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Otorhinolaryngological symptoms among smokeless tobacco (Maras powder) users

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ABSTRACT

OBJECTIVE: This study aims to investigate the relationship between smokeless tobacco (maras powder) consumption and otorhinolaryngological symptoms.

METHODS: This descriptive study was carried out on 599 participants. The participants were divided into two groups. Of these, 299 (49.9%) patients aged over 18 years were the first group; they used smokeless tobacco for at least 5 years. The remaining patients comprised the second group, which included 300 (50.1%) healthy volunteers who did not use tobacco or its products and demonstrated some similarities with the first group. For the purpose of data collection, a questionnaire consisting of 45 questions was administered to the participants.

RESULTS: Cough, sputum, shortness of breath, dysphagia, snoring, and apnea-hypopnea were found to be significantly increased in smokeless tobacco users. The highest odds ratio (OR) found was for sputum at 2.615. Similarly, other oral cavity symptoms such as mouth tickling, dryness of throat, mouth sores, halitosis, taste disorders, and toothache were found to be significantly increased in smokeless tobacco users. It is noteworthy that halitosis was 9.4 times more prevalent among smokeless tobacco users than in the non-tobacco users. Sinonasal symptoms such as sneezing, headache, facial fullness, and anorexia were found to be significantly increased in smokeless tobacco users. However, there were no differences between the groups in terms of ear symptoms.

CONCLUSION: This study demonstrated that the negative effects of smokeless tobacco consumption were particularly higher in the oral cavity, which in turn gave rise to a number of serious upper respiratory tract complaints.

Keywords: Maras powder; otorhinolaryngology; smokeless tobacco; symptoms.

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Recently, tobacco consumption has soared, particularly in developing countries. According to the World Health Organization (WHO), the tobacco epidemic is one of the biggest public health threats the world has ever faced, killing over 7 million people a year. Over 6 million of those deaths are the result of direct tobacco use, while around 890.000 result from passive exposure to tobacco smoke [1].

Although tobacco consumption occurs mainly in the form of cigarette smoking, other smokeless forms of tobacco usage are also prevalent. Smokeless tobacco is used by many cultures all over the world, including the United States, Sweden, India, and the Middle East [2–5]. Some commonly used smokeless tobacco products include chewing tobacco, snuff, snus, and topical tobacco paste [4]. In Turkey, the most common smokeless

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tobacco product is maras powder, a snus-like product that is used by compressing a powder-filled mini bag in the buccal mucosa between the teeth and lips [6]. Maras powder is obtained from a plant called Nicotina rustica linn. The nicotine content of this plant is 6–10 times higher than that of Nicotina tobacum, which cigarettes are produced from [7].

The prevalence of smoking in Turkey is well-known. According to WHO data, the age-standardized estimated prevalence of people aged 15 years or more ever having smoked tobacco is 41.6% for men and 13.2% for women. The health effects of cigarette smoking [8], its role in carcinogenesis [9], and its respiratory symptomatology [10] have been examined in detail in the literature. However, to the best of our knowledge, to date there is no study on the symptomatology of smokeless tobacco use in Turkey [11].

In light of this knowledge gap, we aimed to investigate the relationship between the use of smokeless tobacco and the related otorhinolaryngological symptoms in Kahramanmaras, the city that gives the smokeless tobacco product maras powder its name, and where its usage is extremely common.

MATERIALS AND METHODS

Study Design

This descriptive study was carried out in Kahramanmaras, Turkey in 2016. A questionnaire consisting of 45 questions was administered to the participants. The first 9 questions were regarding the socio-demographic characteristics and the rest of the questions were related to otorhinolaryngological symptoms and smokeless tobacco consumption.

Data Collection

At total of 299 (49.9%) patients aged over 18 years who applied to the Department of Otorhinolaryngology polyclinic between April 2016 and September 2016 and who consumed smokeless tobacco 3 times or more per day for at least 5 years were included in the study as the smokeless tobacco user group. A total of 300 (50.1%) healthy volunteers, who did not use tobacco or its products and demonstrated similarities to the smokeless tobacco user group in terms of age, gender, and certain socio-demographic characteristics formed the non-tobacco user group.

