Nasofacial Anthropometric Study Among Students of Shiraz University of Medical Sciences, Iran: A Population Based Study

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Abstract Anthropometry is a scientific study of linear dimensions and angles of living subjects. Knowing the details and anthropometric properties of nasofacial for each specific ethnic group is important for cosmetic operation as well as identifying individuals. In this study, facial and nasal anthropometric factors were studied in students of Shiraz University of Medical Sciences. In a cross-sectional study, 200 students of Shiraz University of Medical Sciences (100 male and 100 female and age range of 18–30 years) were selected. Nasal width (NW), nasal length (NL), nasal height (NH), face height (FH) and face width (FW) were measured in and the nasal (NI) and facial index (FI) were calculated for each case. Then, the data were analyzed using SPSS-22. The mean age was 21.84 ± 3.18 years. There were significant differences in the facial and nasal measurements including FH ($P = 0.0001$), FW ($P = 0.0001$), FI ($P = 0.0001$), NL ($P = 0.002$), NH ($P = 0.001$), NW ($P = 0.0001$) and NI ($P = 0.0001$) of sex groups. The most common types of face were mesoprosopic (36%) and hyperleptoprosopic (38%) types and and platyrrhine (63%) were mostly frequent. Based on the findings, all students of Shiraz University of Medical Sciences had mesoprosopic (36%)

and hyperleptoprosopic (38%) types of face and platyrrhine type of nose. As well, a sexual dimorphism was recorded according to the nasofacial measurements in Iranian population that should be considered in the cosmetic operations. Sexual dimorphism and differences between different populations were recorded.

Keywords Anthropometry · Facial index · Nasal index · Student · Shiraz

Introduction

Anthropology is a science of the human body morphology and its existent variations between different populations [1]. Anthropometric variations in different populations are attributed to the several factors, such as genetic influences, environmental conditions and nutritional status [2, 3]. Anthropometric informations have several applications in forensic medicine, artificial organ production and cosmetic surgery [4, 5]. In forensic medicine, anthropometric measurements are usually used to identify an individual [6]. Anthropologists can identify a person from its decomposed or deceased body, by measuring the remaining parts of the body and using the previously defined anthropometric equations [7].

Craniofacial anthropometry describing the morphology and measurements of the head and face, has a great importance in determining craniofacial anomaly, design of plastic surgery and identification of an individual in forensic medicine [8]. Face shape is a considerable structure in art, anatomy and surgery [9]. Scientists use the facial measurements for several purposes such as identification of congenital and traumatic abnormalities [10]. Facial measurements are interestingly varied between

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diverse races and ethnicities [11]. Facial index (FI) is a ratio of the facial length to the facial width multiplied by one hundred [12]. There are five types of the face shape according to the FI: Hypereuryprosopic (FI = ≤ 79.9), Euryprosopic (FI = 80.0–84.9), Mesoprosopic (FI = 85.0–89.9), Leptoprosopic (FI = 90.0–94.9) and Hyperleptoprosopic (FI = ≥ 95.0) [11]. Euryprosopic group has a broad and short face, but Leptoprosopic group has a tall and narrow face [13].

The nose shape has a great importance in facial beauty, and its dimensions widely used in plastic surgery and facial reconstruction [14]. Ethnic influences and environmental climate conditions are the two main factors that result in different shapes and size of the nose [15]. To conform the basic standard shape of the nose at rhinoplasty surgery in each ethnic group, there is a great need to have the craniofacial anthropometric databases in different populations [16, 17]. Furthermore, the nasal measurements (nasal height, nasal width and nasal index), as anthropometric parameters can be used for distinguishing between different races [18]. Nasal index (NI) is a ratio of the nasal width to the nasal height multiplied by one hundred [15, 19]. There are five types of the nose in different races according to the NI: Hyperleptorrhine (NI = ≤ 54.9), Leptorrhine (NI = 55–69.9), Mesorrhine (NI = 70–84.9), Platyrrhine (NI = 85–99.9) and Hyperplatyrrhine (NI = ≥ 100) [19, 20]. The white race have a fine nose (Leptorrhine), the blacks have a broad nose (Platyrrhine) and Orientals have a medium sized nose (Mesorrhine) [14].

The aim of the current study was to determine the nasofacial characteristics including facial length (FL), facial width (FW), facial index (FI), nasal height (NH), nasal width (NW) and nasal index (NI) of Iranian students at Shiraz University of Medical Sciences. These parameters were compared in both sexes. Also, the face and nose types of the target population were classified.

Materials and Methods

The study was carried out among volunteer students of Shiraz University of Medical Sciences, Iran, within the age range of 18–30 years. A number of 200 healthy students (100 males and 100 females), whit normal craniofacial configuration were included and Individuals with craniofacial abnormalities, history of trauma and the face and nose cosmetic surgery such as septoplasty or septorhinoplasty were excluded. To determine the sample size, convenient sampling method was carried out.

