Original Research Article

An anthropometric study to correlate the facial index and canine relationship in Distt. Solan population

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ABSTRACT

Introduction: Anthropometery is a measure of living subjects and had played a vital role in majority of fields there appears to be certain facial proportions and relationships that provide a basis for the diagnosis and planning for improvement of facial form. Anthropometeric measurements are used to determine facial shapes.

Aim: To determine the facial index and canine relationship in Distt. Solan population.

Materials and Methods: A total of 250 subjects (108 males and 147 females), aged 10- 40 years, were selected randomly. The facial proportions measured were (facial height and breadth). A digital vernier caliper was used for the measurement of facial proportions. The total facial index was calculated and the results obtained were analyzed statistically using the t-test.

Result: There was a no significant difference in the facial parameters and canine relationship when males were compared with the female subjects. The dominant phenotype in the studied population was Mesoprosopic. Class II canine relation was most common in the overall population. The data obtained in our study may be useful in anthropological research, forensics, genetic research, as well as in medical clinical practice.

1. Introduction

Facial beauty and physical Esthetics has a strong emphasis on modern social society. Alexander Baumgarten has coined the term "Aesthetics" from Greek word for sensory perception (aisthesis). There appears to be certain facial proportions and relationships that provide a basis for the diagnosis and planning for improvement of facial form. Many authors over the years tried quantifying facial beauty and physical attractiveness, among which Ricketts gave "golden proportions" through a mathematical proportion of Fibonacci series. Farkas introduced "Anthropometric

measurements" based on the extensive technical study of face and head measurements in accordance to age, sex, and ethnic origin. It is a measure of living subjects and had played a vital role in majority of fields. It is being used in different techniques of facial reconstruction surgeries. It has been used to study soft tissue morphology more accurately than radiographs. Anthropometeric indices are referred to quantify and qualify the term overall aesthetics of the face. The main difference between human measurements in classic times and modern anthropometry is the denial of realistic sizes and proportions in former times.

The prosopic index by Martin and Saller in 1957 was used to determine face shapes as, Euryprosopic (Broadface), Hypereuryprosopic (VeryBroad), MesoprosopicRound),

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Leptoprosopic (Long Face), Hyperleptoprosopic (Very long face).[1] They are also useful in paediatrics, forensic medicine, plastic surgery, oral surgery and diagnostic comprehension between patient and normal population

Comparison of changes in facial index between parents, offspring and siblings can give a clue to genetic transmission of inherited characters. A hallmark of the diversity and individuality of the people encountered in daily life is the range of variations in the shape of their faces. Studies on craniofacial relations and variations in man will assist in understanding the frequency distribution of human morphologies Accurate facial analysis is essential for diagnosis of genetic and acquired anomalies, for the study of normal and abnormal growth and for morphometric investigation.[2] Craniofacial anthropometrics have become an important tool for genetic counselors to identify any dysmorphic syndromes. The availability of values for facial sizes and proportions enables us to reproduce cosmetically attractive proportions for our patients

Since different types of malocclusions are prevalent in the world and it varies with ethinicity and different communities. Maxillary and mandibular canines for an integral part of facial esthetics, important for canine guidance, important for occlusal stability. Measurements taken from a patient can be compared with the normal values obtained from a reference population, and deviations from the normative values can be assessed. For evaluation of variations in craniofacial morphology, standards of anthropometric measurements should be established for particular population. A person with euryprosopic facial type favours the nasal breathing mode.[3] Facial form may be an important factor in increasing susceptibility to obstructive sleep apnoea.[4]

Accurate facial analysis is essential for diagnosis of genetic and acquired anomalies, for the study of normal and abnormal growth and for morphometric investigation.[2]

2. Aim

To correlate the morphological facial index and Canine relationship in Distt. Solan population.

