Research Article

Occlusal Morphology of Permanent Mandibular First Molar

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ABSTRACT

Dental identification is an important identification tool in Forensic odontology. There is a difference of opinion regarding whether ethnicity influences dental morphology or not. Few studies have shown the associations between these dental features and crown traits in humans. The aim of the study is to determine the prevalence of different occlusal morphological patterns of permanent mandibular first molars. A total of 90 participants were selected randomly. Blinding of sampling was done and participants name, gender and age were recorded. The occlusal morphology (Number of cusps and cuspal pattern) of the permanent mandibular first molar was recorded. The most prevalent number is cusps was 5 cusp pattern (73%), the most prevalent groove pattern was '+' pattern (62%), the most prevalent combination of number of cusps and groove pattern was 5+ (38%), the most prevalent combination of number of cusps and groove pattern in males was 5Y (43%) and the most prevalent combination of number of cusps and groove pattern in females was 5+ (48%). The most common occlusal morphology in permanent mandibular first molars is '5 cusp' (73%) and '+' pattern (62%). It was also observed that it was more prevalent in females than in males.

Keywords: Cusp numbers, groove patterns, occlusal morphology, permanent mandibular first molars.

INTRODUCTION

Teeth are informative indicators for the study of human populations, serving as markers and the bases for comparisons of genetic origin. Much evidence has been accumulated over the past century to indicate that dental development is regulated by genes. This is true for crown and root form, in general, and also extends to positive (cusps) and negative (pit, furrows, and grooves) structural variants of a tooth.[1]

The large variation in morphological features and their form may not be easily altered; thus, a trait of the human dentition can be a valuable diagnostic tool for anthropological studies in classifying and characterizing different ethnic group.[2] The cusps, ridges, and grooves that decorate the crown surface also vary within different species of primates, together with the number and form of tooth roots. Various authors have different opinion regarding whether ethnicity influences dental morphology or not. However, it is observed that there are different degrees of expression and frequency in variation of teeth in dentitions of different populations.[3] Investigations into racial differences in dental morphology have led to the hypothesis that the common origins of peoples are reflected to a certain degree in their similar phenotypic patterns.[2]

Although tooth morphology may be indicator of genetic distances between populations it should be viewed with caution.[4] Almost all dental anatomy textbooks describes permanent mandibular first molar as 'Y' groove pattern with 5 cusp numbers.[5,6,7] However, there may be variations such as the mandibular first molar having 4 cusps and also might have '+' pattern.

Gregory and Hellman and Hellman described variations in occlusal surfaces of the mandibular molars and developed morphological categories as "5 Y," "5+," "4Y" and "4+." And Takeshi Matsuda has used "6Y," "5Y," "4Y," "6+," "5+," "4+," "6X," "5X," "4X" pattern for mandibular molars.

Since only limited data are available on the prevalence of the dental characteristics of the South Indian population, there seems to be a need to investigate the major dental traits in this population. So this study was done to determine the prevalence of different occlusal morphological patterns of permanent mandibular first molars in South Indian Population.

MATERIALS AND METHODS

A total of 90 participants were selected randomly. Blinding of sampling was done and participants name, gender and age were recorded. Before taking the history, the consent of the participant was taken using consent form. Total number of cusps and groove patterns of mandibular first molars were examined clinically and photographs of the same were taken.

The inclusion and exclusion criteria are as follows:

Inclusion criteria

1. Permanent mandibular first molars free from occlusal caries.
2. Presence of bilaterally completely erupted permanent mandibular first molars.

3. Permanent mandibular first molars showing clear occlusal outline with all cusps and groove pattern.

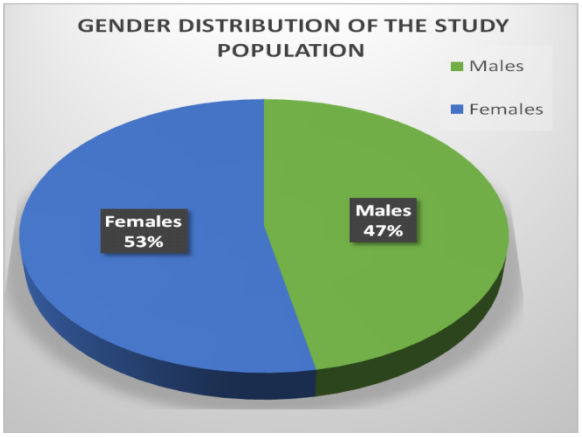
EXCLUSION CRITERIA

1. Participants with restorations and prosthesis in the permanent mandibular first molar.
2. Presence of unilateral erupted permanent mandibular first molar.
3. Participants with caries in permanent mandibular first molars.

