Anthropometric Study of Nose Parameters in Iraqi Arabic and Kurdish Subjects (Possible Personal Identification Tool)

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Abstract

Background and Purpose: The human nose has been reported to differ in its anatomy and morphology between different racial and ethnic groups. Nasal anthropometric features when studied can provide useful information for reconstruction or esthetic surgical procedures and personal identification for forensic purposes. Method: A total of 311 subjects with age (19-23) years were divided according to gender, race (Arabic or Kurdish), and residence regions in Iraq (north, middle and south). Different nose parameters were measured for the subjects using digital Vernier caliper. Results: Comparing races, the nose height and nose length were significant between Arab and Kurds, nasal index showed (60, 60.6) for Arabic vs. Kurdish, respectively. Sexual dimorphism was significant in all the parameters obtained. The fine nose was the commonest among all subjects. Parameters analysis revealed high positive significant correlation among various parameters except the nasal index that showed negative correlation with nasal height and length. Conclusions: Nasal morphometric parameters were unique for each person and have variations between different race (Arabic and Kurdish), gender variation and the correlation among various parameters been recorded for Iraqi people. These morphometric evaluations are the key for standardization among Iraqis, and in comparison with different countries, this have great values in anatomical, surgical (aesthetic) and forensic aspects regarding personal identification.

Keywords*: anthropometry, nasal dimension, nasal index, personal identification, Rhinoplasty*

Introduction

Morphometric variations are noticed in facial features among different races [1]. The human nose has been reported to differ in its anatomy and morphology between different racial and ethnic groups [2]. Measurements of different parameters of nose became very worthy in procedures related to nasal surgery and cosmetology [3]. Nasal anthropometric features when studied can provide useful information to the rhino plastic surgeon especially when nasal reconstruction is performed for individuals who desire to change their nasal morphology [3, 4]. The nasal shape differs in human populations like various facial structures. For example, the interval between nasal wings had higher significant values in Asian and African when compared to European race [5]. The nasal index is one of the morphometric variables among individuals. It defined as the ratio of nasal width divided to nasal height multiplied by 100. It was revealed that the nasal index was the best index for distinguishing the different human ethnicities [6,7].

Material and Method

In this present study, a total of 311 pharmacy students were recruited for the study, having age 18-22years, at Al-Rafidain University College, Baghdad and approved by ethical committee in the university. All the subjects were normal healthy residents of Iraq, 156 male and 155 female, the study was conducted during the period from September 2018 to February 2019. The study purposes were explained to all subjects and a written informed consent was obtained from each subject. Medical history and clinical examination were obtained, none of those enrolled for the study have history of craniofacial trauma, nose diseases, congenital anomalies or surgery of the nose. Subjects are classified according to race into Kurdish race and Arabic race. In addition, subjects are also classified into their different origin; from North, middle and south of Iraq. Measurements of parameters were obtained directly from the nose by a single investigator (to eliminate error), by using a digital Vernier's caliper. Measurements were recorded

in millimeter, to the nearest 0.1mm. Each subject measured twice for accuracy and to each dimension.

Anthropometric measurements were performed depending on the following anatomical landmarks [8,9]: nasion (n), it is the midline point nasofrontal suture and the nasal root; subnasale (sn), it is the point just at middle of columella base; alar curvature (ac), the most lateral point that could be seen at curved base line of each ala ; and pronasale (prn), the most protruding point at the nasal tip. The Anthropometric parameters that were measured include the following, and are illustrated in Figure 1:

