

## **DENTAL OCCLUSION VARIATIONS: A STUDY AMONG UPPER HIERARCHICAL GROUPS**

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### **ABSTRACT**

*Dental variations in humans have been one of the significant variations studied by physical anthropologists, enabling them to compare and classify populations. It is well known that dental health or lack of it, affects all phases of individual development and all the areas of their environment, school, house and community, etc. Neglect in any aspect of dental health results in far reaching effects on overall growth and development. Therefore, problems related to dental health are of a major concern. In this relation, occlusion too occupies a three-dimensional space so that well-balanced cranio-facial development is dependent on normal mandible and maxillary growth, which otherwise may lead to malocclusions of varied types. Consequently, growth of the mandible and maxilla immensely plays an important role in facial growth and development. The present study focuses on malocclusion, oral habits and crowding of teeth among females of two upper hierarchical groups, namely Brahmins and Rajputs of Lucknow City. A total sample of 600 female individual, between the age group of 6-25 years, was chosen from both the groups. The two caste groups were found to vary significantly in the type of malocclusion and oral habits, but less significantly with respect to crowding of teeth.*

**Keywords:** *Dental Anthropology, Occlusion, Malocclusion, Crowding, Oral Habits*

### **INTRODUCTION**

Variations are ultimate results in any evolution, which can be studied through diverse sciences. But best evidences can be had through biological sciences, including physical anthropology. Recently developed applied subfield of anthropology, viz. dental anthropology, is playing an important role in this. It may also serve as one of the best examples of micro-evolutionary processes in action, because even the minutest changes in dental features such as a pit or a groove or an additional cusp on the crown or its deletion are easily discernible.

Dental morphology and odontometry are one of the most fascinating and

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important anthropological characters, which not only reveal population differences but also illustrate inter-specific and intra-specific evolutionary changes. Anatomical variations of permanent teeth and ethnic differences in tooth size morphology have been intensively studied by western anthropologists since the beginning of 20<sup>th</sup> century. For example, Dahlberg 1945-51, Moorrees 1957 (Agnihotri, 1996), (Baydas *et al.*, 2007), (Agenter *et al.*, 2009), (Claudia *et al.*, 2009), (Sabuncuoglu *et al.*, 2014), etc. In India studies on dental morphology and odontology have been done by Prakash and Kaul (1982, 1984), Banerjee *et al.* (1984). Rami Reddy *et al.* (1990), Tsai (2003), Reddy and Prasad (2011), Vishwas Bansal *et al.* (2013), Sharma *et al.* (2015), Das (2017), Sethi (2019), to name a few.

The metric and non-metric studies on dentition always had not only a close proximity but are in direct line in the study of human evolution. There are ethnic differences, which have been observed in teeth as well as in the configuration of dental arch. For instance, Negroid, Caucasoid, Mongoloid, Asiatic and Indian aborigines show quantitative changes in teeth and dental arches (Agnihotri, 1996).

The main objectives of the study were to assess the type of occlusal patterns found among the two higher castes in the population, namely Brahmins and Rajputs, and to collect data regarding their type of oral habit pattern and frequency. Another objective was to study the crowding of teeth with the help of dental casts made during the study and to analyze for the presence of malocclusion in them.

## MATERIALS AND METHODS

The present study was taken-up in order to understand the dental variability among the two upper hierarchical groups of Lucknow, namely the Brahmins and the Rajputs. For studying the dental variability, only females of both the population have been considered, as the studies on them are meager in number. A total number of six hundred females (three hundred from each caste) were selected randomly from various localities of Lucknow District.

To study the desired dental characteristics, dental casts were procured from female individuals, with the help of an elastic gel solution made up of alginic acid, prepared from the marine plants and is a linear polymer of anhydro  $\beta$  - D - mannuronic acid of higher molecular weight. The potassium, sodium and ammonium salts of the acid have the properties that make it suitable for compounding dental impressions. Solution of these salts, produce an elastic gel.

The reaction which takes place is as under:

Potassium alginate + Calcium sulphate  $\longrightarrow$  H<sub>2</sub> O dihydrate Calcium alginate gel + sulfate

**Statistical Analysis:** The collected data were subjected to some basic statistics such as mean, standard deviation. A Chi Square test was used to test

the significance of differences between the observed frequency and the frequency of expected under the hypothesis of independence between the two samples, i.e., to assess the differences with regard to discontinuous traits. All the non-metric traits have been subjected to chi-square test, and the extent of variability or reflection of similarities in between the two caste groups is based on this test.