3. Materials and Methods

The study was conducted on 250 subjects (108 Males/147 Females) who were randomly selected from the subjects reporting to the Department of Orthodontics At Bhojia Dental College, Baddi for fixed orthodontic treatment. The subjects were asked to sit in an upright position on dental chair in Natural Head position. The canine and molar relationship were assessed for the subjects with the help of mouth mirror. Assessment of the antero-posterior relationship of canine was based on modified Angle's classification, which included three basic classes (Table 1).

Various facial landmarks were identified and marked on the patients face (Table 2, Figure 1) for facial proportion measurements.
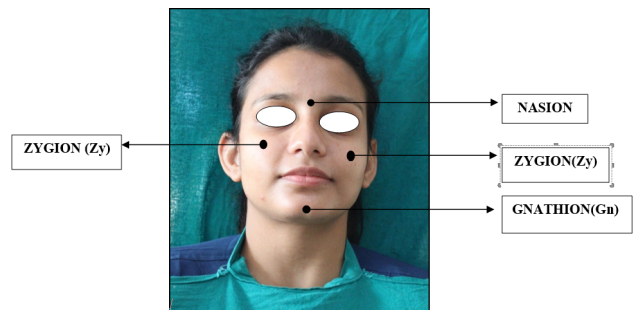

Fig. 1: Facial measurement landmarks

Facial parameters were recorded with the help of digital Vernier Calliper (Table 3). The morphological maximum facial height was measured between Nasion and Gnathion. The tip of Digital vernier calliper was placed at the Gnathion and other tip was placed at the Nasion (Figure 3). The morphological maximum facial width was measured between two Zygomatic prominences (Zygion to Zygion). After palpation by fingers the most lateral points of the Zygomatic arch on both the sides of face was located, the ends of Digital Vernier calliper was placed on the points with pressure to feel the bone. The calliper was slightly moved up and down, back and forth until bone is felt (Figure 2).

Fig. 2: Morphological facial width

Facial index was calculated as the ratio of morphological facial height and facial width

Table 1: Angle's canine classification

Class I	The tip of the maxillary canine lies in the embrasure between the mandibular canine and the first premolar
Class II	The tip of the maxillary canine lies mesial to the embrasure between the mandibular canine and first premolar.
Class III	The tip of the maxillary canine lies distal to the embrasure between the mandibular canine and first premolar.

Table 2: Landmarks used in the study

Landmarks	Definition
Nasion(N)	It is the most anterior point on the frontonasal suture in the midsagittal plane
Gnathion(Gn)	A point located by taking the midpoint between the anterior (pogonion) & inferior(menton) points of bony chin.
Zygion.	It is the most lateral point of the zygomatic arch on both sides.

Table 3: Facial parameters used in the study

Parameter	Definition
Facial height	It is the distance between Nasion and Gnathion. All the measurements were taken by one interexaminer.
Facial width	It is the distance between two zygomatic prominences.

Table 4: The morphological facial index of martin and saller

S.No.	Classification	Mean value
1.	Hypereuryprosopic	X -78.9
2.	Euryprosopic	79.0-83.9
3.	Mesoprosopic	84.0- 87.9
4.	Leptoprosopic	88.0-92.9
5.	Hyperleptoprosopic	93.0-x

Fig. 3: Morphological facial height

Facial Index = Facial Height/ Facial Width X 100

The values obtained were then correlated with the index given by Martin and Saller (1957) (Table 4).

All the measurements were taken thrice to avoid any error and the mean value was evaluated. The values obtained were then subjected to statistical analysis.

3.1. Statistical analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) (Version 15) software. Mean, standard deviation, median were calculated. A Chi- Square test was applied to test the level of significance significance.

4. Results

The study consisted of 250 subjects who had 108 Males and 147 Females who were randomly selected. Various facial measurements were recorded and facial index was calculated. On the basis of facial morphological measurements (Table 5), study reveals that, the majority of subjects had mesoprosopic facial type(86%) followed by Leptoprosopic(9.6%) and then by Euryprosopic (4.4%) in overall sample.

