



ORIGINAL ARTICLE

Salivary caries parameters: Comparative study among Yemeni khat chewers and nonchewers



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KEYWORDS

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Abstract *Background/purpose:* Millions of people in Yemen and East African countries chew khat for more than 5 hours daily for its amphetamine-like effects. Previous studies have associated khat chewing with salivary glands enlargement, inflammation, and xerostomia. However, no information is available on the possible effects of this habit on salivary parameters. This comparative study aims to evaluate salivary parameters, such as salivary flow rate, pH, and viscosity among Yemeni khat chewers and nonchewers.

Materials and methods: Stimulated saliva was collected from 30 Yemeni male khat chewers and 30 nonchewers living in Sana'a City. Salivary flow rate, pH, and viscosity were measured. Data were analyzed using the Mann-Whitney test, an independent *t* test and the Chi-square test.

Results: The mean salivary flow rates (mL/minute) among khat chewers and nonchewers were 0.71 ± 0.07 mL/minute and 0.99 ± 0.09 mL/minute, respectively. The independent *t* test showed a significant difference in salivary flow rate between the two groups at ($P < 0.05$). The mean pH values among khat chewers and nonchewers were 6.32 ± 0.44 and 6.78 ± 0.35 , respectively. The Mann-Whitney test showed that khat chewers have significantly lower salivary pH compared to nonchewers at ($P < 0.05$). The salivary viscosity of khat chewers and nonchewers also differed significantly at ($P < 0.05$).

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Conclusion: The findings suggest that khat-chewing habits may reduce salivary flow rate, lower salivary pH, and lead to unhealthy viscosity.

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Introduction

The khat plant (*Catha edulis*) is widely cultivated in certain areas of East Africa and the Arabian Peninsula, particularly in Yemen. Several million people from these regions are habitual khat chewers. The main effects of continuously chewing khat for more than 5 hours daily, such as during a social-cultural meeting, are moderate euphoria and excitation,¹ owing to the amphetamine-like effect of this plant. This effect is mainly attributed to the alkaloid cathinone, which can be considered "a natural amphetamine".²

Khat leaves are usually kept in the lower distal buccal fold of the mouth. Chewing khat has been linked to gingivitis, periodontal pocket formation, gingival recession, dental caries, and tooth mobility.³ Previous studies have associated khat chewing with salivary enlargement, inflammation, and xerostomia.^{3–5}

Saliva helps to maintain the balance in the oral flora to promote the health and integrity of tooth surfaces.^{6–8} Saliva protects the teeth against caries with mechanisms including bacterial clearance, direct antibacterial activity, buffering, and remineralization. In general, saliva lubricates the oral cavity, keeps microorganisms and food debris off the tissues and teeth, and helps in balancing the demineralization and remineralization process on the tooth surface.^{9–12}

An insufficient salivary flow rate causes an inadequate salivary buffering action, which results in decreased oral pH. Consequently, the inability of the host to counterbalance the acidic environment creates an ideal condition for cariogenic bacteria.¹³ Saliva has major antibacterial activity through its enzymes that could improve tooth health.¹⁴ Several medications, medical circumstances, and radiotherapy to the head and neck of patients cause xerostomia (dry mouth) resulting in rampant caries.¹⁴

Guo and Shi¹⁵ recently found that saliva contains various microbes and hosts biological components that could be used for caries risk assessment. In addition, the viscosity and capability of saliva to lubricate the oral cavity, wash away microorganisms and food debris, and balance the demineralization and remineralization process on the oral cavity aid in maintaining oral health.^{3,10,11}

The khat chewing habit may affect the properties of saliva and consequently contribute to the formation of dental caries. However, no information is available on the possible effects of this habit on salivary parameters. In this study, a comparison of salivary parameters between khat chewers and nonchewers was conducted to provide dental practitioners with knowledge on salivary caries parameters that may affect dental caries management among khat chewers.

Materials and methods

The study was approved by the research ethics committee of the University of Malaya number DFRD 1001/0009 (P). This comparative study involved 60 healthy Yemeni male khat chewers and nonchewers, aged 18–22 years, selected from private dental clinics in Sana'a City. The participants were selected based on their khat chewing habit. The participants were then divided into two groups, one with 30 khat chewers and the other with 30 nonchewers. An individual was excluded from the study if he had any special health care needs, was suffering from any systemic or metabolic diseases, had taken any medication within the last two weeks, or was undergoing orthodontic treatment.

The participants were given written instructions regarding the collection of saliva. They were asked not to eat, drink, or smoke on the day of saliva collection. They were also instructed to swallow several times to clear their mouth and stimulate new saliva. Whole saliva was obtained under basal conditions between 8:00 AM and 9:00 AM to minimize changes attributed to circadian rhythm variations. Before saliva collection, the participants were asked to rinse their mouth twice with tap water to remove food debris and other nonsalivary elements that could interfere with the measurements. All participants were subjected to trial before the collection. Saliva was then collected in a plastic cup for 5 minutes.

Saliva pH, flow rate, and viscosity measurements

All participants were instructed to sit still before saliva collection. They were also instructed to lean their head forward over the funnel, chew gum without swallowing any saliva, and spit every minute into the tube. All saliva samples were processed within a 5-minute collection process. The volume of saliva was measured using a 5 mL syringe, and the flow rate was calculated in mL/minute.

All saliva samples were collected and prepared. The samples were allowed to reach the same temperature, given that pH readings are temperature dependent. The advance pH meter 850056 (Sper Scientific Ltd, Scottsdale, Arizona, USA) was used to measure saliva pH. The pH meter was calibrated, and the manufacturers' instructions were followed. Viscosity was assessed visually.¹⁶ A frothy and bubbly appearance indicates increased viscosity, whereas a watery and clear appearance indicates normal and healthy salivary viscosity.

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