

MANDIBULAR PREMOLARS WITH TOOTH SHAPE DEVIATION – PREVALENCE IN A SAMPLE OF ORTHODONTIC PATIENTS

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ABSTRACT

The aim of this study was to find out the prevalence of this anomaly in a sample of Pakistani population. Mandibular premolar (MnP) is a tooth that frequently shows variation in its morphology such as size and shape. One of these anomalies is the tooth shape deviation (TSD) in which there is increased mesiodistal and reduced faciolingual width.

Orthodontic records of 500 patients were examined to find out the presence of this anomaly. The male and female patients in permanent dentition stage were included in the study with exception to those having lower premolars missing or restored. The mesiodistal and faciolingual widths of lower premolars were measured on the plaster casts between the points of maximum widths, using needle pointed dividers, and the mesiodistal / faciolingual crown index was obtained for each tooth. The teeth with values >100 were labeled as MnP-TSD.

Out of 500 patients observed in total, 17 were found to have MnP-TSD giving an overall prevalence of 3.4%. The prevalence in males was 3.1% and that in females was 3.5% and the effect of gender was insignificant ($p=0.83$). The teeth found with this anomaly were 28 in total, with equal number of first and second premolars.

MnP-TSD is an anomaly that plays an important role in orthodontic diagnosis and treatment planning with a prevalence of 3.4% in the patients presenting for orthodontic treatment at our dental hospital. Therefore it should be carefully observed in every patient.

Key Words: Anomaly, Elongated, Mandible, Premolars, Tooth shape deviation.

INTRODUCTION

Anomalies of teeth include a range of variation in tooth shape, size and structure, most of which occur during the morpho-differentiation phase of development.¹ This occurs primarily due to defects in certain genes, however, some other etiological events in the prenatal and postnatal periods have also been blamed for development of such anomalies.^{2,3}

Mandibular second premolar (MnP) is a tooth that frequently shows anomalies like deviation of crown

morphology, late eruption or sometimes complete agenesis.^{4,6} One of the rare anatomic variations is the Tooth Shape Deviation (TSD) that usually occurs in these teeth. When compared with normal teeth, such premolars have an increased mesio-distal and a diminished facio-lingual dimension. The dental anomalies like these may present problems during the orthodontic treatment, because the altered mesiodistal dimension of one tooth may cause discrepancies in management of space as well as interdigitation of opposing teeth in dental arch, hence interfering in settling of occlusion. Tooth movements like derotation and torquing are also difficult in these teeth because of their imbalanced shapes and unusually broad mesiodistal root surface areas.⁷ Such anomaly may also be a cause of malocclusion as additional space is required for a tooth to be accommodated in dental arch.⁸

Considering the significance of this anomaly there is still little discussion about this in the literature consisting of only a few articles and case reports.^{4,7-9} The first reported case of such variation dates back to 1951 by Dahlberg¹⁰, after which various authors have

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reported this condition using different terminologies. The most recent term coined for this anomaly is mandibular premolar with tooth shape deviation (MnP-TSD) given by Peck.¹¹

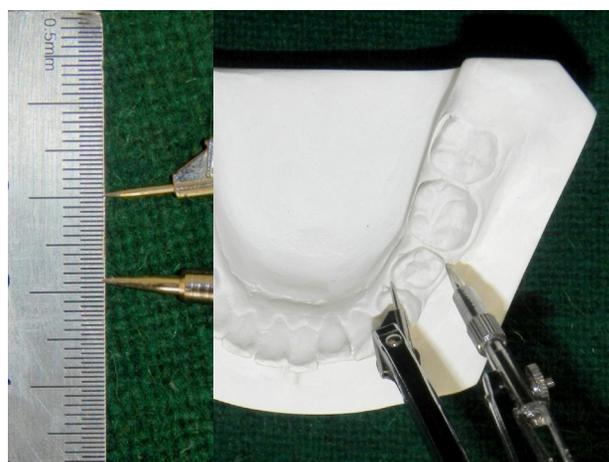
Although in Pakistan several authors have reported the prevalence of dental anomalies^{3,12-14} yet none of them has mentioned specifically about the occurrence of MnP-TSD. The aim of this study was, therefore, to determine the frequency of patients reporting with this dental anomaly in a sample of people presenting for orthodontic treatment at Margalla Dental College Rawalpindi, Pakistan.

