

# Prevalence of Torus Palatinus in Cappadocia Region Population of Turkey

Yildiray Sisman<sup>a</sup>

Elif Tarim Ertas<sup>b</sup>

Cumali Gokce<sup>c</sup>

Faruk Akgunlu<sup>d</sup>

## ABSTRACT

**Objectives:** The objectives of this study were to determine the prevalence, size, shape and location of the torus palatinus (TP) in dental outpatients in Cappadocia region of Turkey and to investigate the relationship between the findings in relation to age and gender.

**Methods:** The present study included 2660 patients, who attended the Department of Oral Diagnosis and Radiology in the Faculty of Dentistry at Erciyes University for their dental problems between December 2005 and May 2007. The presence or absence of TP was examined by clinical inspection and palpation.

**Results:** The prevalence of TP in our large sample was low (4.1%) in comparison to other Turkish population. It was found to be significantly higher ( $P<.001$ ) in females (5.7%) than in males (1.8%). Most TP were found in flat shape (62.7%), smaller than 2 cm (75.4%) and located at premolar-molar region (66.4%).

**Conclusions:** This study indicated that the prevalence of TP in Turkish population was low. Our results showed a significant relationship between the occurrence of TP and gender. According to the literature, it was firstly showed that flat TP was the most common type in our large population. (Eur J Dent 2008;2:269-275)

**Key words:** Epidemiology; Torus palatinus; Prevalence; Shape; Gender; Size.

- <sup>a</sup> Assistant Professor and Chair, Department of Oral Diagnosis and Radiology, Faculty of Dentistry, Erciyes University, Kayseri, Turkey.  
<sup>b</sup> Research Assistant, Department of Oral Diagnosis and Radiology, Faculty of Dentistry, Erciyes University, Kayseri, Turkey.  
<sup>c</sup> Dr., Department of Endocrinology and Metabolism, Kayseri Training and Research Hospital, Kayseri, Turkey.  
<sup>d</sup> Professor and Chair, Department of Oral Diagnosis and Radiology, Faculty of Dentistry, Selcuk University, Konya, Turkey.
- Corresponding author: Dr. Yildiray Sisman, Department of Oral Diagnosis and Radiology, Faculty of Dentistry, Erciyes University, 38039, Melikgazi, Kayseri, Turkey.  
Phone: +90 352 437 4901 /29226 Fax: +90 352 438 0657  
E-mail: drsisman@yahoo.com

## INTRODUCTION

Tori are nodular protuberances of mature bone, the exact designation of which depends on anatomic region.<sup>1</sup> Torus palatinus (TP) is an exostosis of the hard palate localized along the median palatine suture, involving both the processi palatini and the os palatinum. It contains compact and cancellous bone and is formed by the hypertrophy of the spongy and oral compact layers, the nasal compact layer remain unchanged.<sup>2</sup> It is generally accepted as an anatomical variation rather than a pathological condition.<sup>3</sup> TP forms different shapes as flat, nodular, spindle and lobular (Figure 1)<sup>4,5</sup> and is often detected in young adults and middle-aged people.<sup>6-8</sup> TP is asymptomatic, grows slowly during

the second and third decades of life and often goes unnoticed until middle age.<sup>9-11</sup> Although, TP is not pathologically significant, surgical removal is required if it causes chronic trauma or interfere with oral function or with the replacement of a denture base or framework.<sup>3</sup>

Although a large number of researches have tried to clarify the influence of genetic,<sup>8,9</sup> environmental,<sup>7,12</sup> nutritional, and climatologic factors, there is still no consensus on the etiology of TP.

The prevalence of TP ranges from 1.4 to 66.0% in different populations (Table 1),<sup>2-4,6-9,13-26</sup> and it was reported between 20.9-45.4% in Turkish populations.<sup>19,22,26</sup> It was also found that females have a higher prevalence of TP.<sup>3,4,6,7,9,13-15,18,19,21,23,26,27</sup>

The aims of this study were to determine the prevalence, size, shape and location of TP and to investigate the relationship between the findings in relation to age and gender in Cappadocia region population.