## **RESULTS**

### **Malocclusion**

The term occlusion in dentistry refers to the contact between the maxillary and mandibular teeth as well as the relationship between the adjacent teeth in the same dental arch. Malocclusion is applied to any state of occlusion that deviates noticeably from the norms of normal dental arcade pattern. According to United States Public Health Services Statistics malocclusal conditions affects 40 per cent of the total children. It is classified as an intra-arch problem in which the combined size of teeth exceeds the arch space available for their regular alignment, which results in mal-alignment of complete dental arcade.

Malocclusion in general clusters around 34 per cent, though the urban males accounts for only 17 per cent. Awaradi (1979) in his sample from Karnataka also found near about similarity of 24 percent, which was inherited. Brash (1956) has suggested that malocclusion is inherited (Agnihotri, 1996). Orthodontists often emphasize on the environmental determinant such as oral habits, abnormal swallowing pattern and premature loss of deciduous teeth as the main reasons behind malocclusion.

Some anthropologists have pointed out that technologically primitive people had much better aligned dentitions while living in primitive conditions, with a supposedly rougher and functionally more stimulating dietary pattern. This resulted in growth potential in tooth and jaw without any mal-relations, in comparison to civilized man. But the studies in this regard are in such scattered populations, hence nothing much can be said here (Sarana, 2005).

To categorize malocclusion, Angle's classification has been selected for present study, and despite its limitations it stood the test of time and remains universally accepted. The key to the occlusion is the relation between the first permanent molars in normal occlusion, the mesio-buccal cusp of the upper first permanent molar occludes with the mesio-buccal groove (anterior) of the lower first molar.

- Class I -       Neutro-occlusion
- Class II-       Disto-occlusion
- Class III-      Mesio-occlusion.

**Table-1: Types and Frequency of Malocclusion in the present sample.**

Population	No. of Individual	Neutro-occlusion	Disto-occlusion	Mesio-occlusion
Brahmins	300	59.6	35.6	4.33
Rajputs	300	79.3	18.6	2.0

$\chi^2 \leq 0.001 = 26.549$ ; d. f. = 2

Table-1 exhibits the incidences of malocclusion in 600 examined individuals, basically females of both the groups. It is observed that 79.3 per cent Rajput and 59.6 per cent of the Brahmins show neutro-occlusion. 18.6 per cent of Rajput and 35.6 per cent of the Brahmin have disto-occlusion, while only 2 per cent of Rajputs and 4.33 per cent of the Brahmins show mesio-malocclusion. Thus, it can be seen from the table that class I malocclusion is found to occur more frequently in both the caste groups studied. The Rajputs have much higher frequency for this condition. In the cases of 2<sup>nd</sup> and 3<sup>rd</sup> type of malocclusion, the Brahmin females exceed their Rajput counterpart in higher values. The differences among the two caste groups are very much significant for the chi-square test as is suggested by  $\chi^2 \leq 0.001$  having a value of 26.549 with 2 degrees of freedom.

### Crowding of Teeth

This is another non-metric trait of complex nature, which exhibits lack of sufficient space for the teeth in the jaws. There is no unanimity regarding the inherent constitutional variability of tooth crowding, though it is prominently present in modern man. This is the opposite of diastema. Crowding of teeth probably is not an advantageous condition, so selection may be operating to reduce it. Since jaw size is highly responsive to the environment, especially the amount of stress applied to the bone, an economical way to put tooth size and jaw size in accord, would be to reduce tooth size. How this selection operates depends on the genetic basis of tooth size. Therefore, crowding, which is one of many causes for malocclusion, may be considerably influenced by genetic as well as environmental factors.

Crowding is more common in mandibular teeth than those of maxilla, particularly the central and the lateral incisors followed by lateral incisors and canine. Dental crowding was earlier described as 'father's large teeth in mother's small jaw'.

**Table-2: Frequency of Crowding in the dentition in the present sample**

Population	Number of Individuals	Maxillary	Mandibular
Rajputs	300	11.66	15.0
Brahmins	300	5.50	14.0

$\chi^2 \leq 0.20 = 1.1684$ ; d. f. = 1

The frequency distribution of tooth crowding is reported in Table-2. It is observed that the Rajput females show more crowded teeth (maxillary as well as mandibular) than those of their counterparts under study. It is seen that

11.66 per cent of the Rajput females and 5.50 per cent of the Brahmin females show crowding in maxillary teeth, and 15.0 per cent of Rajput females and 14.0 per cent of Brahmins show mandibular crowding. Thus, in the sample as a whole, mandibular crowding exceeds the maxillary one. From the point of view of chi-square test, although differences do exist between the two groups, yet these are not very significant as  $\chi^2 \leq 0.20$  at the value of 0.1684 at 1 degree of freedom.