METHODOLOGY

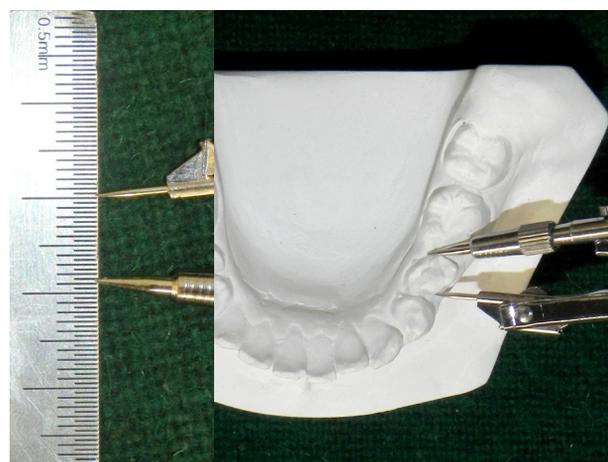
It was a descriptive cross-sectional study conducted at the Orthodontic Department of Margalla Dental College. The Institutes Ethics Review Committee approved the project. Orthodontic records of 500 patients, who presented to the department for orthodontic treatment, were examined. Due to the limited amount of data available the patients could not be segregated on the basis of ethnicity so the study included patients from different areas of Rawalpindi and Islamabad only. Patients of both male and female genders who were in permanent dentition stage were included in the study. Patients were excluded if they had lower premolars as missing or having proximal restorations and crowns. Mesio-distal and bucco-lingual widths of the mandibular premolars were measured on the study casts using needle pointed dividers from the points of maximum widths of the teeth (Fig 1a and 1b).

The crown dimensions were measured using the mesiodistal/faciolingual (MD/FL) crown index developed by Peck H and Peck S^{11,15,16} as shown here.

Mesio-distal diameter in mm
 -----X 100
 Facio-lingual diameter in mm



a



b

Fig 1: Calculation of crown dimensions with needle pointed dividers (a) mesiodistal width (b) buccolingual width

Those mandibular premolar teeth whose index was greater than 100 were labeled as MnP-TSD.

Data Analysis

Data were analyzed using the SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). The descriptive statistics were calculated as frequency and percentage of occurrence of the anomaly. To test the difference between male and female patients, right versus left side and unilateral versus bilateral, Chi-square test was employed. The level of significance was set as $p \leq 0.05$.

RESULTS

There were 500 patients observed in total, out of which 17 were found with MnP-TSD showing a prevalence of 3.4%. Out of the 500 subjects observed, 159 (31.8%) were males and 341 (68.2%) were females. The prevalence in male and female subjects is shown in Table 1. The results of Chi square test indicate that there is no effect of gender on the frequency of this anomaly ($p = 0.83$). Among these 17 patients with MnP-TSD, a total number of 28 teeth were found with this anomaly. Out of these 14 were first premolars (MnP1) and 14 were second premolars (MnP2), showing an equal distribution of 1:1 between first and second premolars. In some patients TSD was found in MnP1 whereas in some it was found in MnP2 only. There were a few more in which both MnP1 and MnP2 were affected simultaneously. This distribution is shown in Table 2 whereas unilateral and bilateral occurrence is shown in Table 3.

DISCUSSION

Dental anomalies occur by alteration in dental development due to genetic, epigenetic or environmental factors and may exhibit changes in number, form and structure to various degrees. Previous studies have

TABLE 1: PREVALENCE OF MNP-TSD

	Males	Females	Total
Number of patients observed	159	341	500
Patients having MnP-TSD	5 (3.1%)	12 (3.5%)	17(3.4%)

TABLE 2: DISTRIBUTION OF TSD IN MNP1 & MNP2

	Males	Females	Total
Patients having MnP1-TSD	2 (12%)	6 (34%)	8
Patients having MnP2-TSD	3 (18%)	4 (24%)	7
Patients having both MnP1-TSD and MnP2-TSD	0	2 (12%)	2
Total	5(30%)	12(70%)	17

TABLE 3: DISTRIBUTION OF UNILATERAL AND BILATERAL OCCURRENCE OF MNP-TSD

	Males	Females	Total
Unilateral occurrence	3 (18%)	5 (30%)	8
Bilateral occurrence	2 (12%)	7 (40%)	9
Total	5(30%)	12(70%)	17

revealed that occurrence of such anomalies is comparatively higher in Orthodontic patients and may cause discrepancies in function hence early diagnosis is important.¹⁷

