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Original Research

The Prevalence of Cusp of Carabelli in Maxillary Molars among the Kashmiri Population

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ABSTRACT:

Background: Comprehensive assessment of the traits of teeth could provide valuable data regarding phylogeny of man which in turn may be used as differentiation tool between different races and subraces. **Aim:** The aim of the present study was to assess the distribution of Carabelli's trait in Kashmiri population. **Materials and Methods:** A total number 400 of individuals were examined clinically and study casts were made. Permanent maxillary first molars were examined for the expression of Carabelli's trait, Dahlberg classification system was used to score the trait on the teeth. The cast were examined by 2 observers independently to eliminate intra observer variation in interpretation and mean of 2 was taken for analysis. The data so obtained was statistically analysed and $p < 0.05$ was considered statistically significant. **Results:** Cusp of Carabelli was present in 25% of the study population in maxillary permanent molar. Type 3 was the most frequently expressed and Type 0, 5 were not seen among the study population. The expression of trait was bilateral among the surveyed population. **Conclusions:** The prevalence of Cusp of Carabelli was only 25 % in the Kashmiri population. This nonmetric dental crown feature may be used to develop a probabilistic model that will help in distinguishing individuals from specific human populations, particularly for forensic purposes.

Key words: Prevalence; Cusp of Carabelli; Permanent maxillary first molar, Kashmiri population; Accessory cusp; Dental Anthropology.

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INTRODUCTION:

Dental anthropology is concerned with the study of morphological variation and dimensions of the dentition of human populations over time and space and their relation with the processes of adaptation and dietary changes that led to the evolution of the dental system and the human race.¹ Although teeth have proven to be an extremely valuable fossil material for scientists to study the history of human, unusual anomalous morphological features were mistakenly regarded by some early observers as aberrations and not considered to represent normal biological variation.^{2,3} One of the first traits to be recorded was the Carabelli's trait in 1842 by Sir Georg Carabelli.⁴ Carabelli's trait is one of the most studied nonmetric traits It is characterized by a Cingular derivative

expressed on the mesiolingual or lingual aspect of the protocone of the upper molars.⁵

The phenotypical appearance of the trait is attributed to a dominant Mendelian gene and also to the intake of fluorides vitamins, nutrients and the size of the jaws.⁶⁻⁸ Therefore, it is a result of interaction between genetic and environmental factors.⁹ If one were to put forward the single most significant aspect of Carabelli's trait would be its ethnic variation.

The Carabelli's trait has been used as a critical ethnic indicator for several decades, most likely because it can be simply observed in both living individuals and skeletal material, and can, therefore, be used to show major ethnic differences in dentition.^{10,11} Analyses of different dental morphological features, particularly the Carabelli's trait, have not been utilized to their full

potential by anthropologists concerned with patterns of human biological variation in the Indian population. Hence, this study was formulated to assess the prevalence of this nonmetric dental crown feature in Kashmiri population.

MATERIALS AND METHODS:

A cross-sectional descriptive study was conducted among 400 individuals who reported to the oral health outreach programmes. Informed consent was solicited from the study participants prior to the start of the oral examination. Permanent maxillary first molars were examined for the Carabelli’s trait using an illuminated magnifying glass (×2). Dahlberg classification system was used to score the trait on the teeth.¹²

Dahlberg’s (1963) scale for the determination of degree and expression of Carabelli cusps¹²:

