ORIGINAL ARTICLE

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Comparison of the Effects of Smoking and Smokeless Tobacco "Maras Powder" Use on Pulmonary Function, Electrocardiogram and Other Parameters

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Abstract

Objective: Through the years, tobacco has been used in many ways. While the most common way of consumption is through smoking cigarettes, smokeless use by chewing or nasal snuffing are also quite common. Smokeless tobacco, also named "Maras powder", is generally used as a substitute to reduce or quit smoking. The effects of smokeless tobacco use on the immune system, respiratory system and cardiovascular system have been extensively researched. In our study, we aimed to investigate the effects of Maras powder on the respiratory, electrocardiogram (ECG) findings and biochemical methods.

Methods: One hundred and forty-nine cases were included and the cases were classified into the following four groups: only using Maras powder; using Maras powder and smoking; only smoking and control group neither smoking nor using Maras powder. Physical examination findings, ECG findings, results of pulmonary function tests, results of biochemical analysis including complete blood count and lipid profile of all participants were recorded on admission.

Results: The risk of mouth sores was 7.9 times higher in the Maras powder group due to direct contact to the oral mucosa. There is a relationship between the daily use frequency of smokeless tobacco and the development of oral wounds, but the total period of use or the duration in mouth was not related to this situation. The ECG findings of both the smoking and Maras powder consuming group was found to be significantly higher than the control group.

Conclusion: The smokeless tobacco use, which is considered as an alternative way of quitting smoking, does not have adverse effects on respiratory functions. However, it is an important risk factor for many life-threatening health conditions such as ECG abnormalities and occurrence of oral lesions. Social awareness must be created for smokeless tobacco use in order to fight this habitual threat to public health.

Keywords: Tobacco smokeless, Maras powder, tobacco

INTRODUCTION

Over the years, tobacco has been used in many ways. While the most common form of consumption is through smoking cigarettes, smokeless use by chewing or nasal snuffing are also quite common (1,2).

The use of "smokeless tobacco" is popular in Eastern Anatolia and South-Eastern Anatolia regions of Turkey, especially within and around the cities of Kahramanmaraş and Gaziantep. Two studies conducted in Turkey reported the smokeless tobacco use rate as 4.0% and 16.8%, respectively (3,4). Smokeless tobacco, also named "Maras powder," has generally been used as a substitute to reduce or quit smoking. Maras powder is made from leaves of a plant called Nicotiana rustica Linn. The leaves of this tobacco plant are dried and powdered, followed by mixing with ashes of vine, oak, or walnut sticks at a rate of 1/2 or 1/3 and mildly moisturized with some water. The final product refined through this process is used orally. The refined mixture is wrapped in cigarette paper or directly applied between lower lip or cheek mucosa and jaw. It is kept in the mouth for 5 to 10 minutes or sometimes for 1 or 2 hours until it is disposed. This process

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is repeated several times according to the addiction level of the individual. Interestingly, the addict can even sleep with the tobacco in his/her mouth to curb the cravings of nicotine (5-7). The effects of smokeless tobacco use on the immune system, respiratory system and cardiovascular system have been extensively researched. Studies suggest that Maras powder has no effect on respiratory function, since it is not inhaled (8). On the other hand, the use of Maras powder was found to be associated with the development of atherosclerosis due to its ability to reduce nitric oxide production and increase oxidative stress (9,10). Thus, it has been concluded that use of Maras powder has negative effects on the cardiovascular system (11). Additionally, it has been suggested that Maras powder affects chronic inflammatory modifications at organ and systemic level due to its nicotine content and tobacco-specific nitrosamine (12).

As shown in our study, local people use Maras powder in order to prevent the harmful effects of smoking on respiratory functions. Therefore, in addition to the detrimental effects of Maras powder on respiratory functions, electrocardiogram (ECG) abnormalities, oral lesions and changes in routine biochemical blood counts have been also demonstrated by our results. In addition, our study was conducted in the region where the Maras powder is used heavily. More patients were included in this study than in previous studies. With this aspect, this study will contribute to the literature of Maras powder use in Turkey.

