

Evaluation of Facial Anthropometric Index among 15-20 Year Old Individuals in Sari City

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Abstract

Introduction: Anthropometry is a branch of anatomy that could be useful as an important para clinical index for growth and development of facial and skull bones. Due to its importance in diagnosis of some diseases, plastic surgery and orthodonty, the purpose of this study was to determine facial anthropometric indexes among young individuals of both sexes in Sari city.

Materials and Methods:

This cross-sectional study was done on 341 students at mean age of 15-20 years with normal faces and Mazani ethnic in 2014-15. The measurements of facial diameters were determined by using Martin Saller Cephalometer with accuracy of 0.5 mm. According to the sex, facial index was estimated and statistical analyses by using t-test and chi-square were carried out.

Results:

The results of present study demonstrated that Hypereuriprosopic, Euriprosopic, Mesoprosopic, Leptoprosopic and Hyperleptoprosopic phenotypes were seen in the studied population. The dominant phenotypes in female and male students were Leptoprosopic and Mesoprosopic, respectively. Moreover it was found that in both sexes, the rare phenotype was Hypereuriprosopic.

Conclusion: The findings of this study indicated that in addition to determining face shapes in the area, there are significant differences between facial phenotypes in both sexes.

Key Words: Anthropometry, Facial index, Ethnicity

Introduction

“Anthropology” comes from the Greek word “anthropos” which means human (1) and it's a branch of anatomy (2,3). In anthropometry various quantitative dimensions of human organs are measured (4). It can be an important paramedical index for growth and development of facial and skull bones (4,5). Cephalometry is one of the most important branches of anthropometry (2,4) in which

anatomical dimensions of maxillofacial region are studied and play an important role in this science (4). Cephalogram is divided into 2 main categories: Frontal or posteroanterior cephalometry that is also called PA and lateral cephalometry (6). Despite the fact, PA and lateral cephalometry were invented at the same time (7) PA cephalometry is less common due to the problems resulted in radiography and cephalometric analysis (8).

Different individuals due to their differences in genes, race, age, ecological factors, nutrition and sex have different physical dimensions, therefore anthropometric studies in one part of the world, cannot be applied to other regions but can be used in comparative studies. This shows the necessity of this assessment (1,3,5). Also by following Anthropometric studies morphological information of a population can be obtained which is useful in comparing various populations. Moreover it makes the studies even more essential (9-11).

Cephalometry can be used in forensic medicine, maxillofacial surgery, reconstruction of missing parts of head or face, pediatrics and also in dentistry particularly in orthodontic branches and maxillofacial surgery(3). Maxillofacial surgeons use Cephalometry in diagnosis of Hypertrophy Turbinate Nasal disorder by studying Nasal Cavity (12), Canine Latency (13), and Cervical Lordosis (14) or obtain valuable information of patients with Cleft Palate or Craniofacial Abnormalities (15). In orthodontic science by choosing certain points of maxillofacial region on cephalogram and drawing lines between these points and measuring the angle between these lines or plans, type of the treatment needed for the patient can be determined. Furthermore the patient is followed by cephalometric serial (6).

Facial phenotypes are divided into 5 main categories according to Facial Index (FA):

- 1) Hypereuriprosopic

- 2) Euriprosopic
- 3) Mesoprosopic
- 4) Leptoprosopic
- 5) Hyperleptoprosopic

Anthropometric studies on different races have been carried out in different parts of the world and in Iran, in order to measure anatomical and physical dimensions and analyze morphological features of that area. Jahanshahi et al. by studying 389 individuals in 2007, in Gorgan, concluded that facial phenotypes vary due to genetic factors, in different ethnic groups (16).

Mahmoudzadeh et al. after studying 800 healthy young Sistani and Baluchi females concluded that there is a significant difference between Baluchi and Sistani females in the south east of Iran according to the indexes and their maxillofacial phenotypes.

As it was mentioned, many factors affect categorizing the diameters (index). Several studies have been done in various parts of Iran for categorizing facial diameters (16) however due to determinant factors of cephalometry and previous studies in Golestan, Tehran and Zahedan on Turkmen, Fars, Baluch aborigines the results of previous studies could not be applied to the population in Sari city. So this research had to be conducted in order to determine an appropriate facial index (adolescents) for this city. In this way not only phenotypes can be used in mentioned cases but also this city can be compared more properly to other parts of Iran according to facial phenotypes (index).

Methods and materials

This research is a cross-sectional descriptive study that has been done on 341 students including 159 males and 182 females aged 15-20 years, in 2013-14. The studied population was Mazani high school students in the Sari city who had no skeletal and muscular disorders or history of facial surgery. A Pure Mazani ethnic group was chosen who had intergroup marriage.

