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Research Paper

Correlation of Prevalence of Torus Palatinus and Torus Mandibularis with the Form of Maxillary and Mandibular Arches in Iraqi Population

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ABSTRACT: *Aims of the study were to determine the shape, size of torus palatinus (TP) and torus mandibularis (TM) and to investigate the genders and age related changes of both tori. Also it performed to determine the correlation between prevalence of tori and clinical characteristics with the form of the maxillary and mandibular arches. The sample consists of 1200 Iraqi subjects, age range from 12 – over 60 years. The subjects were divided into six groups. Plaster casts were made for assessment of the size and shape of tori. The forms of maxillary and mandibular arches were recorded as ovoid, tapering and square. TP were found in 16.3% of the subjects and TM in 10.9% of the subjects. Females show higher percentage of both tori (22.2% for TP and 14.0% for TM) than males (10.0% for TP and 7.8% for TM).TP and TM mostly reported in small size (10.0% for TP and 7.8% for TM). Statistically it was found a significant difference between the size of both tori and age for females. Flat shape TP most frequently observed (7.7%) while for TM bilateral single shape mostly recurrence in 5.6%.Statistically it was found a significant different between shape of TP and age groups for both genders at P< 0.05. Ovoid form arch reported to be mostly associated with flat shape TP (8.8%) and bilateral single shape TM (6.3%). For tapered form arch, spindle shape TP (5.9%) and unilateral single shape TM (3.7%) mostly reported. While for arch of square form, flat shape TP (5.7%) and bilateral single as well as bilateral multiple shapes TM (5.0%) greatly prevalence. Highly significant differences reported between size and shape of TP and TM at P< 0.01.*

***Keywords*:-** *Prevalence, Size, Shape, Torus palatinus and torus mandibularis.*

I. INTRODUCTION

Tori are occurring in the lingual aspect of the mandible and hard palate of the maxilla and they are benign anatomical bony prominences. Torus palatinus (TP) is a sessile nodule of bone that occurs along the midline of the hard palate. Torus mandibularis (TM) is a bony protuberance located on the lingual aspect of the mandible, commonly recurrence at the canine and premolar area [1], [2], [3]. Torus mandibularis and torus palatinus may interfere with the construction and function of removable partial and complete dentures, as well as oral functional movement [4]. Torus mandibularis is covered by an extremely thin layer of soft tissue and for that reason they may be easily irritated by slight movement of the denture base in partially or completely edentulous arches [5].As well as torus palatinus can be uncomfortable to complete or partial denture patients. This is mostly true if the prosthesis overrun a tolerable size which then can interfere with proper seating leading to tissue irritation and inflammation [6]. Torus palatinus and torus mandibularis require no treatment unless they become so large in size and interfere with function, denture placement, or experience from periodical traumatic surface ulceration. When treatment is picked, the lesions may be treated by surgically removal [7].

Regarding for their shapes, torus palatinus is divided into flat, spindle-shaped, nodular and lobular, whereas torus mandibularis is divided into unilateral solitary and bilateral solitary, unilateral multiple, bilateral multiple and bilateral combined. Their size can range from millimeter to centimeter. Regarding speaking, swallowing and eating, as well as planning of partial and complete dentures, small size tori do not cause any problem in the most of cases, whereas large size tori can cause considerable problems [8],[9]. The majority of the tori were small or medium in

size [10]. There are no specified etiological factors but there are numerous predisposing factors such as, environmental, genetic and nutritional [11].

The aims of this study were to determine the shape, size of tori and to investigate the gender and age related changes of torus palatinus (TP) and torus mandibularis (TM). This study was also performed to determine the correlation between prevalence of tori and clinical characteristics with the form of the maxillary and mandibular arches.

II. MATERIALS AND METHODS

The sample consist 1200 Iraqi patients attended college of dentistry at Baghdad University for different dental treatments, the age range from 12 - over 60 years.

The subjects were divided into six groups (12-20, 21-30, 31-40, 41-50, 51-60, 60-over years).The mean ages for males and females were 40.9± 19.3 and 40.5±17.6 years, respectively. A short medical history was obtained, the presence or absence of TP and TM was assessed by clinical inspection and palpation performed by one examiner. Questionable tori were recorded as not present. In cases of positive finding, impressions of the maxillary and mandibular arches were taken by using alginate impression material. Plaster casts were made for assessment of the size and shape of tori.