The examinations were carried out using a dental mouth mirror and dental explorer. A 12 megapixel camera was used for taking the photograph. Photographs of the mandibular arch, right and left permanent mandibular first molar were taken. The number of cusp, groove pattern and occlusal morphologies of both left and right permanent mandibular first molar were noted.

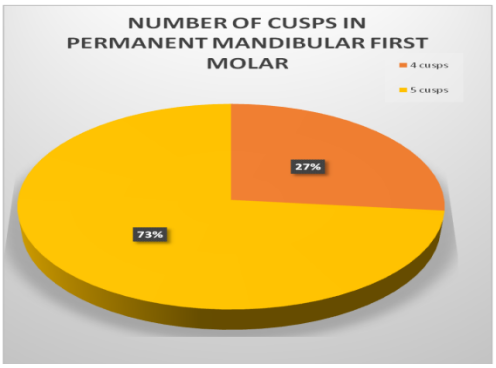
RESULTS

Graph 1 shows Gender Distribution of the study population. In our study, out of 90 participants- 48(53%) are females and 42(47%) are males.Direct oral examination was performed.



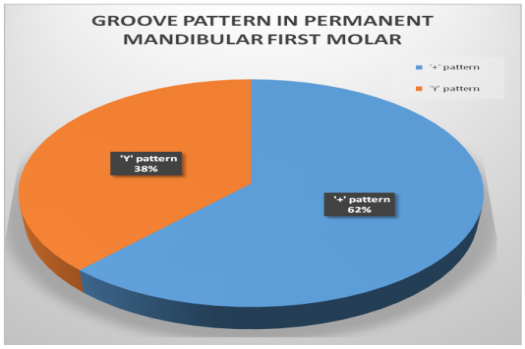
Graph 1: Gender Distribution of the Study Population

Graph 2 shows distribution of number of cusps in permanent mandibular first molar. Out of the 90 participants (180 teeth) – 132 (73%) showed 5 cusp pattern and 48 (27%) showed 4 cusp pattern.



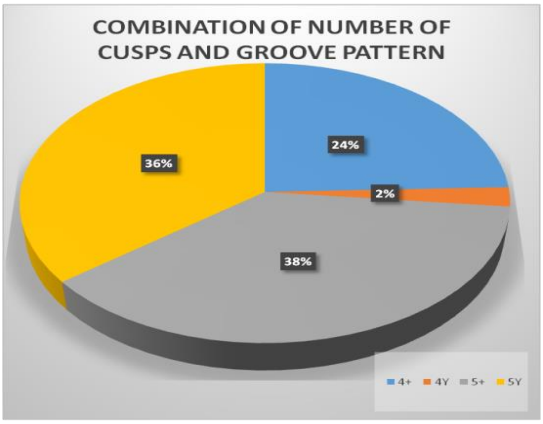
Graph 2: Number of Cusps in Permanent Mandibular First Molar

Graph 3 shows distribution of groove pattern in permanent mandibular first molar. Out of the 90 participants (180 teeth) -112 (62%) showed '+' groove pattern and 68 (38%) showed 'Y' groove pattern.



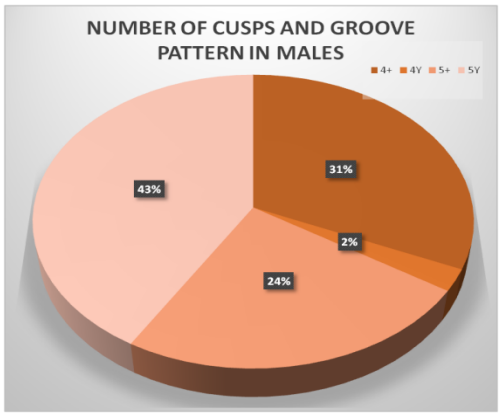
Graph 3: Groove Pattern in Permanent Mandibular First Molar

Graph 4 shows the combination of number of cusps and groove pattern in permanent mandibular first molar. Out of the 90 participants (180 teeth) - 44(24%) showed 4+ pattern, 4(2%) showed 4Y pattern, 68(38%) showed 5+ pattern and 64(36%) showed 5Y pattern.