### **Oral Habits**

Undesirable oral habits, such as thumb sucking, lip biting, tongue thrusting or nail biting, can modify the positions of teeth and the forms and relationship of the arches. Pressure habits interfere with normal growth and orofacial muscular functions. Even a 50 mg continuous pressure over a period of 12 hours, may cause a measurable displacement of the tooth.

**Thumb sucking:** It is a normal activity in infancy but usually disappears about the third year of life. When it persists, it is considered as a symptom of anxiety and emotional maladjustment in the child. A persistent thumb sucking habit will cause malocclusion. It persists into the deciduous dentition and effects on the deciduous occlusion and dental arch from many aspects like, proclination of upper and retro lineation of lower incisors, reduction of incomplete overbite or often bite, and narrowing of the upper arch.

Thumb sucking causes protrusion of the maxillary anterior teeth and an anterior open bite. The crow-bar effect may also result in a flattening and crowding of mandible incisors. In this circumstance, the upper lip is hypotonic and the lower lip, resting behind the maxillary incisors stabilizes and enhances the protrusion of incisors. Respiratory functions and its effect on orofacial forms have been debated for the past 100 years.

**Mouth breathing:** This is defined as habitual breathing through the mouth. In most instances a combination of oral and nasal respirations in varying degree is observed. Restricted respiratory flow through the nose may result from enlarged tonsils and adenoids, as well as from deviated nasal septum. Recurrent allergic rhinitis in early childhood is a common cause of obstruction of nasal passage. In this condition, the mandible is dropped due to contraction of the sub-mandibular muscles to permit respiration since the tongue is held down and the maxillary arch is deprived of the lingual pressure and support. Because of this imbalanced relationship between the exterior and interior muscular forces about the mouth the buccinators muscle produces a lateral pressure bringing about the collapse of the maxillary arch. The inhalation of air through mouth is of the following two types:

- (a) Obstructive - the child/adult is forced to inhale through the mouth as his/her nasal passage is blocked.
- (b) Non-obstructive: in this the child breaths through the mouth through

the nasal passage are clear.

From an orthodontic point of view, mouth breathing is associated with a laterally constricted maxillary arch, resulting in a cross bite, a highly arched palate, crowded or protruded maxillary incisors and consequently relatively shortened upper lips. And, at large, the functional structural deficiencies evoke a broad spectrum of functional adaptations that induce further morphological change resulting in mouth breathing.

**Tongue thrusting:** It involves a complete action of tongue and has significant effect on other teeth as well as dental arch. The pressure exerted by the tongue on the palate are low when compared with those exerted on the teeth due to swallowing and excessive tongue pressure on the teeth is a factor for malocclusion. In many individuals the infantile swallowing pattern persists and may contribute to malocclusions. A study by U.S. Public Health Service of 8,000 children revealed that 5 to 7 per cent of them exhibited tongue thrusting that appeared to be related to open bite, the frequency of which differs in various races from 16.3 per cent in Blacks to 3.9 percent in Caucasians.

**Table-3: Variety of Oral Habits exhibited by females in the present sample**

Population	Number of Individuals	Thumb Sucking	Tongue Thrusting	Mouth Breathing
Rajputs	300	4.0	2.33	14.66
Brahmins	300	13.6	6.0	4.0

$\chi^2 \leq 0.001 = 25.604$ ; d. f.= 2

A glance at the Table- 3 depicts that 4 per cent of the Rajputs and 13.6 per cent of the Brahmin females have the habit of thumb sucking (children above 12 years). In case of mouth breathing, 14.66 per cent of Rajputs and 4 per cent of Brahmin females fall in this category. While 6 per cent of the Rajput females and 2.33 per cent of the Brahmin females were tongue thrusters. Significant caste differences are exhibited by chi-square test ( $\chi^2 \leq 0.001$  has a value of 25.604 at 2 degrees of freedom).

## CONCLUSIONS

India is a country with a varied diaspora. This is reflected in their customs, norms, values, beliefs, culture and religion. Differences can be witnessed in food, physical and dental features as well. Even today, although with much advancement in every sphere of life, yet the concept of caste still looms large in urban as well as rural areas. The two caste groups selected for the present study vary significantly in the type of malocclusion features. It has been observed that Rajput females have more frequency of Neutro-occlusal pattern, while Brahmin females are more Disto-occlusal and mesio-occluded. Thus, class I type of malocclusion is more frequent in Rajputs, while class II and III type occurs more in Brahmins. As far as crowding of teeth is concerned, differences do occur but are of insignificant nature. Variability in the dental features among the

two upper hierarchical groups can, at large, be attributed to differences in their type of diets, and feeding habits along with oral habits like thumb sucking, nail biting, breathing habits, etc.

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