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PREVELANCE OF TAURODONTISM IN PATIENTS ATTENDING THE DENTAL CLINICS COMPLEX, FACULTY OF DENTISTRY, ZLITEN

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ABSTRACT

A retrospective descriptive study comprising 402 panoramic radiographs of patient records, 204 females and 198 males,ranging in ages from 18 to 68 years old. The panoramic radiographs were evaluated forpresence of taurodontism. Gender predilection and location of taurodont molars were analysed using a chi-square test.

Taurodontism was found in13 (3.23%) radiographs distributed according to gender (7females and 6 males[P > 0.05].The overall prevalence of taurodont molars was (0.73%) from a total of 3955molarsthat were examined. The mandibular molar teeth were more affected than the maxillary molar teeth and the second mandibular tooth was the most affected.

Taurodontism was not uncommon in a group of patients that attended the Clinics Complex, Faculty of Dentistry, Zliten. Further larger scale studies are required to assess its distribution in the general population of Libyato compare it with other ethnic groups and to establish any associations.However, taurodontism in mandibular teeth is a condition that should be taken into consideration, especially the second mandibular tooth, to avoid any treatment complications.

Keywords: Classification Diagnosis Occurrence Panoramic Radiographs Taurodontis

Introduction

Taurodontism is one of the anomalies of tooth morphology seen in the dentition. This anomaly is a developmental disorder of a tooth that shows a deficiency of constriction at the cement-enamel junction (CEJ) and is characterized by vertically elongated pulp chambers, apical displace of the pulpal floor and bifurcation or trifurcation of the roots (Hargreaves and Goodis 2002; Neville *et al*. 2002).

Old anthropological studies of Croatian Neanderthal specimens dating back 70000 years showed signs of taurodontism (Barker, 1976;Keith, 1913).

In the early 1900`s, authors like De terra (1903),Gorjanovic and Kramberger (1907),Pickrill (1909)and Adloff (1907)mentioned a difference in tooth form of peculiarhuman dentitions in definite patients.They made no attempt to label this alteration.

In 1913, taurodontism was first explained by Keith as: a tendency for the body of the tooth to enlarge at the expense of the roots.

The origin of the name taurodontism is a combination of the two words “tauros”, meaning “bull” in Latin and “odus” which is of Greek origin meaning “tooth" and the initialuse of the term,taurodontism, was to explain molar teeth similarity those of ungulates, particularly bulls (Witkop, 1976). Taurodontism now defined as tooth morphologic changes with the absence of the usual constriction at the cemento-enamel junction; apical displacement of the pulp chamber floor and furcation area at the expense of the roots and the root canal length (Witkop, 1971).

Taurodontism can make complications in some procedures for the dentist during extraction and endodontic, orthodontic and/or prosthetic treatment planning(Ghabanchi *et al*.2010).

There is a lack of literature on the prevalence of taurodontism in Libya, bearingin mind that Libya is a country of diverse ethnic affiliations with varying representation.

To date, international studies have focused on the incidense of taurodontism and very few have focused on the site and the exact teeth that can be affected as well as the prevalence between genders. This study attempts to know the prevalence of taurodontism in a population, the gender differences and which the most affected teeth.

Aim:

The occurrence of taurodont molars and analysis of it among patients attending the Dental Clinics Complex, Faculty of Dentistry, Zliten.

Objectives

- to determine the incidence of taurodontism in molars.
- to determine the gender distribution of taurodontism.
- to determine the highest prevalent type of taurodontism.
- to determine the variations of taurodont molars (maxillary vs mandibular).
- to determine the site of taurodont molars (first, second).

methodology and materials

Study Design is a descriptive cross-sectional retrospective design.

Sample Size

A convenient sample of 402 panoramic radiographs was selected from the archives of patients' records at Clinics Complex, Faculty of Dentistry, Zliten during the period of January 2015 to December 2021.

Study Population

Inclusion Criteria

- Radiographs of patients above the age of 18 years.
- Only radiographs which were taken in Dental Clinics Complex, Faculty of Dentistry, Zliten with full demographic details of the patients were used for this study.
- Good diagnostic quality radiography that shows at least 2 molars per quadrant with completed root formation.

