

Occlusal Morphological Variants of Permanent Mandibular Second Premolar - A Cross-Sectional Study

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ABSTRACT :

BACKGROUND: Dental identification is an important identification tool in forensic odontology. Permanent mandibular second premolars are generally included in the bicuspid . They are two types namely two cusp and three cusp variants. There is a difference of opinion regarding whether ethnicity influences dental morphology or not.

AIM :To analyse and determine different occlusal morphological patterns of permanent mandibular second premolars in the chennai population.

MATERIALS AND METHOD : The present cross sectional study was conducted in April-May 2020. A total number of 100 participants were selected by convenient sampling predominantly among the chennai population. Oral photographs were examined for cusp number variations and groove patterns of permanent mandibular second premolars. The statistical tests used were descriptive tests for determining the frequency and chi square tests for gender comparison. Statistical software used was SPSS software. P value less than 0.05 was considered as statistically significant and the confidence level was set at 95%.

RESULTS: The study revealed that the predominant cusp pattern was two cusp patterns(82%) and the predominant groove pattern was H shaped groove (61%). Among males, the predominant cusp and the groove pattern was bicuspid (41%) and H groove (33%). Among females, the predominant cusp and groove pattern was two cusp (42%) and 'H' groove (29%).

CONCLUSION: The predominant combination of cusp and groove pattern was 2 H. It may be concluded that variation in degree of expression and frequency of permanent mandibular second premolars of different populations are different, which may help in personal and forensic identification.

KEYWORDS: Mandibular Second Premolar, Cusp, Groove pattern

INTRODUCTION :

The mandibular second premolar is the fifth tooth from the midline and it is the succedaneous tooth of deciduous mandibular second premolars[1]. Premolars are generally categorized into bicuspid but mandibular premolars do not follow the criteria. In mandibular first premolars, there are two cusps with the lingual cusps being not functional. Mandibular second premolar are of two cusp and three cusp variants.[2]

The mandibular second premolar is the successor of the deciduous second molar and is comparatively larger than the mandibular first premolar[3]. Although the buccal cusp of the mandibular second premolar is not as pronounced as that of the buccal cusp of mandibular first premolar, the mesiodistal measurement of crown and its general outline are similar to first premolar. The three cusp variety appears more angular from the occlusal aspect. The two cusp variety is more rounded from the occlusal aspect.

In mandibular second premolars, the lingual lobes are more developed making the cusps longer [4]. In three cusp varieties, mesiolingual cusp is larger than distolingual cusp and the buccal cusp is the largest [5]. A groove extending lingually extends lingually between the two lingual cusps. Each cusp has well formed triangular ridges separated by deep developmental grooves. These grooves converge in the central pit and form Y shape on the occlusal surface.[6]

The central pit is located in the middle between buccal cusp ridge and lingual margin of the occlusal surface and slightly distal to the central point between mesial and distal marginal ridges. In the two-cusp, one lingual cusp is directly opposite to the buccal cusp in a lingual direction. The central groove travels in a mesiodistal direction.[7]. There are three different occlusal groove patterns in permanent mandibular second premolars. "Y" shaped pattern is

associated with three cusp type varieties and “U” shaped, “H” shaped and “Straight groove” pattern are associated with two cusp type variety.

This knowledge of morphology can be employed in the fields of forensic odontology. Anthropology and odontometry can provide information on the phylogenetic relationship between species as well as variations and diversities within a population.[8] The permanent mandibular second premolars of three cusp types is relatively larger mesiodistally than the two cusp premolars[9]. Previously our team had conducted numerous original studies [10-16] and surveys [17-24] over the past 5 years. Now we are focussing on the various prevalence patterns in hospital setting related to our field of interest. The idea for this prevalence study stemmed from the current interest in various traits in different ethnic population for forensic identification. This study was undertaken to analyse and determine different patterns of permanent mandibular 2nd premolars in chennai population.

MATERIALS AND METHOD :

Study Setting :

The present cross sectional study was conducted in April-May 2020. A total number of 100 participants were selected by convenient sampling predominant among the chennai population. The approval was taken from the Institutional review board.

Data Collection :

Data collection was done by taking pictures of the 100 participants. The picture was collected as oral cavity pictures of the participants. Then excel tabulation was done on the basis of name, age, gender, number of cusps in 36, number of cusps in 46, Groove patterns forms of 36, Groove pattern form of 46.

