Original Article

Different Cuspal Pattern In Mandibular Second Premolar And Its Association With Other Dental Anomalies

Mohammad Naeem[1], Mohammad IftikharAdil[2], Pashmina Nisar[3], Raham Zaman[4]

[1]Department of Community Dentistry, Dental Section, Bacha Khan Medical College, Mardan, KP, Pakistan

[2]Department of Pharmacology, Gajju Khan Medical College, Swabi, KP, Pakistan

[3]Department of Oral Biology, Sardar Begum Dental College, Peshawar, KP, Pakistan

[4]Department of Chemistry of Dental Material, Dental Section, Bacha Khan Medical College, Mardan, KP, Pakistan

ABSTRACT

Objective: *to ascertain the unique cuspal pattern in the mandibular second premolar and how it relates to further dental abnormalities.*

Study Design: *This was a descriptive cross-sectional study.*

Place and Duration Of Study: *This study was conducted in the Orthodontic Department of Sardar Begum Dental College Peshawar from June 2014 to July 2015.*

Methodology: *370 individuals, 165 men. Non-probability selection procedures were used to choose 205 female participants for the research who met the inclusion and exclusion criteria. Casts from the orthodontics department of Sardar Begum Dental College in Peshawar were used for the research. Each cast was categorized as either tricuspidate or bicuspidate. Data analysis was performed using SPSS version 16. Chi-square and the odds ratio were used to compare the groups. A p-value of less than 0.05 was deemed significant.*

Result: *It is not statistically significant that the tricuspidate pattern, mostly seen in females (56%), is more frequent in men (66%). The relationship between dental abnormalities and tricuspidate and bicuspidate was not statistically significantly different. The maxillary canine impaction, peg lateral maxillary incisor, absent maxillary lateral incisors, and Carabelli cusps all have P-values over the crucial threshold.*

Conclusion: *The bicuspidate pattern is typical of second premolars in the mandible. Two cuspal variations in the mandibular second premolar do not significantly correlate with other dental abnormalities.*

Keywords: *Bicuspidate, Tricuspidate, Maxillary canine impaction, Cusp of Carabelli, Peg lateral incisor.*

INTRODUCTION

20% of the mouth cavity's surface is made up of teeth[1]. Mastication, offense, defense, speech, forensic investigation [2], age estimate (Demirjain method [3]), eruption timing, and aesthetics are all areas in which they are crucial. The incisors, the four front teeth in each arch, are used to cut food with their thin, sharp edges. The canines utilized for gripping or grabbing food are located at the corners of the mouth, on each side of the incisors. The premolars behind the canines contain several cusps and are designed to grip food similarly to the canines. They may also smash food. The molars are the teeth located farthest back in the mouth. These teeth are developed for crushing food and have large chewing surfaces with four or five cusps [1]. The purpose of the mandibular second premolar is to support the mandibular first molar during mastication or chewing. It also preserves arch integrity and facilitates speaking [4]. It manifests at about age 11, while it manifests a bit sooner in females. It is a tooth that comes after the second main molar. Because of its lesser size than the second primary molar, leeway space, or more room, is created before it. In the permanent dentition, this leeway space aids in establishing the class I molar relationship

Correspondence: Mohammad Naeem
Assistant Professor Department of Community Dentistry, Dental Section, Bacha Khan Medical College, Mardan.
Email: dr.naeemneelavi@gmail.com
Cell: 0302-5919540
Date Received: April-12-2021
Date Accepted: May-21-2021

Citations : Mohammad Naeem, Mohammad Iftikhar Adil, Pashmina Nisar, & Raham Zaman. (2021). DIFFERENT CUSPAL PATTERN IN MANDIBULAR SECOND PREMOLAR AND ITS ASSOCIATION WITH OTHER DENTAL ANOMALIES: Original Article. Journal of Bacha Khan Medical College, 2(02), Page No. 84–90. https://doi.org/10.69830/jbkmc.v2i02.34

from the flush terminal plane, which is necessary for appropriate occlusion throughout the whole of the complement of teeth [5, 6].