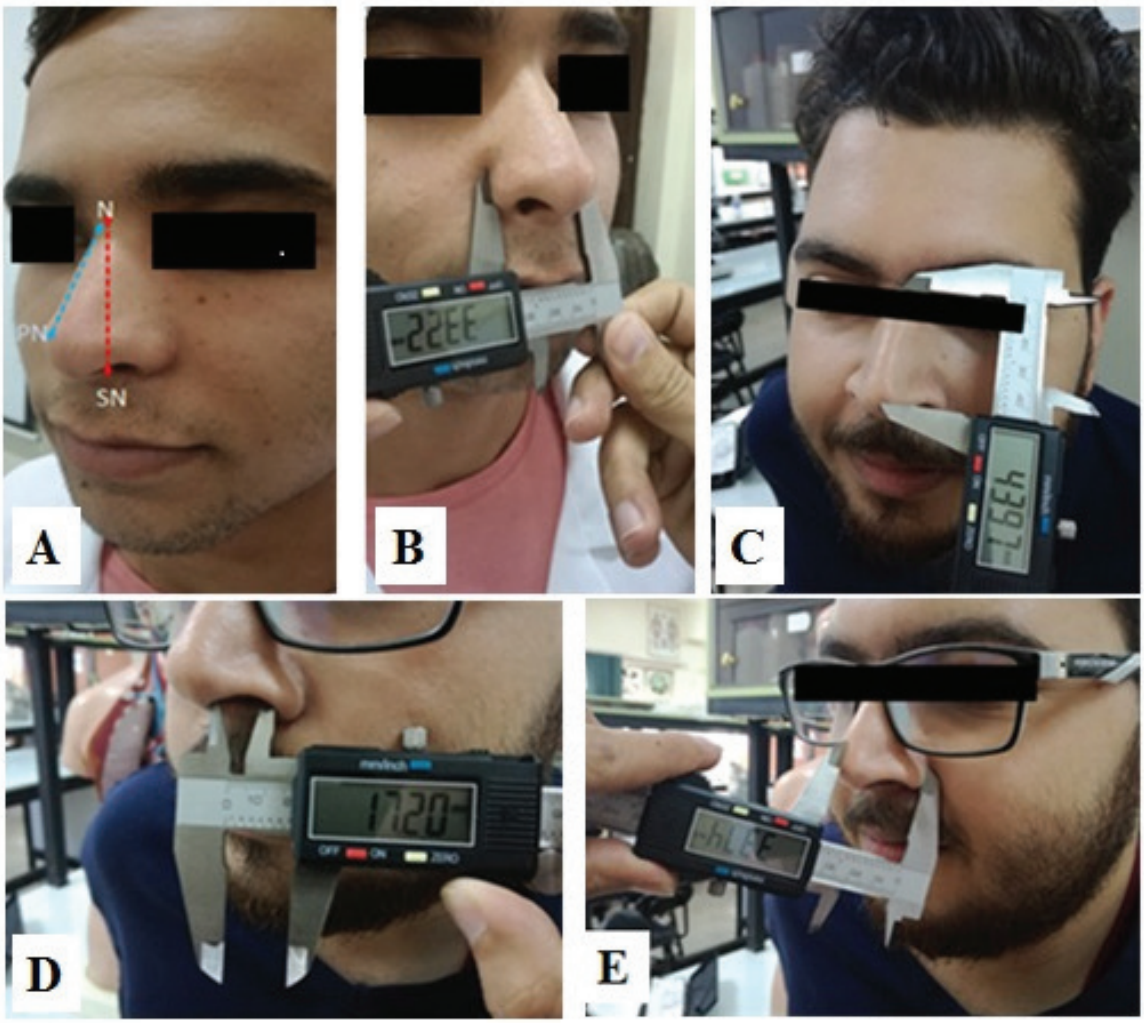

Figure 1: Showing the recorded Anthropometric parameters of the nose. (A) Nasal landmarks and measurements nasion (N), subnasale (SN) and pronasale (PN). (B) Width of nose (WN). (C) Nose length (NL). (D) Left nostril diameter (LND). (E) Left alar curve pronasale (LACP).