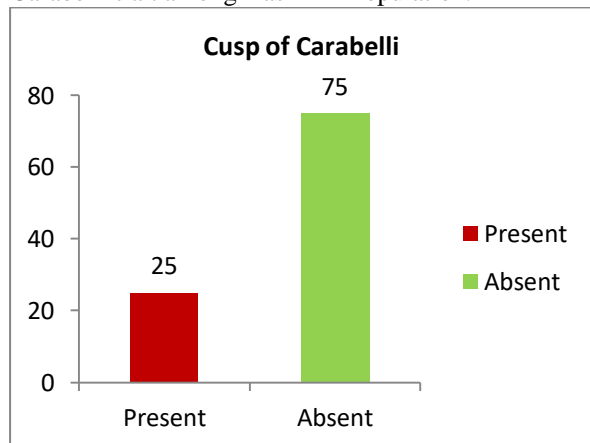
- Type 0 = Smooth
- Type 1 = Small vertical ridge and groove
- Type 2 = Small pit with minor grooves diverging from depression
- Type 3 = Double vertical ridges or slight and incomplete cusp outline
- Type 4 = Y form: moderate grooves curving in opposite directions
- Type 5 = Small tubercle
- Type 6 = Broad cusp outline, moderate tubercle
- Type 7 = Large tubercle with free apex

When one of the observed teeth expresses the trait, it was scored as present. When none of the observed teeth express the trait, it was scored as absent. The casts were examined by two observers independently to eliminate intraobserver variation in interpretation. The data was analysed using the statistical package for the social sciences SPSS (version 21) through Chi-square test. *P* < 0.05 was considered statistically significant.

RESULTS:

As shown in Figure 1, Cusp of Carabelli’s trait was expressed in only among 25% of the study population.

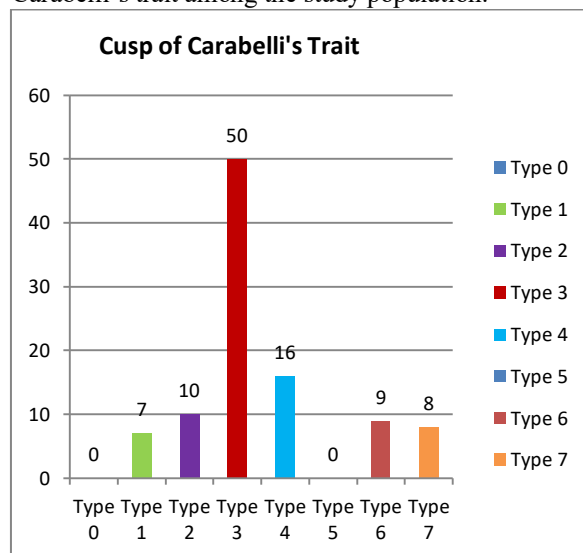
Figure 1: Prevalence of maxillary molar Cusp of Carabelli trait among Kashmiri Population.



Type 3 (50%) was the most frequently expressed and Type 1 (7%) was the least frequently expressed.

[Figure 2] The expression of trait was bilateral among the surveyed groups. All the results were statistically significant.

Figure 2: Distribution of various grades of Cusp of Carabelli’s trait among the study population.



DISCUSSION:

The frequency and variability of tooth crown morphologic traits have traditionally been used to compare human populations, geographical distributions and to make inferences about migratory patterns and population affinities.¹³

Carabelli’s trait is most commonly expressed among the European populations, followed by the African populations and American Indians, with the lowest prevalence occurring in the other Mongoloid races. However, the present study showed an overall prevalence of 25% in the surveyed population, which is lesser than that of Smitha T et al (87.6%) and Sadatullah S et al (44.8%).^{14, 15}

Dahlberg’s classification was applied for determining the degree and expression of Carabelli cusps. In this study, Type 3 was the most frequent Carabelli cusp configuration (50%) and Type 1 was the least frequent (7%). Similar results were echoed in Smitha T et al where Type 3 (54%) was the most frequent expression of Carabelli’s Cuspp, however least found was Type 6 (10%).¹⁴

The present study has few limitations, firstly study sample was small. A larger sample size will provide more accurate representation of the trait in the target population. Secondly, various ethnic groups were not taken into consideration which would have helped us to understand the differences in the phenotypic expression of this trait. Future studies are recommended to take these opinions into consideration.

CONCLUSION:

Phenotypic enamel forms are expressed and regulated by the genome of an individual and population. Carabelli's trait can provide a probabilistic model to distinguish individuals from specific human populations, particularly for forensic purposes in relation to its genetic and environmental influence.

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