Students were chosen by Cluster sampling. Demographic and ethnicity of people were recorded. To measure diameters of face, graded *Martin Saler* cephalometer was used with an accuracy of 5.0 mm. So the straight distance between left and right Zygon points in face (In Zygomatic arch and along the outer corner of the eye) was measured as facial width and the straight distance between two Nasal points (above the Nasal bone and between two eyebrows) to Menton (In Mandible) was measured as facial height (Figure A and B). According to standards, facial index was

defined as facial height to facial width ratio multiplied by 100(2, 3, 5). The resulting number is facial index.

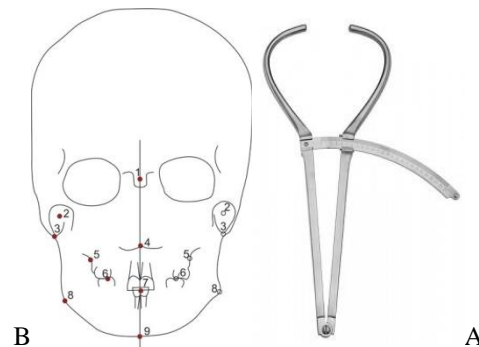


Figure A: Martin Saler cephalometer

Figure B: Point 1: Nasion, point 2: Zygon, point 9: Menton

$$\text{facial index} = \frac{\text{Facial height}}{\text{facial width}} \times 100$$

After calculating facial index, students were divided into 5 main groups according to anatomical and cephalometric factors (5):

- 1) Hypereuriprosopic
- 2) Euriprosopic
- 3) Mesoprosopic
- 4) Leptoprosopic
- 5) Hyperleptoprosopic

So the people whose facial index was in the range of 75-79.9 were classified as Hypereuriprosopic and people in the range of 80-84.9 were Euriprosopic, people in the range of 85-89.9 were Mesoprosopic, People in the range of 90-94.9 were Leptoprosopic and finally people whose facial index was 95 or above were classified as Hyperleptoprosopic.

Eventually after calculating each person's index and recording it, data was analyzed by SPSS20 statistical software. Chi-Square statistical test was used to assess the relationship between facial phenotypes in females and males and T-test was used for calculating the mean sizes. Initially normal assumption of data was analyzed. If data wasn't based on assumption of normality The Box-Cox transformation was used and normality test was carried out again. If data wasn't based on assumption of normality nonparametric Mann_Whitney test was conducted. The significant level was 0.05.

Results

By analyzing data, population was divided into two groups; males and female. In studied population the results of mean facial indexes were as followed: In %5 of females the facial index was 77.49±1.37

(Hypereuriprosopic), in %14 of females the facial index was 82.81 ± 1.77 (Euriprosopic), in %23 of females the facial index was 87.55 ± 1.27 (Mesoprosopic), in %31 of females the index was 92.02 ± 0.45 (Leptoprosopic) and in %27 of females the index was 96.10 ± 0.54 (Hyperleptoprosopic). In %12 of males the mean facial index was 76.94 ± 1.84 (Hypereuriprosopic), in %22 of males mean facial index was 82.93 ± 1.47 (Euriprosopic), in %25 of males the index was 87.84 ± 1.11 (Mesoprosopic), in %20 the facial index was 91.60 ± 0.62 (Leptoprosopic) and finally in %21 of males the mean facial index was 95.62 ± 0.28 (Hyperleptoprosopic). Total mean facial index in females was 90.19 ± 5.29 and in males was 87.50 ± 5.98 .

Table 1. Comparing the frequency of facial morphological categories in male and female Mazani students aged 15-20 years in Sari city

Facial phenotype	Male		Female		P-Value
	number	percentage	number	percentage	
Hypereuriprosopic	20	12	9	5	0.279
Euriprosopic	37	22	25	14	0.971
Mesoprosopic	41	25	41	23	0.381
Leptoprosopic	32	20	55	31	0.003
Hyperleptoprosopic	29	21	52	27	0.000
total	159	100	182	100	

Table 2. Statistical assessment of sex impact on facial phenotype

Facial Phenotype		Mean rank	P-value	Explanation
Hypereuriprosopic	Data was not based on assumption of normality. Box-Cox transformation didn't normalized it.	Male=13.88 Female=17.50	0.279	According to P-value that was higher than 0.05, null hypothesis wasn't rejected and significant difference wasn't observed in test.
Euriprosopic		Male=31.57 Female=31.40	0.971	No significant
Mesoprosopic		Male=43.76 Female=39.24	0.381	No significant
Leptoprosopic		Male=33.84 Female=49.91	0.003	According to P-value that was lower than 0.05, null hypothesis was rejected and significant difference was observed in test.
Hyperleptoprosopic		Male=24.69 Female=50.10	0.000	significant

In the studied population every 5 facial indexes, categorized by international standard, were observed. Overall Leptoprosopic phenotype with frequency of 31 in females and Mesoprosopic phenotype with frequency of 25 in males were dominant and Hypereuriprosopic in both males and females with frequency of 12 and 5 was the least common phenotype.

All data wasn't based on assumption of normality. Whole procedure was done by Mann_Whitney test.