The size of tori was measured at the highest elevation of the out growth by using electronic digital caliper to the nearest tenth of a millimeter. Plaster casts of the maxilla were trimmed dorsally to the area of the second molar; this area usually identify to the maximal height of the TP.The natural convexity of the palate was slightly marked with red colored pencil to allow for measurement of the height of the torus. Casts of the mandible were trimmed at the same manner. The natural form of the mandible was also marked with red colored pencil to allow for measurement of the height of the TM (Fig.1).The average size of tori was graded according to classification of Reichart et al [12] as follows: small (<3mm), medium (3-6mm) and large (>6mm).

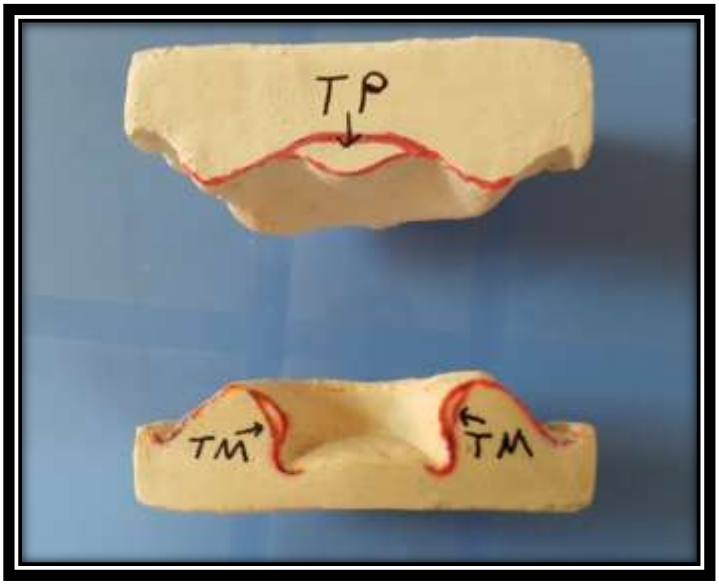

Figure 1: Cross-section of maxillary and mandibular plaster casts in areas of the second molar. The height of TP and TM were measured between two red lines as indicated by arrows.

The shapes of TP were classified as [2], [3]:

1. Flat torus (F): occurring as a slightly convex protuberance with a smooth surface extending symmetrically on both side of the palate.

2. Lobular torus (L): present as a pedunculated or sessile lobular mass that can arise from a single base.

3. Nodular torus (N): occurring as multiple protuberance each with individual bases; these may coalesce forming grooves between them.

4. Spindle torus (S): present along the midline ridge along the palatal raphe area.

Torus mandibularis were grouped as to whether the bony nodules were single or multiple. Thus four groups of form were recorded: unilateral single (US), unilateral multiple (UM), bilateral single (BS), bilateral multiple

(BM) [9], [10].The forms of maxillary and mandibular arches were recorded as squared, tapering and ovoid form [13], [14].

The statistical package for social science (version 12.0) was used for the analyses. The Chi-square test was used to test for group differences. Differences between groups with $P \leq 0.05$ were considered significant (S), $P > 0.05$ non significant (NS) and $P < 0.01$ highly significant (HS).

III. RESULTS

TP and TM were observed in 16.3% and 10.9% of the total subjects respectively (Table 1).Females show higher percentage of both tori (22.2% for TP and 14.0% for TM) compared with males (10.0% for TP and 7.8% for TM). Statistically it was found that a non significantly different regarding the correlation between the occurrence of both tori and genders at $P > 0.05$, as well as the occurrence of both tori and each age group (Table 1).

From 1200 subjects, it was found that TP and TM mostly reported in small and medium sizes (10.0% and 5.7% for TP respectively) and (7.8% and 2.9% for TM respectively) while large size were reported in small percent (0.7% for TP and 0.3% for TM) (Table 2 and Table 3). Statistically it was found a non significant different between size of both types of tori and age for males at $P > 0.05$ while there was a significant different reported for females at $P < 0.05$ (Table 2 and Table 3). There was a significant different found between size of tori and age for total sample at $P < 0.05$ regarding TP (Table 2). Highly significant different was found between size of tori and age for TM regarding total sample at $P < 0.01$ (Table 3).

Table 1: Distribution of torus palatinus and torus mandibularis in relation to age and genders.