Inclusion Criteria :

- Permanent mandibular second premolars free from occlusal caries.
- Presence of bilaterally completely erupted permanent mandibular second premolars.

Exclusion Criteria:

- Restorations and prosthesis in the permanent mandibular second premolar.
- Any pathology teeth involving teeth including age related changes.
- Traumatic injuries of jaws.

Data Analysis :

The statistical tests used were descriptive tests for determining the frequency and chi square tests for gender comparison. Statistical software was used as SPSS by IBM. The dependent variables are cusp pattern and groove patterns. The p value less than 0.05 was considered as statistically significant. Confidence level is set as 95%.

RESULTS :

In this study, 50% people were males and 50% of people were females. In this study cusp pattern will be of two types, two cusp and three cusp. Groove pattern will be three types, 'H', 'Y' and 'U Groove.

The overall number of cusps in the mandibular second premolar was two cusp patterns (82%). (figure1) and the three cusp pattern was recorded as 18%. (figure 1).The overall type of groove pattern in mandibular second premolar was H groove (61%) and the Y groove pattern was recorded as 22% and U groove was recorded as 17%.(figure 2).

In our study, the cusp pattern of 35 showed predominantly two cusp patterns, with 82% of two cusp pattern and 18% of three cusp pattern (figure 3). The cusp pattern of 45 also predominantly showed two cusp pattern. The result was 82% showing bicuspid and 18% tricuspid (figure 4).

The groove pattern of 35 showed predominantly the H groove. The result showed 61% H groove, 22% Y groove and 17% U groove (figure 5). The groove pattern of 45 also showed predominantly of H groove. The result showed 61% H groove, 22% Y groove and 17% U groove (figure 6).

In the present study, the number of cusp in males was recorded as 41% showing two cusps and 11% three cusps.(figure 7). Number of cusps in females was recorded as 42% showing two cusps and 7% three cusps. (Figure 7).

Types of grooves in males were recorded as 33% H groove, 12% Y groove and 7% U groove . Types of grooves in females was 29% H groove, 9% Y groove and 11% U groove. (figure 8).

DISCUSSION :

Mandibular second premolars is one of those permanent teeth with diverse morphological features existing in different populations. That is why the knowledge of its type is very important from the clinical point of view so that not only its other variants are identified from one another but also differentiate it from the second deciduous molar. The Study of dental morphological characteristics and odontometry is important in anthropological research as it can provide information on the phylogenetic relationship between species, well as variations and diversities within a population. Furthermore, knowing common variations in dental

anatomy and morphology about each individual tooth can help in performing some dental treatments. Degree of expression and frequency of teeth in dentitions of different populations is different, which may help in forensic identification.

In the present study, the most predominant cusp pattern was Two cusps(82%).(figure 1). Similar findings were seen in study by Sunil et al, which showed 53% of two cusp patterns and Priyadharshini et al, showed 56% of Two cusp patterns. Opposite findings were seen in Bath-Baloch et al, with 55% Tricuspid and Jamel-fuller et al, showing 55% of Tricuspid.[25][26]. This shows that the cuspal variations can be seen in different population, indicating a ethnic diversity.

In our study, the most predominant groove pattern was H groove(61%) (figure 2). No similar findings were found .Opposite findings were Sunil et al , which showed Y groove(44%), and Asrar et al ,Y groove (44%). The population in our study was the chennai population whereas in others it was a different population.This shows that the result will be varied according to the population. But a study done by Priyadharshini et showed Y groove pattern predominance (43.5%, which was conducted in the south indian population. This indicates that larger population with a more specific ethnic background is needed for analysing the variations.

In our study, the most predominant number of cusps in both 35 and 45 was Two cusps variant. The most predominant type of groove pattern in both 35 and 35 was the H groove. No similar and opposite findings for this were found in the literature

In our study, the most predominant number of cusps in males was Two cusp(41%) and in females was also Two cusp (42%) (figure 7). The p value was 0.189 which indicates statistically insignificant. Similar findings were seen in Priyadharshini et al, Male-Two cusp (61%) and Females-Two cusp (51%), Sunil et al-Males- Two cusp and Female-Two cusp. No opposite findings are there. This shows that there is no gender variation in number of cusps [27]

In our study, the most predominant type of grooves pattern in males was H grooves (33%) and in females was also H groove (29%). p value was 0.214 which indicates statistically insignificant. No similar findings are there. Opposite findings are Priyadharshini et al which was done in the south indian population- which showed Males and Females -Y groove (45%) and Y groove (42%). This indicates that a larger population with a more specific ethnic background is needed for analysing the variations, which can help in gender identification in forensics [28-31]

The limitation of the study was its short sample size and no representation of ethnic groups of population in the study and Homogenous population in the study. Understanding the different patterns of mandibular second premolar can be a source of forensic identification.