Exclusion Criteria

- Patients under 18 years old were excluded.
- Panoramic radiographs not have good diagnostic quality.
- Incomplete apical foramen formation teeth were excluded.
- fractured molar teeth and unshowed furcation and fused molar roots were not included.

Data Collection

A sample of 402 panoramic radiographs, having met the inclusion criteria, from a total of 1792 panoramic radiographs, were included in the study.

taurodontism and the modified classification of Shifman and Chanannel (1978). The lower second molar on the right side was used for the exercise. The same 30panoramic radiographs were re-examined 3 weeks later by the senior examiners. Diagnosis was recorded once mutual consensus was agreed.

All the radiographs that met the inclusion criteria were divided into 8 groups of 50 panoramic radiographs each.

50 panoramic radiographs were examined at a time to minimize examiner fatigue.

All the panoramic radiographs were viewed on the same secreen with fixed light intensity; ambient light was eliminated or kept to a minimum.

Radiographs were assessed for presence of a large pulp chamber in relation to outer tooth form, less marked cervical constriction than the normal tooth, an apically displaced furcation and short roots based on Shaw`s diagnostic method.

The posterior teeth that showed large pulp chambers and less marked cervical constriction (than normal) and apically displaced furcation and short roots were further examined to measure the distance between the CEJ and the highest point of the floor of the pulp chamberwith the aid of a software package called ImageJ® 1.46r (Microsoft®). The value obtained from measuring this distance was used to know the degree of taurodontism for

every tooth.

Hypotaurodontism will be confirmed as a range of 3.5-5.0mm, Mesotaurodontism 5.5-7.0mm and Hypertaurodontism 7.5mm or over, according to the modified classification of Shifman and Chanannel(1978); Tulensalo *et al*.(1989).

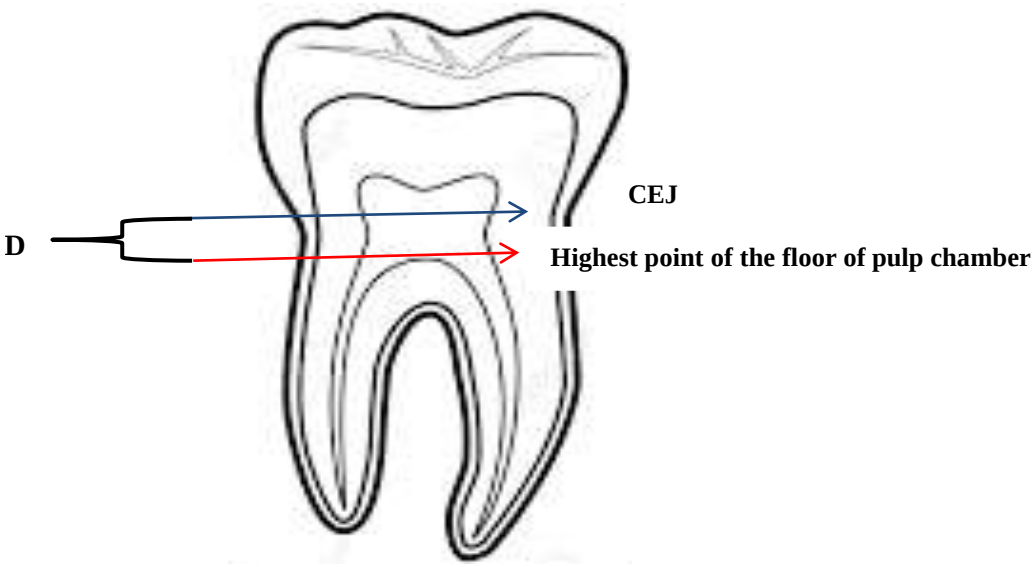

Figure 4: Diagram of measuring the distance between CEJ and highest point of the floor of the pulp chamber.