Prevalence of several dental anomalies have been studied by different researchers throughout the world^{18,19} and within these studies mandibular premolars hold the significance for exhibiting a vast array of anomalies and developmental disturbances such as agenesis,¹⁹ impaction¹⁴ macrodontia²⁰ and aberrations in root and canal morphology.²¹⁻²⁴ MnP-TSD is a rare dental anomaly which has been reported by very few authors. In addition to causing malocclusion, such anomalies may also predispose the affected teeth as well as the adjacent teeth to caries owing to the displacement of contact points.⁸

In a study by Chate⁹, a detailed evaluation of such teeth has been done on 10,000 English patients and the prevalence of 0.6% has been reported in indigenous British population. Another study by Barnes²⁵ has shown a prevalence of 0.5% in 4,000 black Ugandan children. In comparison to this our study shows a higher prevalence of 3.4%. The reason for such difference could be the selection of patients, Chate⁹ and Barnes²⁵ conducted their studies in general population where as our study included only the patients who presented with

malocclusion. Edger and Sciulli²⁶ have also reported a somewhat higher prevalence of 3.06% which is closer to that of our study.

Our results also indicate an equal prevalence in both genders with male to female ratio of 1:1. This is also different as compared to the results of studies by Chate⁹ and Garib and Peck⁷, which was reported to be 1.4:1 in both the studies showing a higher prevalence in males.

It has also been shown in this study that the prevalence of such anomaly is equal in first and second mandibular premolars. This is different from the study of Garib and Peck⁷ in which TSD is eight times more commonly seen in second than first premolars and the study of Chate⁹ which shows the occurrence of this anomaly three times more common in second than first premolars. This difference can be due to the method of assessment of MnP-TSD, in both the studies the mesiodistal and faciolingual widths were compared to those of their established norms in addition to their MD/FL crown index. The results of the study by Edger and Sciulli²⁶ are, however, totally different with the anomaly being three times more prevalent in first than the second mandibular premolars. Their method of assessment was similar to that of our study however the difference could be due to the difference in ethnicity.

Present study also shows that when MnP-TSD, occurs there are higher chances of this anomaly to occur bilaterally as the percentage of bilateral occurrence was 53%. This is also in accordance with the previous studies. Garib and Peck⁷ have reported bilateral occurrence in 59% of subjects whereas the findings of Chate⁹ are even higher showing 69% of bilateral occurrence.

There are very few published studies which report the prevalence of MnP-TSD and none that represent its occurrence in a Pakistani sample. The studies by Abbas et al³, Sukhia et al¹², Khan et al¹³ and Zahra et al¹⁴ have all shown the prevalence of dental anomalies in Pakistani population but yet none of these studies discuss about the MnP-TSD. This is the first study, in providing the information about one particular anomaly of MnP-TSD in mandibular premolars and its prevalence in the Pakistani patients requiring orthodontic treatment.

Meticulous observation of discrepancies in dental occlusion is a routine in orthodontic diagnosis and treatment planning. Tooth size discrepancy as proposed by Bolton²⁷ has always been an important part of this due to its effect on establishing occlusion. Although it is present in only 5% of the population but owing to its significance it is observed in many orthodontic patients. Our study reports the prevalence of MnP-TSD in 3.4% of orthodontic patients, therefore, it is prudent to carefully observe this anomaly in every patient who is being planned for orthodontic treatment.

Due to the lack of local data the results could only be compared to those of the studies in other parts of the world and the obvious difference in results as compared to those of the previous studies mentioned may probably be due to difference of ethnicity in different populations. Moreover this study is only conducted on the patients being presented for the orthodontic treatment to our dental college and does not include the subjects representing general Pakistani population. The future studies should therefore be aimed in a larger population including general subjects and not just those requiring orthodontic treatment.

CONCLUSION

MnP-TSD is a dental anomaly that could play a significant role in the etiology of malocclusion as well as its treatment planning. Despite its importance only a few authors from all over the world have reported this anomaly. This is the first local study to discuss this anomaly reporting a prevalence of 3.4% in the patients presenting for orthodontic treatment at Margalla Dental College. Therefore it should be carefully observed in every patient.

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CONTRIBUTIONS BY AUTHORS

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| 1 Usman Ahmed: | Data collection; Manuscript writing. |
| 2 Amjad Mahmood: | Study concept and design; manuscript writing. |
| 3 Rozina Nazir: | Data collection and data analysis. |