CONCLUSION :

The study revealed that the predominant cusp pattern was two cusp patterns(82%) and the predominant groove pattern was H shaped groove (61%) in the Chennai Population. There was no difference in cuspal pattern and groove pattern among males and females. Among both males and females, the predominant cusp and the groove pattern was bicuspid and H groove .Due to variants in permanent mandibular second premolars, there is a difference of opinion regarding

whether ethnicity influences dental morphology or not. There is a need for more studies with larger sample size and specific ethnic background for better evaluation and comparison.

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AUTHOR CONTRIBUTION

Gokul: literature search, data collection, data analysis. manuscript writing

K. R. Don: Topic discussion, data verification, manuscript drafting.

CONFLICT OF INTEREST

The author declares that there were no conflicts of interest.

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LIST OF FIGURES:

Figure 1: Bar graph showing distribution of number of cusps in mandibular second premolars. X axis represents number of cusps pattern and Y axis represents number of mandibular second premolars (%). The most predominant cusp was Two cusp 82%, followed by Three cusp 18%.

Figure 2 : Bar graph showing distribution of groove pattern in mandibular second premolars. X axis represents type of groove pattern and Y axis represents number of mandibular second premolars (%). The most predominant groove pattern was H groove 61%, followed by Y groove 22% and U groove 17%.

Figure 3: Bar graph shows the distribution of the number of cusps of permanent left mandibular second premolars i.e 35. X axis represents number of cusps pattern and Y axis represents number of left mandibular second premolars (%). The most predominant cusp pattern was Two cusp 82%, followed by Three cusp 18%.

Figure 4: Bar graph shows the distribution of the number of cusps of permanent right mandibular second premolars i.e. 45. X axis represents number of cusps pattern and Y axis represents number of right mandibular second premolars (%). The most predominant cusp pattern was Two cusp 82%, followed by Three cusp 18%.

Figure 5: Bar graph shows the distribution of the type of groove pattern of permanent left mandibular second premolars i.e. 35. X axis represents type of groove pattern and Y axis represents number of left mandibular second premolars (%). The most predominant groove pattern was H groove 61%, followed by Y groove 22% and U groove 17%.

Figure 6: Bar graph shows the distribution of the type of groove pattern of permanent right mandibular second premolars in 45. X axis represents type of groove pattern and Y axis represents number of right mandibular second premolars (%). The most predominant groove pattern was H groove 61%, followed by Y groove 22% and U groove 17%.

Figure 7: Bar graph showing association between gender and number of cusps in permanent mandibular second premolar. X axis shows gender and Y axis shows the number of mandibular second premolars (%). The most predominant cuspal pattern in both genders was found to be Two cusp patterns(blue), with females showing slightly higher, but was statistically not significant. Chi square analysis, $p = 0.189$ ($p > 0.05$ indicating statistically not significant). Implying that there was no significant difference in number of cusps patten between males and

