

Frequency of cusp of carabelli in orthodontic patients reporting to Islamabad Dental Hospital

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Abstract

Introduction: Anatomic variation in the anatomy of maxillary molars can have clinical implications in dentistry ranging from predisposition to dental caries or loosely fitting orthodontic bands. The aim of this study was to determine the frequency of cusp of carabelli in permanent first molars of patients reporting to the Orthodontic department.

Material and Methods: A total of 698 patients reporting to the Orthodontic Department, Islamabad Dental Hospital, were evaluated from their orthodontic records. Upper occlusal photographs and dental casts of these patients comprised the data.

Results: 245 (35.1%) patients showed the presence of the cusp while 453 (64.9%) had no accessory cusp present. Larger proportion of females had cusp of carabelli when compared with males. Bilateralism was found in 75.1% subjects while unilateralism existed in 24.9%, both being higher in females. Among the unilateral cases, higher trend was observed on the right side then the left.

Conclusions: It was concluded that the frequency of cusp of carabelli was less in a population sample of Islamabad than other Asian samples, but an opposite trend was seen when compared to a population sample of Khyber Phukhtunkhwa showing different prevalence rates in different ethnicities.

Keywords: Cusp of carabelli; maxillary first molars; caries; orthodontic patients

Introduction

The Cusp of Carabelli is a small additional cusp which is situated on the mesio-palatal surface of first maxillary molars and less likely on second and rarest on third molars. This nonfunctional cusp on the mesio-palatal cusp of the maxillary permanent molars comes in many forms including furrows, ridges or pits¹ collectively known as the Carabelli trait.²

Cusp of Carabelli was initially illustrated by Georg Carabelli in his textbook of oral anatomy in 1842³ and first described as a tubercle.⁴ It is entirely absent in some individuals and present in others either

unilaterally or bilaterally. However it generally appears bilaterally⁵ but Hirakawa and Dietz found 'rare' unilateral cases.⁶ Its size varies from being the largest cusp of the tooth to a rudimentary elevation. Two types of cusp of carabelli are the 'positive-cusp' and the 'negative-cusp'. The 'Positive-cusp' is the protuberant and cusp formed structures while the furrow and pit formed structures are termed 'negative-cusp'.⁶

It is mostly prevalent in European population, lower in frequency in African population and Indian-American and least prevalent among Arctic population.⁶ Hence the aim of the present study was to find the frequency of cusp of carabelli in Pakistani population.

Material and Methods

This quantitative, cross sectional study was carried out on 770 patient's records reporting to the Orthodontic department of Islamabad Dental Hospital. Data included previous orthodontic records which were present in

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the department. The records included history sheets, casts and intra oral pictures. Patients with erupted permanent maxillary first molars on both sides were included in the study. 72 patients were exempted from evaluation because of incomplete records and the remaining 698 fulfilled the inclusion criteria and were further investigated. On the other hand 67 cases were further discarded from the study because of having grossly carious, extracted or restored maxillary permanent first molar. Approval of this research was sought out from the ethical committee of Islamabad Medical and Dental College.

Records of all the patients included in the study were carefully evaluated by two researchers. Also the intra-oral photographs (upper occlusal view) and the casts were examined to confirm the presence or absence of the cusp of carabelli. The data was analyzed using tables and charts.

Results

Out of 698 records examined, 245 patients showed the presence of cusp of carabelli. Out of these 38% were males and 54% were females (Table I).

Table I: Frequency of Cusp of Carabelli in Males and Females

	Male	Female	Total	Missing	Total
Frequency	267	383	650	48	698
Percent	38.3	54.9	93.1	6.9	100.0
Valid Percent	41.1	58.9	100.0		
Cumulative Percent	41.1	100.0			

Table II: Overall Frequency of Cusp of Carabelli

	Frequency	Percent	Valid Percent	Cumulative Percent
Present	245	35.1	35.1	35.1
Absent	453	64.9	64.9	100.0
Total	698	100.0	100.0	

The remaining 453 records showed either absence of the accessory cusp or were discarded as they did not fit the inclusion criterion (Table II).

Table III: Frequency Distribution of the Presence of Cusp of Carabelli

	Frequency	Percent
unilateral	61	24.9
bilateral	184	75.1
Total	245	100.0

Out of the 245 records showing presence of the cusp, 184 cases had bilateral presence with presence of the cusp on both right and left maxillary first molars. Unilateralism was seen in only 61 of the cases (Table II and III)

Table IV: Distribution of the Cusp of Carabelli in Unilateral Cases

	Frequency	Percent	Valid Percent	Cumulative Percent
Right side	33	54.1	4.7	60.3
Left side	28	45.9	3.7	64.0
Total	61	100.0	100.0	

In the Unilateral cases, 54.1 % were seen on the right maxillary permanent first molar and 45.9% were seen on the left side (Table IV).