Age groups	TP			TM				TP	TM
(years)	n	Male n (%)	Females n (%)	n	Males n (%)	Females n (%)	n	Total n (%)	Total n (%)
12-20	100	7 (7.0)	10 (10.0)	100	5 (5.0)	6(6.0)	200	17 (8.5)	11 (5.5)
21-30	100	12 (12.0)	26 (26.0)	100	7 (7.0)	16 (16.0)	200	38 (19.0)	23 (11.5)
31-40	100	10 (10.0)	30 (30.0)	100	10 (10.0)	19 (19.0)	200	40 (20.0)	29 (14.5)
41-50	100	14 (14.0)	24 (24.0)	100	8 (8.0)	16 (16.0)	200	38 (19.0)	24 (12.0)
51-60	100	11 (11.0)	25 (25.0)	100	9 (9.0)	14 (14.0)	200	36 (18.0)	23 (11.5)
61 &over	100	9 (9.0)	18 (18.0)	100	8 (8.0)	13 (13.0)	200	27 (13.5)	21 (10.5)
Total	600	63 (10.0)	133 (22.2)	600	47 (7.8)	84 (14.0)	1200	196 (16.3)	131 (10.9)

Age groups	Genders difference in TP in each age group		Genders difference in TM in each age group	
	z-score test	p-value	z-score test	p-value
12-20	0.835	0.407 (NS)	0.692	0.490 (NS)
21-30	-0.083	0.936 (NS)	-0.599	0.549 (NS)
31-40	-1.084	0.280 (NS)	-0.178	0.857 (NS)
41-50	0.691	0.490 (NS)	-0.288	0.772 (NS)
51-60	-0.226	0.818 (NS)	0.358	0.719 (NS)
≥ 61	0.143	0.889 (NS)	0.231	0.818 (NS)

Genders versus prevalence of TP $X^2 = 2.021$ **d.f. = 5 P=0.846(NS)**

Genders versus prevalence of TM $X^2 = 0.977$ **d.f. = 5 P=0.964(NS)**

Table 2: Distribution of torus palatinus in relation to age, genders and size.

Age groups	Males				Females				Total			
years	n	Small n (%)	Medium n (%)	Large n (%)	n	Small n (%)	Medium n (%)	Large n (%)	n	Small n (%)	Medium n (%)	Large n (%)
12-20	100	5 (5.0)	2 (2.0)	0 (0.0)	100	7 (7.0)	3 (3.0)	0 (0.0)	200	12 (6.0)	5 (2.5)	0 (0.0)
21-30	100	9 (9.0)	3 (3.0)	0 (0.0)	100	11 (11.0)	14 (14.0)	1 (1.0)	200	20 (10.0)	17 (8.5)	1 (0.5)
31-40	100	7 (7.0)	3 (3.0)	0 (0.0)	100	14 (14.0)	12 (12.0)	4 (4.0)	200	21 (10.5)	15 (7.5)	4 (2.0)
41-50	100	10 (10.0)	4 (4.0)	0 (0.0)	100	10 (10.0)	14 (14.0)	0 (0.0)	200	20 (10.0)	18 (9.0)	0 (0.0)

51-60	**100**	**11 (11.0)**	**0 (0.0)**	**0 (0.0)**	**100**	**15 (15.0)**	**7 (7.0)**	**3 (3.0)**	**200**	**26 (13.0)**	**7 (3.5)**	**3 (1.5)**
61&over	**100**	**6 (6.0)**	**3 (3.0)**	**0 (0.0)**	**100**	**15 (15.0)**	**3 (3.0)**	**0 (0.0)**	**200**	**21 (10.5)**	**6 (3.0)**	**0 (0.0)**
Total	**600**	**48 (8.0)**	**15 (2.5)**	**0 (0.0)**	**600**	**72 (12.0)**	**53 (8.8)**	**8 (1.3)**	**1200**	**120 (10.0)**	**68 (5.7)**	**8 (0.7)**

Comparisons for size difference of TP and age in males	**X^2 =4.371**	**d.f.=5**	**P=0.497 (NS)**
Comparisons for size difference of TP and age in females	**X^2 =19.508**	**d.f.=10**	**P=0.034 (S)**
Comparisons for size difference of TP and age in total sample	**X^2 =18.862**	**d.f.=10**	**P=0.041 (S)**

Genders versus size: Small: X^2 = 2,645 d.f. =5 P=0.755 (NS) Medium: X^2 =5.871 d.f. =5 P=0.319 (NS) Large: X^2 =0.0

Table 3: Distribution of torus mandibularis in relation to age, sex and size.

Genders versus size: Small: X^2 = 1.362 d.f. =5 P=0.928 ((NS) Medium: X^2 =3.841 d.f. =5 P=0.573 (NS) Large: X^2 =0.0