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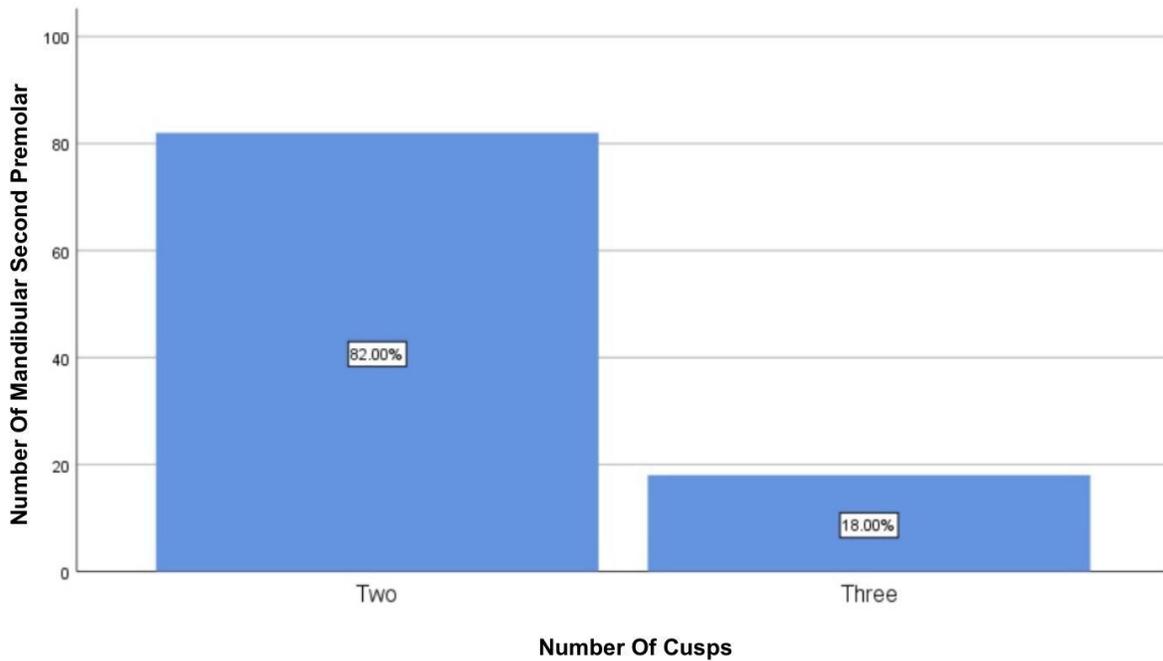


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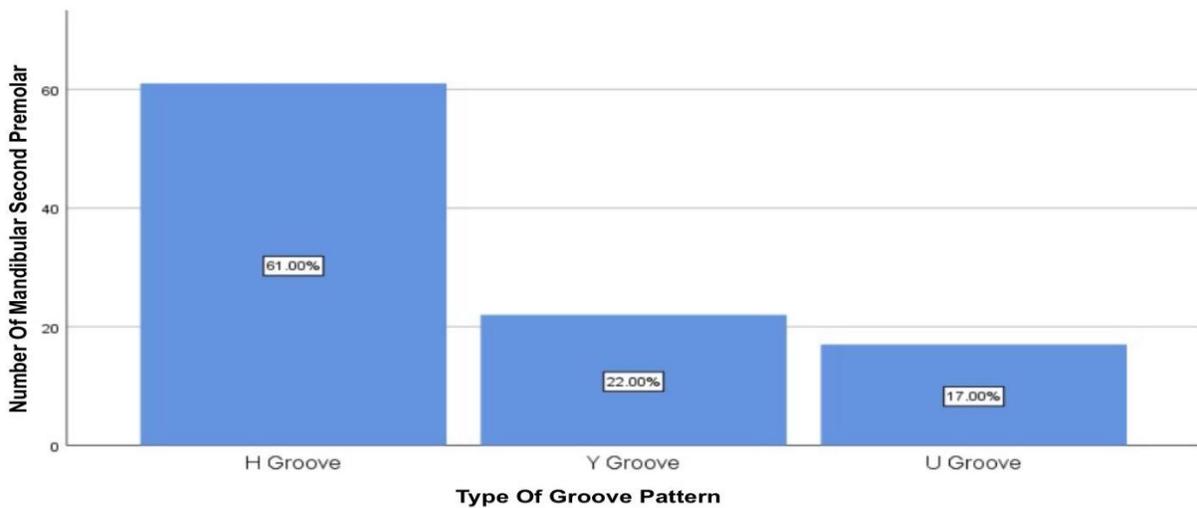