METHODS

This retrospectively designed study included patients referred to the Department of Pulmonary Medicine at Dr. Sureyya Adanalı Göksun State Hospital and Kahramanmaraş Sütçü İmam University Faculty of Medicine between June 2013 and August 2014. Exclusion criteria were the presence of accompanying systemic diseases such as Chronic Obstructive Pulmonary disease (COPD), malignancies, hypertension, heart failure, ischemic heart disease, diabetes mellitus, liver and kidney failure, and/or current medical treatment. One hundred and forty-nine men were included and were classified into the following four groups: only using Maras powder (n=38); using Maras powder and smoking (n=41); only smoking (n=33); and control group of neither smoking nor using Maras powder (n=37). Frequency of use, duration of use and method of use (direct contact of powder with oral mucosa or using wrapped in cigarette paper) were noted for the participants using Maras powder. Duration of smoking, packs per year and current smoking status were noted with the participants' coal or biomass exposure and additional medical conditions. Systolic and diastolic blood pressure, physical examination findings (sores in mouth, gum abnormalities, abnormal respiratory sounds), ECG findings (presence of arrhythmias), results of pulmonary function tests (FEV1, FVC, FEV1/FVC measurements), results of routine biochemical analysis including complete blood count and lipid profile of all participants were recorded upon admission (Tables 1, 2). The study was approved by the Local Ethics Committee and was in accordance with the Declaration of Helsinki (24.11.2014/181).

Statistical Analysis

SPSS version 18.0 was used for statistical analysis. A p value of less than 0.05, with confidence interval of 95%, was considered statistically significant. Kolmogorov-Smirnov test was used to determine the consistency of numeric variables with normal distribution. Parametric tests were used in the analysis of data consistent with normal distribution. One-way ANOVA test was used to compare the numerical variables between the groups. Multivariate analysis was processed to determine if the statistically significant data at ANOVA test were originating from group variables or other factors such as age and gender. Chi-square analysis was used to compare abnormal ECG findings between the case groups. Binary logistic regression test was used to identify the data associated with mouth sores. ROC analysis was used to determine cut-off values, specificity and sensitivity values and statistically significance of numeric variables of factors that could be associated with development of sores such as duration of Maras powder, use (in years), daily amount, duration held in mouth, and amount of smoking (as pack per year).

RESULTS

One hundred forty nine cases were included and 91.3% of them were male. The mean age of the participants was 43.7±16.3 years. The rate of Maras powder users and smokers were 53.0% and 49.7%, respectively. Maras powder users (91.1%) and smokers (54.1%) were currently using these products. Among the Maras powder users, 84.8% were using it wrapped in paper (indirect contact) and the frequency of daily use was 13.8±11.4 days, mean duration of use was 13.4±12.1 years, and mean duration held in mouth was 17.0±14.9 minutes. Mean duration of use was 18.8±15.6 packs per year for the smokers. Dust or smoke exposure and coal or biomass exposure cases were 40.3% and 79.2%, respectively (Table 1). Eight point one percent of the cases had mouth lesions and 14.8% had abnormal ECG findings (arrhythmia, etc.). The demographic distribution of complete blood count and biochemical analysis of the cases are shown in Table 2. The binary logistic regression test, which

was used to identify causative parameters for mouth lesions, found the method and number of daily use of Maras powder as statistically significant variables (p=0.026 and p=0.035, respectively). The risk for mouth sores was 7.9 times higher in the Maras powder group due to direct contact with the oral mucosa. For each additional daily session of Maras powder use, risk for mouth sores increased by 1.055 times (Table 3). Among the numerical parameters that could be associated with mouth sores, ROC analysis revealed statistically insignificant findings for the duration of Maras powder use in years and duration held in mouth (p=0.566 and p=0.243, respectively). However, the amount of daily use was found to be statistically significant (p=0.035, area under curve=0.692). The cut-off value for the amount of daily use was 17.5. The sensitivity for mouth sores was 66.7% and specificity was 74.6% (Figure 1). When the groups were compared with chi-square analysis for abnormal ECG findings, the control group had no ECG abnormality. In contrast, 15.8% of only Maras powder users, 18.2% of only smokers, and 24.4% of both Maras powder users and smokers had statistically significant increases in ECG abnormalities (p=0.021) (Figure 2). Diastolic blood pressure, hemoglobin (Hb), leukocytes and cholesterol levels were found to be statistically and significantly different as determined by One-way ANOVA test, which compared physical examination findings, results of pulmonary function test, complete blood count, lipid profile, and numerical parameters of the other biochemical variables (Table 3). Tukey's

