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# PREVALENCE OF CUSP OF CARABELLI IN 652 TEETH AMONGST SOUTH INDIAN POPULATION

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**Abstract:**

Background: The cusp of Carabelli, or Carabelli's tubercle, or tuberculum anomalum of Georg Carabelli is a small additional cusp at the mesiopalatal line angle of maxillary first molars. This extra cusp is usually found on the first molar, and becomes progressively less likely in the second, third molars. It is not found in all individuals. The cusp of Carabelli is a heritable feature. Carabelli's cusp is most common among Europeans (75-85% of individuals) and rarest in Pacific Islands (35-45%).Carabelli's cusp may rival the main cusps in size. The cusp of Carabelli trait was first described by Carabelli in 1842.

Aim: To study the Prevalence of cusp of carebelli in an given population. To analysis first maxillary molar in different races (Indian, Srilankan, Malaysians, Chinese)

Methods/Materials: At least 200 maxillary first molar is visually observed in patients and students of Saveetha dental college and hospital.

Reason for the project: To justify that the presence of cusp of carebelli will vary for individuals from different races.

**Introduction:**

Cusp of carabelli is an accessory cusp present on the mesiopalatal surface of maxillary molars. Human dentition has not been constant it has been changed over years .Change in the food habits, reduction in the tooth size, third molar eruption , morphological simplification are all part of it. [1] The nomenclature of this anatomical trait has been attributed to George Carabelli, who first described it in 1842 in a paper by Korenhof. It is also referred as the fifth lobe, supplemental cusp, mesiolingual elevation, accessory cusp, tuberculum anomalies, tuberculum. Cusp of carabelli is formed either due to genetic factor or due to exogenous factor. [2].The cusp may take up many forms like groove, pity shape, tubercle or a well developed one. They may be unilateral or bilateral. [3]Variations in phenotypic trait expression between sides, sexes and dentitions probably reflect the interplay between environmental influences and the timing of developmental processes. [8]

There are clinically three accessory cusp mostly found in the oral cavity that are cusp of carabelli, talon's cusp of incisors, Leong's tubercle of premolars in which cusp of carabelli is most prominent. [2] The prevalence and mode of inheritance of Carabelli trait has been studied in 1040 Sinhalese (561 males and 479 females, age range 20 to 30 yrs) [3]. The association has been described between the increased maxillary molar tooth size and the occurrence of Carabelli's trait. Tooth size is reported to be larger in Carabelli's trait-positive than in Carabelli's trait-negative molars. It is just to compensate the space and the size of the tooth[4]The cusp of carabelli was defined by Dietz, Kraus, Dalbergs into different categories .The oral epithelium and the neural crest cells helps in the formation of future crown.[2]The aim of the study is to detect the presence of cusp of carabelli in South Indian population and to bring out the morphological variations of the cusp which is defined by different authors.

**Key Words:** Cusp of Carabelli & Trait

**Methods and Materials:**

One hundred and sixty three patients attending saveetha dental college were examined between March 26, 2015 to April25, 2015. Upper maxillary first and second molar was taken into account .Any patients with caries, restoration and missing tooth were excluded in this study. Interview, examination and recording were done by one individual to avoid confusion and error in recording the data. After examination the data was recorded according to two authors like Kraus and Dalbergs method. The examination wasd one using mouth mirror and probe on the palatal surface for the absence and presence. If it is presence then they are classified into Kraus and Dalbergs method. In Kraus method the trait of cusp of carebelli was classified as groove, pit, small tubercle and large tubercle. In Dalbergs method the trait of cusp of carebelli is classified No vertical ridges or pits, Small vertical ridge and groove, Small pit with minor grooves, Double vertical ridges or slight and incomplete cusp outline Y form, moderate grooves, Small tubercle, moderate tubercle and Large tubercle.

**Result:**

Total of 163 individuals were studied i.e. 652 teeth examined. In which 47 are males and 116 are females. Totally 60 first maxillary molar, 8 second maxillary molar, 49 first molar of the other side and 4 second

maxillary molar has the trait of cusp of carebelli. These studies include two methods Kraus and Dalbergs criteria. The percentage for Kraus method is a) pits -1.9%. b) groove -5.6% c) small tubercle -62.5% d) pronounced tubercle -9.3%. The percentage for Dalbergs criteria is a) Y- shaped -1.9%. b) small groove and ridge -5.6%, c)pit -1.9%, d)double vertical groove -0% e) small tubercle -62.5%, f) large tubercle -6.8% and g) moderate tubercle -2.5%.