The measurements including L, FW, NH and NW were taken twice using sliding venire calipers to control the error of measurement. All measurements were taken in a neutral position and individual was asked to breathe calmly

through their nose with relaxed facial expression without lifting the head.

Definitions (Fig. 1):

Nasion (n): Midpoint of nasofrontal suture

Gnathion (gn): Midpoint on the lower border of the mandible

Zygions (zy): Most lateral point of the zygomatic arch

Measurements (Fig. 1):

FL: Distance between nasion (n) and gnathion (gn)

FW: Distance between two zygions (zy)

FI: Calculated using the following formula [20]:

$$FI = \frac{FL}{FW} \times 100 \quad (1)$$

NH: Distance between the nasion and the subnasale (sn)

NW: Distance between the two ala (al) of the nose.

NI: Calculated using the following formula [21]:

$$NI = \frac{NW}{NL} \times 100 \quad (2)$$

Then, and face and nose of cases were classified based on Table 1 [22, 23].

Data for each individual were entered into a standard checklist including demographic characteristics and nasofacial measurements.

Statistical Analysis

Statistical analysis was done by using SPSS 22.0. The differences between two sexes were carried out using independent *t* test. Pearson's correlation coefficient (*r*) were used to find the correlations between quantitative variables. The *P* values < 0.05 were considered significant.

Results

In this study, 200 volunteer medical students (100 males and 100 females) with mean age of 21 ± 3.06 at Shiraz University of Medical Sciences were investigated. The measurement of nasofacial variables such as FH, FW, FI, NL, NH, FW and NI of all subjects were summarized in Table 2. Significant differences were reported in the facial measurements including FH ($P = 0.0001$), FW ($P = 0.0001$), and FI ($P = 0.0001$) bases on sex groups. Additionally, There were significant differences in the NL ($P = 0.002$), NH ($P = 0.001$), NW ($P = 0.0001$) and NI ($P = 0.0001$) of sex groups as shown in Table 3.

The nasal shapes were described according to the nasal index and its distribution in this study was as follow: 120 mesorrhine (60%), 75 leptorrhine (37.5%) and 5

Fig. 1 Anthropometric measurements of nasofacial parameters. *n* Nasion, *gn* Gnathion, *Zy* Zygions, *sn* subnasale, *al* ala of nose, *NL* nasal length, *NH* nasal height, *NW* nasal width, *FH* facial height, *FW* facial width

Table 1 Face classification based on facial index and nose classification based on nasal index

Face classification	Facial index
Hypereuryprosopic	40–54.9
Euryprosopic	Less than 70
Mesoprosopic	70–84.9
Leptoprosopic	85–99.9
Hyperleptoprosopic	100 or more
Nose classification	Nasal index
Hyperleptorrhine	40–54.9
Leptorrhine	Less than 70
Mesorrhine	70–84.9
Platyrhine	85–99.9
Hyperplatyrhine	100 or more

platyrhine (2.55%) types. The distribution of nasal shapes in the sex groups was demonstrated in Table 4. The most nasal shape frequency was related to mesorrhine type in male group and equally leptorrhine and mesorrhine in female group.

There were significant correlations between nasal and facial measurements however, the value of “*r*” was not suitable for these correlation (Table 5).

Discussion

Face and nose are developed from different bony structures including nasal and frontonasal and as well as maxillary and mandibular prominences. The face final features depends mainly on the alterations in the proportion and position of these facial components [24]. It has been shown that the growth and development of humans are under the influence of different factors including gender, geography and geocology, biology, race and age, [11, 25]. Each ethnicity has special characteristics for example in their nasofacial features that is important in the facial operation planning in patients with defects due to trauma, tumor or congenital malformations [24].

Based on a result of this study, the mean FH, FW and FI of students was 7.3, 11, 12 and 92 cm, respectively. Mean NH, NW and FI was 3.08, 2.1 and 90.2 cm, respectively.

These findings are comparable with the results of other studies. In this study, all nasofacial values were higher in males compared to the females. The FH for both males and females were 12.7 and 10.2 cm, respectively. The FW for males were 13.2 cm and for females 11.2 cm. As for the NL and NW, the values for males were 3.2 and 2.4 while female were 3 and 2 cm, respectively. These findings confirmed the existence of sexual dimorphism in Iranian population. In a similar study, Din et al. [26] demonstrated

Table 2 Summary of nasofacial anthropometric measurements of all students at Shiraz University of Medical Sciences, Iran