Age groups	Males				Females				Total			
years	**n**	**Small n (%)**	**Medium n (%)**	**Large n (%)**	**n**	**Small n (%)**	**Medium n (%)**	**Large n (%)**	**n**	**Small n (%)**	**Medium n (%)**	**Large n (%)**
12-20	**100**	**4 (4.0)**	**1 (1.0%)**	**0 (0.0)**	**100**	**6 (6.0)**	**0 (0.0)**	**0 (0.0)**	**200**	**10 (5.0)**	**1 (0.5)**	**0 (0.0)**
21-30	**100**	**5 (5.0)**	**2 (2.0)**	**0 (0.0)**	**100**	**12 (12.0)**	**4 (4.0)**	**0 (0.0)**	**200**	**17 (8.5)**	**6 (3.0)**	**0 (0.0)**
31-40	**100**	**8 (8.0)**	**2 (2.0)**	**0 (0.0)**	**100**	**16 (16.0)**	**3 (3.0)**	**0 (0.0)**	**200**	**24 (12.0)**	**5 (2.5)**	**0 (0.0)**
41-50	**100**	**5 (5.0)**	**3 (3.0)**	**0 (0.0)**	**100**	**10 (10.0)**	**6 (6.0)**	**0 (0.0)**	**200**	**15 (7.5)**	**9 (4.5)**	**0 (0.0)**
51-60	**100**	**6 (6.0)**	**0 (0.0)**	**3 (3.0)**	**100**	**11 (11.0)**	**3 (3.0)**	**0 (0.0)**	**200**	**17 (8.5)**	**3 (1.5)**	**3 (1.5)**
61&over	**100**	**5 (5.0)**	**3 (3.0)**	**0 (0.0)**	**100**	**5 (5.0)**	**8 (8.0)**	**0 (0.0)**	**200**	**10 (5.0)**	**11 (5.5)**	**0 (0.0)**
Total	**600**	**33 (5.5)**	**11 (1.8)**	**3 (0.5)**	**600**	**60 (10.0)**	**24 (4.0)**	**0 (0.0)**	**1200**	**93 (7.8)**	**35 (2.9)**	**3 (0.3)**

Comparisons for size difference of TM and age in males	**X^2 =16.643**	**d.f.=10**	**P=0.0.083 (NS)**
Comparisons for size difference of TM and age in females	**X^2 =11.919**	**d.f.=5**	**P=0.036 (S)**
Comparisons for size difference of TM in total sample	**X^2 =27.27**	**d.f.=10**	**P=0.002 (HS)**

Concerning the shape of tori, it was found that F and S shapes for TP most frequently observed (7.7% and 6.8% respectively) followed by L and N shape (1.3% and 0.8% respectively) (Table 4).While for TM it was reported that BS and US shapes most frequently found (5.6% and 2.3% respectively) followed by BM and UM (1.8% and 1.3% respectively) (Table 5).Statistically it was found that a significant different between shapes of TP and age groups of the sample for males , females as well as in total sample at P<0.05. There was a significant different observed between the S shape of TP and genders regarding age groups at P<0.05 but there were a non significant differences reported for other shapes at P>0.05 (Table 4).

For TM, statistically it was reported that a high significant different between the shapes of TM and age groups in males, females and total sample at P<0.01 (Table 5). There was a high significant different observed for US shape of TM and genders according to age groups at P<0.05 while there was a significant different for UM shape of TM at P<0.05 and a non significant differences for BS and BM shapes at P>0.05 (Table 5).

Table 4: Distribution of torus palatinus in relation to age, genders and shape.

Age groups	Males	Females	Total

years	n	S n (%)	N n (%)	L n (%)	F n (%)	n	S n (%)	N n (%)	L n (%)	F n (%)	n	S n (%)	N n (%)	L n (%)	F n (%)
12-20	100	2 (2.0)	1 (1.0)	0 (0.0)	4 (4.0)	100	3 (3.0)	1 (1.0)	1 (1.0)	5 (5.0)	200	5 (2.5)	2 (1.0)	1 (0.5)	9 (4.5)
21-30	100	7 (7.0)	1 (1.0)	1 (1.0)	3 (3.0)	100	11 (11.0)	3 (3.0)	3 (3.0)	9 (9.0)	200	18 (9.0)	4 (2.0)	4 (2.0)	12 (6.0)
31-40	100	9 (9.0)	0 (0.0)	0 (0.0)	1 (1.0)	100	12 (12.0)	3 (3.0)	1 (1.0)	14 (14.0)	200	21 (10.5)	3 (1.5)	1 (0.5)	15 (7.5)
41-50	100	5 (5.0)	0 (0.0)	0 (0.0)	9 (9.0)	100	11 (11.0)	0 (0.0)	6 (6.0)	7 (7.0)	200	16 (8.0)	0 (0.0)	6 (3.0)	16 (8.0)
51-60	100	6 (6.0)	0 (0.0)	0 (0.0)	5 (5.0)	100	5 (5.0)	0 (0.0)	0 (0.0)	20 (20.0)	200	11 (5.5)	0 (0.0)	0 (0.0)	25 (12.5)
61& over	100	0 (0.0)	0 (0.0)	2 (2.0)	7 (7.0)	100	9 (9.0)	0 (0.0)	1 (1.0)	8 (8.0)	200	9 (4.5)	0 (0.0)	3 (1.5)	15 (7.5)
Total	600	29 (4.8)	2 (0.3)	3 (0.5)	29 (4.8)	600	51 (8.5)	7 (1.2)	12 (2.0)	63 (10.5)	1200	80 (6.7)	9 (0.8)	15 (1.3)	92 (7.7)