## MATERIALS AND METHODS

A total of 2660 dental patients admitted to the Faculty of Dentistry, Erciyes University from Cappadocia region of Turkey. All the patients were examined by YS in terms of the presence of TP. The subjects were stratified into six age groups: 13-19, 20-29, 30-39, 40-49, 50-59 and 60 years and older. The examination of the TP was assessed by clinical inspection and palpation, performed by the same author. The patients who have questionable TP were not included in this study. For the diagnosis, TP was defined as a raised bony exostosis in the midline of the hard palate.

The maximum elevation of the outgrowth of TP,

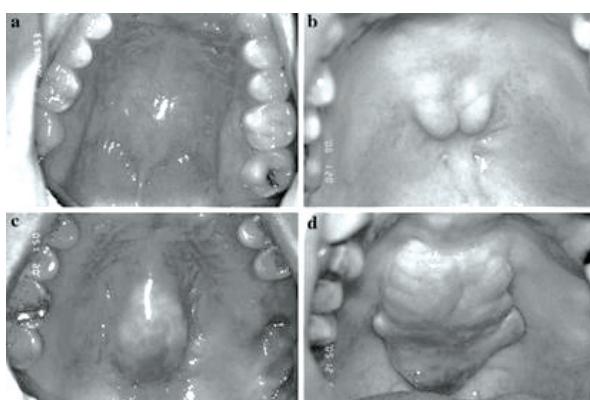


Figure 1 a-d. Taken from Jainkittivong et al,<sup>4</sup> reprinted with the permission of Surgical Radiol Anatomy Journal.

usually in consistent with width and length,<sup>3</sup> was applied for the measurement of the size of TP and graded according to previous description<sup>21,26</sup> as more or less than 2 cm.

The shape of TP was classified as flat, nodular, spindle and lobular according to Jainkittivong et al.<sup>4</sup> The locations of TP were classified as incisors, incisors-premolars, premolars-molars, molars, and incisors-premolars-molars.

## Statistical analysis

The observed results were analyzed with SPSS 11.0 (Statistical package for social science Inc., Chicago, Illinois, USA). The chi-square test and t-test were used for group differences. P values <.05 were considered statistically significant.

## RESULTS

A total of 2660 subjects, 1576 were females and 1084 were males. The mean age was  $33.0 \pm 15.1$  years with the ages ranging from 13 to 85 years. The mean age was  $32.3 \pm 14.3$  years for females and  $33.9 \pm 16.0$  years for males. There were 591 (22.2%) subjects in the 13-19 year, 693 (26.0%) subjects in the 20-29 year, 508 (19.1%) subjects in the 30-39 year, 437 (16.4%) subjects in the 40-49 year, 277 (10.4%) subjects in the 50-59 year and 154 (5.8%) subjects in the 60 years and older groups (Table 2).

Table 2 presents the distribution of TP in relation to age and gender. TP was recorded in 110 (4.1%) of the 2660 individuals. It was found to be significantly higher ( $P < .001$ ) in females (5.7%) than in males (1.8%). The highest TP prevalence (7.1%) were in the oldest group (60 and older years age range). The prevalence of TP in females was higher than in males in terms of all age groups (except 13-19 years age group).

The distribution of TP size according to gender and age is shown in Table 3. Of the 110 TP cases the mostly (75.4%) were smaller than 2 cm. The age and gender differences in the distribution pattern of TP according to size were not statistically significant ( $P > .05$ ).

Table 4 shows the location of TP on the hard palate in 110 subjects in relation to age. The most common TP was found at the premolar-molar region (66.4%), followed by molars (15.4%) and premolars regions (13.6%). The less common locations were at incisor-premolar and incisor-

premolar-molar regions (4.5%).