The diagnosis of taurodontism was determined by an diffrent method called the taurodontism Index which use of measuring two variables: (*Variable 1)* the vertical height of the pulp chamber - the distance between the highest point in the floor of the pulp chamber and the lowest point of the roof of the pulp chamber;*(Variable 2)* the distance between the lowest point of the roof of the pulp chamber and the apex of the longest root (Shifman and Chanannel 1978).

To calculate the TI (Taurodontism index) $= \frac{\text{variable1}}{\text{variable2}} \times 100$

Taurodontism was assessed in those molars in which the TI was more than 20 and using these findings in terms of TI, degrees of T were confirmed to be: hypo-T 20-30; meso-T 30-40; and hyper- T 40-75.

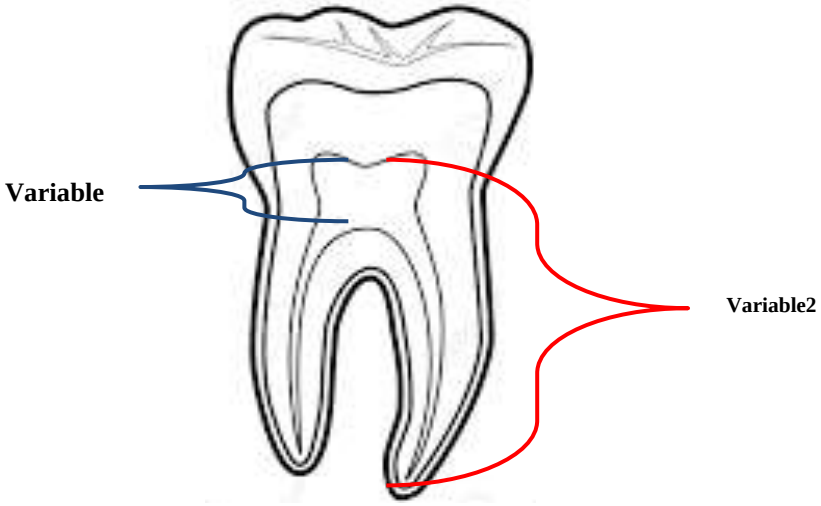

Figure 5: Diagram of measurement landmarks of TI.

All the data that was collected was entered into a Microsoft Excel 2011® spreadsheet. Each panoramic radiograph was given a number to maintain anonymity.
Statistical analysis of the data was performed using the computer program SPSS for Microsoft Windows7 and the frequency distribution for taurodontism was calculated. The Chi-square test was used to compare the prevalence of taurodontism between male and female subjects, and the correlations regarding the location of taurodont teeth (maxillary versus mandibular).

The results

The study sample comprised 745 panoramic records, of which 402 fulfilled the inclusion criteria. 204 of these radiographs belonged to females (50.7%) and 198 panoramic radiographs (49.3%) belonged to males. From the 402 panoramic radiographs, 13 (3.23%) radiographs showed positive for single or multiple taurodontism.

Distribution of taurodontism according to gender showed a female prevalence of 7/204 (3.43%), and male prevalence of 6/198 (3.03%).According to a chi-square test these two observed prevalences are not statistically significantly different: chi-square = 0.7861, df = 1, p-value = 0.3753.