Association between shape of TP and age in males	**X^2 =30.052**	**d.f. =15**	**P=0.012 (S)**
Association between shape of TP and age in females	**X^2 =29.466**	**d.f. =15**	**P=0.014 (S)**
Shape difference of TP in total sample	**X^2 =29.42**	**d.f. =15**	**P=0.014 (S)**

Form of TP versus genders according to age groups:

S: X^2 =7.365 d.f. =2 P=0.195 (NS) **N: X^2 =1.768 d.f. =1 P=0.047 (NS)**

L: X^2 =6.146 d.f. =2 P=0.189 (NS) **F: X^2 =12.89 d.f. =2 P=0.024 (S)**

Table 5: Distribution of torus mandibularis in relation to age, genders and shape.

Age groups	Males					Females					Total				
years	n	BS n (%)	BM n (%)	US n (%)	UM n (%)	n	BS n (%)	BM n (%)	US n (%)	UM n (%)	n	BS n (%)	BM n (%)	US n (%)	UM n (%)
12-20	100	4 (4.0)	0 (0.0)	1 (1.0)	0 (0.0)	100	5 (5.0)	0 (0.0)	1 (1.0)	0 (0.0)	200	9 (4.5)	0 (0.0)	2 (1.0)	0 (0.0)
21-30	100	7 (7.0)	0 (0.0)	0 (0.0)	0 (0.0)	100	9 (9.0)	3 (3.0)	4 (4.0)	0 (0.0)	200	16 (8.0)	3 (1.5)	4 (2.0)	0 (0.0)
31-40	100	5 (5.0)	5 (5.0)	0 (0.0)	0 (0.0)	100	12 (12.0)	3 (3.0)	4 (4.0)	0 (0.0)	200	17 (8.5)	8 (4.0)	4 (2.0)	0 (0.0)
41-50	100	3 (3.0)	1 (0.0)	0 (0.0)	4 (4.0)	100	0 (0.0)	3 (3.0)	10 (10.0)	3 (3.0)	200	3 (1.5)	4 (2.0)	10 (5.0)	7 (3.5)
51-60	100	9 (9.0)	0 (0.0)	0 (0.0)	0 (0.0)	100	7 (7.0)	0 (0.0)	4 (4.0)	3 (3.0)	200	16 (8.0)	0 (0.0)	4 (2.0)	3 (1.5)
61& over	100	5 (5.0)	1 (1.0)	2 (2.0)	0 (0.0)	100	1 (9.0)	5 (5.0)	1 (1.0)	6 (6.0)	200	6 (3.0)	6 (3.0)	3 (1.5)	6 (3.0)
Total	600	33 (5.5)	7 (1.2)	3 (0.5)	4 (0.7)	600	34 (5.7)	14 (2.3)	24 (4.0)	12 (2.0)	1200	67 (5.6)	21 (1.8)	27 (2.3)	16 (1.3)

Association between shape of TM and age in males	**X^2 =42.89**	**d.f. =15**	**P=0.000 (HS)**
Association between shape of TM and age in females	**X^2 =48.491**	**d.f. =15**	**P=0.000 (HS)**
Shape difference of TM in total sample	**X^2 =48.995**	**d.f. =15**	**P=0.000 (HS)**

Form of TM versus genders according to age groups:

BS: X^2 =9.147 d.f. =5 P=0.103 (NS) **BM: X^2 =5.438 d.f. =3 P=0**

US: X^2 =15.188 d.f. =5 P=0.009 (HS) **UM: X^2 =0.857 d.f. =2 P=0.032 (S)**

The distribution of TP and TM in relation to arch form, tori shapes and genders explain in (Table 6 and Table 7). It was found that for ovoid form arch F shape TP and BS shape TM most frequently found (8.8% and 6.3% respectively). For tapered form arch S shape TP and US shape TM mostly reported (5.9% and 3.7 respectively)

.While for square form arch F shape TP and both BS and BM shapes TM mostly prevalence (5.7% and 5.0% respectively). Ovoid form arch shown greater percentage for males and females (66.25% and 77.0% respectively).

Statistically it was found that a significant different regarding the association between maxillary arch form and shapes of TP in males while there were a non significant differences found between the arch form and shapes of TP in females as well as in total sample (Table 6 and Table 7).

