

# Morphometric Nose Parameters In Adult Nigerians

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## Abstract

**Background:** Morphometric measurements including height, length, thickness and width of various part of the body vary among people even of the same race. This study of nose dimensions in normal adult Nigerians was carried out at University College Hospital, Ibadan and University of Maiduguri Teaching Hospital, Nigeria. **Objective:** The purpose of the study is to provide a set of standard values of the form of nose and its relationship with other facial structures of adult Nigerians. **Methods:** The subjects were 1010 adult Nigerians selected by convenience sampling method. Composed of 572(56.6%) males, 438 (43.4%) females. Nostril type was assigned according to inclination of the medial longitudinal axis of the nostril following Topinard system. Other measurements include height, length of the nose, length of the face and 5 soft tissue nose measurements. The data obtained were compared with the measurements of other population in literature. **Results:** The mean length of the nose found in the study was 47.7 (4.9)mm, width of the nose was 42.2 (3.7)mm. The most common nostril type was Nostril type VI (41.3%).None in this study was found with Nostril Type I or II. There was no Significant difference in the distribution of Nostril Type between the sexes ( $p>0.05$ ). **Conclusion:** Parameters evaluated in this study provides important data for forensic medicine, physical anthropology data base and to guide surgeons in rhinoplasty, nasal reconstruction on adult Nigerian.

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## Introduction

The external nose is pyramidal in structure and its skeletal framework made up of bone and cartilages which maintain its shape. The upper angle of the nose where it is continuous with the forehead is called the root of the nose. The base is triangular in shape and has two openings

called the anterior nares or nostrils. The two nostrils lead to the skin lined part of the nasal cavities called the vestibule of the nose. The nasal cavity is divided into left and right cavities by nasal septum behind and columella in front. The free angle of the nose below forms its apex and is called the tip of the nose. It is connected to the nose by the dorsum. The upper part of the dorsum is called the bridge. The external nose serves the cosmetic function by enhancing the personality and beauty of the individual, the nasal cavities act as a gateway to the respiratory tract where it filters and conditions the inspired air, it also serves as an organ for perception of smell. <sup>1</sup>

The white race has a narrow, long, high nose (Leptorrhine), blacks have wide flat noses (Platyrrhine) and the Orientals have nose with intermediate measurements (Mesorrhine). <sup>2,3</sup> Nostrils were classified into seven types according to the inclination of the medial longitudinal axis. <sup>4</sup>

The nose may be evaluated by direct clinical measurements (morphometry), <sup>5,6,7</sup> by photography (photogrammetry), <sup>8,9,10</sup> lateral radiograph (cephalometry) <sup>11,12</sup> or more recently three-dimensional(3D) scans and digitizers. <sup>13</sup>

The purpose of the study was to obtain normal values of nose parameters in adult Nigerians in order to guide surgeons to correct various nose anomalies and aesthetic surgery especially on blacks.

## **Subjects And Methods**

The study group consisted of 1010 selected adult Nigerians (18 years and above) by convenience sampling of cases who attended the Ear Nose and Throat Clinic of two tertiary institutions in Nigeria, namely University College Hospital, Ibadan. University of Maiduguri Teaching

Hospital, Maiduguri. Non Nigerians and those with noticeable nose anomalies or bald subjects were excluded from the study.

The following measurements were carried out on each subject: Height (HT), upper facial height (UFH), Midfacial Height (MFH), Lower facial Height (LFH), Nasal tip protrusion (NTP), length of the nose (LN), width of the nose (WN), width of the columella (WC), length of columella (LC), inclination of medial longitudinal axis of the nostril (IMLA)

Measurements were obtained using sliding caliper, transparent protractor, measuring ruler, and height board. The facial and nasal measurements were carried out with the patients lying in supine position on an examination table, the inclination of the medial longitudinal axis of the nostril were measured with the patients head in recumbent position and with the mid facial plane in vertical position. The top and bottom points were marked on the skin of the nostrils and the inclination of line connecting the top and bottom points of the medial longitudinal axis were measured by placing the zero mark of the protractor on the point at the bottom of the nostrils while holding the protractor horizontal. The top point of the nostril indicates the degree of the inclination on the scale fig. 1, 2. The linear measurements were measured using sliding calipers and measuring tapes. The Data were analyzed using SPSS versions 16.0 software programme, the results were presented in tabular forms and diagrams, the statistical test (t-test, chi-square) and correlations studies were applied where appropriate, level of significance was taken to be  $P < 0.05$ . The data obtained were compared with the measurements of other population in literature.

## Results

Five hundred and seventy two (56.6%) were males and 438 (43.4%) were females, mean age of the study group was 33.2 years with age range of 18 – 70 years. The mean height was 1.64m with range of 1.43 – 1.91m.

