



## ARAŞTIRMA / RESEARCH

### Acute effects of Maras powder (smokeless tobacco) on blood pressure and heart rate

Maraş otu (dumansız tütün) kullanımının kan basıncı ve kalp hızı üzerine akut etkileri

Hamit Sırrı Keten<sup>1</sup>, Soner Ölmez<sup>2</sup>, Hüseyin Üçer<sup>3</sup>, Oğuz Işık<sup>4</sup>, Fatis Yıldırım<sup>5</sup>, Mustafa Çelik<sup>6</sup>

<sup>1</sup>Kurtul Family Health Center, Department of Family Medicine, Kahramanmaraş, Turkey

<sup>2</sup>Samsat Family Health Center, Department of Family Medicine, Adıyaman, Turkey

<sup>3</sup>Kulp State Hospital Department of Family Medicine, Diyarbakir, Turkey

<sup>4</sup>Beyoğlu Family Health Center, Department of Family Medicine, Kahramanmaraş, Turkey

<sup>5</sup>Doğukent Family Health Center, Department of Family Medicine, Kahramanmaraş, Turkey

<sup>6</sup>Kahramanmaraş Sütçü İmam University, Department of Family Medicine, Medical Faculty, Kahramanmaraş, Turkey

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#### Abstract

**Purpose:** The aim of this study was to determine the acute effects of Maras powder on blood pressure and heart rate.

**Material and Methods:** This study was conducted in 20 cafés in Kahramanmaraş city on 140 voluntary males. Brachial systolic blood pressure, diastolic blood pressure and the heart rate were measured from the left arm by automated digital oscillometric device. The first heart rate, systolic blood pressure and diastolic blood pressure after a relaxing period of 15 minutes were accepted as the basal values. After the basal measurement, following measurements were performed on 5th, 10th, 15th and 20th minutes. Following initial measurement, the participants were made to place and keep 1.5 grams of Maras powder between the gingiva and the lower lip for 10 minutes. The measurements of the 5th and 10th minutes were performed when Maras powder was still in participants' mouths. After measurement of the 10th minute, Maras powder was taken out of the participants' mouths.

**Results:** Heart rate, systolic blood pressure and diastolic blood pressure values of 5th, 10th, 15th and 20th minutes were significantly higher compared to basal measurements.

**Conclusion:** We revealed that Maras powder increased the heart rate, systolic blood pressure and diastolic blood pressure acutely and significantly in our study.

**Key words:** Blood pressure, heart rate, smokeless tobacco, Maras powder

#### Öz

**Amaç:** Bu çalışmada Maraş otu (dumansız tütün) kullanımının kan basıncı ve kalp hızı üzerine akut etkisinin belirlenmesi amaçlanmıştır.

**Gereç ve Yöntem:** Bu çalışma Kahramanmaraş ilindeki 20 kıraathanede, 140 gönüllü erkek üzerinde yapıldı. Brakiyal sistolik kan basıncı, diastolik kan basıncı ve kalp hızı, sol koldan otomatik dijital osilometrik cihaz ile ölçüldü. Katılımcıların on beş dakikalık dinlenmeyi takiben yapılan ilk kalp hızı, sistolik kan basıncı ve diastolik kan basıncı ölçümü bazal olarak kabul edildi. Bazal ölçüm sonrası katılımcıların 5, 10, 15 ve 20.dakikalarda tekrar kalp hızı, sistolik kan basıncı ve diastolik kan basıncı ölçümü yapıldı. Bazal ölçümün hemen sonrasında, katılımcıların 1.5 gram Maraş otunu alt dudakın iç kısmında 10 dakika bekletmesi sağlandı. 5 ve 10. dakikada yapılan ölçümler Maraş otu ağızda iken yapıldı. 10. dakika yapılan ölçümün hemen sonrasında Maraş otu ağızdan çıkarıldı.

**Bulgular:** Çalışmamızda katılımcıların 5, 10, 15 ve 20.dakikalarda yapılan ölçümlerde kalp hızı, sistolik kan basıncı ve diastolik kan basıncının bazala göre anlamlı seviyede yüksek olduğu tespit edildi.

**Sonuç:** Çalışmamızda Maraş otu kullanıcılarında, Maraş otu kullanımının akut olarak kalp hızı, sistolik kan basıncı ve diastolik kan basıncını anlamlı olarak yükselttiğini ortaya konulmuştur.