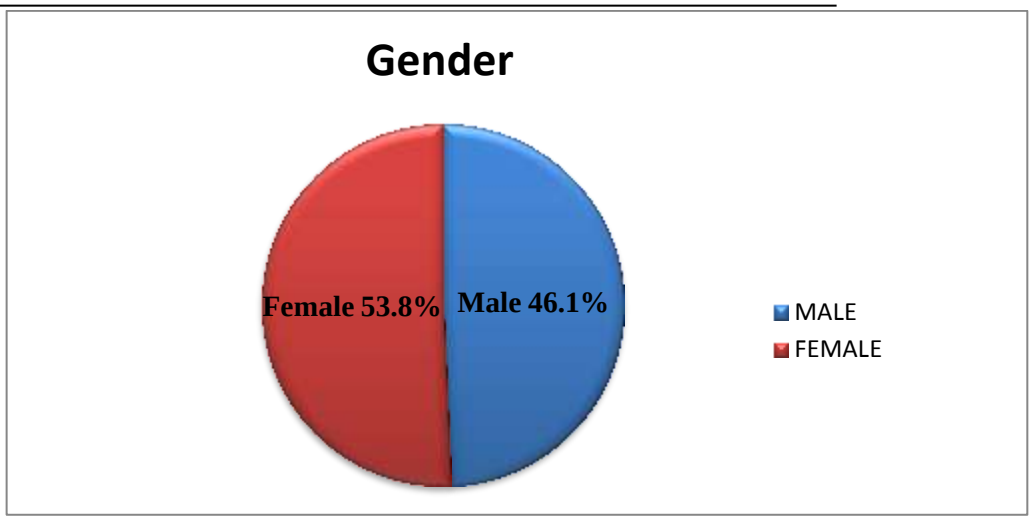

Figure 6.Pie graph indicating the percentage gender difference of taurodontism distribution.

According to this study the highest incidence of taurodontism was found in the mandible, nine patients from a total of 12 had mandibular taurodontism, while only one patient had maxillary taurodontism.The remainder (3 patients) presented with both maxillary and mandibular taurodontism.

Table 3.Distribution of taurodontism in the maxilla and mandible by gender.

Jaw	Male	Female	Total
Mandible	4	5	9
Maxilla	0	1	1
Maxilla & Mandible	2	1	3
Total	6	7	13

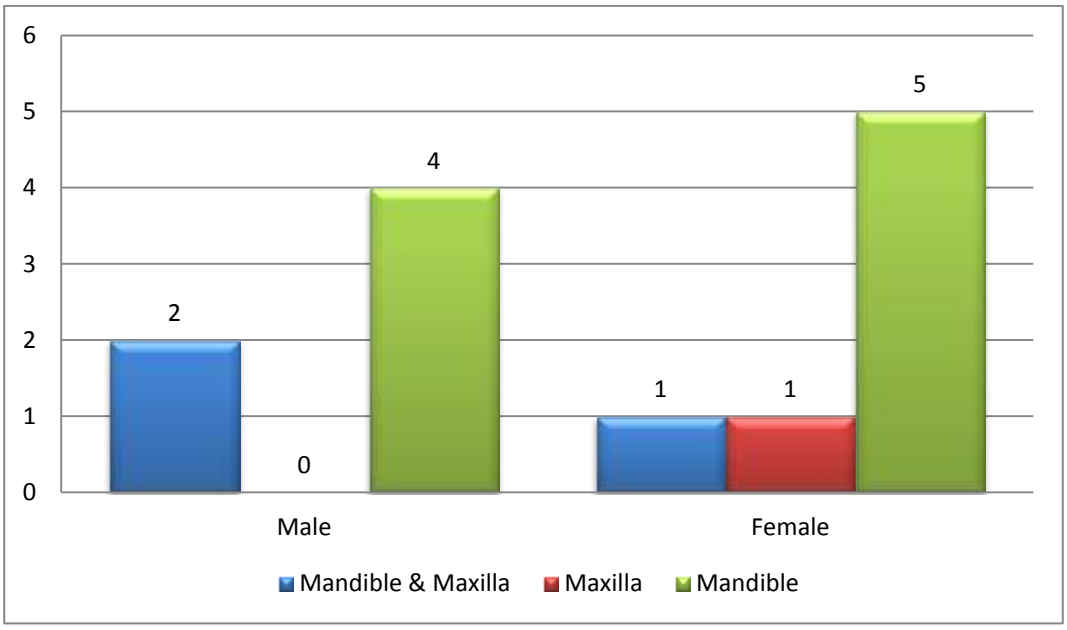

Figure 7. Graph indicating the distrbution of taurodontism in the maxilla and mandible by gender**.**

Discussion

The prevalence of taurodontism in patients attending the Dental clinics complex was reported as 3.23% of all patients (N=1608) and 0.73% of all teeth examined had evidence of taurodontism.