Table 5 shows the distribution of TP according to shape in relation to gender. The most common shape of TP was flat (62.7%). Other less common shapes of TP were spindle (36.3%), nodular (0.9%) and lobular (0.0%). There was no significant difference found in TP shape between females and males ( $P>.05$ ).

## DISCUSSION

There are many studies showing the TP prevalence ranges from 1.4 to 66.0% in different populations.<sup>2-4,6-9,13-26</sup> A Turkish study<sup>22</sup> was performed in 80 dry skulls, reported a high

prevalence (45.4%) of TP. In other study,<sup>26</sup> the prevalence of TP was 30.9% in 1943 school children (5-15 years old). Cagirankaya et al<sup>19</sup> pointed out that the prevalence of TP was 20.9% in consecutive 253 subjects (17-49 years old). According to our knowledge, this is the most detailed study in terms of the subject number (n=2660) and the age range (13-85 years old) investigating TP prevalence in Turkish population.

The TP prevalence in this study (4.1%) was lower in comparison to most of the other studies.<sup>2-4,6-9,13-17,19-24,26</sup> The same low prevalence (3.9%) was found by Bruce et al<sup>18</sup> in 926 dental patients in the Ghanaian community. It was suggested that

**Table 1.** Comparison of findings of TP in various populations.

Year of Publication	Population	Sample Size	Females (%)	Males (%)	Prevalence (%)
1950	Eskimos <sup>3, a</sup>	–	–	–	66.0
1953	United States <sup>24</sup>	2478	–	–	20,.9
1966	Yugoslavian <sup>2</sup>	–	–	–	49.7
1977	Brazilian Indian <sup>17</sup>	200	–	–	10.0
1984	Singapore <sup>20</sup>	–	48.0	48.0	48.0
1985	Icelandic,South-Thingeyjarsysla <sup>16</sup>	763	–	–	33.3
1985	Icelandic,North-Thingeyjarsysla <sup>16</sup>	213	–	–	14.6
1987	Saudi Arabia <sup>25</sup>	1932	–	–	1.4
1988	Germans <sup>8</sup>	1317	–	–	13.5
1992	Norway, Oslo area <sup>7</sup>	5000	11.,2	6.7	9.2
1994	Norway, Lofoten <sup>6</sup>	1181	43.4	32.7	38.2
1994	Norway, Gudbrandsdalen <sup>6</sup>	829	39.8	23.7	32.7
1996	Israel <sup>21</sup>	1002	24.9	16.4	21.0
1998	Israel <sup>9</sup>	168	39.3	38	38.7
1999	Southern Thailand <sup>23</sup>	609	69.9	30.1	61.7
1999	Turkish <sup>22, a</sup>	86	–	–	45.4
2001	African <sup>15</sup>	367	6.7	5.5	6.2
2001	West Indies <sup>15</sup>	212	7.9	4.7	6.6
2002	Thai <sup>13</sup>	1200	67.3	48.8	58.1
2004	Ghanaian community <sup>18</sup>	926	5.2	2.2	3.9
2004	Turkish <sup>19</sup>	253	28.2	6.0	20.9
2005	Turkish <sup>26</sup>	1943	34.3	28.1	30.9
2006	Jordan <sup>14</sup>	338	47	14	29.8
2007	Thai <sup>4</sup>	1520	70.5	48.8	60.5
2007	Turkish (Present Study)	2660	5.7	1.8	4.1

<sup>a</sup>: Skulls

dietary and ethnic factors may be important in this study. However, it was showed that there is a high prevalence of TP in other studies such as 21.0% in the young and adult population of Israelis,<sup>21</sup> and in 20.9% of the United States population<sup>24</sup> and in the Norway study (32.7%).<sup>6</sup> It was thought that environmental, genetic and functional factors are important for these prevalences. A less TP prevalence was found at Giza region, Saudi Arabia (1.4%).<sup>25</sup> This study may reveal that racial differences are much more important for the prevalence.