The mandibular second premolar may have three cusps, although it usually has two. The two cusp variant groove pattern is often formed like a "U" or "H." Premolars with two cusp varieties, 7 and 8, are also known as bicuspids. According to several research studies, around 45% of people have tricuspid form [9], and 55% have bicuspid form [9]. Peshawar research found the bicuspid type in 61.55% of cases and the tricuspid form in 38.45% [10].

Three cusps are typically present in mandibular second premolars [11]. With two smaller lingual cusps and one larger buccal cusp, this variant has three cusps. Compared to the distolingual cusp, the mesiolingual cusp is twice as large. The second premolar's single root is longer and bigger than the first premolar. Rarely, if ever, does the root bifurcate, albeit some examples have a deep developing groove. This spot often has a leveled area [12].

A dental anomaly is a deviation in shape, function, or location of one or more teeth from the normal range. The maxillary and mandibular arches and occlusion may be impacted by variations in tooth quantity, shape, and size, which might make treatment planning more difficult [13]. Though dozens of anomalies may be found, some are more frequent than others [14].

Three words describe agenesis, or missing teeth, often observed: hypodontia, oligodontia, and anodontia. The pattern of familial tooth agenesis is autosomal dominant [15]. The teeth most often absent are the mandibular second premolars, maxillary lateral incisors, and third molars [16].

Five dental defects, including infra occlusion of deciduous molars, aplasia of premolars, the small size of maxillary lateral incisors, enamel hypoplasia, and palatal displacement of maxillary canines, were shown to have a substantial reciprocal connection in research conducted by Baccetti [17]. Peg-shaped upper lateral incisors and absent canines have been linked to palate displacement. In contrast, Peck ET al [18]. discovered a substantial correlation between PDCs and second premolar and third molar agenesis.

Little is known about the relationships between comparable malformations and the tri- and bicuspid forms of the second mandibular premolar. The purpose of this research was to ascertain if there was any correlation between the cuspal pattern of the mandibular second premolar and other dental abnormalities, such as enamel hypoplasia, impacted canines, pegshaped or absent permanent maxillary lateral incisors, and the cusp of Carabelli. The researchers will benefit since no research has yet to bet the title. A favorable correlation between two types of mandibular second premolars and other dental malformations may help when additional dental abnormalities are diagnosed appropriately.

Learning about the many cuspal variants of the mandibular second premolar is aided by this research. The occlusal table is crucial for forensic investigations and plays a significant role in identifying individual teeth. Materials and Methods: Between June 2014 and July 2015, Peshawar's Sardar Begum Dental College performed this study. The study included 370 patients—205 women and 165 men.

Patients of either sex were selected via non-probability convenient sampling. Adults aged 12–40 with intact bilateral second mandibular premolars and permanent dentition were studied—patients with systemic diseases, craniofacial anomalies, and dangerous second premolars. Patients with Down's syndrome, ectodermal dysplasia, fluorosis, faulty amelogenesis, dentinogenesis, or premolar restorations. No premolars with occlusal surface attrition or impacts were studied.

Peshawar's Sardar Begum Dental College orthodontic department provided casts for the study. To gather investigative data, all dental casts and files were meticulously examined. The study included individuals who strictly satisfied inclusion and exclusion criteria. Individual files contained ages and sexes.

Dental anomalies associated with the bi- and tricuspid mandibular second premolar were examined.
The odd ratio and Chi-squared test assessed group comparisons. The significance threshold was 0.05.

RESULTS

The research included 370 patients, with 165 (44.59%) men and 205 (55.41%) females aged 12 to 40. The mean age was 19.7±4.7 SD. Results show somewhat more female than male patients.

1. The maxillary lateral incisor is peg-shaped or small, with a dramatic crown thinning from the cervical area to the incisal edge. When tooth agenesis or impaction occurs, an OPG X-ray and other facts are analyzed.

2. The Carrabelli cusp is an accessory cusp on the palatal surface of the maxillary first permanent molar.

3. Enamel hypoplasia is diagnosed when at least one permanent tooth has a crown deficiency without trauma or dental disease.

4. Canine impaction describes teeth in their bone
socket that are visible on radiographs but not clinically.

5. Missing lateral incisors were clinically and X-ray-invisible teeth.

The individuals were then classified by dental anomalies linked with each mandibular second premolar, tri- or bi-cuspid.