Table 1. Descriptives of case groups

		Control		Maras powder		Tobacco		Maras powder + tobacco		Total	
		(n=37)		(n=38)		(n=33)		(n=41)		(n=149)	
		n	%	n	%	n	%	n	%	n	%
Gender	Female	9	24.3	2	5.3	2	6.1	0	0.0	13	8.7
	Male	28	75.7	36	94.7	31	93.9	41	100.0	136	91.3
Comorbidity	No	37	100.0	38	100.0	33	100.0	41	100.0	149	100.0
	Yes	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Dust exposition	No	24	64.9	18	47.4	25	75.8	22	53.7	89	59.7
	Yes	13	35.1	20	52.6	8	24.2	19	46.3	60	40.3
Biomass exposition	No	12	32.4	4	10.5	14	42.4	1	2.4	31	20.8
	Yes	25	67.6	34	89.5	19	57.6	40	97.6	118	79.2
Tobacco smoking status	Non smoker	37	100.0	38	100.0	0	0.0	0	0.0	75	50.3
	Smoker	0	0.0	0	0.0	33	100.0	41	100.0	74	49.7
Still tobacco smoker	No	0	0.0	0	0.0	5	15.2	29	70.7	34	45.9
	Yes	0	0.0	0	0.0	28	84.8	12	29.3	40	54.1
Maras powder status	No	37	100.0	0	0.0	33	100.0	0	0.0	70	47.0
	Yes	0	0.0	38	100.0	0	0.0	41	100.0	79	53.0
Still using Maras powder	No	0	0.0	4	10.5	0	0.0	3	7.3	7	8.9
	Yes	0	0.0	34	89.5	0	0.0	38	92.7	72	91.1
Direct mouth contact	No	0	0.0	0	0.0	0	0.0	38	92.7	38	92.7
	Yes	0	0.0	0	0.0	0	0.0	3	7.3	3	7.3
Mouth lesion	No	37	100.0	27	71.1	33	100.0	39	95.1	136	91.3
	Yes	0	0.0	11	28.9	0	0.0	2	4.9	13	8.7
Arrhythmia	No	37	100.0	32	84.2	27	81.8	31	75.6	127	85.2
	Yes	0	0.0	6	15.8	6	18.2	10	24.9	22	14.8
Operation history	No	34	91.9	31	81.6	27	81.8	27	65.9	119	79.9
	Yes	3	8.1	7	18.4	6	18.2	14	34.1	30	20.1
Complication during general anesthesia	No	3	100.0	5	71.4	5	83.3	8	57.1	21	70.0
	Yes	0	0.0	1	14.3	1	16.7	2	14.3	4	13.3
	Unknown	0	0.0	1	14.3	0	0.0	4	28.6	5	16.7