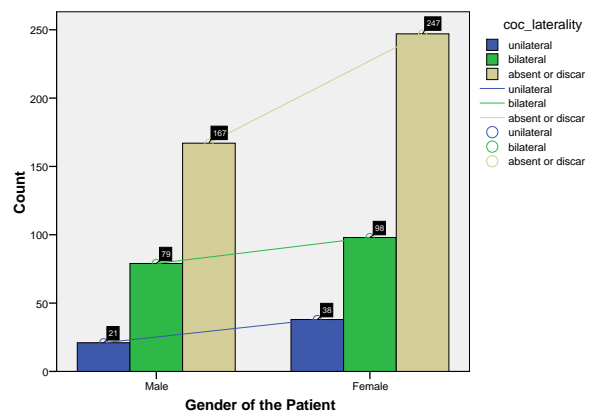


Figure 1: Comparison of Frequencies of Cusp of Carabelli with gender

Male unilateralism and bilateralism was seen in 21 and 79 cases respectively out of a total of 267. In female sample, 38 subjects

demonstrated unilateral presence while in 98 of the cases bilateral presence of the carabelli cusp was seen.

Discussion

The Cusp of Carabelli is a variation that is present on maxillary molars. It varies amongst individuals from either being entirely absent or presenting unilaterally or bilaterally.^{7,8} This cusp is mostly present on the maxillary first molars and rarely on third molars.⁵

Alvesalo et al⁹ in their review found the cusp to vary highest from 51% to 90% in European population, lower in African and American-Indians and lowest in Arctic populations. No sexual dimorphism was noticed however the frequency appeared higher in men than women.⁹

In this study however, the frequency of the cusp of carabelli was 35% which is higher to the prevalence rate of 29.7% reported in the study done by Khan and co workers⁴ on a population sample of Khyber Pakhtunkhwa. Also higher than those of Hassanali¹⁰ who reported a prevalence rate of 27%. Similar studies by Kannapan¹¹ and Rushma¹² however reported higher rates of occurrence of the cusp of carabelli.

In the present study, more females (54%) reported with the cusp of carabelli, while males had a comparatively lesser occurrence rate (38%). These results were in agreement with the study by Subedi et al¹³ who reported greater incidence in females (51%). Studies by Hasu JW et al¹⁴ in a Chinese population and Tsai OL et al¹⁵ in a population of Taiwan also reported more expression of the cusp in females. Most of the records examined revealed a total absence of the Carabelli cusp reaching up to 64% which is in agreement to the study by Khan et al.⁴ 184 cases (75.1%) of bilateralism were seen in this study while unilateralism was seen in only 61 (24.9%) of the cases. Both traits of unilateralism and bilateralism were at a higher rate in females than in males. A similar bilateralism rate of

70.7% was reported by Subedi et al,¹³ and this was also in agreement with studies by Shethri¹⁶, Edgar¹⁷, Bermudez¹⁸ and Falomo⁶ who reported bilateral occurrence of Carabelli cusp in ratios of 82.2%, 75.6%, 91.2% and 70.71% respectively.

The appearance of the cusp varied from a well formed tubercle or a mini-cusp in some cases to a deep groove present at the exact location on the mesio-palatal cusp of the first molar. Cases showing unilateralism were 24.9% which was in harmony with the prevalence rates of Khan et al⁴ and Falomo⁶ who reported 29.7% and 25.99% of unilateralism respectively. Also seen in this study was that among the unilateral cases, more occurrence of the cusp of carabelli occurred on the right maxillary first molar (54.1 %) than on the left side (45.9%).

In the present study, records of orthodontic patients have been included exclusively. The Cusp of Carabelli is seen on the mesio-palatal cusp of the permanent maxillary first molars, which is the tooth used for placing orthodontic bands. The cusp appears in various forms and sizes ranging from a well formed mini-cusp, emerging in some cases as a small tubercle or a well defined groove, to a small pit. In patients with absence of this cusp the mesio-palatal surface is completely smooth. Some clinical significance lies with this cusp as the groove lining the cusp away from the parent tooth is prospective stagnation site welcoming the accumulation of food debris and developing into dental caries and periodontal disease. Since the orthodontic bands used in conventional orthodontic procedures have no compensation for the cusp of carabelli the space left at that area become a stagnation point. If the orthodontic band is loose or the cement dissolves with the course of time, this area becomes more sensitive to the incidence of caries and if goes undetected, may progress deep enough to involve the pulp. This would end up in the preparation of an

unconventional cavity in order to arrest the progression.

Conclusions

Presence of Cusp of Carabelli was found to be higher in the population sample of Islamabad as compared to the sample of Khyber Pakhtunkhwa (KPK) but was still lower than other similar Asian population samples. Also more females showed the occurrence of this cusp while the opposite gender was found as having a higher rate in KPK. These results depict the fact that difference in the occurrence of the Carabelli Cusp exist in same populations with different ethnicities and also between different countries. Further studies are needed to evaluate this, as it can be useful to identify different ethnic group and can also be used for identification of dentition for comparative studies. Also the orthodontic band available for banding should have a pre-adjusted region to accommodate the presence of the Cusp of Carabelli, in order to avoid the formation of a caries prone area thus preventing cavity formation.

Aknowlegments

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