Data was analysed using SPSS 16. Calculations included mean and SD for each continuous variable.

DISCUSSION

Disorders during odontogenesis may cause dental abnormalities. Teeth size, number, form, structure, and location may be affected. Clinicians may struggle to detect and treat these abnormalities despite their low occurrence. Ethnicity and location affect severity and kind. We must know the prevalence of these abnormalities to treat our patients effectively.

Many hereditary illnesses cause dental abnormalities, which may be seen on dental radiographs as tooth morphology or chemical composition changes. Thus, the dentist may first discover development and metabolic abnormalities affecting the patient and family.

This study's age range was 12-40 years, with a mean of 19.7±4.7. The maximum was presented in 12-20-year-olds (66.75%) and 21-30-year-olds (29.18%). The majority of patients were under 30.

Table 1: Distribution of Number of Dental Anomalies and their Percentages

S.No	Name of Anomalies	No. of Anomalies	Percentages

Pakistani mandibular second premolars erupt at 1112.19. To document cuspal morphology, the study's lowest age limit was 12. Different patient behaviors cause tooth structural loss with aging. Age contributes to abrasion, attrition, and erosion. Mandibular second premolar occlusal anatomy is difficult to investigate in unerupted teeth.

Yilmaz et al. [20] found that Turkey's tooth transpositions and dental abnormalities afflicted 17-20-yearolds more. This matches the current results. Like this data, Sener S et al. [21] found 54.4% of Turkish dental abnormalities among 17-20-year-olds. The 12-20 age

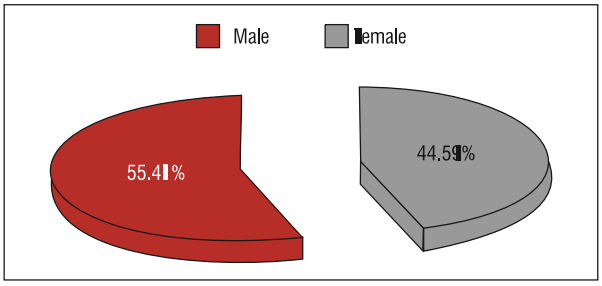

Fig 1: Gender Distribution of Sample

1	Missing lateral	10	2.7
2	Maxillary Canine impaction	14	3.8
3	Cusp of Carabelli	45	12.2
4	Enamel hypoplasia	0	0
5	Peg lateral incisor	16	4.32

Table 2: Distribution of Number of Dental Anomalies and their Percentages

	Gender		
Dental anomalies	Male	Female	Total
Cusp of Carabelli	19(5.15%)	26(4.05%)	45(12.16%)
Eanamel Hypoplasia	0(0%)	0(0%)	0(0%)
Maxillary canine impaction	8(2.16%)	6(1.62%)	14(3.78%)
Peg-shaped Lateral incisor	4(1.08%)	12(3.24%)	16(4.32%)
Missing lateral incisor	5(1.35%)	5(1.35%)	10(2.70%)

Table 3: Distribution of Dental Anomalies According to Age Groups

Dental anomalies	Age in years of patients						
	12-20		21-30		31-40		Total
	Female	Male	Female	Male	Female	Male	
Cusp of carabelli	20(5.4%)	7(1.98%)	6(1.62%)	12(3.24%)	0(0%)	0(0%)	45(12.2 %
Enamel hypoplasia	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Maxillary Canine Impaction	2(0.54%)	8(2.16%)	4(1.08%)	0(0%)	0(0%)	0(0%)	14(3.8%)
Peg lateral incisor	1(0.27%)	5(1.35%)	3(0.81%)	7(1.98%)	0(0%)	0(0%)	16(4.32%)
Missing lateral incisor	0(0%)	3(0.81%)	5(1.35%)	2(0.54%)	0(0%)	0(0%)	10(2.7%)

Table 4: Comparison of Tricuspidate and Bicuspidate Types in Mandibular Second Premolar by Gender

Mandibular second premolar		Gender		Total	Chi-Square Tests	
					X_2	P-value
	Bicuspidate	109(66.06%)	91(44.39%)	200(54.54%)	0.448	0.530
	Tricuspidate	56(33.94%)	114(55.61%)	170(45.46%)		
Total		165(100%)	205(100%)	370(100%)		