Table 2. Comparation of vital findings. pulmonary functions and laboratory results between case groups (Independent t and ANOVA test result)															
Case groups															
	Control (n=37)		**Maras powder (n=38)**		**Tobacco (n=33)**		**Maras powder + tobacco (n=41)**		**p values**						
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p values**	**p1**	**p2**	**p3**	**p4**	**p5**	**p6**
Age	40.6	14.3	45.6	21.0	40.3	12.9	47.5	15.3	0.140						
Tobacco smoking duration (year)					19.2	12.1	16.2	10.2	0.253						
Tobacco smoking amount (packet/ year)					19.1	13.3	18.8	17.4	0.934						
Maras powder amount (number/ day)			14.6	13.0			13.2	10.0	0.612						
Maras powder using duration (year)			14.9	12.9			12.1	11.4	0.301						
Retention time in mouth (min)			16.2	11.0			17.9	17.9	0.617						
Heart rate	88.1	16.4	85.9	16.9	86.5	17.1	83.0	14.7	0.567						
Systolic BP	116.5	15.8	118.2	11.8	126.4	18.8	117.9	20.3	0.730						
Diastolic BP	73.0	9.4	74.5	8.6	79.4	12.0	77.1	8.1	0.030	0.904	0.028	0.233	0.136	0.620	0.725
SPO^2	97.2	1.5	97.2	1.1	97.2	1.2	96.9	1.7	0.790						
FVC (mL)	3.459.2	1.092.1	3.507.1	893.8	3.703.3	813.0	3.344.5	904.7	0.450						
FVC (%)	81.5	15.9			82.4	12.6	77.7	16.4	0.383						
FEV1 (mL)	3.201.6	946.8	3.277.7	821.7	3.359.1	801.3	3.007.1	846.2	0.160						
FEV1 (%)	91.4	15.7	93.3	14.5	90.2	14.3	85.5	16.5	0.346						
FEV1/FVC	93.6	7.2	93.7	6.3	90.6	7.4	89.9	8.4	0.056						
FEF 25-75 (mL)	4.346.8	1.599.5			4.050.9	1.409.4	3.797.4	1.485.4	0.290						
FEF 25-75 (%)	100.5	27.7			94.0	26.4	94.4	29.6	0.540						
PEF (mL)	4.076.2	1.073.6			4.361.5	837.3	3.719.2	954.6	0.022		0.220	0.130			0.004
PEF (%)	80.4	14.2			84.6	20.7	71.9	16.4	0.008		0.310	0.020			0.005
WBC	7.367.3	1.750.2	7.318.4	1.921.5	7.450.6	2.308.3	7.249.5	1.930.1	0.018	0.440	0.570	0.567	0.032	1.000	0.034
PLT	255.702.7	54.074.0	242.342.1	67.008.4	231.727.3	48.957.4	226.780.5	46.842.6	0.110						
HB	13.9	1.3	14.0	1.6	14.9	1.2	14.5	1.0	<0.001	1.000	0.010	0.179	0.011	0.248	0.499
NE (%)	59.1	8.7	62.0	9.2	56.8	7.3	61.1	9.6	0.070						
EO (%)	2.6	2.2	2.9	4.0	2.2	1.2	3.2	4.9	0.610						
MO (%)	8.1	1.8	7.9	2.8	8.9	4.2	7.2	3.5	0.150						
LY (%)	28.7	8.6	25.7	8.5	30.1	6.1	26.9	7.4	0.090						
BA (%)	0.6	0.7	0.4	0.6	0.5	0.3	0.4	0.8	0.494						
Albumin	4.3	0.4	4.1	0.3	4.3	0.4	4.2	0.4	0.050						
Glucose	100.4	15.2	104.0	21.0	101.2	18.3	107.7	52.7	0.740						
AST	21.8	10.4	22.3	7.6	19.7	6.5	19.8	6.2	0.370						
ALT	20.0	10.0	18.6	6.3	21.8	13.5	20.5	13.0	0.670						
Amylase	64.0	17.2	74.2	22.3	72.0	21.2	73.7	26.1	0.170						
Cholesterol	156.6	34.0	163.6	34.5	178.9	35.6	172.7	37.5	0.040	0.830	0.040	0.195	0.268	0.668	0.874
HDL	43.1	9.4	40.3	8.9	44.9	13.9	41.0	11.5	0.280						
LDL	97.7	25.3	102.7	28.4	116.0	27.9	113.7	27.6	0.012	0.850	0.029	0.052	0.170	0.280	0.980

VLDL	26.4	18.0	27.8	14.3	32.2	18.9	33.8	15.1	0.160						
TG	130.5	90.4	134.8	71.7	169.8	94.4	157.0	75.3	0.150						
LDH	189.4	30.2	201.8	40.7	178.3	23.4	201.1	42.6	0.018	0.430	0.560	0.460	0.032	0.990	0.034
CK	183.9	182.1	182.2	182.2	144.8	85.6	111.0	50.1	0.060						

SD: Standart deviation, SPO[2]: Pulse oxygen saturation, FVC: Forced vital capacity, FEV1: Forced expirator volume (1. second), PEF: Peak expiratory flow, WBC: White blood cell, LDL: Low-density lipoprotein, VLDL: Very low-density lipoprotein, LDH: Lactate dehydrogenase, TG: Thyroglobulin, HDL: High-density lipoprotein, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, CK: Creatine kinase, HB: Hemoglobin, PLT: Platelets, p: (ANOVA or T test)

significiant value, p[1]: Control-tobacco, p[2]: control-maras powder, p[3]: Control-tobacco plus maras powder, p[4]: Tobacco-maras powder, p[5]: Tobacco-tobacco plus maras powder, p6: Maras powder-tobacco plus maras powder sig. values

