

## Study evaluating prevalence of Taurodonts in patients using Cone Beam Computed Tomography

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### ABSTRACT

**Objective:** The objective of the study was to evaluate prevalence of taurodonts in patients using cone beam computed tomography.

**Design:** Descriptive cross-sectional study.

**Place and Duration of Study:** This study was undertaken in Department of Radiology, Rehman College of Dentistry, Peshawar, from 15th July 2022 till 15th January 2023.

**Methodology:** Cone Beam Computed Tomography scans of 120 patients of both genders between 18 and 60 years of age were studied for the presence of taurodonts. Results were analyzed with the help of SPSS version 21. Chi-square was applied for comparison of genders and teeth of maxilla and mandible.

**Results:** Out of 120 Cone Beam Computed Tomography scans (N=120), There were 69 females (57.5%) and 51 males (42.5%) having mean age of 32.02, ranging from 18-55 years with a standard deviation of 13.45 years. 11 patients (9.16%) had taurodonts. There was prevalence of taurodonts in maxilla (n=8, 6.66%). No significant statistical difference was observed between the male and female groups ( $p > 0.05$ ).

**Conclusion:** Taurodontism is a complex anomaly which is prevalent and more common in maxilla. Dental practitioners need to be vigilant to properly diagnose and treat such patients.

**Keywords:** Taurodontism, Maxilla, Pulp, Cone Beam Computed Tomography, Endodontics, Orthodontics.

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### INTRODUCTION

Taurodontism is a complex anomaly which is characterized by a tooth having a large body and smaller roots. There is enlarged pulp chamber with loss of apical constriction at the cement enamel junction.<sup>1</sup> It appears most frequently as an isolated anomaly. These teeth were identified as early as beginning of 20<sup>th</sup> century. Fossil teeth which had shortened roots and

enlarged pulp chambers were found. As such teeth are mostly found in cattle they were called taurodonts.<sup>2</sup>

Throughout history a number of ways have been used to diagnose and classify taurodonts. Mostly these methods rely on translocation of pulp chamber floor to the root apex as assessed on radiographs.<sup>3</sup> These days there is increase in the usage of cone beam computed tomography (CBCT). Although conventional radiographs serve their purpose but they are typically a 2 dimensional picture of a 3 dimensional object. CBCT with the help of sagittal, axial and coronal images provide an exact detail of different structures in oral cavity and greatly help in diagnosis and treatment planning.<sup>4</sup> Radiation concerns are there as intraoral radiography results in radiation exposure typically in the range of 1-8 microsieverts (usv) where as for cbct the values are 50-100 usv. The higher doses of CBCT have health and ethical concerns but are considered safe for use in oral and maxillofacial region.<sup>5</sup>

A number of studies have been done to find prevalence of taurodontism among adolescents. These studies have shown that the prevalence of taurodontism was as high as 46.4%.<sup>6</sup> Although taurodontism is common all over the world, it rarely attracts attention in clinical practice. The prevalence of taurodonts varies in different populations.<sup>7</sup>

Taurodonts have surgical, endodontic and orthodontic implications due to their particular shape and is also related to

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various syndromes. These teeth are often missed by dental practitioners during patient management. This study will help in formulating of a more accurate diagnostic criteria for identifying this condition and help dental practitioners in effectively managing such teeth. Therefore current study was planned with an objective to evaluate prevalence of taurodonts in patients using cone beam computed tomography.

### METHODOLOGY

This descriptive cross-sectional study was done in Department of Radiology at Rehman College of Dentistry after getting ethical approval from ethical committee review board (RCD-10-06-111). It was carried out from 15<sup>th</sup> July 2022 till 15<sup>th</sup> January 2023. After taking verbal consent, CBCT scans of 120 patients of both genders above 18 years of age were included. Consecutive sampling technique was used to enroll patients. CBCT images having dental restorations or caries were excluded from the study. Distorted images were also excluded.

The radiographs were taken by "Carestream Ger, model 90003D" with 73.9 kv (male patients), 69.9kv (female patients), 10.1mA. These values were adjusted according to manufacturer's radiation protocols for different age groups and genders. Standard resolution of 0.30 mm voxel and 10.80 s was used for all scans.

Images were analyzed by using CS Imaging Browser 7.0.20 software. The G\* Power software version 3.1.9.4 at a p-Value of 0.05, medium-power (0.3) and confidence level of 95% was used to calculate sample size. Presence of taurodonts was diagnosed on basis of Shifman and Chanannel criteria.<sup>8</sup> Taurodontism was determined by the taurodontism index (Ti).<sup>9</sup> This is shown in figure I where ratio of distance from the pulp chamber's lowest point to the apical end of the chamber's highest point (a) is calculated and divided by distance from the occlusal end of the pulp chamber's highest point to the longest root apex (b) × 100 ( $Ti = a/b \times 100$ ). The tooth was categorized as taurodont if  $Ti =$  or  $> 30\%$ . Digital scale provided with CBCT machine was used to make all measurements. Data was recorded in a preformed proforma.