**Anahtar kelimeler:** Kan basıncı, kalp hızı, dumansız tütün, Maraş otu.

Yazışma Adresi/Address for Correspondence: Dr. Hamit Sırrı Keten, Kurtul Family Health Center, Department of Family Medicine Kahramanmaraş, Turkey E-mail: hsketen@hotmail.com  
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## INTRODUCTION

Smokeless tobacco has been being consumed by humans for thousands of years<sup>1</sup>. Approximately 1.3 billion people use cigarette or other tobacco products worldwide<sup>2</sup>. The product of smokeless tobacco varies from a region or country to another. The consumption ratio of smokeless tobacco was 3.2% in America<sup>3</sup>. In Sudan<sup>4</sup> 40 % of the male and 10 % of the female use Toombak and in Sweden 21% of the male and 3.9 % of the female use Snus<sup>5</sup>. In a study in Turkey (Kahramanmaras city) it was reported that 16.8% of the normal population (25.1% of the male and 1.4% of the female) and 9.4% of the individuals with chronic disease (16.0% of the male and 1.1% of the female) consumed Maras powder<sup>6,7</sup>.

Maras powder is a kind of smokeless tobacco which is widely produced and consumed in South region of Turkey, especially Kahramanmaras city<sup>8</sup>. Maras powder is prepared by powderizing the leaves of the smoke plant, *Nicotiana rustica linn* and mixing it with ash in different ratios and it is kept in copper boilers to get dampened<sup>9,10</sup>. It was reported that the tobacco content used for preparation of Maras powder is 6 to 10 folds higher than the amount used for cigarette preparation<sup>11</sup>. One or two grams of Maras powder is used either by wrapping within a paper or sucking between the gingiva and the lower lip without paper<sup>12</sup>.

Smoking leads to an acute increase in systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) in several studies<sup>13,14</sup>. It was proven that there was a relationship between consumption of smokeless tobacco and acute or chronic increase in blood pressure or heart rate in epidemiological studies<sup>15,16</sup>. However in some studies it was shown that there was not an association between blood pressure levels and habit of smoking<sup>17,18</sup>. It was stated in the literature that tobacco products induce the increase in blood pressure and heart rate by activating the sympathetic system and enhancing the catecholamine excretion from adrenal medulla<sup>19,20</sup>. In this study it is aimed to determine the acute effects of Maras powder on hemodynamic parameters.

## MATERIALS AND METHODS

This study was conducted in 20 cafés on 140 voluntary males between 01.02.2014-01.04.2014 in Kahramanmaras city which is a province in the

South region of Turkey with an approximate population of one million. The participants were informed prior to study and the ones to give written consent were enrolled in the study. The ones using cigarette, alcohol and substance and the ones with hypertension history or usage of antihypertensive drugs were excluded from the study. All of the participants had experience of Maras powder usage. A survey about their age and characteristics of consumption of Maras powder was performed to all participants. Also height, weight, heart rate and blood pressure were measured and recorded. The measurement of height was performed by taking the shoes out, heels leaning back, standing upright and the head in normal anatomic position.

The arterial blood pressure measurements were performed following a relaxing period of 15 minutes, in sitting position and from the left arm. The participants were made not drinking coffee or tea at least 2 hours prior to measurements and not using Maras powder at least 4 hours prior to measurement. The heart rate and blood pressure were measured from the left arm by automated digital oscillometric device (Omron Model HEM-705 CP, Omron Corporation, Tokyo, Japan) advised by European Society of Hypertension<sup>21</sup>. The first HR, SBP and DBPs after a relaxing period of 15 minutes were accepted as the basal values. After the basal measurement, the measurements were performed on 5th, 10th, 15th and 20th minutes. Following the initial measurement, the participants were made to place and keep 1.5 grams of Maras powder between the gingiva and the lower lip for 10 minutes. The measurements of the 5th and 10th minutes were performed when Maras powder was still in participants' mouths. After the measurement of the 10th minute, Maras powder was taken out of the participants' mouths. The environment was silent and the temperature was 22-25 °C during the study.

## Statistical analysis

Data analysis was performed by using SPSS 20.0 statistical pocket program. The mean, frequency and Standard deviation were determined. The paired t test was used in order to determine the alterations in HR, SBP and DBP.  $p < 0.05$  was accepted to be statistically significant.