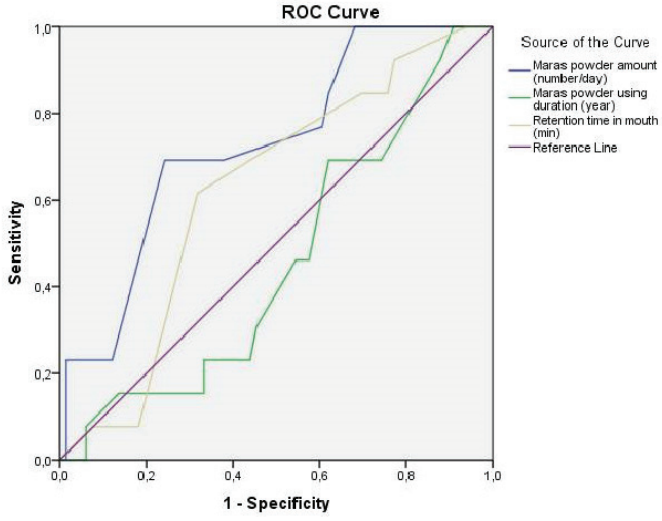

Figure 1. Sensitivity and spesifity of amount of usage, using duration and retention time in mouth for maras powder (ROC curve)

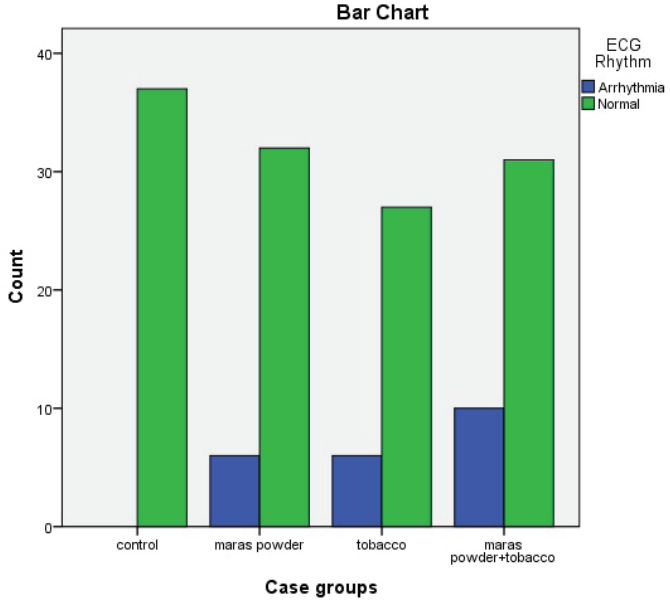

Figure 2. Bar chart of electrocardiogram comparisons for patient groups

ECG: Electrocardiogram

test in ANOVA was processed to determine which subgroups had statistically significant differences. Multivariate analysis was processed to determine whether this statistically significant

Table 3. Factors determining mouth lesion (binary logistic test)

	B	S.E	Wald	df	p	OR		CI
Direct mouth contact (direct contact group)	2.072	0.765	7.332	1	0.007	7.942	0	
Maras powder amount (number/day)	0.054	0.026	4.431	1	0.035	1.055	0.99	1.42
Constant	-3.044	0.639	22.686	1	0	0.048		

CI: Confidence interval, OR: Odds ratio

Variables entered at step 1: Direct mouth contact. Maras powder amount (number/day). Retention time in mouth (minimum). Maras powder using duration (year)

difference originated from the group variables or other factors such as age and gender. We found that none of these parameters actually differed between group variables (p=0.716). Instead, they were determined by age and gender (p<0.001 and p=0.009, respectively). The same analysis revealed the age factor to be associated with diastolic blood pressure (p=0.02), Hb (p<0.001) and cholesterol level (p=0.001). Also, the age factor was associated with Hb level (p<0.001).