The participants with upper respiratory tract infections and chronic respiratory system diseases such as chronic obstructive pulmonary disease and asthma were excluded from the study. The smokeless tobacco user group enrolled only those who did not have an obvious pathological explanation for their symptoms. The non-tobacco user group included healthy individuals who had no health problems.

Each member of both groups filled and signed the detailed questionnaire form that queried socio-demographic characteristics and otorhinolaryngological symptoms.

Statistical Analysis

Data were analyzed using the SPSS statistical software version 22. Symptoms and socio-demographic variables were presented as frequencies and percentages in tables. The Pearson chi-square test and Student's t-test were applied to assess the results. The level of statistical significance was accepted as $p<0.05$ and the estimated odds ratios (OR) were presented with a 95% confidence interval.

Ethical Considerations

The study was approved by the Local Scientific Research Ethics Committee. Written informed consent was obtained from all participants, and their participation in the study was purely voluntary.

RESULTS

A total of 599 participants were included in the research. Of these, 299 had used smokeless tobacco for at least 5 years prior to the study and the remaining 300 people were not tobacco users. The distribution of some socio-demographic factors such as age, gender, marital status, education, economic status, and place of settlement of the groups are shown in Table 1. There were no differences between the groups in terms of age, gender, marital status, education, economic status, and place of settlement ($p>0.05$).

Comparison of smokeless tobacco users and non-tobacco users according to upper respiratory tract symptoms is shown in Table 2. Cough, sputum, shortness of breath, dysphagia, snoring, and apnea-hypopnea were found to be significantly increased in smokeless tobacco users ($p<0.05$). There were no significant differences between the groups in terms of hoarseness, reflux, neck pain, swelling in the neck, and pruritus ($p=0.031$, $p=0.938$, $p=0.785$, $p=0.879$, $p=0.287$ respectively). The highest odds ratio found was for sputum at 2.615.

Table 1. Comparison of smokeless tobacco users and non-tobacco users according to social demographic characteristics

Socio-demographic characteristics	Smokeless tobacco users		Non-tobacco users		p
	n	%*	n	%*	
Age	36.80±15.42		38.92±14.44		**0.123**
Gender					
Female	24	38.7	38	61.3	**0.062**
Male	275	51.2	262	48.8	
Marital status					
Married	198	47.3	221	52.7	
Single	91	58.3	65	41.7	**0.055**
Divorced	8	44.4	10	55.6	
Education					
Illiterate	6	35.3	11	64.7	
Literate	22	61.1	14	38.9	
Elementary school	82	54.7	68	45.3	
Middle school	38	44.7	47	55.3	**0.091**
High school	101	53.4	88	46.6	
University	49	41.9	68	58.1	
Economic status					
Low	49	41.5	69	58.5	
Moderate	220	52.9	196	47.1	**0.080**
High	26	46.4	30	53.6	
Settlement place					
Village	36	61.0	23	39.0	
District	50	43.9	64	56.1	**0.100**
City	210	50.4	207	49.6	

*Row percentage.

Comparison of groups regarding oral cavity symptoms is shown in Table 3. Mouth tickling, dryness of throat, mouth sores, halitosis, taste disorders, and toothache were found to be significantly increased in smokeless tobacco users ($p<0.05$). It is noteworthy that halitosis was 9.4 times more among smokeless tobacco users than among the non-tobacco users. However, there were no differences between the groups in terms of sore throat, throat stinging, and gingival bleeding ($p=0.187$, $p=0.790$, $p=0.424$ respectively).

Comparison of smokeless tobacco users and non-tobacco users according to sinonasal symptoms is shown in Table 4. Sneezing, headache, facial fullness, and anorexia were found to be significantly increased in smokeless tobacco users ($p<0.05$). There were no significant differences between the groups in terms of runny nose, nasal bleeding, postnasal drainage, and nausea ($p=0.134$, $p=0.345$, $p=0.475$, $p=0.084$ respectively).

Comparison of groups regarding ear symptoms is shown in Table 5. There were no differences between the groups in terms of hearing loss, dizziness, ear disorders, ear fullness, and tinnitus ($p=0.310$, $p=0.185$, $p=0.248$, $p=0.330$, $p=0.586$ respectively).