The canine relationship of the overall population was assessed which was depicted in (Table 6) showing that Class

Table 5: Distribution of facial morphological type in overall sample

Facial morphological type	Percentage (%)	Count(n)
Euryprosopic	(4.4%)	11
Mesoprosopic	(86%)	215
Leptoprosopic	(9.6%)	24

II canine relationship is the most common (57.6%) followed by Class I (40%) and Class III (2.4%) in overall sample.

The mean of the facial morphological type were analysed when males and females were compared using chi- square test (Table 7). It was found that Mesoprosopic facial type was more prevalent in females (88.2%) than the males (83.1%) whereas Leptoprosopic facial type was dominant in males (13.2%) then in females (7%) On the contrary Euryprosopic has somewhat equal distribution in males (4%) and females (7%) respectively. Statistically, there was no significant difference between the two genders when facial morphological type was compared (p<0.24)

The mean of canine relationship was analysed by comparing male and female using Chi-square test (Table 8). It was found Class II canine relationship was higher in females as compared to males and the results were statistically non significant (p<0.05).

Note: Non-significant association in comparing canine relation and facial morphological profile in relation to gender

When correlation between facial morphological type and canine classification was done it showed a negative correlation (p=0.61).

5. Discussion

Craniofacial anthropometry is used for the determination of the morphological characteristics of the head and face. Face shape is dependent on many factors, such as gender, race and ethnicity, climate, socioeconomic, nutritional, and genetic factors. The facial parameters are used to determine the facial trauma, congenital and traumatic deformities and easier identification of many congenital malformations. The collected data can be used in anthropology and forensic medicine for identification of racial and sexual differences as well as in reconstructive surgery for facial reconstruction.

Diversity and individuality of people are seen due to variations in the physical shape of their faces. Craniofacial anthropometry has become an essential tool for genetic counselors to identify any dysmorphic syndromes. Measurements taken from a person can be compared with the normal values obtained from a reference population, and these deviations from the normal values can be evaluated. Inheritence determines the varities of cranium among different races. Enviornment is undoubtedly an effective determinant as well, it can be concluded that it is actually the genotype of the population which dictates its response to environmental stimuli. The present study was conducted to determine the Facial Index and canine relationship in Distt. Solan population.

In the present study the overall sample showed that the facial index values ranged from 94mm to 190mm. Mesoprosopic facial type being the most prevalent followed by leptoprosopic and then euryprosopic. In males, the values ranged from 98mm to 190 mm whereas in females the values ranged from 94mm to 187mm. When the facial index was compared between the sexes it was found it was found that Mesoprosopic facial type was more prevalent in females than the males whereas Leptoprosopic facial type was dominant in males then in females and it was found to be statistically non significant (p<0.001). This is because males have higher facial height (190 mm) than females (187 mm). Similar results were obtained from the study done by Jeremic et al,[5] where they observed facial height increased in males (121.4 mm) in females (110.8 mm) but the dominant facial type was Leptoprosopic (81.7%) followed by Mesoprosopic (14.28%) and Hyperleptoprosopic (4%) which is different from the result of our study. The study on the anthropometrical variations among Haryanvi Banias 2013.[6] The dominant type of face shape in males was mesoprosopic followed by Euryprosopic leptoprosopic,. In females the dominant type of face was also mesoprosopic followed by Hypereuryprosopic, euryprosopic, leptoprosopic and hyperleptoprosopic. The mean value of study in male was lower than the previous studies done on Albanian population, Andhra population and the Indian population.(Shetti et al)[7] but higher than Onges and Malasian population and close to the study done on Indian population by Singh & Bhasin. The mean value of Facial index in females was lower than the previous studies in Haryanvi Banias.Golalipour et al.(2003)[8] observed in the Turkman and Fars population that the dominant and rare facial type was hypereuryprosopic and leptoprosopic respectively. These findings were not concomitant with the present study in terms of dominant facial type. Heidari Z et al.[9] found that in 18-25 years old Baluchi and Sistani young woman, the dominant and rare facial type was Euryprosopic and Hyperleptoprosopic respectively. This is in accordance to our study. Rexhepi A and Meka V (2008),[10] they found that the Leptoprosopic was the dominant facial type in males while in females Hyperleptoprosopic was very common. Hypereuryprosopic was the least common followed by euryprosopic facial type among both the genders. This result was not concomitant with our study. Bayat PD and Ghanbari A (2009)[11] in Ark, Fars and Turkmen population found that the dominant facial type was mesoprosopic for