For assessing the sex impact on facial index, Mann_Whitney nonparametric method was used because the data was not normal. According to P-value (=0.000) that was lower than 0.05, null hypothesis rejected and the test was significant.

Discuss

The recent research has studied cephalometric measurements of 341 students aged 15-20 years. Results have shown that in studied population Leptoprosopic phenotype, with the mean facial index of 90.19 is dominant in females which approve Amini et al. studies. His study was done to analyze maxillofacial anthropometric indexes in a group of Iranian adults. Among males mean facial index in Mesoprosopic phenotype was 87.5 which was dominant. These results are different from Amini et al. studies (17).

In studied population, generally Hypereuriprosopic phenotype was rare. Also the results of Cohort study, carried out in Japan, states that the facial index in a group of females aged 20 was Mesoprosopic and in another group the phenotype was Euriprosopic which is in conflict with results of this study (18). This difference is due to environmental and genetic variation in two studied populations.

Jahanbakhshi et al. examined two Iranian ethnic groups, Turkmen and Fars. In both of these populations the facial index was Mesoprosopic. Moreover it was stated that the least common phenotype in populations was Hypereuriprosopic, which is similar to the results of this study (19). In other words, people whose facial width is greater than their facial height, were rare.

The results approve Abdolhassanzadeh's research results. In both studied populations Hypereuriprosopic was the least common phenotype (20). In Hossain M G study, in Japan, it was demonstrated that Hyperleptoprosopic was the rare phenotype which is in conflict with this study. The most important factor in differences of facial phenotypes was genotype variation or in other words, the impact of genetics on anatomical dimensions. However also environmental factors should be considered.

In most populations facial index had a high variation, therefore different facial phenotypes were observed. It's proved these differences can be due to race, age, ecologic factors, nutrition and sex (1,3,5). One of the factors that affects the size of head and face is age. Even in some researches it's declared that breathing by mouth can cause the face grow vertically (21) and makes it narrower. Golalipour et al. suggested that infants have lower facial index. In

this study the infants were mostly Hypereuriprosopic and the least common phenotype was Hyperleptoprosopic among them. These findings are similar to Emami's results (22) and show age impact on facial index (23). It should be noted that facial index in children is lower than older adults. After analyzing these findings it was declared that children are not fully grown, therefore they are smaller in anatomical sizes. According to the facial index relationship and children's lower facial index than adults, it can be concluded that this index increases through life time. In other words it seems like due to the growth of facial height and width, the height grows more than the width, in this way the facial index increases by ageing and maturity.

Some disorders may also affect facial and Cephalic dimensions. For example, a study by Rahmani showed that Schizophrenia affects the shape and circumference of head but has no effect on shape of face. The results suggested that the prevalence of people with very broad head was high in patients. Furthermore the head circumference in patients was significantly lower than in controls (24).

In this study it was stated that there are significant statistical differences between sex and facial index ($P \leq 0.05$). So the Prosopic index in males is less than in females. This result corresponds to the findings of Sheikholeslami's study which examined the influence of gender and ethnicity on skull and facial anthropometrics of students in Islamic Azad University of Arak who were studying at the university in 2010-11(25).

Vaishali et al. studied facial index of Malaysian and Indian student in 2011 and demonstrated that Indian males had a mean facial index of 87.19 whereas 86.75 in females. Both belonged to Mesoprosopic face type, and comparison of facial index was statistically not significant. Comparison between Indian and Malaysian subjects indicates that Indians (both sexes together) had a higher (87.04) mean facial index than Malaysians (86.76). However, this difference was statistically not significant (26).

Result of Yesmin et al's study titled "A Study of Facial Index among Malay Population" that was conducted in 2014 demonstrate that the dominant phenotype in Malay population was Mesoprosopic or round face (45%) and least common face type was Hyperleptoprosopic or very long face (5%). There were significant variations in the face index between Malay males and females. Finally they recommended that future research have to been done in larger sample size and in different races (27).

Conclusion

This study was carried out to determine the facial phenotypes of students in the Sari city. Every five facial phenotypes were observed in the population. In general, dominant phenotype in females, was Leptoprosopic and in males the dominant phenotype was Mesoprosopic. Moreover Hypereuriprosopic was the least common phenotype in both sexes. By comparing obtained data with results of previous studies in different regions of Iran and the world it can be concluded that genetic factors were so significant. Furthermore like most previous studies, this study suggests that also sex is a factor in facial size parameters. Due to the age range and anthropometric basis of this study, it can be used in healthcare policies for the population of this region. Economic and Therapeutic demands for the society can be predicted in future or present time in order to prevent lack of equipment or adequate health facilities especially for orthodontic treatments. Dentists, Orthodontists and maxillofacial surgeons can focus on the dominant phenotype in the geographical area of their work, and choose the predominant treatment for maxillofacial disorders. Also they can strengthen their skills in medical procedures.

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