**Discussion:**

The study of tooth morphological characteristics is important in research which include culture, tradition, society which is included in the study, since it can provide information on the relationship between species, as well as variations and diversities within a population. [5]

The cusp has both evolutionary and functional perspective. [1] In the present study, it has been observed that females have more prevalance of cusp of carabelli than males. The study was examined in four maxillary molars. Totally 60 first maxillary molar, 8 second maxillary molar, 49 first molar of the other side and 4 second maxillary molar has the trait of cusp of carebelli. This study include two methods Kraus and Dalbergs criteria. The percentage for Kraus method is a) pits -1.9%. b) Groove -5.6% c) small tubercle -62.5% d) pronounced tubercle -9.3%. The percentage for Dalbergs criteria is a) Y- shaped -1.9%. b) small groove and ridge -5.6%, c)pit -1.9%, d)double vertical groove -0% e) small tubercle -62.5%, f) large tubercle -6.8% and g) moderate tubercle -2.5%.each trait of cusp of carebelli's ratio was taken between Kraus and Dalbergs method in 16 a) pits-1:1, b) groove -1:1, c) small tubercle- 1:1, d) pronounced tubercle- 7:6. In 17 a) pits-0, b) groove – 0, c) small tubercle – 7:0, d) pronounced tubercle – 2:1. In 26 a) pits-1:1, b) groove-1:1, c) small tubercle -1:1, d) pronounced tubercle- 3:1. In 27 a) pits-0:0, b) groove-0:0, c) small tubercle- 1:1, d) pronounced tubercle - 2:1.Finally the the trait has been classified into different types by different author the most acceptable one is Dalbergs and kraus. Dalbergs method is classified into pits, small groove and ridge, small tubercle, double groove and ridge, y shaped, moderate tubercle and large tubercle. Kraus is divided into pits, groove, small and large tubercle. Cusp of carabelli depend on many factors like sex, food habits, social habits, evolutionary and functional changes. The trait is expressed mostly on the lingual surface.

Many researchers like Alvesaloetal.,1975[9]; Rusmah,1992; Saunders and May hall et al ,1982;Thomaset al.,1986 failedto show any sexdimorphism in the occurrence of the trait, although some investigators like KaulandPrakash,1981[10]; Kieser andPreston,1981observedasex-linkedpattern.[6]The most common form of the cusp observed in small tubercle in both males and females. This observation is supported by DILA BAZ KHAN et al in his study [7]. The races and the religion plays an important role in the prevalence of the trait. This was proven by so many researchers like K.Mavrodisz et al showed a prevalence of 65.34 per cent in the contemporary group, and 34 per cent for the 11th century skulls, which is, in both cases, lower than the European average. In Malaysian children, the frequency of a Carabelli cusp on the maxillary first molars was 54.2 per cent by Rushman et al and Meon et al, 1991. In India, 52.77 per cent of maxillary first permanent molars displayed a Carabelli tubercle by Kanappan et al and Swaminathan et al 2001. Hassanali et al 1982 showed that Carabelli's trait was present in 26 – 27 per cent of Asian school children. Caucasoid populations differ from Mongoloids by having a high prevalence of Carabelli's trait Hsu et al., 1997. [5] however In this present study the race and religion has not taken into account.

**Statistical Analysis:**

Table 1: Shows the trait association between gender and the teeth.

| **Male** | | | | **Female** | | | | **16** | **17** | **26** | **27** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 - 188 Teeth | | | | 116 - 464 Teeth | | | | 60 | 8 | 49 | 4 |
| 16 | 17 | 26 | 27 | 16 | 17 | 26 | 27 | | | | |
| 18 | 3 | 12 | 0 | 42 | 5 | 37 | 4 | | | | |