DISCUSSION

Tobacco use is a global problem similar to drug addiction and alcohol abuse. While the developed countries have reduced smoking rates as a government policy, smoking still remains an important health problem for most developing countries. Turkey has come a long way in the fight against tobacco use through the restrictions on tobacco consumption, purchasing of products and the creation of social awareness about the issue. As a tobacco variety, cigarette alternative products such as smokeless tobacco should be carefully evaluated for in order to increase public awareness. Unfortunately, the targeted level of smokeless tobacco use (especially in the Eastern and Southeastern regions of Turkey) has not been reached yet (notice no: 2013/4 published by Kahramanmaraş Governorship, Tobacco Control Council). The

common belief of "it is less harmful than smoking", cheaper prices, consideration of smokeless tobacco as an alternative method to stop smoking, and its ease of use in "non-smoking" areas are some of the underlying reasons why smokeless tobacco use is rapidly increasing (13-16). Numerous studies have researched the effects of smokeless tobacco on carcinogenesis, oral health, the respiratory system, and the cardiovascular system as well as the immunological, biochemical and hematological parameters. The nicotine content of Nicotiana rustica L. has been reported to be 6-10 times higher than the nicotine content of Nicotiana tabacum used for cigarettes (17). One study revealed that blood nicotine levels were 15 times higher when tobacco was consumed orally, compared to smoking (18). A limiting factor in the evaluation of the results of our study was that we did not measure nicotine levels of participants.

Nicotine and other chemicals in tobacco are responsible for the harmful effects on multiple organs, including the respiratory system. The effects of smokeless tobacco on these same systems have been documented to be equal or greater (19,20). Smoking has been considered as harmful on the cardiovascular system through nicotine, and increased blood nicotine levels of smokeless tobacco consumers can increase the risk of cardiovascular diseases. Several studies have reported that using these products can increase the risk factors for fatal myocardial infarctions (21-24). Güven et al. (11) conducted a study on Maras powder consumers and found that serum lipid levels were high and that diastolic function parameters were impaired compared to the control group. They stated that Maras powder was as harmful to the cardiovascular system as smoking cigarettes. Similarly, Allen et al. (25) investigated the incidence of cardiovascular diseases in smokeless tobacco consumers (26). They observed that blood pressure, heart rate and functions, and lipoprotein levels were different from the control group. These values were increased or decreased among smokeless tobacco users, while they remained stable within the control group. In our study, we detected statistically and significantly increased ECG findings in participants regardless of their method of consuming tobacco. While there was no significant difference between only Maras powder group and only smoking group, the ECG findings of both smoking and Maras powder consuming group was found to be statistically and significantly higher than the control group. When age and gender of the participants were considered, other cardiac parameters such as blood pressure, heart rate and lipid levels were not different between groups. This indicates that tobacco use is a risk factor for cardiovascular diseases alone, but using Maras powder along with smoking increases that risk. Smokers are exposed to more than 3,000 substances, including alkaloids, as well as many toxic and carcinogenic substances through tobacco consumption. For smokers, exposure to carcinogenic substances may also happen by burning the cigarette and inhaling the smoke of it. Smoke from the cigarette causes chronic inflammation in the airways and is the underlying etiology of various diseases such as chronic bronchitis, COPD, oral and oropharyngeal cancers and lung cancers. Recently, it has been reported that free radicals increase in patients with COPD, which may be responsible for the disease (27,28). Several studies have proved that the use of smokeless tobacco causes systemic effects by the association among usage of smokeless tobacco, free radicals, and endothelia (19,21). Köksal et al. (8) investigated the effects of Maras powder on the airways and cardiovascular system. According to the results of the study, Maras powder had no effect on airways because it was not inhaled, although it did affect the cardiovascular system equivalent to smoking cigarettes. In another similar study, Büyükbese et al. (6) investigated the effects of Maras powder on pulmonary function and they observed that pulmonary function was negatively affected. In our study, we could not detect any difference in pulmonary function parameters between the smokers and the control group. This may be associated with the fact that we conducted our study in the rural regions of Turkey, which exposed patients to biomass in varying degrees. There was no statistically significant difference in pulmonary function parameters between the cases of Maras powder use and smoking cigarette use. This was associated with the fact that Maras powder did not circulate through the respiratory system like smoking cigarettes. Maras powder contains many harmful substances such as nicotine and this can affect hematological and biochemical parameters. In a research conducted by Ukoha et al. (29) in Wistar rats treated with smokeless tobacco, hematological and homeostatic effects of smokeless tobacco in sublethal doses were shown to increase leukocyte levels and decrease erythrocyte and platelets compared to the control rat group. They suggested that smokeless tobacco use in high doses and in chronic processes might be a risk factor for abnormal homeostatic and hematological conditions. Another clinical study by Kılınç et al. (12) found high leukocyte levels and low monocyte and thrombocyte levels in participants using Maras powder. It has been shown that Maras powder can adversely affect biochemical and hematologic parameters negatively. Many studies have found a positive correlation between Maras powder use, Hb, leukocyte, lipid profiles, and C-reactive protein values. However, there are reports in the literature that suggest no statistical correlation (30). When comparing the participants