**Data Analysis:** Results were analyzed with the help of SPSS (version 21). Chi-square was applied for comparison of male and female groups and maxillary and mandibular teeth. A p-Value of  $\leq 0.05$  was considered significant

Figure 1 is taken from a CBCT scan showing two lengths. 'a' which is distance from the pulp chamber's lowest point to the apical end of the chamber's highest point. 'b' which is distance from the occlusal end of the pulp chamber's highest point to the

longest root apex. If the ratio of these two values is more than or equal to 30%, tooth is labeled as a taurodont.



**Figure 1: Diagnostic criteria of a taurodont ( $Ti = a/b \times 100$ ), Taurodont =  $Ti \geq 30\%$**

### RESULTS

Over all a total of 120 CBCT scans of patients were analysed (N=120). Data showed that there were 69 females (57.5%) and 51 males (42.5%). The mean ages of patients were 32.02 years, ranging from 18-55 years with a standard deviation of 13.45 years. The demographics and baseline characteristics like age gender are shown in table I.

Date of 120 CBCT scans showed that 11 patients (9.16%) had taurodonts. Most of these taurodonts were in maxilla (n=8, 6.66%). There were taurodonts in mandible as well but their number was considerably smaller as compared to mandible (n=2, 2.55%). This result was statically significant (p-Value  $< 0.05$ ). taurodonts present in the male group (n=5, 9.8%) and female groups (n=6, 8.69%) was almost same. No significant statistical difference were observed in the male and female groups (p-Value  $> 0.05$ ). All of these results are summarized in table II.

**Table I: Age and Gender distribution (N=120)**

Age	Gender
Range:18-55 years	Male: 51(42.5%)
Mean: 32.02 years ( ± 13.45 )	Female: 69 (57.5%)

**Table II: Prevalence of taurodonts and their distribution in maxilla, mandible and gender wise (N=120)**

Taurodonts	Male	Female	Total	Maxilla	Mandible	Total
Present	5(9.8%)	6(8.69%)	11(9.16%)	8(6.66%)	3(2.5%)	11(9.16%)
Absent	46(90.2%)	63(91.31%)	109(90.84%)	112(93.34%)	117(97.5%)	109(90.84%)
Total	51	69	120	120	120	120
Chi square value	0.09			2.27		
p-Value	0.76			0.13		

## DISCUSSION

Taurodontism is considered a complex anomaly and its etiology is still not clear.<sup>10</sup> A number of factors have been proposed which result in taurodontism. These include genetics, hereditary factors. Environmental conditions and hormonal levels.<sup>11</sup> Currently scientists are convinced that this anomaly occur due to abnormality of Hertwig's epithelial root sheath (HERS).<sup>12</sup> Disintegration of HERS is a very important step in formation of root and either delay or disintegration at an inappropriate level results in formation of taurodonts.<sup>13</sup> Some scientists have postulated taurodonts to be related with increase in X chromosomes. According to them severity of taurodontism is directly proportional to number of X chromosomes.<sup>14</sup> Taurodontism is associated with a number of syndromes such as trichodonto osseous syndrome, cleft lip and palate, ectodermal dysplasia etc.<sup>15</sup>

Current study found prevalence of taurodonts to be 9.16 %. This value is considerably lower than studies which have been done in past to record the prevalence of taurodonts in different populations.<sup>16</sup> The reason could be due to diagnostic criteria as we combined two variables i.e.  $Ti=a/b \times 100$  where as in the past only 1 variable was used to diagnose taurodonts which is distance from top of pulp chamber to floor.<sup>17</sup> Also there are differences in different races regarding prevalence of taurodont. Jabali AH *et al.* found prevalence of taurodonts to be 0.1 % in Saudi Arabia.<sup>18</sup> These values are considerably low as compared to other studies. The reason can be attributed to differences in ethnicity, diagnostic criteria differences and differences in specific teeth.

The present data indicated that the most common of all taurodonts were maxillary teeth, which was the same as the results reported in other studies.<sup>19</sup> Kamburoglu K *et al.* have recorded similar results in their study.<sup>20</sup> Although the exact cause of their prevalence in maxillary teeth is not fully understood but scientists have postulated that maxillary teeth are more prone to genetic, environmental and anatomical factors which may contribute to higher prevalence of taurodonts in maxillary teeth.<sup>21</sup>

Our study showed no considerable difference of taurodonts in males and females. Our results are consistent with other studies done worldwide.<sup>22</sup>

Taurodontism has orthodontic, endodontic implications and are associated with certain syndromes. Dental practitioners and they are usually the first ones to diagnose taurodonts. Treatment of such teeth is challenging because of their special morphology. Dentists should have a very good understanding of taurodonts to provide effective treatment.

Further studies should be done to evaluate the correlation of hereditary and genetical background. Assessing the relationship between the incidence of taurodontism and genetics may provide a valuable clue for clinicians to detect any associated syndromes and other systemic conditions.

## CONCLUSION

Taurodontism is a complex dental anomaly which is considerable prevalent and more common in occurrence in

maxilla. Dental practitioners need to properly diagnose and treat such patients accordingly or refer them to concerned specialist.

## AUTHOR'S CONTRIBUTION

**Rehman A:** Conceived Idea, Designed Research methodology, data interpretation, manuscript writing, manuscript final reading and approval

**Khalid MD:** manuscript writing

**Sheeraz M:** literature search

**Alam I:** Data collection

**Nazir K:** Literature review, Statistical analysis

**Bashir G:** Data collection.

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