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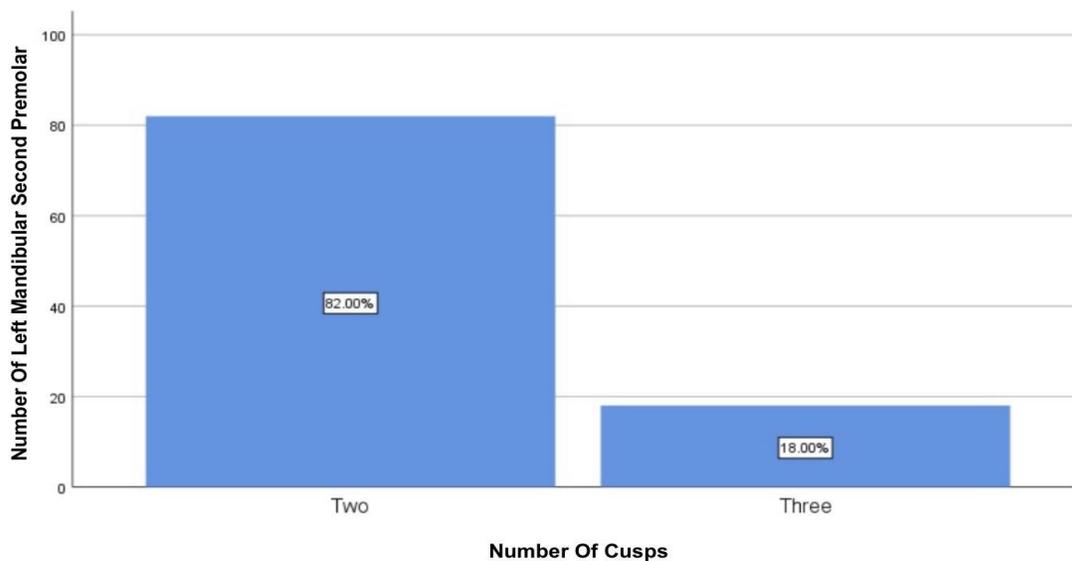


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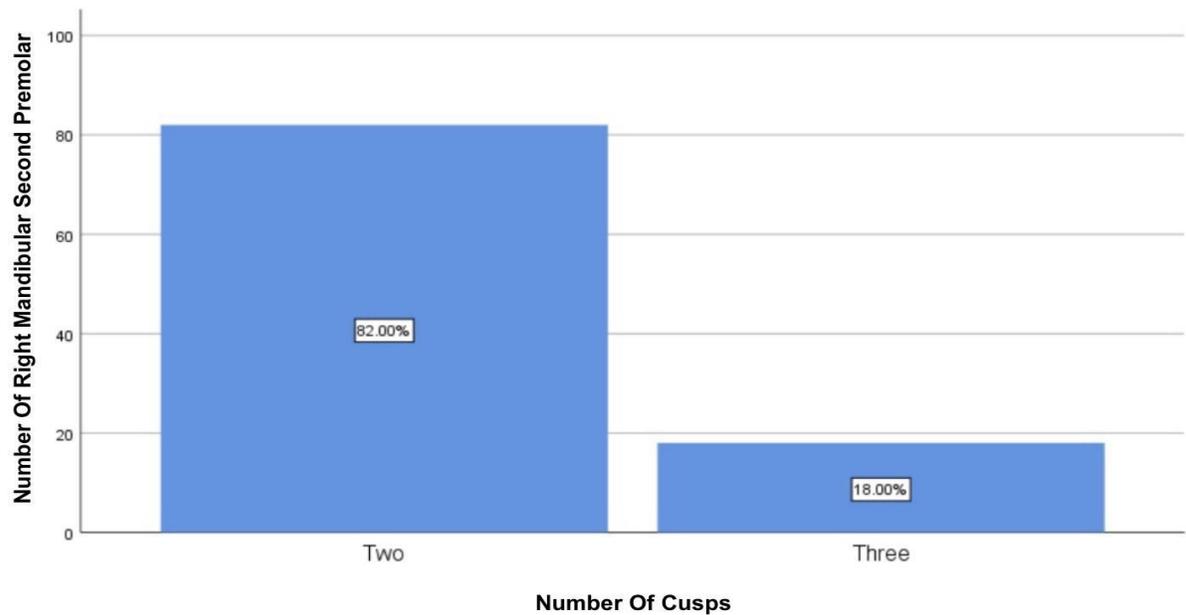