In Turkish population, Yildiz et al<sup>26</sup> investigated TP prevalence in 1943 school children and showed a higher prevalence (30.9%) in comparison to the present study. All the school children were 5-15 years old, but our patients were 13-85 years old. The number of our subjects (2660) is higher than that study. In the other study,<sup>19</sup> it was showed that the prevalence of TP was 20.9% in consecutive 253 subjects (17-49 years old). All these reports including our study were performed in the different regions and populations of Turkey. It may suggest that these prevalence differences may be due to age, regional and dietary factors.

These different prevalences in different populations may be due to ethnicity. It was reported that among similar ethnic groups

living in different areas,<sup>6,16</sup> or different ethnic groups living in same areas<sup>21,28</sup> have various prevalences of TP. The formation of TP has been attributed to various factors by different authors. A huge number of investigators have evaluated the effects of environmental,<sup>7,12</sup> and genetic factors<sup>8,9</sup> including masticatory stress,<sup>7,8,23</sup> and nutritional<sup>6</sup> factors. The prevalence of TP within the same race reported by different authors varies greatly (Table 1). The inconsistent results of various authors possibly are due to the difference of the number of subjects, different geographic location, and standards.

Dietary factors may have a role for the tori prevalence. Eggen and Natvig<sup>29</sup> investigated the influences of nutrients in the etiology of tori. It was suggested that saltwater fish consumption in Norway possibly supplies higher levels of polyunsaturated fatty acids and Vitamin D which is involved in bone growth and this may increase the prevalence of tori. Gorsky et al<sup>9</sup> investigated the inheritance of TP by segregation analysis. Their results suggested that TP is an autosomal dominant trait. Belsky et al<sup>30</sup> showed that the presence and especially the size of TP is correlated with increased bone mineral density. High bone mass may be associated with a gene mutation. Genetic factors may be the probable causes of the

**Table 2.** Prevalence of TP in relation to age and gender.

Age groups (years)	Females		Males		Total		P
	n (%)	TP (%)	n (%)	TP (%)	n (%)	TP (%)	
13-19	338 (21.4)	6 (1.8)	253 (23.3)	5 (2.0)	591 (22.2)	11 (1.9)	
20-29	441 (28.0)	18 (4.1)	252 (23.2)	5 (2.0)	693 (26.0)	23 (3.3)	
30-39	311 (19.7)	30 (9.6)	197 (18.2)	3 (1.5)	508 (19.1)	33 (6.5)	
40-49	278 (17.6)	20 (7.2)	159 (14.6)	0 (0.0)	437 (16.4)	20 (4.6)	
50-59	136 (8.6)	10 (7.3)	141 (13.0)	2 (1.4)	277 (10.4)	12 (4.3)	
≥60	72 (4.5)	6 (8.3)	82 (7.5)	5 (6.1)	154 (5.8)	11 (7.1)	
Total	1576 (59.2)	90 (5.7)	1084 (40.8)	20 (1.8)	2660 (100)	110 (4.1)	***

Chi-square test: \*\*\*:P<.001

**Table 3.** Distribution of TP in relation to gender, size and age.

TP size	Females (n=90)		Males (n=20)		Total (n=110)	Age (years) Mean±SD
	n (%)	n (%)	n (%)	n (%)		
<2 cm	67 (74.4)	16 (80.0)	16 (14.5)	4 (20.0)	83 (75.4)	38±15.7
>2cm	23 (25.6)	4 (20.0)	4 (3.6)	1 (5.0)	27 (24.5)	37±13.2

low TP prevalence in Turkish population. Seafood consumption is not as common in the Cappadocia region population as in the other parts of the world having water sources. It might also have a role in this low prevalence.