*level significant is less than 0.05

Table 5: Comparison of Dental Anomalies in Bicuspidates and Tricuspidate Mandibular Second Premolar

Dental Anomalies	Mandibular second premolar		X_2	P-value
	Bicuspidate	Tricuspidate		
Cusps of Carabelli	16(35.6%)	29(64.4%)	2.227	0.136
Eanamel Hypoplasia	0	0	-	-
Maxillary canine impaction	9(60%)	5(40%)	1.971	0.160
peg lateral incisor	9(56%)	7(44%)	0.715	0.398
Missing lateral incisor	6(60%)	4(40%)	0.817	0.366

* The Chi-square statistic is significant at the 0.05 level

range may appear early owing to significant aesthetic concerns and functional repair.

This research included more women (55.4%) than men (44.59%). Male: female ratio: 1.24. The large number of females in this research may be attributable to their higher aesthetic concern than men. Female teeth have more abnormalities, which may explain these findings. Females have greater oral issues and seek dental treatment due to undernutrition, lifestyle, habits, drug abuse, and other environmental variables. Loh HS et al. [22] examined Singaporean Chinese mandibular second premolar coronal morphology. There were more women than men in their research. The ratio of female to male 1:1.4 by Nemati S et al. [23] is closer to the present research. King NM et al. [24] reported a 1:1.04 male-to-female ratio. Kositbowornchai S [25] and colleagues reported a 1:3.6 male-female ratio. Inclusion and exclusion criteria, ethnicity, sample size, procedure, and population structure may explain the variance in percentage.

Mandibular second premolars have two normal morphological forms, 2-cusps and 3-cusps. Therefore, their dental deformities are generalizable. Second, the data supports the null hypothesis that tricuspidate and bicuspidate variations of mandibular second premolars do not cause dental abnormalities (Table 7). This Peshawar sample has 45 (12.16%) Carabelli cusps. Kraus BS [23] found the cusp of trained examiner collected data on dental casts, which are more trustworthy than intra-orally.

Permanent dentition eruption disturbances most often involve canines. This topic has been studied extensively. Many researchers [28] have confirmed maxillary canine impaction trends with this study. Impaction is likely more common in women and on

Table 6: Strength of Association between two Cuspal Variants of Mandibular Second Premolar

cuspal variants of premolar					Association statistics	
		Bicuspid	Tricuspid	Total	OR	CI(lower limit-upper limit)
Missing lateral incisors	Yes	6	4	10	1.793	0.497-6.461
	No	194	166	360		
Total		200	170	370		
Canine impaction	Yes	9	5	14	2.180	0.716-6.635
	No	191	165	356		
Total		200	170	370		
Peg lateral incisors	Yes	9	6	15	2.069	0.720-5.941
	No	191	164	355		
Total		200	170	370		
Cusp of Carabelli	Yes	9	6	15	2.069	0.720-5.941
	No	191	164	355		
Total		200	170	370		

Carabelli in 7585% of Europeans and 35-45% of Pacific Islanders. Ethnicity, methodology, and sampling strategy may explain Kraus's high prevalence. Carabelli cusps in permanent teeth were examined in a cross-sectional study by Dilabazet al [27] at Khyber College of Dentistry. The research found Cusp of Carabelli in 29.7% of maxillary first permanent molars and none in second permanent molars. Male prevalence (31.9%) was somewhat higher than female (25.9%). The current study's prevalence is lower than Dilabaz's. Their research used first- and second-year BDS students to gather data without sample calculation. They examined carabellli cusps intra-orally. In this investigation, a

the palatal side [29]. This study's findings are difficult to compare to those from earlier studies due to variances in sample size, grouping methodologies, clinical examination procedures, and radiographic diagnostic methods.

Permanent lateral incisors are the third most lost tooth after upper and lower second premolars. This research's missing lateral incisors were 2.7%, affecting both genders equally. The frequency of congenitally missing lateral incisors is 1–2%, according to Bajali M et al [30]. These findings match ours.