Theseresults were in accordance with previous studies in Europe and the Middle East, for example in Germany (2.25%) Bürklein *et al.*(2011), the South of Iran (5.5%) Bronoosh *et al.* (2012)and Israeli (5.6%) (Shifman and Chanannel 1978). Darwazeh *et al.* (1998)reported a slightly higher incidence in a Jordanian population (8%) while Ruprecht *et al.*(1987) reported (11.3%) in Saudi dental patients. In contrast to studies reported by MacDonald-Jankowski and Li (1993) of an adult Chinese population where 46.4% had a diagnosis of taurodontism. Similar high values were reported in a study of a Senegalese population (48%) as reported by Sarr *et al.*(2000). The distinguishing variable from these two high results is the small sample size usedwhich accounted for less than two hundred patients.This is in comparison to most other studies encountered in the literature were sample sizes range between 800 and 1200.

A recent studyconducted by Topcuoglu *et al.* 2011 using panoramic radiographs in Turkey reported that (22.8%) of the patients showed taurodontism. This resultis considerably higher than our findingswherein both studies evaluated panoramic radiographs.The Turkish study made use of the Shifman and Chanannel method for the diagnosis which was established for periapical and bitewings radiographs. It is also a higher result because of the comparative sample size being 490 subjects, around half the mean of most studies mentioned.

The variance in the incidence from different parts of the world could be due to ethnic differences, sample size or differences in diagnostic principles.More studies need to be done in Africa,Europe and Asia to be able to accurately compare previous studies across ethnic groups. These could then be correlated amongst the various continents to provide more meaningful results.

Another factor that could be the cause of varying prevalenceswas the teeth used in the diagnostic criteria of the study.
Some studies included the premolars in their assessment(Darwazeh *et al*.1998;Topcuoglu *et al*. 2011;Pillai *et al*. 2007), while other authors did not include the premolars because they believed that taurodontism cannot affect premolar teeth. Most premolars (with the exclusion of the first maxillary premolar) are single rooted teeth and thus do not have anatomical or apically positioned features in the floor of the pulp chamber(Ruprecht *et al*. 1987;Bürklein*et al*. 2011;MacDonald-Jankowski and Li 1993). This study used permanent molars to diagnose taurodontism and did not include any premolars.

In this study a higher prevalence of Taurodontism was observed in the female sample (3.43%), in comparison to the prevalence in the male sample (3.03%), with no statistically significant difference (P value > 0.05). There was also a higher distribution of taurodont teeth in the mandibles of female patients (5) compared to the mandible of male patients (4).Few studies reported statistical differences across gender. It wasreported in a Chinesepopulation by MacDonald-Jankowski and Li (1993) (56% females: 36% males, $P<0.01$); in studies conducted in South Iran (P>0.05) and India (Bronoosh *et al*.2012;Gupta and Saxena 2013). The results of gender prevalence from the present study were similar to the studies done by Ruprecht *et al*.1987;Shifman and Chanannel 1978;Darwazeh *et al*.1998. A genetic study conducted by Varrela and Alvesalo(1988) showed that patients with an extra X chromosome, number 47, as in XXY males with Klinefelter's Syndrome had a higher incidence of taurodontism. Komatz *et al*.(1978)suggested that the X chromosome contains gene(s) that favoured the development of taurodontism which implied that taurodontism should be more prevalent in females, as was found in a Chinese population.

According to results of the present study the mandibular molar teeth (25/29) are more affected than the maxillary molar teeth (4/29). The second mandibular molars were the most affected (51.7%) followed by first mandibular molars (34.4%) and the maxillary second molars and first maxillary molars were the least affected (6.9%) each. These results are consistent with studies done by Andersson *et al*.(2013) who reported that the second mandibular molars had the highest prevalence of taurodontism, 72.3%.Coincidentally,the sample consisted of individuals diagnosed with Laurence-Moon/Bardet-Biedl syndrome. Another study with a similar high prevalence of taurodontism of second mandibular molars(53.2%)was recorded byPatil*et al*.(2013).Shifman and Chanannel (1978) found that the second mandibular molar wasthe most prone tooth, being involved in two thirds of all cases found.