Table 6: Distribution of canine relationship in overall sample

Canine relation	Percentage (%)	Count(n)
Class I	40(%)	100
Class II	(57.6%)	144
Class III	(2.4%)	6

Table 7: Comparision of facial morphological type between males and females

Facial Morphological Type	Males (N=106)	Females (N=144)	Chi-Square Value	Df	P value
Euryprosopic	4 (3.7%)	7(4.8%)			
Mesoprosopic	88(83.1%)	127(88.2%)	2.849	2	0.24
Leptoprosopic	14(13.2%)	10(7%)			

Table 8: Comparision of canine relationship between males and females

Canine relation	Males (N=106)	Females (N=144)	Chi-square value	Df	P value
Class I	39(36.7%)	61(42.3%)			
Class II	65(61.3%)	79(55%)	1.118	2	0.57
Class III	2(2%)	4(2.7%)			

Table 9: Correlation between canine relation and facial morphological

Facial Morphological Type	Canine relation type			Chi-square	(DF)	P value
	Class I (n=100) (40%)	Class II (n=144) (57.6%)	Class II (n=6) (2.4%)			
Euryoproscopic	3	8	0			
Mesoproscopic	89	120	6	2.692	4	0.61
Leptoproscopic	8	16	0			

Turkmen population while hypereuryprosopic was for Fars and Ark. This result was concomitant with our study. Raji et al.(2010)[12] found in north-eastern Nigerian population that the dominant and rarest facial type in both the genders was Hyperleptoprosopic and Hypereuryprosopic. Calvin Kurnia (2012)[13] found in Chinese population that the dominant facial type is leptoprosopic and the females have dominant facial type being mesoprosopic. The lower facial height index was greater in males than in females. Facial shape in men tended to be longer because the growth in men was larger than in women.

Along with the facial index the most common canine relationship in the present study was found to be canine Class II followed by canine Class I in overall sample with its prevelance being more in females than in males. The means of canine relationship was analysed by comparing males and females, it showed that prevalence of Class II was higher in females as compared to males with results being statistically non significant.

Young et al.[14] On comparison of different facial types, canine relationship, Euryprosopic was found to be dominant facial type supported by the study done by irrespective of facial morphologic type, Class I canine relationship was most common. However, for both the sides prevalence of class II and III was significantly higher in females as compared to males (p<0.05). These findings were not concomitant with the present study.In study done by Kulshrestha R, et al in 2017[15] in random Indian Population showed that Euryprosopic facial type (53.2%) was most common in majority of the subjects followed by Mesoprosopic (21.6%), Hypereuryprosopic (19%), Leptoprosopic (5.6%) and the least common was Hyperleptoprosopic (0.6%). The canine relation was mostly Class I in both the genders, females showed a higher value of Class II and Class III canine relation.

6. Conclusion

The following conclusion may be drawn from the present study:

1. Mesoprosopic facial type (86%) was most common followed by Leptoprosopic (9.6%) and Euryprosopic (4.4%) in overall sample.
2. Males and females both showed the Mesoprosopic facial type as most. This showed no significant difference between genders.
3. The canine relationship showed Class II canines (57.6%) most prevalent in overall sample.
4. Males and females both showed Class II canine. this showed no significant difference between the genders.
5. There was no relationship between facial morphological types and canine relationship.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

8. Source of Funding

None.

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