1. Nose height (NH): distance from subnasale to nasion
2. Nose length (NL): from pronasale to nasion
3. Width of nose (WN): span from right curve of nasal alae to left one.
4. Right nostril diameter (RND) where maximum diameter of right nostril measured
5. Left nostril diameter where (LND) maximum diameter measurement was done.
6. Right alar curve pronasale (RACP) distance from right curve of ala to nasal tip
7. Left alar curve pronasale (LACP) distance from left curve of nasal ala to nasal tip

8. Nasal index was measured by calculating the nasal width divided to nasal height multiplied by 100.

Nose shape had been classified into five types according to nasal indices [10]: 1. Very fine nose with nasal index <54.9 (Hyperleptorrhine), 2. Fine nose with nasal index =55.0-69.9 (Leptorrhine), 3. Medium nose when nasal index had a value between 70.0-84.9 (Mesorrhine), 4. broad nose with nasal index = 85.0-99.9 (Platyrrhine) and 5. very broad nose when nasal index >100 (Hyperplatyrrhine).

The collected data was statistically analyzed using SPSS software v.20. Values were expressed as mean ± standard deviation (SD). T test ,one way ANOVA followed by post hoc test, chi square Fisher Exact and Pearson correlation test were used to compare the differences of parameters with significance value $P<0.05$.

Results

All different nasal parameters were recorded in Table 1. The parameters were recorded as mean ± SD, comparing the two races Arabic and Kurdish in one hand and comparing males and females on other hand. Sexual dimorphism was noted with male having higher values than their female counterparts, which were significant in all obtained parameters and nasal index (Table 1).

Table 1: Nose morphometry among races and gender (measurements in mm). The results were expressed as mean ±SD. significant difference marked by * (P<0.05)

Parameter	Race	Mean ± SD	Gender	Mean ± SD
Nose height (NH)	Arabic (200)	54.4 ± 5.9 *	Female (156)	51.3 ± 3.8 *
	Kurdish (111)	52.6 ± 5.0	Male (155)	56.3 ± 6.1
Nose length (NL)	Arabic	48.1 ± 6.2*	Female	45.2 ± 4.3*
	Kurdish	46.4 ± 5.0	Male	49.8 ± 6.3
Width of Nose (WN)	Arabic	32.5 ± 4.5	Female	30.2 ± 2.9 *
	Kurdish	31.7 ± 3.2	Male	34.2 ± 4.2
Right nostril diameter (RND)	Arabic	21 ± 3.2	Female	19.3 ± 2.4 *
	Kurdish	20.4 ± 2.9	Male	22.3 ± 3.0
Left nostril diameter (LND)	Arabic	20.2 ± 3.6*	Female	18.6 ± 2.5 *
	Kurdish	20 ± 2.8	Male	21.7 ± 3.4
RACP	Arabic	33.5 ± 5.2	Female	30.8 ± 3.0 *
	Kurdish	32.6 ± 3.9	Male	35.5 ± 5.1
LACP	Arabic	33.5 ± 4.7*	Female	30.8 ± 3.0*
	Kurdish	32.6 ± 3.5	Male	35.6 ± 4.1
Nasal Index (NI)	Arabic	60 ± 7.9	Female	59.2 ± 6.4*
	Kurdish	60.6 ± 7.2	Male	61.2± 8.7

Comparison of anthropometric nasal measurements between the two races, Arabic and Kurdish Iraqis, a statistically significant difference was found for only four parameters; nose height, nose length, LACP and LND. On the other hand, nasal index shows no significance between the two races (Table 1). Furthermore, the correlations of different parameters among Arabic, Kurdish and total subjects were analyzed and presented in Table 2.

Table 2: Pearson correlation for different parameters of nose among Arabic, Kurdish and total subjects.