DISCUSSION

Maras powder is obtained from a plant that has a higher nicotine content than the plants that are used in regular cigarette production. It is mostly consumed in Kahramanmaras and Gaziantep, cities located in the Southeastern Region of Turkey. There is a misguided public opinion that the use of maras powder does not carry

TABLE 2. Comparison of smokeless tobacco users and non-tobacco users according to upper respiratory tract symptoms

Upper respiratory tract symptoms	Smokeless tobacco users		Non-tobacco users		x^2	p	OR
	n	%	n	%			
Cough							
Yes	111	60.7	72	39.3	12.17	**<0.001**	**1.871** (1.313–2.667)
No	187	45.2	227	54.8			
Sputum							
Yes	127	65.8	66	34.2	28.55	**<0.001**	**2.615** (1.829–3.738)
No	170	42.4	231	57.6			
Hoarseness							
Yes	62	53.4	54	46.6	0.62	0.031	–
No	237	49.4	243	50.6			
Shortness of breath							
Yes	99	59.3	68	40.7	7.99	**<0.005**	**1.683** (1.171–2.418)
No	199	46.4	230	53.6			
Reflux							
Yes	85	50.0	85	50.0	0.00	0.938	–
No	213	50.4	210	49.6			
Dysphagia							
Yes	65	60.7	42	39.3	6.43	**0.011**	**1.733** (1.130–2.657)
No	226	47.2	253	52.8			
Snore							
Yes	155	55.6	124	44.4	6.87	**0.009**	**1.540** (1.115–2.129)
No	142	42.8	175	52.2			
Apnea hypopnea							
Yes	68	63.0	40	37.0	8.75	**0.003**	**1.900** (1.237–2.918)
No	230	47.2	257	52.8			
Neck pain							
Yes	82	49.1	85	50.9	0.07	0.785	–
No	217	50.3	214	49.7			
Swelling in the neck							
Yes	24	51.1	23	48.1	0.02	0.879	–
No	275	49.9	276	50.1			
Pruritus							
Yes	46	55.4	37	44.6	1.13	0.287	–
No	253	49.1	262	50.9			

Pearson Chi-Square Test; α: 0.05.

the same detrimental health effects as cigarette smoking. On the contrary, studies show that maras powder can cause many systemic diseases in humans [12–14]. Consumption of maras powder causes genotoxic, mutagenic, and carcinogenic effects, particularly due to the *N*-nitrosamines in its content.

There is much evidence that nicotine is a major immunosuppressant. Nicotine induces ACTH secretion, which releases catecholamines that have suppressive effects on the immune system [15]. This leads to the emergence of clinical symptoms, which are indicators of several diseases. Smoking also causes changes in the

Table 3. Comparison of smokeless tobacco users and non-tobacco users according to oral cavity symptoms

Oral cavity symtoms	Smokeless tobacco users		Non-tobacco users		x^2	p	OR
	n	%	n	%			
Mouth tickling							
Yes	114	69.1	51	30.9	33.94	**<0.001**	**3.038** (2.074–4.451)
No	181	42.4	246	57.2			
Dryness of throat							
Yes	168	66.4	85	33.6	48.84	**<0.001**	**3.304** (2.351–4.645)
No	128	37.4	214	62.6			
Sore throat							
Yes	87	54.4	73	45.6	1.73	0.187	–
No	211	48.3	226	51.7			
Throat stinging							
Yes	61	50.8	59	49.2	0.07	0.790	–
No	236	49.5	241	50.5			
Mouth sores							
Yes	56	62.2	34	37.8	6.50	**0.011**	**1.810** (1.143–2.869)
No	242	47.6	266	52.4			
Halitosis							
Yes	226	75.1	75	24.9	154.56	**<0.001**	**9.417** (6.489–13.665)
No	72	24.2	225	75.8			
Taste disorders							
Yes	75	63.3	43	36.4	11.08	**<0.001**	**2.010** (1.327–3.046)
No	223	46.5	257	53.5			
Toothache							
Yes	111	56.6	85	43.4	5.26	**0.022**	**1.494** (1.060–2.108)
No	187	46.6	214	53.4			
Gingival bleeding							
Yes	111	52.1	102	47.9	0.63	0.424	–
No	187	48.7	197	51.3			

Pearson Chi-Square Test; α: 0.05.