This research found that 4.33% of individuals had peg-shaped maxillary lateral incisors. The most prevalent anomaly is maxillary lateral incisor size variation, according to Proffit [31]. Peg-shaped maxillary lateral incisors were our sample's second most common dental abnormality at 1.51%.

Altug-Atac et al. [32] discovered 0.57% peg lateral incisor abnormalities in Turkish orthodontic patients. Numerous genetic and environmental variables may affect prevalence. Bäckman B et al. [33] described pegshaped lateral incisors.

This research found 54.1% bicuspidate and 45.9% tricuspidate mandibular second premolar. Males have more bicuspidate, and females have more tricuspidate mandibular second premolars, although the difference is not statistically significant. In Khyber College of Dentistry, Peshawar, Dilbaz et al. [34] found that 61.55% of mandibular 2nd premolars were bicuspid and 38.45% were tricuspid. The results are similar to our current research. In their research in Egypt, Amin et al. [35] found a greater frequency of 2-cusps. Loh HS et al.22 discovered that 374 (66.3%) of Chinese mandibular second premolars had bilateral 2-cusp forms, 143 (25.4%) had 3-cusp forms, and 47 (8.3%) were mixed. No mixed cuspal patterns were discovered in this investigation.

This research demonstrated a statistical difference between two and three mandibular premolar cuspal variations and other dental abnormalities. We failed to reject the null hypothesis since all p-values exceeded the threshold (<0.05). This title has no literature research.

CONCLUSION

Mandibular second premolars are bicuspidate. No substantial relationship exists between two mandibular second premolar cuspal variations and other dental abnormalities.

REFERENCES

1. Nanci A. oral histology, development, structure and function. 7th ed. Missouri: Mosby; 3008: 1-15.
2. Shamim T. Forensic odontology. J Coll Physicians SurgPak 2011; 22(4), 240-5.
3. Kumar, V Jayanth K, Gopal S. Reliability of Age Estimation Using Demirjian's 8 Teeth Method and India Specific Formula. Journal of Forensic Dental Sciences 2015; 3(1): 19–22.
4. Fuller JL, Denehy GE. The permenant mandibular premolars. Concise Dental Anatomy and Tooth Morphology 5th Ed. 2010; 85-8.
5. Andrews LF. The six keys to normal occlusion. Am J Orthod 1972; 62(3):296-309.
6. Legovic A M, Legovic A, Slaj M, Mestrović S, Lapter-Varga M, Slaj M.Teeth eruption in children with normal occlusion and malocclusion.CollAnthropol 2008 Jun;32(2):519-22.
7. Bath-Balogh M, Fehrenbach MJ. Occlusion. In: Dental embryology, Histology, and Anatomy. 3rded. Philadelphia: WB Saunders 2011; 274-86.
8. Ash MM, Nelson S. Wheeler's Dental Anatomy, Physiology, and Occlusion. 9thed.Philadelphia: WB; Saunders; 2011. Chapter 4: 76-7.
9. Amin F, Prevalence of Hypodontia in Orthodontic patients in a Pakistani sample, Pak Oral and Dent J 2010; 30: 142-5.
10. 10.Thongudomporn U, Freer TJ. Prevalence of dental anomalies in orthodontic patients. Aus Dent J 1998; 43: 395-8.
11. Newman MG, Henry HT, Perry PK, Carranza FA. Carranza's clinical periodontology. 10th ed. Elsevier Inc 2009: 34-74.
12. Kottoor J, Albuquerque D, Velmurugan N, Kuruvilla J. Root Anatomy and Root Canal Configuration of Human Permanent Mandibular Premolars: A Systematic Review. Anatomy. Research Int 2013; 1: 122-8
13. Lorena SC. Multiple dental anomalies. J Oral Sci 2003; 45: 47-50.
14. Vastardis H. The genetics of human tooth agenesis: Discoveries for understanding dental anomalies. Am J OrthodDentofacOrthop 2000; 117: 650-6.
15. Uslu O, Akcam, MO, Evirgen JK. Prevalence of dental anomalies in various malocclusions. Am J OrthodDentofacOrthop 2009; 135(3): 328-35.
16. Casey DF. Congenitally missing mandibular second premolar: Treatment outcome with orthodontic space closure. Am J OrthodDentofacOrthop 2003; 123: 676-82.
17. Baccetti T. Prevalence of dental anomalies. Minerva Stomatol 1993; 42:281-94.
18. Peck S, Peck L, Kataja M. The palatally displaced canine is a dental anomaly of genetic origin. The Angle Orthod 1994; 64(4): 250-6.
19. Witkop CJ. Clinical aspects of dental anomalies.Int Dent J 1976 Dec;26(4):378-90.
20. Yılmaz HH, Türkkahraman H, Sayın MO. Prevalence of tooth transpositions and associated dental anomalies in a

