

Variations in Occlusal Morphology of Permanent Maxillary First Molars in Zawia Population: A Comparative Study

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Abstract

Tooth variation in both crown and root morphology has always been a topic of interest in investigation. Moreover, dental morphological characteristics are useful for many fields including anthropology, genetics and phylogenic studies and understanding variations among gender. Permanent maxillary first molars are expressed in several

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degrees and different frequencies between humans, thus being useful in comparing and characterising populations. Thus, the purpose of current study was intended to determine the prevalence of cuspal variations and quantification of the cusps of permanent maxillary first molar in Libyan population particularly in Zawia city and compare the obtained results with earlier studies in different gender.

A total of 500 individuals were selected from the faculty of medical technology, University of Zawia to evaluate the number of cusps in permanent maxillary first molars. Single examiner examined maxillary arch impressions were taken to assess the number of cusps, by the impressions were made in alginate for all the participants and immediately poured in dental stone, the obtained casts visually, and the details were recorded.

The results showed that out of 500 individuals, 320 (64%) cases had permanent maxillary first molars with five cusps, while 179 (35.6 %) cases had four cusps and a one (0.4%) case had three cusps. The case having three cusps permanent maxillary first molars were present bilaterally and only in females.

The present study concluded that there is a significant prevalence of five cusps (64%) in permanent maxillary first molars in Libyan population at Zawia city.

Keywords: *Maxillary first molar, Morphological variation, 3-cusps Molar, Prevalence, Zawia City.*

Introduction

The quantification of the cuspal and morphologic variation has always been the subject of research, the anthropological system and should be determined in different populations [1]. Dental morphology can

be an indicator of gene disturbance between populations and therefore the cusp plays an important role in determining such patterns [1, 2].

The first maxillary molars are the largest tooth in the maxillary arch, and they play an important morphometric role in gender differentiation. In addition to, the anchorage value of first permanent maxillary molars is high and that makes it an important tooth from orthodontic treatment point of view [3]. Therefore, it is important to know the different forms and the variation in cusps of permanent first maxillary molar.

Maxillary first molars usually have four cusp extra or missing cusp. Variations in occlusal morphology of these teeth include in the number of cusps [2]. Each cusp has a different growth pattern and changing background [3, 4]. Various studies have revealed that the mesio-distal width and oral width measured are higher in males than in females and the difference is statistically significant [5].

To time, there is no study has been conducted to assess the cuspal variation of the first permanent maxillary molar in Libyan population. Therefore, the purpose of this paper was to quantify cuspal variation in permanent maxillary first molar and report the variations in its cuspal numbers in the Zawia population of Libya.

Materials and Methods:

500 individuals were studied at the faculty medical technology, University of Zawia, Libya, to assessment the morphology and the number of permanent maxillary first molar cusps.

The followed criteria in the present study was that the age of individuals between 18 -30 years, no severe attrition or abrasion of the molars, not suffered any preceding treatment in their permanent first

molars, non-appearance of any systemic diseases, no congenital abnormalities or medical problems, and first permanent maxillary molars present bilaterally.

The individuals were subjected to impressions using upper stock tray and alginate impression to record the features of occlusal surface of their maxillary first molars and to confirm the presence of Carabelli cusps. Then, all taken impressions were poured immediately by using dental stone to prevent impressions' deformation. The extracted casts were analysed visually by single examiner and the data was recorded. The cases with any strange features were recalled and examined clinically again to confirm with the findings of the cast. All statistical calculations were performed by computer programs (SPSS), the extent of the association between the number of cusps and gender was assessed using chi-square analysis. $P < 0.05$ was considered statistically significant.

Results:

In this study, the variation of cuspal morphology in the permanent first maxillary molars was investigated and it was clearly different between the genders for their cuspal morphology, and (figure 1) shows the stone casts that produced from poured impressions.



Figure 1 : The final model cast

Out of 500 selected individuals, 258 were males and 242 were females, and (figure 2) shows the gender and the number of cusps in permanent maxillary first molars. 320 (64%) cases of the permanent maxillary first molars had five cusps while 179 (35.6%) had four cusps and 1 (0.4%) cases had three cusps. The unique finding of the three cusped permanent maxillary first molar in one individual was that they were present bilaterally in all the one case. In this case, it was present on both the right and left side. Statistical comparisons between the number of cusps and gender were highly significant (P value = 0.001) and is shown in Table 1.