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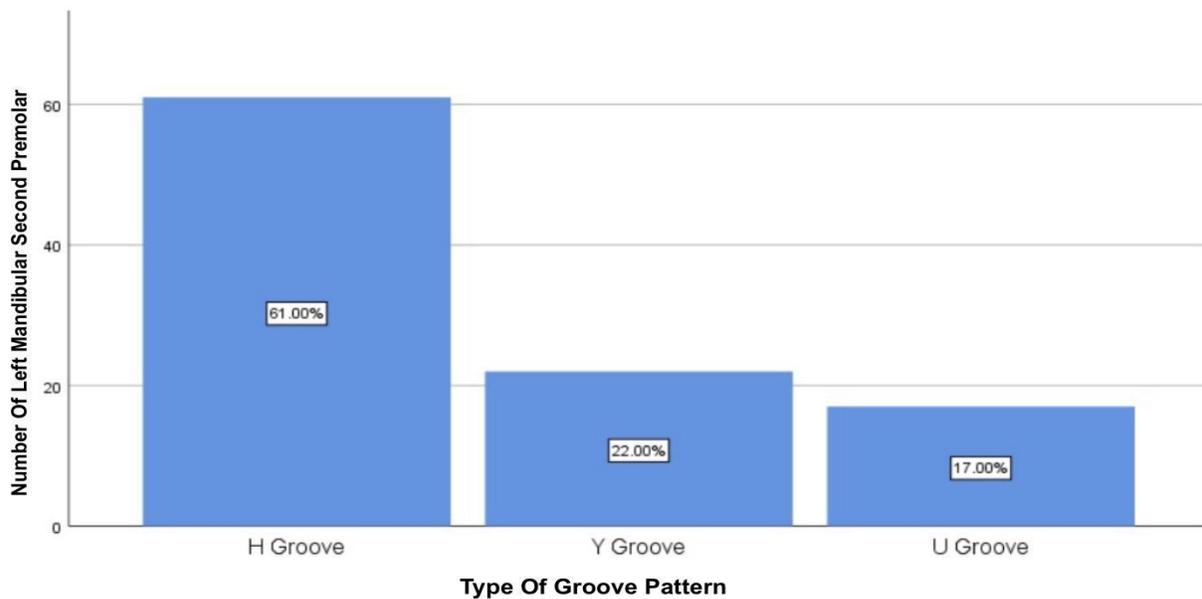


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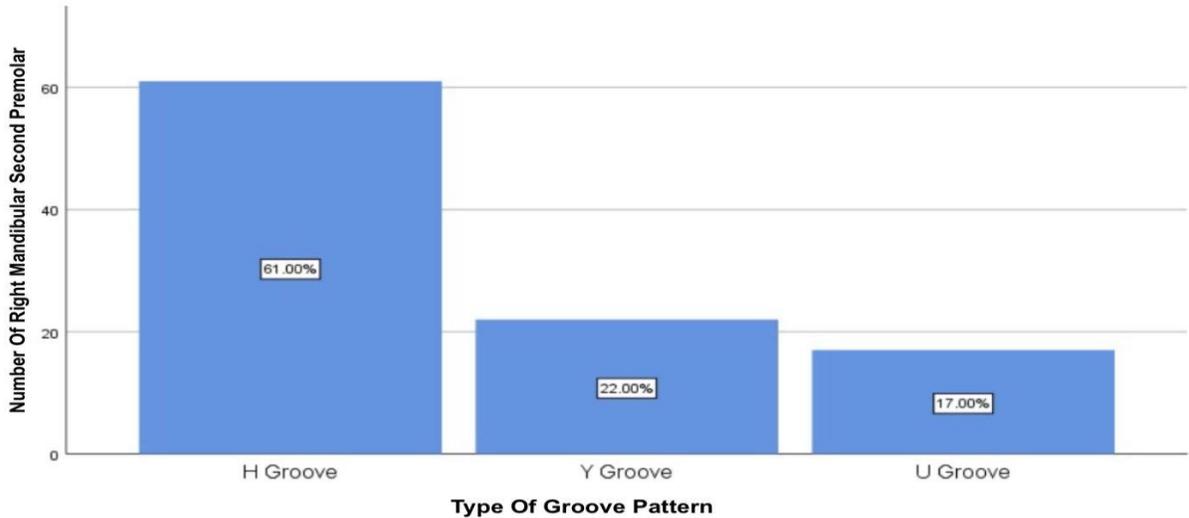