mucus production mechanism. Chronic exposure to smoke increases the number and size of goblet cells, resulting in metaplastic changes in the respiratory mucosa and a consequent increase in upper respiratory secretion [16, 17]. Although there are many studies in the literature about the effect of cigarette smoking on the upper respiratory tract, there is limited research on the effects of smokeless tobacco. In a study which the effect of local herbal tobacco use on pulmonary function was assessed, pulmonary dysfunction was determined in chronic consumption and symptoms such as coughing were reported to be high [18]. Another study [19] reported a higher risk of chronic bronchitis in smokeless tobacco users. Even though the systemic effects of maras powder taken orally are different from the direct effects of cigarette smoke, we found that cough, sputum, and shortness of breath were significantly higher among the smokeless tobacco users than the non-tobacco users. We agreed that these symptoms paved the way for pulmonary disorders in the future.

In chronic voice disorders, the negative effect of cigarette smoke on vocal cords is a known fact. However, as expected, we found that smokeless tobacco did not have any effect on voice morbidity. Smoking negatively affects

TABLE 4. Comparison of smokeless tobacco users and non-tobacco users according to sinonasal symptoms

Sinonasal symtoms	Smokeless tobacco users		Non-tobacco users		x^2	p	OR
	n	%	n	%			
Runny nose							
Yes	89	54.9	73	45.3	2.24	0.134	–
No	210	48.1	227	50.9			
Nasal bleeding							
Yes	36	45.0	44	55.0	0.89	0.345	–
No	263	50.7	256	49.3			
Sneeze							
Yes	157	54.9	129	45.1	5.25	**0.022**	**1.457** (1.056–2.011)
No	142	45.5	170	54.5			
Postnasal drainage							
Yes	69	52.7	62	47.3	0.51	0.475	–
No	229	49.1	237	50.9			
Smell disorders							
Yes	56	57.1	42	42.9	2.33	0.126	–
No	243	48.7	256	51.3			
Headache							
Yes	150	54.5	125	45.5	4.35	**0.037**	**1.409** (1.021–1.946)
No	149	46.0	175	54.0			
Facial fullness							
Yes	58	59.2	40	40.8	4.02	**0.045**	**1.564** (1.008–2.427)
No	241	48.1	260	51.9			
Nausea							
Yes	71	56.8	54	43.2	2.99	0.084	–
No	228	48.1	246	51.9			
Anorexia							
Yes	97	61.8	60	38.2	12.00	**0.001**	**1.922** (1.324–2.790)
No	201	45.7	239	54.3			

Pearson Chi-Square Test; α: 0.05.

the gastroesophageal reflex and pharyngeal swallowing reflex [20, 21] and may cause dysphagia and respiratory complications due to gastroesophageal reflux. Aro et al. [22] found that smokeless tobacco significantly changes the histology of the distal esophagus but does not lead to gastrointestinal symptoms or peptic ulcers. In our study, the rate of reflux symptoms was similar in both groups. However, dysphagia was found to be higher among smokeless tobacco users.

Due to its high nicotine content, sleepiness tends to increase during the day in people using smokeless tobacco. Studies have shown that there is a synergistic effect between smoking and snoring, and smoking increases the risk of cardiovascular disease with both oxidative stress and endothelial dysfunction through abnormal inflammatory response [12, 13, 23]. In our study, snoring and apnea-hypopnea rates were higher in smokeless tobacco users.

Over 700 species of bacteria have been identified in the human oral cavity [24, 25]. These bacteria play a role in both oral and systemic health. One of the causes of halitosis is the deterioration of the bacterial flora. These bacteria cause oral malodor by producing various substances such as sulfur compounds, diamines, and short

Table 5. Comparison of smokeless tobacco users and non-tobacco users according to ear symptoms

Ear symtoms	Smokeless tobacco users		Non-tobacco users		x^2	p	OR
	n	%	n	%			
Hearing loss							
Yes	53	54.6	44	45.4	1.03	0.310	–
No	246	49.0	256	51.0			
Dizziness							
Yes	91	54.2	77	45.8	1.75	0.185	–
No	207	48.1	223	51.9			
Ear disorders							
Yes	46	44.7	57	55.3	1.33	0.248	–
No	252	50.9	243	49.1			
Ear fullness							
Yes	33	55.9	26	44.1	0.94	0.330	–
No	266	49.3	274	50.7			
Tinnitus							
Yes	88	51.8	82	48.2	0.29	0.586	–
No	211	49.3	217	50.7			