High significant different observed between the S shape of TP and genders regarding arch form at $P< 0.01$ and significant different found between N shape of TP and genders as well as the UM shape of TM and genders regarding arch form at $P< 0.05$. While the others shapes of TP and TM shown a non significant differences at $P>0.05$ (Table 6 and Table 7).

Table 6: Distribution of torus palatinus in relation to maxillary arch form, tori form and genders.

Maxillary arch form	Males					Females					Total				
	n (%)	S n (%)	N n (%)	L n (%)	F n (%)	n (%)	S n (%)	N n (%)	L n (%)	F n (%)	n (%)	S n (%)	N n (%)	L n (%)	F n (%)
Ovoid form	397 (66.2)	17 (4.3)	1 (0.3)	1 (0.3)	24 (6.0)	462 (77.0)	46 (10.0)	7 (1.5)	10 (2.2)	51 (11.1)	859 (71.6)	63 (7.4)	8 (0.9)	11 (0.3)	75 (8.8)
Tapered form	146 (24.3)	9 (6.2)	1 (0.7)	0 (0.0)	3 (2.1)	87 (14.5)	5 (5.4)	0 (0.0)	1 (1.1)	8 (8.6)	233 (19.4)	14 (5.9)	1 (0.4)	1 (0.4)	11 (4.6)
Square form	57 (9.5)	3 (5.3)	0 (0.0)	2 (3.5)	2 (3.5)	51 (8.5)	0 (0.0)	0 (0.0)	1 (2.0)	4 (8.2)	108 (9.0)	3 (2.8)	0 (0.0)	3 (2.8)	6 (5.7)
Total	600 (100.0)	29 (4.8)	2 (0.3)	3 (0.5)	29 (4.8)	600 (100.0)	51 (8.5)	7 (1.2)	12 (2.0)	63 (10.5)	1200 (100.0)	80 (6.7)	9 (0.8)	15 (1.3)	92 (7.7)

Association between maxillary arch form and TP form in males	**X^2 =15.419**	**d.f.=6**	**P=0.017 (S)**
Association between maxillary arch form and TP form in females	**X^2 =5.532**	**d.f.=6**	**P=0.478 (NS)**
Association between maxillary arch form and TP form in total sample	**X^2 =7.866**	**d.f.=6**	**P=0.248 (NS)**

Form of TP versus genders according to arch form groups:

S: X^2 =12.378 d.f. =2 P=0.002 (HS) **N: X^2 =3.938 d.f. =1 P=0.047 (S)**

L: X^2 =5.152 d.f. =2 P=0.076 (NS) **F: X^2 =0.109 d.f. =2 P=0.947 (NS)**

Table 7: Distribution of torus mandibularis in relation to mandibular arch form, tori form and genders.

Maxillary arch form	Males					Females					Total				
	n (%)	BS n (%)	BM n (%)	US n (%)	UM n (%)	n (%)	BS n (%)	BM n (%)	US n (%)	UM n (%)	n (%)	BS n (%)	BM n (%)	US n (%)	UM n (%)
Ovoid form	411 (68.5)	26 (6.3)	3 (0.7)	2 (0.5)	0 (0.0)	405 (67.5)	25 (6.2)	7 (1.7)	14 (3.5)	9 (2.2)	816 (68.0)	51 (6.3)	10 (1.2)	16 (2.0)	9 (1.1)
Tapered form	126 (21.0)	3 (2.4)	3 (2.4)	0 (0.0)	0 (0.0)	117 (19.5)	5 (4.3)	2 (1.7)	9 (7.7)	1 (0.9)	243 (20.3)	8 (3.3)	5 (2.1)	9 (3.7)	1 (0.4)
Square form	63 (10.5)	4 (6.3)	1 (1.6)	1 (1.6)	4 (6.3)	78 (13.0)	3 (3.8)	6 (7.7)	1 (1.3)	2 (2.6)	141 (11.8)	7 (5.0)	7 (5.0)	2 (1.4)	6 (4.3)
Total	600 (100.0)	33 (5.5)	7 (1.2)	3 (0.5)	4 (0.7)	600 (100.0)	33 (5.5)	15 (2.5)	24 (4.0)	12 (2.0)	1200 (100.0)	66 (5.5)	22 (1.8)	27 (2.3)	16 (1.3)

Association between mandibular arch form and TM form in males	**X^2 =23.553**	**d.f.=6**	**P=0.000 (HS)**
Association between mandibular arch form and TM form in females	**X^2 =16.18**	**d.f.=6**	**P=0.013 (S)**
Association between mandibular arch form and TM form in total sample	**X^2 =19.51**	**d.f.=6**	**P=0.003 (HS)**