of our study, leukocyte levels were found to be higher in the group using Maras powder compared to the smokers group. The leukocyte levels were also higher in the group using both Maras powder and smoking compared to the only smoking group. Further analyses suggested that increased Hb and lipid profiles were associated with age and gender. There was no difference between the groups in terms of other biochemical and hematological parameters. The obtained data support the opinion that Maras powder has systemic adverse effects and it may increase peripheral leukocyte levels. It is a well-known fact that differences in the pack-per-year consumption, the kind of tobacco, and depth and duration of inspiration of the smoke are important contributors to the adverse effects of smoking cigarettes. Frequency, using method, duration held in the mouth, oral flora, and amount of saliva are among other factors on the emergence of adverse effects of tobacco (31-34). There are studies available emphasizing that smokeless tobacco may cause disturbances in or around mouth. Also, it can cause oral-oropharyngeal cancers, leukoplakia, bleeding gums, and gum abnormalities (35-37). Considering leukoplakia, there are studies indicating that smokeless tobacco has a 3.0% lower rate of progressing into dysplasia when compared to normal cigarette smoking. Therefore, progression into cancer is less and slower (38,39). But, adverse effects of smokeless tobacco have varying degrees of risk depending on various conditions such as consumption route and frequency. In an analysis of case-control studies, risk for oral and respiratory cancers was found to be statistically and significantly higher in participants using dry snuff, lower in moist snuff and chewing tobacco (40). In our study, we found that effective parameters on developing oral lesions were the amount of daily use and method of use. We concluded that direct contact of Maras powder with mucosa increased the risk for oral lesions up to 8 times compared to using it wrapped in paper. Also, a positive correlation between daily use frequency and oral lesions was found. According to this, we can conclude that use of smokeless tobacco may contribute to deterioration of mucosal integrity, leukoplakia, and dysplasia. The progression of oral-oropharyngeal cancer development by consumption with direct contact to mucosa and number of daily use sessions is also a concern. This is consistent with results of many studies within the literature (35-37). But the fact that we did not obtain samples from lesions or mucosa of the participants to process histopathologically was a limiting factor of our study.

CONCLUSION

In conclusion, the smokeless tobacco use, which is considered as an alternative way of quitting smoking, does not have adverse effects on respiratory functions. However, it is an important risk factor for many life-threatening health conditions such as cardiac diseases, impairment of several blood parameters, oral lesions, and gum abnormalities that contribute to malignancies. Also, daily use frequency and method of use (direct contact to mucosa) for these tobacco products should be considered due to their harmful effects. Social awareness should be created for smokeless tobacco use, similar to smoking, in order to fight this habitual threat to public health. Additionally, more comprehensive studies are necessary to raise awareness about the effects of smokeless tobacco as a serious health problem.

Ethics

Ethics Committee Approval: The study was approved Department of Pulmonary Medicine at Dr. Sureyya Adanalı Göksun State Hospital and Kahramanmaraş Sütçü İmam University Faculty of Medicine by the Local Ethical Committee and was in accordance to the Declaration of Helsinki (24.11.2014/181).

Informed Consent: There is not informed consent because of nature of the retrospective study.

Peer-review: External and internal peer-reviewed.

Authorship Contributions

Concept: İ.I., H.A., Design: İ.I., H.A., Data Collection or Processing: U.S.K., P.A.G., Analysis or Interpretation: İ.I., N.A., Literature Search: İ.I., M.T., Writing: İ.I.

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