(Figure 3) illustrates the number of cusps in males and female cases, the frequency of occurrence of four cusped and three cusped molars were more in females compared to males. However, the five cusped molars were not seen more frequently with females compared to males

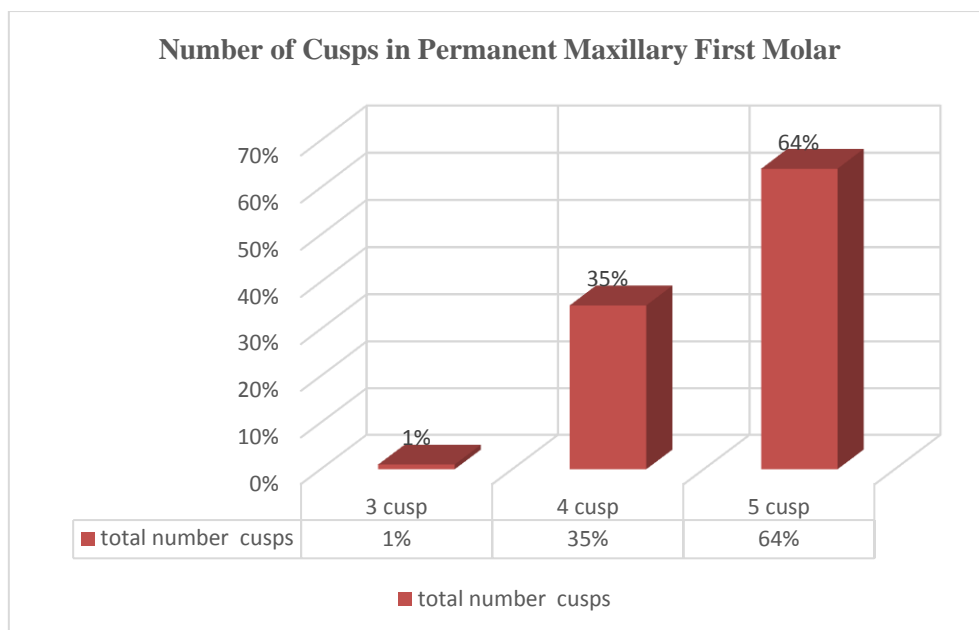


Figure 2: Number of cusps in permanent maxillary first molar

Number of cusps / Gender	3 cusp	4 cusp	5 cusp	(p-value)*
Male	0	88	111	0.001
Female	1	232	68	
Total	1	320	179	

Table 1: Association between the number of cusps and gender

*P-Value <0.05

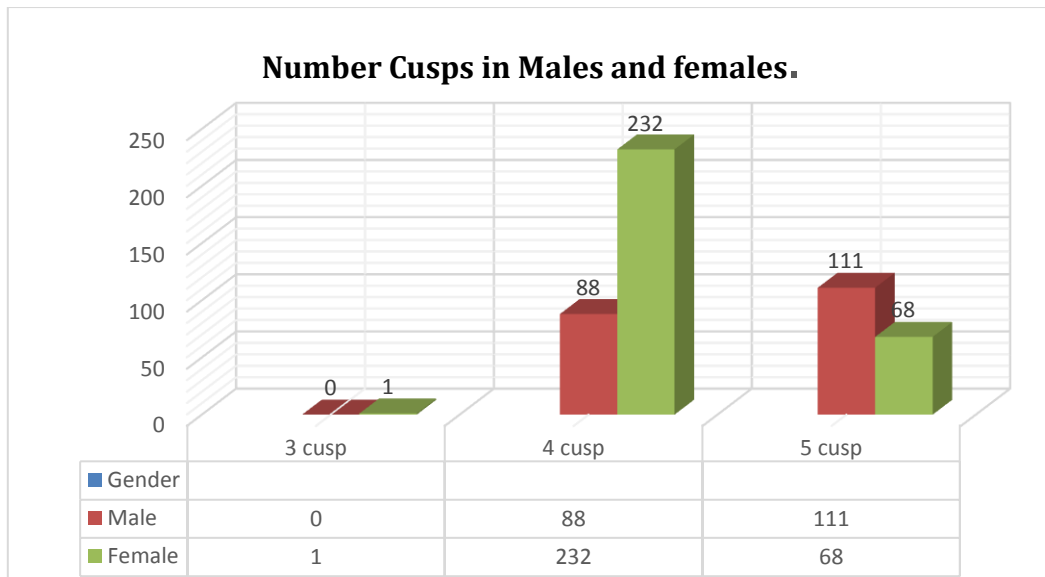


Figure 3: Compared between number Cusps in Males and females.

(Figure 4) displays the intra-orally photograph of the one female case with three cusp maxillary first molar present bilaterally on right and left sides.

