine pouches (n=50) revealed parakeratosis with acanthotic epithelium, intraepithelial and connective tissue oedema, and chronic inflammatory infiltration with lymphocytes and macrophages.¹⁹ Oral abnormalities varied from: a slight wrinkling of the buccal mucosa to extensive white patches, including gingival margins; inflammation of minor salivary gland ducts; erythematous patches; and gingival blisters (Fig. 2). Other oral side effects included dry mouth, soreness and a strange sensation in the jaw. A large number of bacteria linked to periodontal diseases were found in the saliva of ONP and other tobacco product users.¹⁹

Recommendations

Oral health care professionals should record the use of ONPs, and whether or not they contain tobacco. They should record the number of pouches the patient uses per day, the duration of use and the amount of nicotine consumed per pouch. They should discuss the reasons why they are used by the patient. If the patient is using these as an aid to quitting smoking, they should be signposted to approved smoking cessation services. Any oral soft tissue abnormality should be photographed and documented in the notes and the patient followed up 3-6 monthly. Most soft tissue abnormalities are likely to resolve when the use of ONP is decreased or discontinued. However, unresolved soft tissue abnormalities should be referred for biopsy.

Conclusion

The use of oral nicotine pouches, with or without tobacco, is increasing and their sale is currently unregulated in the UK. Oral health care professionals should have an awareness of the emerging evidence of the impact of ONPs on oral and general health. Users should be informed of the side effects of nicotine on their health and signposted to approved smoking cessation services for alternative therapy until more research on ONPs is available.

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Cite this article:

Davda L. Oral nicotine pouches: A scoping review. *Dental Health* 2025;**64(3)**:41-45. <https://doi.org/10.59489/bsdht158>