Pearson Chi-Square Test; α: 0.05.

chain fatty acids [26, 27]. Keene and Johnson [28] found that *Streptococcus mutans* (*S. mutans*) increases in the oral mucosa due to increased nicotine. Increased levels of nicotine in saliva have been thought to stimulate the colonization of *S. mutans* and increase the risk of oral carriage. In our study, the most notable of the oral symptoms in smokeless tobacco users was halitosis. In an in vitro study, it was found that the number of fibroblasts and the amount of gingiva type 1 collagen increased with nicotine use [29], which indicates that nicotine causes fibrosis in the oral mucosa. As a matter of fact, we found that mouth tickling, dryness of throat, throat stinging, taste disorders, and toothache were higher among smokeless tobacco users. These findings suggest that smokeless tobacco consumption may lead to a deterioration of the oral flora and a rise in the risk of infection.

Smokeless tobacco may cause hyperkeratotic lesions, periodontal diseases and intra-oral premalignant lesions in the oral mucosa. It also chronically stimulates the lymphoid tissue in the oral mucosa and consequently raises the risk of gingivitis, erythroplakia, leukoplakia, submucous fibrosis, and lichen planus. Epidemiological and experimental studies have shown a strong association between oral and pharyngeal cancers and smokeless tobacco [30, 31]. Dodani et al. [32] found pathological findings in mucosa as a result of direct exposure of gingiva to various toxic chemicals. In previous studies, epithelial anomalies and precancerous lesions were determined from biopsies of gingival tissues of maras powder users [6, 33]. With increased nicotine-induced vasoconstriction, the gingival keratinization increases, as a result of which smokers are prone to less gingival bleeding. Although we found a higher number of mouth sores in smokeless tobacco users, gingival bleeding and sore throat were not different from the non-tobacco users.

Epidemiological studies suggest a correlation between exposure to tobacco smoke and rhinosinusitis. Goldstein-Daruech et al. [34] found that exposure to tobacco led the formation of a synonasal biofilm and contributed to the conversion of a transient and medically treatable infection to a tenacious and therapeutic persistent state. Mahakit et al. [35] showed that cigarette smoking negatively affects the mucociliary function. Sanli et al. [36] found that while nasal obstruction, malodor, and snoring were significantly higher in smokers, symptoms such as nasal discharge, sneezing, nasal discharge, and headache were similar to the control group. In our study, while sneezing, headache, facial fullness, and anorexia were

higher in smokeless tobacco users, the rates of runny nose, nasal bleeding, post nasal drainage, and smell disorders were similar in both groups. These results suggest that the negative effects of cigarette smoke on nasal function are higher than smokeless tobacco.

Gaur et al. [37] found that smokers had more otological diseases. Sanli et al. [36] found that ear discharge, hearing loss, dizziness, and tinnitus were more common in smokers. While there are many studies in the literature proving that cigarette disrupts cochlear function, not many studies on the effect of smokeless tobacco on the ear have been researched [37–39]. In our study, we found equal rates of ear symptoms in both groups. However, we believe that there is a need for more extensive research in this regard.

Strengths and Limitations

A strength of the present study was that it was conducted in a city where smokeless tobacco consumption is prevalent. Another strength was that the study population was relatively large.

However, there were several limitations. First, the study was carried out on the applicants of a hospital, which hinders extrapolation of the results to the general population. Second, the duration of smokeless tobacco presence in the oral cavity was not questioned, therefore, the dose-response relationship between the usage habit and symptoms could not be assessed. Lastly, as this was a survey study, the inconsistencies in patients' memory may have affected the responses to the questionnaire.

Conclusion

Our study revealed that the effect of smokeless tobacco on the oral cavity was excessive and that there was no difference between the groups in terms of any ear symptoms. We found that smokeless tobacco users had significant potential clinical symptoms compared to non-tobacco users, which are premonitors of several diseases. By the elimination of the etiology that causes the symptoms and by performing screening for the emerged symptoms, the disease may be prevented. Thus, preventive medicine should be brought to the forefront.

Ethics Committee Approval: The study was approved by the clinical research local ethics committee of Kahramanmaras Sutcu Imam University (2016/138).

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

Conflict of Interest: The authors have no conflict of interests.

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