Table 2: Shows the association of the trait with the Kraus and Dalbergs method

| **Tooth Number** | **Kraus Criteria** | | | | | **Dalberg's Criteria** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Absent | Pit | Groove | Small Tubercle | Pronounced Tubercle | Y Shaped | Small Verticle Groove/ Ridge | Pit | Double Verticle Groove | Small Tubercle | Large Tubercle | Moderate Tubercle |
| 16 | | 2 | 3 | 48 | 7 | 2 | 3 | 2 | 0 | 48 | 6 | 1 |
| 17 | | 0 | 0 | 7 | 2 | 0 | 0 | 0 | 0 | 7 | 1 | 1 |
| 26 | | 1 | 6 | 40 | 4 | 1 | 6 | 1 | 0 | 40 | 3 | 1 |
| 27 | | 0 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 5 | 1 | 1 |

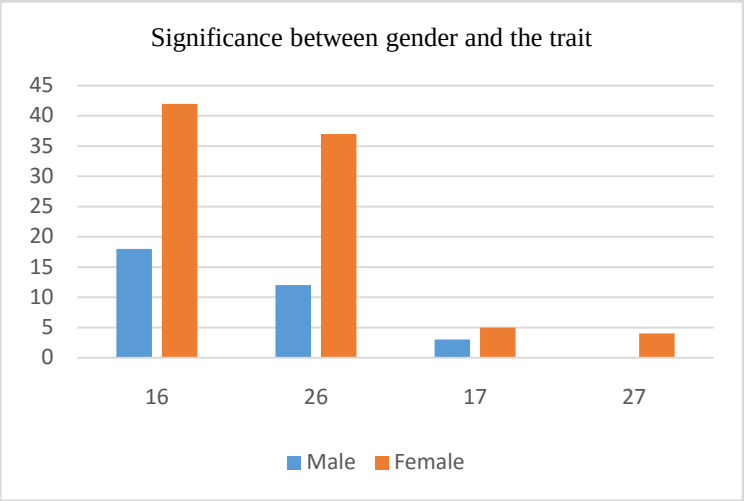
Table 3: Shows the trait percentage of Kraus

| **Krauss Criteria** | **Trait** | **Percentage** |
|---|---|---|
| Pits | 3 | 1.9 |
| Groove | 9 | 5.6 |
| Small Tubercle | 100 | 62.5 |
| Pronounced Tubercle | 15 | 9.3 |

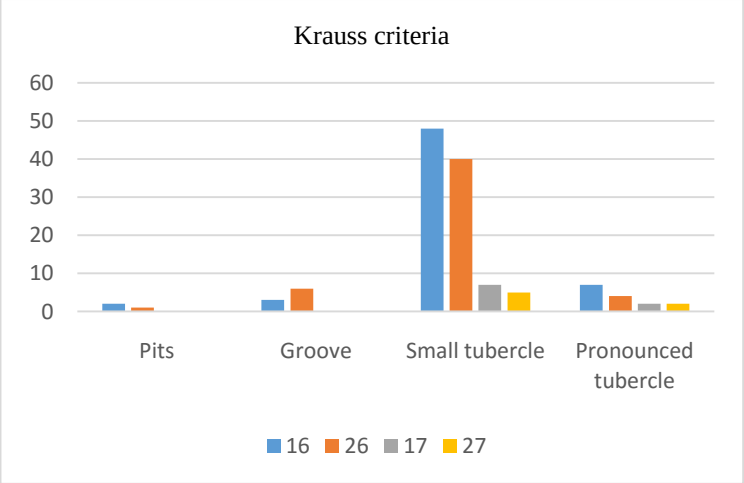
Table 4: Shows the percentage of Dalbergs method

| Dalberg's Criteria | Trait | Percentage |
|---|---|---|
| Y Shaped | 3 | 1.9 |
| Small Vertical Groove/ Ridge | 9 | 5.6 |
| Pit | 3 | 1.9 |
| Double Vertical Groove | 0 | 0 |
| Small Tubercle | 100 | 62.5 |
| Large Tubercle | 11 | 6.8 |
| Moderate Tubercle | 4 | 2.5 |