The ethics committee approval of the study was obtained from Kahramanmaras Sütçü İmam

University Faculty of Medicine Ethics Committee (2013/56) in accordance with Helsinki Declaration (Seoul, 2008).

## RESULTS

In our study 140 males between ages of 29-85 using Maras powder were enrolled. The mean age of the participants was  $51.64 \pm 13.46$ . The mean basal HR of the participants was  $82.37 \pm 12.91$  bpm and the mean HRs were  $88.04 \pm 14.08$  bpm in the 5. minute,  $86.39 \pm 12.19$  bpm in the 10. minute,  $85.16 \pm 12.31$  bpm in 15. minute and  $84.80 \pm 13.54$  bpm in 20. minute. The HR values were given in table 1. It was

determined that the HR was significantly higher than basal measurement in all repetitive measurements ( $p < 0.05$ ). The HR was the highest at 5. minute when Maras powder was still in mouth and that it decreased in following measurements. The significance levels of blood pressure and heart rate alterations were presented in the table (Table 2).

The mean basal SBP of the participants was  $124.25 \pm 14.60$  mmHg and the mean SBPs were  $131.42 \pm 18.77$  mmHg in the 5. minute,  $130.46 \pm 17.39$  mmHg in the 10. minute,  $127.85 \pm 20.12$  mmHg in 15. minute and  $127.17 \pm 16.33$  mmHg in 20. minute.

**Table 1. The HR, SBP and DBP values of the participants**

Measurements	SBP	DBP	HR
	p	p	p
Basal-5. minute	<0.0001	<0.0001	<0.0001
Basal-10. minute	<0.0001	<0.0001	<0.0001
Basal-15. minute	0.012	0.011	0.001
Basal-20. minute	0.035	0.022	0.005
5. minute -10. minute	0.479	0.607	0.023
5. minute -15. minute	0.014	0.011	0.001
5. minute -20. minute	0.006	0.005	<0.001
10. minute -15. minute	0.045	0.027	0.048
10. minute -20. minute	0.022	0.010	0.027
15. minute -20. minute	0.659	0.689	0.637

SBP:Systolic blood pressure; DBP:Diastolic blood pressure; HR: Heart rate

The mean basal DBP of the participants was  $77.91 \pm 8.81$  mmHg and the mean DBPs were  $84.32 \pm 14.08$  mmHg in the 5. minute,  $83.62 \pm 12.89$  mmHg in the 10. minute,  $81.00 \pm 12.68$  mmHg in 15. minute and  $80.48 \pm 12.51$  mmHg in 20. minute. The SBP and DBP values were given in Table 1. SBP and DBP values were significantly higher than basal measurement in all repetitive measurements ( $p < 0.05$ ).

The SBP and the DBP were the highest at 5th minute when Maras powder was still in mouth and that they decreased in following measurements. Moreover, SBP and DBP values in 5. and 10. minute measurements when Maras powder was still in mouth were significantly higher than other measurements. The significance levels of SBP and DBP alterations were presented in the table (Table 2).

**Table 2. The significance levels of (p values) alterations of the HR, SBP and DBP.**

Measurement time	SBP (mmHg)	DBP (mmHg)	HR (bpm)
Basal	$124.25 \pm 14.60$	$77.91 \pm 8.81$	$82.37 \pm 12.91$
5. minute	$131.42 \pm 18.77$	$84.32 \pm 14.08$	$88.04 \pm 14.08$
10. minute	$130.46 \pm 17.39$	$83.62 \pm 12.89$	$86.39 \pm 12.19$
15. minute	$127.85 \pm 20.12$	$81.00 \pm 12.68$	$85.16 \pm 12.31$
20. minute	$127.17 \pm 16.33$	$80.48 \pm 12.51$	$84.80 \pm 13.54$

SBP:Systolic blood pressure; DBP:Diastolic blood pressure; HR: Heart rate

The mean number of daily Maras powder usage of the participants was  $17.09 \pm 9.36$  times (min=3, max=50), the mean consumption duration was  $18.16 \pm 12.96$  years (min=1, Max=70) and the mean time to keep in mouth was  $16.27 \pm 14.17$  minutes (min=2, max=60). Ninety percent of the participants (n:126) consumed it by wrapping within a paper and 10% (n:14) used it directly placing to inner part of the lip.