Form of TM versus genders according to arch form groups:

BS: X^2 =0.662 d.f. =2 P=0.718 (NS) **BM: X^2 =2.838 d.f=2 P=0.242 (NS)**

US: X^2 =4.219 d.f. =2 P=0.121 (NS) **UM: X^2 =8.889 d.f=2 P=0.012 (S)**

The distribution of TP and TM in relation to shape and size were explained in (Table 8 and Table 9). For TP, S and F shape tori mostly found in small size (77.5% and 88.9% consequently) while N and L shape tori mostly reported in medium size (88.9% and 88.0% consequently) (Table 8). For TM, BS shape and US shape tori mostly reported in small size (79.1% and 96.3% consequently) while BM and UM shape tori mostly prevalence in medium size (57.1% and 68.8% consequently) (Table 9). Large size tori reported in very small percentage or not present concerning all shapes of TP and TM. Statistically there were a highly significant differences observed between the size and shape of tori for both TP and TM at $P< 0.01$.

Table 8: Distribution of torus palatinus in relation to size and shape.

Shapes of TP for males and females	Size of TP for males and females			
		Small	**Medium**	**Large**
	n (%)	**n (%)**	**n (%)**	**n (%)**
S	**80 (40.8)**	**62 (77.5)**	**18 (22.5)**	**0 (0.0)**
N	**9 (4.6)**	**0 (0.0)**	**8 (88.9)**	**1 (11.1)**
L	**15 (7.7)**	**3 (20.0)**	**12 (80.0)**	**0 (0.0)**
F	**92 (46.9)**	**55 (59.8)**	**30 (32.6)**	**7 (7.6)**
Total	**196 (100.0)**	**120 (61.2)**	**68 (34.7)**	**8 (4.1)**

Association between the size and shape of TP, X^2 = 40.975 d.f. = 6 P = 0.000 (HS)

Table 9: Distribution of torus mandibularis in relation to size and shape.

Shapes of TM for males and females	Size of TM for males and females			
		Small	**Medium**	**Large**
	n (%)	**n (%)**	**n (%)**	**n (%)**
BS	**67 (51.1)**	**53 (79.1)**	**11 (16.4)**	**3 (4.5)**
BM	**21 (16.0)**	**9 (42.9)**	**12 (57.1)**	**0 (0.0)**
US	**27 (20.6)**	**26 (96.3)**	**1 (3.7)**	**0 (0.0)**
UM	**16 (12.2)**	**5 (31.2)**	**11 (68.8)**	**0 (0.0)**
Total	**131 (100.0)**	**93 (71.0)**	**35 (26.7)**	**3 (2.3)**

Association between the size and shape of TM, X^2 = 37.692 d.f. = 6 P= 0.000 (HS)

IV. DISCUSSION

The prevalence of tori in this sample of Iraqi population found to be about 16.3% for TP and 10.9% for TM which is within the ranging found in other studies from (1.4% to 66.0%) in different population [11],[15]. The percentage of this study lower than other studies like that reported in Croatian population (66.0% for TP and 64.0% for TM) [9] and higher than other study like that reported in Indian population (1.3% for TP and 6.9% for TM) [16].These variation related to fact that different in nutrition that supplies different level of polyunsaturated fatty acid and vitamin D that involve in bone growth which increase the prevalence of tori [9]. Also the different may related to ethnicity [11] and also it stated that tori may be less common in blacks population than in whites population[17].Haugen suggested that it may be related to genetics responsible factor [15].

Females show higher percentage for recurrence of TP and TM compared with males (Table1). This result agree with other studies [1], [11], [19], [18] but disagree with other [20].So it suggested that it a genders related phenomenon [1].However in this study did not show any significant differences in prevalence of TP and TM in

comparison between genders as well as the incidence of TP and TM in comparison with each age groups at P 0.05, this result agree with Chohayeb and Volpe [21] but disagree with the result reported by Al Quran and Al Dwairi [2] .This is may be because their sample size small. The incidences of TP were more reported in age group between 41-50 year for males and 31-40 years for females. While for TM between 31- 40 years for both genders (Table 1).This result agrees with that reported by Patil et al and Yoshinaka et al [16], [22]. It was shown from (Table 1) the prevalence of tori decrease with progression of age especially after the age of 50 years. This variation may be related to functional factors and as progression of age there were be decrease in numbers of teeth as result to extraction of teeth and periodontal disease, this result in decrease of masticatory function as the persons become partially or completely edentulous, so less occlusal stress get and it can be consider as functional factors as suggested by other authors [1], [12].