The TP prevalence obtained from dry skulls was always higher than those from living subjects.<sup>3,22</sup> Woo<sup>3</sup> studied five series of adult skulls and reported the TP prevalence ranging 38 to 66.5%. Gözil et al<sup>22</sup> investigated 80 dry skulls, and reported a high prevalence (45.4%) of TP in Turkish population. This high prevalence may be due to a detailed and easy examination of dry skulls in terms of TP.

In the present study, the TP prevalence was significantly higher in females (5.7%) than in males (1.8%) ( $P<.001$ ). Singaporean study is the only study that shows the same frequency of TP in both sexes.<sup>20</sup> The findings of our study that the prevalence of TP was higher in females than in males is consistent with other studies.<sup>3,4,6,7,9,11,13-15,18,19,21,23,26,27</sup> There is no certain explanation for this difference, but genetics may be suggested as a major factor.

Earlier studies<sup>3,7,13,17</sup> revealed higher TP

prevalences during the second and third decades of life, whereas in our present study, it was higher during the sixth decade. The high prevalence of TP among the 60 years and older age group in our study should not be taken into consideration as an important finding because the sample of that age group is not large and might not reflect the true prevalence.

In our study, most of TP was smaller than 2 cm (75.4%), and located in premolar-molar area (66.4%). Yildiz et al<sup>26</sup> reported that 91.5% of TP smaller than 2 cm, and 62% located in molar area in 5–15 age group. King and More<sup>31</sup> who studied 400 individuals from the United States and United Kingdom reported that 67% of TP smaller than 2 cm. However, Hashim et al<sup>32</sup> revealed that the prevalence of TP larger than 2 cm was much greater than that of smaller. As Hashim et al<sup>32</sup> studied groups from the Malaysian ethnic group; it is possible that size may be associated with ethnicity.

Most of the studies,<sup>2,17,24,33,34</sup> in agreement with the present study, showed that flat TP is the most common type, but Reichart et al<sup>8</sup> and Jainkittivong

**Table 4.** Distribution of TP location in relation to age.

Age groups (years)	Location				
	I-P region n (%)	P region n (%)	P-M region n (%)	M region n (%)	I-P-M region n (%)
13-19	0 (0.0)	1 (0.9)	6 (5.4)	4 (3.6)	0 (0.0)
20-29	0 (0.0)	3 (2.7)	16 (14.5)	4 (3.6)	0 (0.0)
30-39	1 (0.9)	5 (4.5)	20 (18.1)	4 (3.6)	3 (2.7)
40-49	0 (0.0)	4 (3.6)	14 (12.7)	2 (1.8)	0 (0.0)
50-59	0 (0.0)	1 (0.9)	8 (7.2)	2 (1.8)	1 (0.9)
≥60	0 (0.0)	1 (0.9)	9 (8.2)	1 (0.9)	0 (0.0)
Total	1 (0.9)	15 (13.6)	73 (66.4)	17 (15.4)	4 (3.6)

I: incisors; P: premolar; M: molar.

**Table 5.** Distribution of TP shape in relation to gender.

TP shape	Females		Total n (%)
	n (%)	n (%)	
Flat	56 (50.9)	13 (11.8)	69 (62.7)
Spindle	33 (30)	7 (6.3)	40 (36.3)
Nodular	1 (0.9)	0 (0.0)	1 (0.9)
Lobular	0 (0.0)	0 (0.0)	0 (0.0)

et al's<sup>4</sup> studies reported spindle TP. It may suggest that ethnic differences in terms of TP shape do exist or not need further investigations.

## CONCLUSIONS

The prevalence of TP in our sample was low in comparison to other Turkish population. Our results showed a significant relationship between the occurrence of TP and gender. The age and gender related differences with the size of TP were not noted. Most TP were found in flat shape (62.7%), smaller than 2 cm (75.4%) and located at premolar-molar region (66.4%). According to the literature, it was firstly showed that flat TP was the most common type in our large population. The present study supports that the etiology of TP are a combination of multifactorial genetic and environmental factors.

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