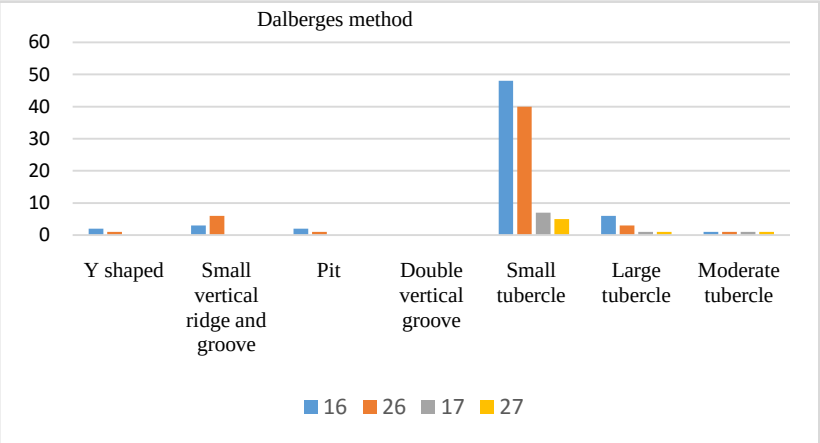
Graph 1: Shows the trait association between gender and tooth



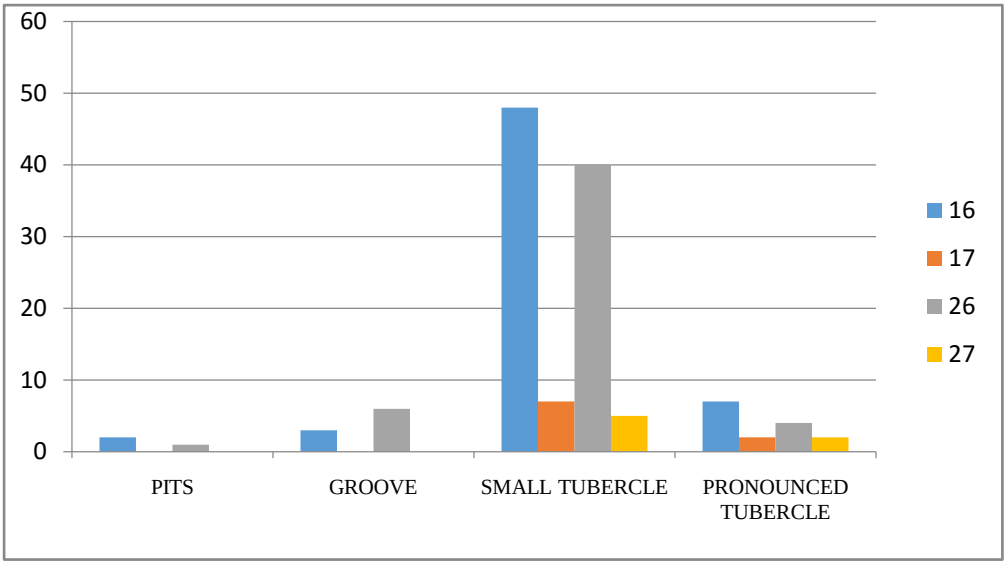

Graph 2: Shows the trait association with Kraus method



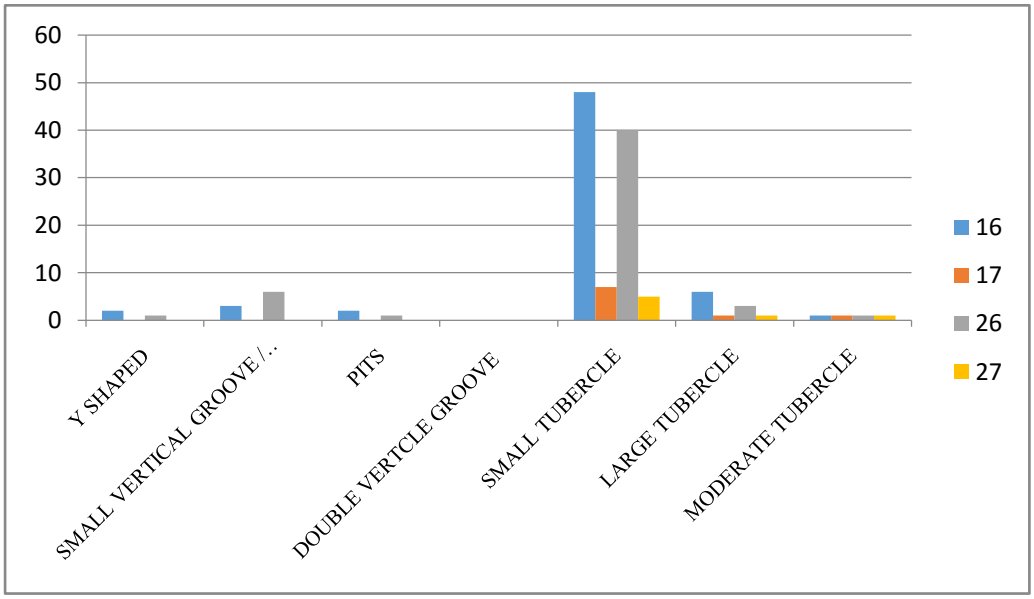

Graph 3: The trait association with Dalbergs method



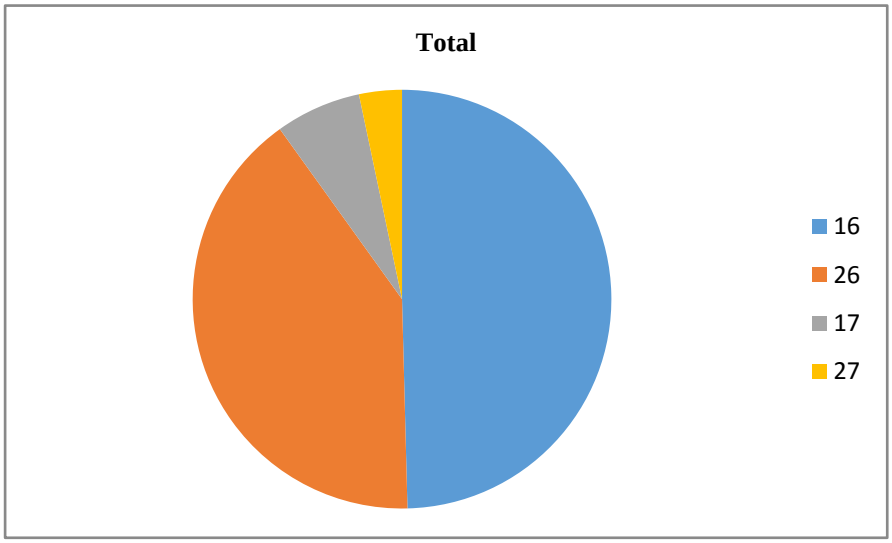
Graph 5: Shows the association between Kraus method and tooth



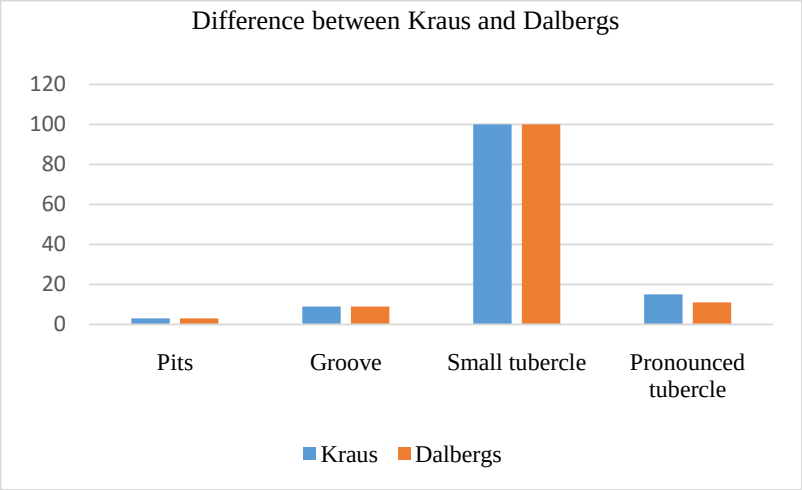

Graph 6: Shows the association between tooth and the Dalbergs method




Pie chart snows the prevalance of trait in each tooth



Graph 7: Shows the difference between Kraus and Dalbergs method.




**Conclusion:**

This study concludes that females have more prevalence of cusp of carabelli than males. The ratio between Kraus and Dalbergs method is almost in equilibrium. The trait is said to be purely dependent on evolution or functional habits.

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