Correlations		Nasal Height	Nasal Length	Nasal Width	Right Nostril Diameter	Left Nostril Diameter	RACP	LACP	Nasal Index
Nasal Height	total	1	0.8	0.4	0.3	0.4	0.5	0.5	-0.4
	Arabic	1	0.9	0.4	0.3	0.4	0.5	0.6	-0.4
	Kurdish	1	0.7	0.3	0.2	0.3	0.5	0.3	-0.6
Nasal Length	total	0.8	1	0.3	0.3	0.4	0.5	0.5	-0.3
	Arabic	0.9	1	0.3	0.3	0.4	0.4	0.5	-0.3
	Kurdish	0.7	1	0.3	0.3	0.4	0.5	0.4	-0.3
Nasal Width	total	0.4	0.3	1	0.7	0.8	0.5	0.7	0.7
	Arabic	0.4	0.3	1	0.8	0.8	0.5	0.7	0.7
	Kurdish	0.3	0.3	1	0.7	0.7	0.6	0.5	0.6
Right Nostril Diameter	total	0.3	0.3	0.7	1	0.9	0.6	0.7	0.5
	Arabic	0.3	0.3	0.8	1	0.9	0.6	0.7	0.5
	Kurdish	0.2	0.3	0.7	1	0.8	0.7	0.5	0.4
Left Nostril Diameter	total	0.4	0.4	0.8	0.9	1	0.7	0.8	0.4
	Arabic	0.4	0.4	0.8	0.9	1	0.7	0.8	0.5
	Kurdish	0.3	0.4	0.7	0.8	1	0.8	0.6	0.3
RACP	total	0.5	0.5	0.5	0.6	0.7	1	0.7	0.1
	Arabic	0.5	0.4	0.5	0.6	0.7	1	0.8	0.1
	Kurdish	0.5	0.5	0.6	0.7	0.8	1	0.6	0.1
LACP	total	0.5	0.5	0.7	0.7	0.8	0.7	1	0.2
	Arabic	0.6	0.5	0.7	0.7	0.8	0.8	1	0.3
	Kurdish	0.3	0.4	0.5	0.5	0.6	0.6	1	0.2
Nasal Index	total	-0.4	-0.3	0.7	0.5	0.4	0.1	0.2	1
	Arabic	-0.4	-0.3	0.7	0.5	0.5	0.1	0.3	1
	Kurdish	-0.6	-0.3	0.6	0.4	0.3	0.1	0.2	1

Pearson correlation of various parameters revealed positive correlation among many parameters. The highest score was 0.9 and it noticed between Right and Left Nostril Diameter. In contrast, negative correlations were seen in nasal index with nasal height (-0.4, -0.4 and -0.6) for total, Arabic and Kurdish respectively. Another negative correlation was observed between nasal index and nasal length with same value for total, Arabic and Kurdish (-0.3) (Table 2). Nose shapes were calculated based on the number and percentage of nose shape by race (Arabic and Kurdish) and presented in Table 3. The most common shape in both races was the fine nose (68%) while the least frequency was the broad type (1%). No significant difference was observed between races and shape, indicating that the race does not have any effect on nose shape.

Table 3: Distribution of nose shape in different races, Arab and Kurd (Chi square)

Shape	Arab	Kurd	Total
Very fine nose	52	23	75 (24%)
Fine nose	130	82	212 (68%)
Medium nose	17	5	22 (7%)
Broad nose	1	1	2 (1%)
Total	200	111	311

The results of the anthropometric analysis obtained among different regions of Iraq (north, middle, and south) are shown in Table 4. The middle region shows the highest parameters of all regions. One-way ANOVA test was performed to compare parameters among the three regions. A significant difference was seen only in nose height and nose length. Tukey post hoc test revealed the significance was only between the middle and north group and in both nose height and nose length (Table 4).