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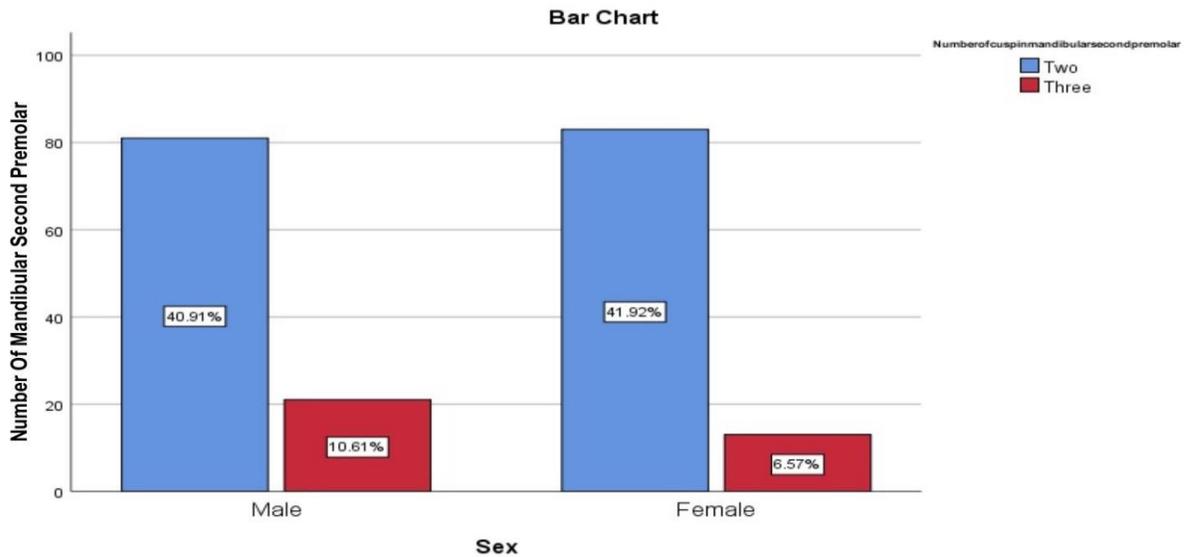


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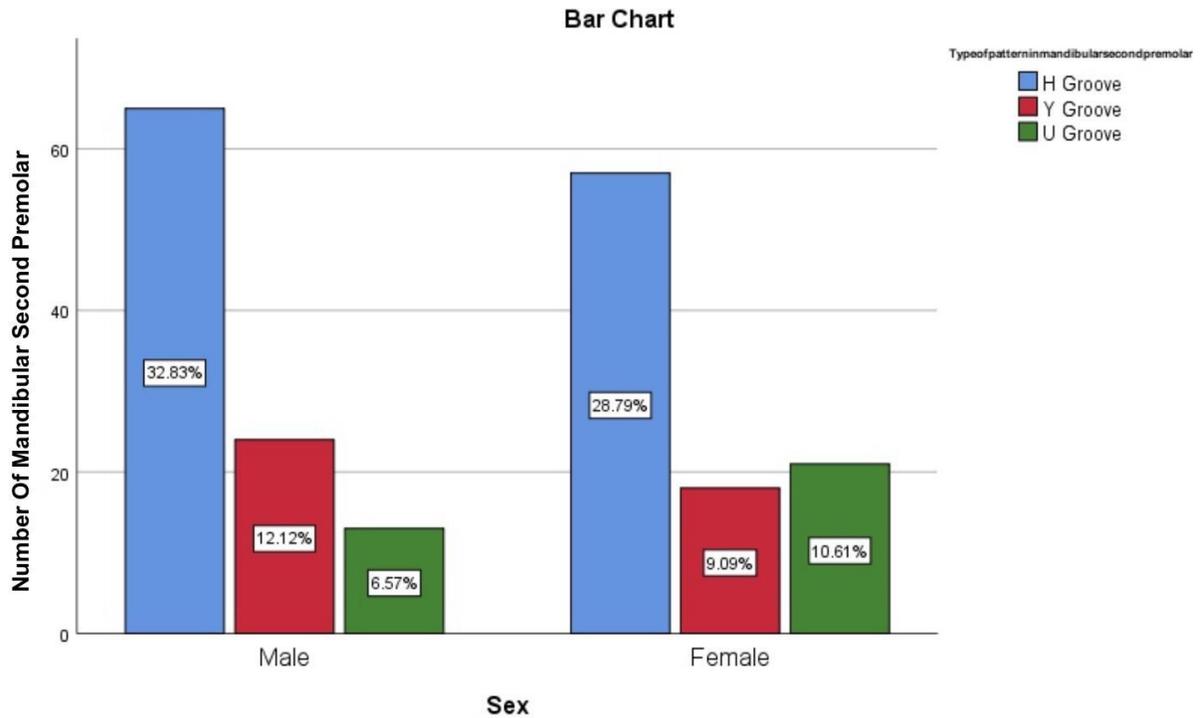


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