	N	%	Mean	SD	Min	Max
Age (year)			21.00	3.06	18	41
FH (cm)			11.3	0.4	9	12
FW (cm)			12.2	1.00	9	19
FI			92.00	6.00	60	105
Face classification						
Euryprosopic	6	3				
Mesoprosopic	73	36.0				
Leptoprosopic	45	22.0				
Hyperleptoprosopic	76	38.0				
NL (cm)			6.02	0.4	4	7
NH (cm)			3.08	0.5	2	3
NW (cm)			2.1	0.3	2	3
NI			90.2	8	70	107
Nose classification						
Mesorrhine	42	21.0				
Platyrrhine	127	63.0				
Hyperplatyrrhine	31	15.0				

SD standard deviation, *Min* minimum, *Max* maximum, *NL* nasal length, *NH* nasal height, *NW* nasal width, *NI* nasal index, *FH* facial height, *FW* facial width, *FI* facial index

Table 3 Comparing the nasofacial anthropometric measurements of male and female students at Shiraz University of Medical Sciences, Iran

	Sex								<i>P</i> value
	Male				Female				
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Age (year)	21.8	3	18	41	22.2	2.1	18	34	0.211
FH (cm)	12.7	0.2	10	12.3	10.2	0.2	9	11	0.0001
FW (cm)	13.2	0.3	11	19	11.2	0.3	9	15	0.0001
FI	88.4	4.5	60	98	97.1	4.1	72	105	0.0001
NL (cm)	6.1	0.3	5	7	5.1	0.4	4	7	0.002
NH (cm)	3.2	0.3	2	3	3.2	0.2	2	3	0.001
NW (cm)	2.1	0.1	2	3	2.2	0.1	2	3	0.0001
NI	88.2	7.1	70	106	93.1	8.1	70	107	0.0001

SD standard deviation, *Min* minimum, *Max* maximum, *NL* nasal length, *NH* nasal height, *NW* nasal width, *NI* nasal index, *FH* facial height, *FW* facial width, *FI* facial index

that the nasal and facial values in males were higher than females. The study of Omotoso et al. [27] showed significant differences in the mean FL, NL and NW based on the gender. Mohammed et al. [15] investigated the nasal index in Hausa ethnic population of northwestern Nigeria and showed that the NI of males was higher than females. Their results are comparable to the present study.

Bases on a results of our study, most of the Iranian population had mesoprosopic (36%) and hyperleptoprosopic (38%) classification of face and platyrrhine (63%) were mostly frequent. Mesoprosopic (69%) type of face was frequent in male students and hyperleptoprosopic

(72%) in female students. Platyrrhine classification of nose was frequent in both males (66%) and females (61%). In a study on NI of Qazvin Residents, Iran, Zolbin et al. [2] showed that the most common nose classification was platyrrhine nose (70.5%), which confirmed the results of present study. Based on the Mohammed et al. [15] study, 120 mesorrhine (60%), 75 leptorrhine (37.5%) and five platyrrhine (2.55%) recorded in Hausa ethnic population Nigeria. In a similar stuftu in 2009, Heidari et al. proved that the most frequent type of nose in the Iranian population (Sistani and Baluch groups) was the leptorrhine type which confirmed our results. However, the most common

Table 4 Distribution of facial and nasal classifications in the medical students based on sex groups

	Sex				<i>P</i> value
	Male		Female		
	N	%	N	%	
Face classification					
Euryprosopic	5	2	1	0.5	0.0001
Mesoprosopic	69	34	4	2	
Leptoprosopic	22	11	23	11	
Hyperleptoprosopic	4	2	72	36	
Nose classification					
Mesorrhine	28	14	14	7	0.0001
Platyrrhine	66	33	61	30	
Hyperplatyrrhine	6	3	25	12	

Table 5 The correlation between nasal and facial measurements obtained from medical students

	FH (cm)	FW (cm)
NL		
<i>r</i>	0.001	0.001
<i>P</i> value	0.0001	0.0001
NH (cm)		
<i>r</i>	0.001	0.001
<i>P</i> value	0.0001	0.001
NW (cm)		
<i>r</i>	− 0.020	0.034
<i>P</i> value	0.0001	0.0001

NW nasal width, NH nasal height, FH facial height, FW facial width

face classification was the leptoprosopic type [17]. Kurnia et al. [25] stated that the common face classification among Chinese of Indonesia was leptoprosopic type in male and mesoprosopic in female.

These findings from different populations showed that environment affect the nasofacial parameters. As a result of natural selection in human evolution [28], Kaushal et al. [29] indicated that NI of a population is associated with climate; broad and flat nose types favored moist and warm climate, whereas the long and narrow noses were observed in dry and cold climate to have more surface area to warm the air.

Conclusion

Bases on a results of our study, most common type of face was mesoprosopic (36%) and hyperleptoprosopic (38%) type and most common nose type was platyrrhine (63%) type. As well, there was a sexual dimorphism in the facial

and nasal measurement of Irnanin population. It was speculated that the nose and face types in Iran were adapted to the environment.

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