Table 4: Nose morphometry among different regions, north, middle and south (measurements in mm). The results were expressed as mean ±SD. One way ANOVA followed by post hoc Tukey analysis were used to compare the differences between groups. [a], [b] and [c] represent significantly difference as compared to South , middle and north (P<0.05) respectively

Region				
Parameter	South N=93	Middle N=107	North N=111	Total N=311
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Nose height	54 ± 5.3	54.7 ± 6.4 c	52.6 ± 5.0b	53.8 ± 5.7
Nose length	47.6 ± 5.4	48.5 ± 6.8 c	46.4 ± 5.0b	47.5 ± 5.8
Width of nose	32.2 ± 4.2	32.7 ± 4.8	31.7 ± 3.2	32.2 ± 4.1
Right nostril diameter	20.8 ± 3.1	21.1 ± 3.2	20.4 ± 2.9	20.7 ± 3.1
Left nostril diameter	20 ± 3.6	20.4 ± 3.6	20 ± 2.8	20.2 ± 3.4
RACP	33.3 ± 4.4	33.7 ± 5.738	32.6 ± 3.9	33.2 ± 4.8
LACP	32.9 ± 4.6	33.9 ± 4.8	32.6 ± 3.5	33.2 ± 4.3
Nasal Index	59.9 ± 6.9	60 ± 8.7	60.6 ± 7.2	60.2 ± 7.7

Discussion

The nasal morphometry is one of the significant features that characterize different races because it is at the center of the face. Different anthropological findings have described the nose as a signature indicating the ethnicity, race, age, and sex of an individual [11,12]. Morphometric assessments of parameters have clinical importance for nasal reconstruction after injury or for esthetic causes in addition to its importance in personal identification. Arabs had different race from Kurdish people that might help us to evaluate different race. Moreover there is variation in climate between north, middle and south of Iraq. According to our knowledge, the study of nose morphometry among Iraqis is the first study that carried out among our population, including the racial difference between Arabic and Kurdish. As presented above significant differences were noticed regarding nasal length and nasal height in both races. The dominant shape among subjects was the fine nose in both races. In addition, differences were noticed among nasal length, nasal height and nasal index. Some of the distinctive parameters that were carried out in this study are RACP and LACP. These two parameters assess distance of nasal tip and the nasal curve that provide indirect way to appreciate nasal deviation or not and the shorter distance means Ipsilateral nasal tip deviation. RND and LND parameters obtained above revealed RND and LND showed the high positive correlation only with NW and should be taken in consideration in reconstruction surgery.

Comparing our results with other results obtained from different studies, for instance among Nigerian populations [13, 14], there were lower values of nasal height and nasal length (44.1±3.7mm and 39.8±2.8mm) respectively, compared to our findings (53.8±5.7mm and 47.5±5.8 mm). However, nasal width and nasal index showed higher values (37.7±2mm and 86.1±8mm) compared to ours (32.2±4.1mm and 60.2±7.7mm) respectively. Both Nigerian studies showed similar findings to ours concerning sexual dimorphism, specifically there was significant difference in both gender regarding nasal height, nasal width and nasal index. Although, our results showed lower values of nasal width and nasal index compared to their results and higher values of nasal height. Conversely, on a recent Nigerian study, it stated lower values for nasal height, nasal length and nasal width compared to our results · Furthermore, it represented higher nasal indices for female and male (92.9, 98.9) respectively, and therefore broad nose is the dominant type, in contrast to ours, where the nasal indices for females and males were (59.2, 61.2) respectively, and fine nose is most common type. On the other hand, among Italian subjects nasal height, nasal length, nasal width and nasal index were 57.6±4mm, 49.3±4.8mm, 37.1±2.5mm and 64.9±6.9 respectively for adult male, while for females the same parameters were 54.3±4.2mm, 46.3±4.0mm, 35.3±2.6mm and 65.3±6.5 respectively [15]. Our findings showed lower values for nasal height, nasal width and nasal index, with close values for nasal length.

Conclusions

Nasal morphometric parameters had different values for each parameter in different countries and had variations in regions within same country. Our results between Arabic and Kurdish, gender variation and the correlation among various parameters were recorded for Iraqi people subsequently these morphometric evaluations are the key for standardization among Iraqis, which have important impact for anthropologists, forensic and surgical procedures, by depending on values obtained from same community. In general, our study and many studies showed different nose parameters that emphasize the effects of race, sexual dimorphism, genetic and climate conditions on parameters.

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Ethical Clearance – Not required

Conflict of Interest: None

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