## DISCUSSION

There are few studies in the literature investigating the effects of Maras powder on cardiovascular system. In our study it was revealed that Maras powder increased the HR, SBP and DBP acutely. In a study by Güven et al it was found that early left ventricular filling time was lower and atrial filling time and deceleration time was longer in individuals consuming Maras powder compared to the control group<sup>22</sup>. Furthermore it was reported that Maras powder increased the oxidative stress<sup>23</sup> and the carotid intima media thickness<sup>24</sup>.

In our study the HR values of the 5., 10., 15. and 20. minutes were significantly higher compared to basal measurements. The HR was the highest at 5. minute when Maras powder was still in mouth and it decreased in following measurements. In a study on healthy smoking males, the HR at rest was found to be 57 bpm. In the 30. minute measurement when 1.5 grams of snuff given at 15 minutes intervals twice was in mouth, the HR was found to be 73 bpm. It was reported that snuff usage increased the HR significantly<sup>25</sup>. Martin et al measured the HR in male participants and then made them keep 2.5 gr smokeless tobacco in mouth for 30 minutes and measured the HR serially. They detected that the HR was significantly higher in 10., 20., 30., 40. and 50. minutes and was similar to basal value at 60. minute<sup>26</sup>. Ramakrishnan et al found that basal HR was 68.3 bpm in resting males and that the HR reached to 78.2 bpm in 15. minute, 77.1 bpm in 30. minute and 76.3 bpm in 60. minute after 1 gr of snus was chewed and kept in mouth for 60 minutes. It was found that the HR was significantly higher compared to basal value in all measurements<sup>27</sup>.

Both in our study and the other studies, it was revealed that tobacco consumption increased HR acutely. It is considered that cigarette and smokeless tobacco increases the HR by various mechanisms. That nicotine increases catecholamine secretion

from adrenal medulla by activating the sympathetic system<sup>19,20</sup>, and enhances cortisone levels by norepinephrine in postsynaptic receptors are among these hypotheses<sup>28</sup>.

In this study SBP and DBP levels of the participants were significantly higher in all of the measurements in the first 20 minutes compared to basal values. SBP and DBP were highest in 5th minute measurement when Maras powder was still in mouth and that they decreased in repetitive measurements. Furthermore, SBP and DBP values of 5. and 10. minutes when Maras powder was in mouth were significantly higher than other measurements. In a study on healthy males, it was reported that the heart pressure increased for the first 5 minutes and it became similar to basal levels in 30. minute<sup>29</sup>. In a study it was determined that systolic blood pressure increased 6.7 mmHg and diastolic blood pressure increased 4.4 mmHg after 45 minutes of exposure to shisha<sup>30</sup>. Wolk et al measured SBP to be 122 mmHg and DBP to be 57 mmHg at rest in healthy males. After administration of two doses (1.5 gr) of oral snuff, SBP was found to be 134 mmHg and DBP was found to be 64 mmHg in 30th minute measurement when the snuff was still in mouth. It was concluded that SBP and DBP were increased significantly by snuff consumption<sup>25</sup>. In another study on males with tobacco experience, the participants were made to keep 2.5 gr smokeless tobacco in mouth for 30 minutes after chewing and it was found that SBP values were higher in 10., 20., 30., 40., 50. and 60. minutes compared to basal. Also DBP was found to be significantly higher in all measurements compared to basal measurement<sup>26</sup>.

Our study is compatible with the literature. It was proven by many studies that tobacco products increased the blood pressure. It is emphasized that nicotine plays the major role in this effect. That nicotine leads to coronary vasoconstriction by  $\alpha$ -adrenergic mechanism, enhances local and systemic secretion of catecholamines and that it stimulates vasopressin excretion are the possible factors to explain it<sup>19,20,32</sup>. It was considered that nicotine would act as an adrenaline enhancer, would cause hormonal changes and affect the blood pressure regulatory system<sup>28</sup>.

The limitations of this study was to measure blood pressure from one arm and carry a digital device of measurement. There was no control group. Not questioning of parameters such as the use of salt

might also affect the measurements. The time period that the measurements made were relatively short.

We revealed that Maras powder increased the HR, SBP and DBP acutely and significantly in our study. This effect of Maras powder on hemodynamic parameters indicate that it is an important risk for cardiovascular diseases. Therefore preventive measures should be taken in order to limit the consumption of Maras powder.

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