The literature commonly hints to a possibility of a technical error of distortion being responsible for some diagnosis of taurodontism. This is due to the possible angulation of the second molar and the positioning and angulation of posterior teeth on radiographs that give the appearance of taurodontism. A physical measurement of the pulp or a more accurate imaging technique may be the solution to overrule the theory of distortion. Cone beam computed tomography may be a viable method to conduct further studies regarding taurodontism as the image has a one to one ratio and is more accurate.

In the present study hypotaurodontic molars (82.7%) were more commonthan hypertaurodonts (13.8%) and mesotaurodonts (3.4%), with no significant differences found in the type of taurodontism between males and females ($p>0.05$). This was similar to the results of other studies which reported the difference between the types of taurodontism. Patil *et al*. (2013)reported a prevalence of 75% for hypotaurodontism, % for 6.2% mesotaurodontism and hypertaurodontism 18.8%. This trend was also reported byBronoosh*et al*.(2012) who reported hypotaurodontism as 67%, mesotaurodontism 31% and hypertaurodontism 2%. This study was comparatively similar in that diagnosis ranged in familiarpatterns where hypotaurodontismwas the highest around 60 to 80%, mesotaurodontismwas intermittent between 20 to 30% and hypertaurodontism was less than 10%.

Conclusion

From this study it can be concluded that the prevalence of taurodontism in patients attending Dental clinics complexwas 3.23%, with females having a higher prevalence rate than males. The mandibular molar teeth were more affected than the maxillary molar teeth, especially the second mandibular molar teeth which had the highest rate of taurodontism (51.7%). This incidence is low (3.23%), but still has clinical significance for general dental clinicians.The association with genetic syndromes will always be an important consideration for appropriate management.

Racial expression of different populations plays an important role in the variation of prevalence of taurodontism, but may also be influenced by other factors such as sample size, differences in diagnostic principles and also the specific teeth being examined.

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معدل حدوث أضراس الثور لدى المرضى الذين يحضرون مجمع عيادات الأسنان، كلية طب الأسنان، زليتن.

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بكالوريوس طب أسنان وماجستير في طب الفم والأشعة التشخيصية

عضو هيأة تدريس ورئيس قسم جراحة وطب الفم وأمراض الفم بكلية طب وجراحة الفم والأسنان

الجامعة الأسمرية زليتن– ليبيا

نبذة مختصرة:

الهدف: ظهور أضراس الثور بين المرضى الذين يحضرون مجمع عيادات الأسنان، كلية طب الأسنان، زليتن.

دراسة وصفية بأثر رجعي تضم 402 صورة شعاعية بانورامية لسجلات المرضى، 204 إناث و 198 ذكر، تتراوح أعمارهم من 18 إلى 68 عامًا. تم تقييم الصور الشعاعية البانورامية لوجود ظاهرة أسنان الثور. تم تحليل الميل لنوع الجنس وموقع أضراس الثور باستخدام اختبار مربع كي.

تم العثور على أضراس الثور في 13 (3.23٪) صورة شعاعية موزعة حسب الجنس (7 إناث و 6 ذكور [P> 0.05] وكان معدل انتشار أضراس الثور (0.73٪) من إجمالي 3955 ضرس تم فحصها. أضراس الفك السفلي كانت أكثر تضررا من أضراس الفك العلوي وكان الضرس الثاني هو الأكثر تضررا.

لم تكن ظاهرة أضراس الثور نادرة في مجموعة من المرضى الذين حضروا مجمع العيادات، كلية طب الأسنان، زليتن. هناك حاجة إلى مزيد من الدراسات على نطاق أوسع لتقييم توزيعها في عموم السكان في ليبيا لمقارنتها مع المجموعات العرقية الأخرى. ومع ذلك، فإن أضراس الثور في أسنان الفك السفلي يجب أن تؤخذ في الاعتبار، وخاصة الضرس السفلي الثاني، لتجنب أي مضاعفات للعلاج.

الكلمات المفتاحية: تصنيف تشخيص، حدوث، صور شعاعية بانورامية، أسنان الثور.