Concerning the size of TP and TM, it was reported mostly in small and medium size while large size found in very small percentage for both tori (Table 2 and Table 3). There was a non significant different concerning the relation between size of both tori and genders. A non significant different found between size of each type of tori and each age group regarding males but there was a significant different for females. This result agree with the result observed by Reichart et al [12] as they reported small size tori more frequently found than large size. Females had higher frequency of TP and tend to have more small and medium size tori than males while the result in contrast for TM regarding large size TM in which large size TM found more frequent in males than females, this result agree with Haugen [15]. It was notice from this study that no larger size observed after the age of 60 years, this may be due to that most of persons become completely edentulous and get more bone resorption.

From (Table 4) it was reported that F shape tori most frequently observed (7.7%) followed by S shape (6.7%). This result agree with others previous studies [2], [6], [17], while disagree with other studies [1], [9], [12], [18] in which they reported that S shape more frequently recorded shape of TP. Although for males in this study, the F shape and S shape tori reported to be in the same percentage (4.8%).

Concerning TM (Table 5) it was reported that BS shape of TM most frequently prevalence (5.6%) followed by US shape tori (2.3%). This result agree with the finding of most studies [1], [12], [16], [18], [19]. Although BS shape tori (5.5%) most frequently observed for males sample followed by BM shape tori while for females, BS shape tori (5.7%) most frequently recurrence followed by US shape tori (4.6%).

These explain by that the environmental and functional factors play an important role during life. The response of the persons to these factors different from population to others in addition to that they will effected by other factors like genetic factors for genders differences and effect of Y chromosome on growth [8],[18].

The distribution of TP and TM in relation to the arch form and genders explain in (Table 6 and Table 7). Regarding total sample it was found that F shape TP mostly reported for ovoid and square form arches while for tapered form arch S shape TP most frequently observed. Concerning TM, the BS shape TM observed in higher percentage than other shapes of TM in both ovoid and square form arches. While for tapered form arch US shape of TM presented in higher percentage than other shapes.

Concerning my search there is no study reported studying the relation between the form of the dental arch and the shape of tori. From this study the result may be explain as it may be due to that ovoid and square forms arch have more surface area and as a result more irritated surface area result in F shape tori while for tapered form arch there was a restricted surface area which result in less irritated area also may be due to direction of force exerted will be differ with the different forms of dental arches.

Regarding genders, there were a variation in percentage reported for the association between arch form and shapes of both TP and TM. The ovoid form arch found to have F shape TP and BS shape TM in higher percentage than other shapes for both genders.

For tapered arch, males reported to have S shape TP more percentage than other shapes in upper arch, for TM, BS shape found to be in equal percent with BM shape and they were in higher recurrent than other shapes in lower arch. Females reported to have F shape TP and US shape TM more recurrent than other shapes.

For arch of square form, males reported to have S shape TP more recurrent and BS shape TM found to be in equal percent with UM shape TM and more prevalence than other shapes. Females reported to have F shape TP and BM shape TM more percent than other shapes. This variation may be due to different in number of arch forms samples reported for both genders as the ovoid arch form reported in higher percentage than others (68%), different in amount and type of irritation expose to it, amount of occlusal forces exerted by each genders, different in age groups, diet variation, hormonal change, number of missing teeth, absent or present of restoration with complete or partial removable restorations. Further studies needed to confirm these result and studying the effect of depth palate and amount of bone resorption on these relation.

From Table 8 and Table 9, it was reported that there was a highly significant relation between the shape and size of both TP and TM. S shape and F shape TP (Table 8) reported to be more recurrence in small size and this result agree with the result reported by other authors [1], [12]. While for N shape and L shape TP mostly prevalence in medium size. For L shape TP, the result of this study in agrees with Apinhasmit et al while it in contrast regarding N shape TP. Large size TP reported only in small percentage for N shape and F shape TP, this result in agree with Apinhasmit et al for N shape TP but it disagree with them for F shape TP. Regarding TM (Table 9), BS shape and US shape TM reported in high percentage as small size while BM shape and UM shape TM mostly reported in larger size, this result agree with the result reported by Apinhasmit et al and Reichart et al [1],[12].

V. CONCLUSION

Females show high prevalence of TP and TM than males. The incidence of tori decrease after the age of 60 as this related to functional factors. Most of TP and TM present in small and medium size. Ovoid form arch show to be mostly associated with F shape TP and BS TM. Tapered form arch mostly reported with S shape TP and US shape TM while for square form arch seems to be mostly associated with the F shape TP and BS shape TM more recurrence. There were a highly significant differences reported between the shapes and sizes of both tori. So the result of this study supported the finding that There are no specified etiological factors but there are many predisposing factors such as, environmental, genetic ,nutritional and functional factors.

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