Turkish population. Dentomaxillofac Rad 2014. 34 ; 32-5.

21. Şener S, Bozdağ G, Ünlü N. Presence, Distribution, And Association Of Dental Anomalies: A Clinical And Radiographical Study. Clin Dent And Research 2011; 35(3): 43-52

22. Loh HS. Coronal morphology of the mandibular second premolar in the Singaporean Chinese. Aust dent J 19913: 38(4):: 283-6.

23. Nemati S, dalii Z, dolataBadi N, jawavedZadeh AS. Prevalence of developmental and acquired dental anomalies on digital panoramic radiography. J DentomaxillofacialRadiology patholSurg 2012; 1: 24-32.

24. King NM, Jennie SJ, sai T, Wong HM. Morphological and numerical characteristics of the southern Chinese dentitions. Part I: anomalies in the permanent dentition. Open Anthropol J 2o10; 3: 54-64.

25. Kositbowornchai S. Prevalence and distribution of dental anomalies in pretreatment orthodontic Thai patients. KhonKaenUniv Dent J 2010; 13(2): 92-100.

26. Kraus BS. Carabelli's anomaly of the maxillary teeth. American Journal of Human Genetics 1951; 3: 348-55.

27. Khan DB, Khan MA, Khattak M. Prevalence of cusp of carabelli in permanent teeth in a group from Khyber Pakhtunkhwa, Pakistan. Pak Oral Dent J 2011; 31(2):409-15.

28. Kim Y, Hyun HM, Jang KT. The position of maxillary canine impactions and the influenced factors to adjacent root resorption in the Korean population. Eur J Orthod 2011 ; 145: 1-5.

29. Aydin H, Yilmaz H, Yildirim D. Incidence of canine impaction and transmigration in a patient population. DentomaxfacRadiol 2004; 33(3): 164-69.

30. Bajali M, Abdulgani Azz.2 , Abu-Hussein M.3 ,Prof. Wanted N. Replacement of congenitally missing bilateral incisors using implants: a case report. Int J Dent Health Sci 2014; 1(3): 387-400.

31. Proffit WR. The development of orthodontic problems. In: Proffit WR, editor. Contemporary orthodontics.2nd ed. St Louis: Mosby; 1997. p. 110.

32. Altug-Atac, Ayse Tuba, and Dilek Erdem. "Prevalence and distribution of dental anomalies in orthodontic patients. Am J Orthod 2007; 131(4): 510-514.

33. Bäckman, B., and Y. B. Wahlin. "Variations in number and morphology of permanent teeth in 7-year-old Swedish children. Int J Paediatric Dentist 2001; 11(1):11-17.

34. Khan DB, Rehman Z, Khan F, Khan H.Frequency of bicuspid and tricuspid form of mandibular second premolar a mandibular second premolar at Khyber College t khyber college of dentistry pesha of dentistry peshawar. J Med Sci 2013: 21(3): 118-120.

35. Amin RM, Rabea AA. Prevalence of the two variants of mandibular second premolars in the Egyptian population. Int J Academic Research2015;7(1): 34

Disclaimer: Nil

Conflict of Interest: There is no conflict of nterest.

Funding Disclosure: Nil

Authors Contribution

Concept & Design of Study: Mohammad Naeem1

Data Analysis: Mohammad IftikharAdil2, Pashmina Nisar3

Critical Review: Raham Zaman4

Final Approval of version: Mohammad Naeem1

Open Access: This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format,as long as you give appropriate credit to the original author(s) andthe source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commonslicense, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licenseand your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license,visithttp://creativecommons.org/licenses/by/4.0/. © The **Author(s) 2021**