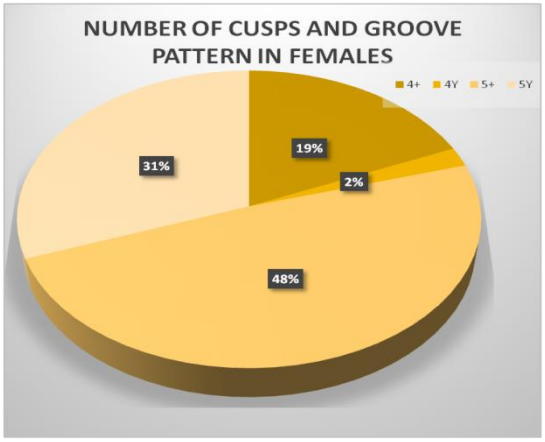
Graph 4: Combination of Number of Cusps and Groove Pattern

Graph 5 shows the combination of number of cusps and groove pattern in permanent mandibular first molar, in Males. Out of the 42 males (84 teeth), 26 (31%) showed 4+ pattern, 2(2%) showed 4Y pattern, 20(24%) showed 5+ pattern and 36(43%) showed 5Y pattern.



Graph 5: Number of Cusps and Groove Pattern in Males

Graph 6 shows the combination of number of cusps and groove pattern in permanent mandibular first molar, in Females. Out of the 48females (96 teeth), 18(19%) showed 4+ pattern, 2(2%) showed 4Y pattern, 46(49%) showed 5+ pattern and 30(31%) showed 5Y pattern.



Graph 6: Number of Cusps and Groove Pattern in Females

In our study, the most prevalent number is cusps was 5 cusp pattern (73%), the most prevalent groove pattern was '+' pattern (62%), the most prevalent combination of number of cusps and groove pattern was 5+ (38%), the most prevalent combination of number of cusps and groove pattern in males was 5Y (43%) and the most prevalent combination of number of cusps and groove pattern in females was 5+ (48%).

DISCUSSION

Dental identification is an important identification tool in Forensic odontology. There is a difference of opinion regarding whether ethnicity influences dental morphology or not. Few studies have shown the associations between these dental features and crown traits in humans.

The mandibular first molar has five cusps: the mesiobuccal (MB, toward midline and cheek), mesiolingual (ML, toward midline and tongue), distolingual (DL, away from midline and towards tongue), distobuccal (DB, away from midline and toward cheek), and distal (D, away from midline), listed in order of decreasing size. Listed in order of decreasing height they are: ML, DL, DF, MF, and D.

To evaluate the groove pattern "Y," "+" or "X," the contact of metaconid (mesioligual cusp) with the hypoconid (distobuccal cusp) have been checked. If contact occurs the pattern resembles a "Y" form and if no contact occurs then pattern resembles "+" form and if entoconoid (distoligual cusp) contacts with protoconoid (mesiobuccal cusp) pattern resembles "X" form.

In our study, the most prevalent number is cusps were 5 cusp patterns (73%). This was found to be in accordance to the studies done by Dholiaet al.[4], Guoet al.[8], Hasund and Bang.[9]

In our study, the most prevalent groove pattern was '+' pattern (62%). It was found that it was not in accordance with the studies done by Dholia et al. [4], Guoet al.[8],Hasund and Bang[9], as these studies showed that 'Y' pattern was the most prevalent groove pattern.

In our study, the most prevalent combination of number of cusps and groove pattern was '5+' pattern (38%). It was found that it was not in accordance with the studies done by Dholia et al. [4], Guoet al. [8], Hasund and Bang[9], as these studies showed that '5Y' pattern was the most prevalent groove pattern.

CONCLUSION

From the following study, it was observed that the most common occlusal morphology in permanent mandibular first molars is '5 cusp' (73%) and '+' pattern (62%). It was also observed that, the combination of '5+' pattern was more prevalent in females than in males. In males, it was the '5Y' pattern which was more prevalent. More number of samples is needed for confirmation of the variations. Thus, it may be concluded that variation in degree of expression and frequency of teeth in dentitions of different populations is different, which may help in forensic identification.

Table 2: Comparison of Our study with the literature

S.NO	Study	Most Prevalent Number of Cusps	Most Prevalent Groove Pattern	Most Prevalent Number of Cusps And Groove Pattern	Number of Cusps And Groove Pattern Most Prevalent In Males	Number of Cusps And Groove Pattern Most Prevalent In Females
1	My study	5 cusps (73%)	'+' pattern (62%)	5+ (38%)	5Y (43%)	5+ (48%)
2	Dholia et al.	5 cusps (71%)	'Y' pattern (60.5%)	5Y (47%)	-	-
3	Guo et al.	5 cusps	'Y' pattern	5Y	-	-
4	Hasund and Bang	5 cusps	'Y' pattern	5Y	-	-

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