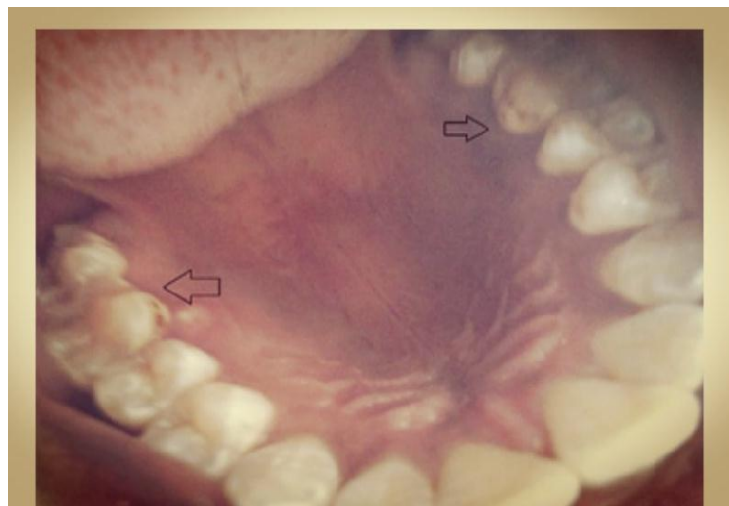


Figure 4: Female case with three cusped molar

Discussions:

The study of dental morphological characteristics is important in anthropological research since it can provide information on the phylogenetic relationship between species, as well as diversities and variations within population [6]. It is commonly accepted that dental features, such as shape, size, presence, number of cusps, and the size of the dental arches, are genetically determined [5].

For this purpose, the aforementioned characteristics differ among species and races and can constantly alter due to genetic changes and natural selection.

Hassan S *et al* reported that the sexual dimorphism in males typically had a lower tendency than in females; this could be a reason for decreasing the number of cusps in the upper molars [7]. In addition, females have a tendency to have more cusps for the same crown diameter.

The bigger teeth in the same class had more cusps [7,8]. This finding is with agreement with the finding of present study. Hassan S *et al.*, in their study on Southern Chinese population found that in maxillary first molars, five cusp molars were most prevalent in males (39%) while four cusp molars were most prevalent in females (39%) [7].

The first maxillary molar is the largest tooth of the maxillary arch and actually has the largest crown in the mouth. Of all maxillary molars, the first molar is the least variable in anatomical shape, and thus the standard to the other maxillary molars are compared. There are four principal cusps and a minor cusp, sometimes indistinct, which is the cusp of Carabelli. It was absent in 35.4% of teeth in 489 children [8]. Mukhopadhyay P *et al.*, in a study of 2020 first maxillary molars of his pupils found that 70.5% had some kind of Carabelli formation [9].

This study presents with one case in which three cusped permanent maxillary first molar have been observed. All of these cases reported to the faculty of medical technology, Zawia, Libya. The one case females. The patient were healthy with no significant pathological findings. Complete medical and dental history along with nutritional status were noted. No nutritional deficiencies were detected and no disorders were diagnosed in the subjects. During a thorough examination, the first permanent maxillary molar revealed three distinct cusp on the occlusal surface rather than four or five usually observed cusps.

Mesio-buccal and disto-buccal cusps were present but the lingual surface had only one cusp. The oblique ridge, which is an arch trait of maxillary molars, the cusp of Carebelli and the disto-lingual cusp were missing in some the cases. The ridges do not connect to form the transvers ridge. It may be appropriate to say that these molars resemble the three cusp second mandibular premolar, but are slightly larger relative to them. These three cusp first maxilla molars had a heart-shaped contour. The lingual cusp is located almost in the center of the mesio-buccal and disto-buccal cusps, giving it a heart shape.

The cuspal variation if associated with the root number and morphology can affect the clinical outcome during endodontic treatment, periodontal management, extraction, tooth preparation for restorative treatment, as well as orthodontic treatment of such teeth [10, 11]. Furthermore, the presence of a single large lingual cusp should be observed for occlusal interference/premature contact and altered function of equilibrium. The difference in the morphological form or size of the molars can also lead to difficulty with the placement of the bands and mouth tubes in the labial and lingual orthodontics [12].

Conclusion:

The study of odontometry and dental morphological characteristics is important in anthropological research and forensic as it can provide information on the phylogenetic relationship between species, as well as variation and diversities within a population. From the present study, it was observed that the most common occlusal morphology in permanent maxillary first molars is 320 (64%) cases had five cusps, while 179 (35.6 %) cases had four cusps and a one (0.4%) case had three cusps. It was also observed that, five cusps was more prevalent in male than female and the one case of three cusped permanent maxillary first molars was observed in female. The one case of three cusped permanent maxillary first molars was present bilaterally. This might indicate a site-specific alteration in the morphologic behavior of the developing molar. The large single lingual cusp should be taken into consideration during clinical management.

In addition, knowing the common variations in the dental anatomy and morphology of each tooth can help to carry out certain dental treatments such as restorative, endodontic and orthodontic treatments. Thus, the results of this study may be helpful in both clinical dental research and anthropological.

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