Nasal measurements: The mean ( $\pm$  standard deviation) length of the nose found in the study was 47.6 (4.9)mm. In males it was 47.8 (4.9)mm and in females, 47.6 (4.9)mm. The mean of the nasal tip protrusion in males was 19.7 (2.2)mm and in females, 19.3 (2.2)mm, there was significant difference in the measurements between the two sexes ( $P < 0.05$ ). The mean width of the nose was 42.2 (3.7)mm, in males was 42.5 (3.9)mm and in females 41.8 (3.4)mm, there was significant difference in measurements between the sexes ( $P < 0.05$ ). The mean length of the columella was 13.8 (3.8)mm, in males 13.9 (3.8)mm and in females 13.7 (3.7)mm. The mean width of the columella was 9.6 (1.4)mm, in males 9.6 (1.4)mm, in females 9.5 (1.6)mm. There was no significant difference in measurements between the two sexes ( $P > 0.05$ ) Table 1.

Nostril type: The nostrils were symmetrical in all subjects in the study group. One hundred and twenty seven (12.6%) of the study group had nostril type III, 117 (11.6%) had type IV, 253 (25.0%) type V, 417 (41.3%) type VI, 96 (9.5%) had type VII and none in the study group with either type I or type II nostrils. There was no significant sex difference in the distribution of the nostril type ( $P > 0.05$ ) table 2. Relationship was found between the nasal measurements and the nostril type. Nostril type III was found with narrow width of the nose but longer Nasal tip protrusion, Length of columella and Length of the Nose. Whereas Nostril type VII was found to have wider Nose, short length of the nose, Nasal tip protrusion, Length of the columella. The length of the nose, nasal tip protrusion and length of the columella significantly decreased ( $P < 0.05$ ) from type III through type VII. Table 3.

Facial measurements: The mean (standard deviation) of upper facial height was 67.4 (7.5)mm, Mid-facial height was 62.1 (8.1)mm and lower facial height was 64.7 (6.8)mm ( $P < 0.05$ ). In males, the mean upper facial height was 67.8 (7.5)mm, the mean lower facial height was 65.1 (7.1)mm which was significantly longer ( $P < 0.05$ ) than in females, however, the mid-facial height varied non significantly amongst the sexes ( $P > 0.05$ ) table 4. A significant correlation ( $p < 0.05$ ) was observed between the height of an individual and nasal tip protrusion and width of the nose but varies non-significantly with the length of the nose, the height of an individual does not

necessarily influence the length of the nose. There was a significant correlation ( $p < 0.05$ ) observed between the different facial measurements and the height of an individual, a tall individual is likely to have a longer upper and lower facial height.

Measurement	Sex	N	Mean	SD	P. Value
Length of the nose (LN)	Male	572	47.8	4.9	0.9
	Female	438	47.6	4.9	
Width of the nose (WN)	Male	572	42.5	3.9	0.001*
	Female	438	41.8	3.4	
Nasal tip protrusion (NTP)	Male	572	19.7	2.2	0.3
	Female	438	19.3	2.2	
Length of the columella (LCR)	Male	572	13.9	3.8	0.4
	Female	438	13.7	3.7	
Width of the columella (WC)	Male	572	9.6	1.3	0.5
	Female	438	9.5	1.5	

Table 1: Nasal Measurement By Sex

572 males, 438 females, \*Significant values.

Inclination (Degrees)	Nostril type	Male N 572(56.6%)	Female N 438 (43.4%)	Total N 1010 (100%)
40-54	III	75(59.1)	52(40.9)	127(12.6)
0	IV	65(55.6)	52(44.4)	117 (11.6)
25-39	V	143(56.5)	110(43.5)	253(25.0)
10-24	VI	237(56.8)	180(43.2)	417(41.3)
Reverse	VII	52(54.2)	44(45.8)	96(9.5)

Table 2: Nostril Type By Sex

Chi square P = 0.9

Note: None in the study group was found with either Nostril type I or II

Nasal Measurements (mm)						
Nostril Type	N	Nasal tip Protrusion (NTP)	Width of Nose (WN)	Width of Columella(WC)	Length of Right Columella (LCR)	Length of Nose (LN)
III	127	22.6 $\pm$ 2.0	41.4 $\pm$ 4.4	9.6 $\pm$ 1.2	15.5 $\pm$ 4.1	50.9 $\pm$ 4.5
IV	117	18.3 $\pm$ 1.8	42.3 $\pm$ 3.4	9.5 $\pm$ 1.3	12.9 $\pm$ 3.4	47.4 $\pm$ 5.5
V	253	19.6 $\pm$ 2.2	42.2 $\pm$ 3.6	9.5 $\pm$ 1.3	13.9 $\pm$ 3.8	47.3 $\pm$ 4.7
VI	417	19.4 $\pm$ 1.6	42.2 $\pm$ 3.7	9.7 $\pm$ 1.3	13.8 $\pm$ 3.7	47.0 $\pm$ 4.6
VII	96	17.9 $\pm$ 1.8	42.8 $\pm$ 3.4	9.8 $\pm$ 1.5	12.1 $\pm$ 3.3	46.8 $\pm$ 5.1
P Value	0.000*	0.000*	0.05*	0.01*	0.000*	0.000*

Table 3: Nasal measurement according to nostril type in the study population.

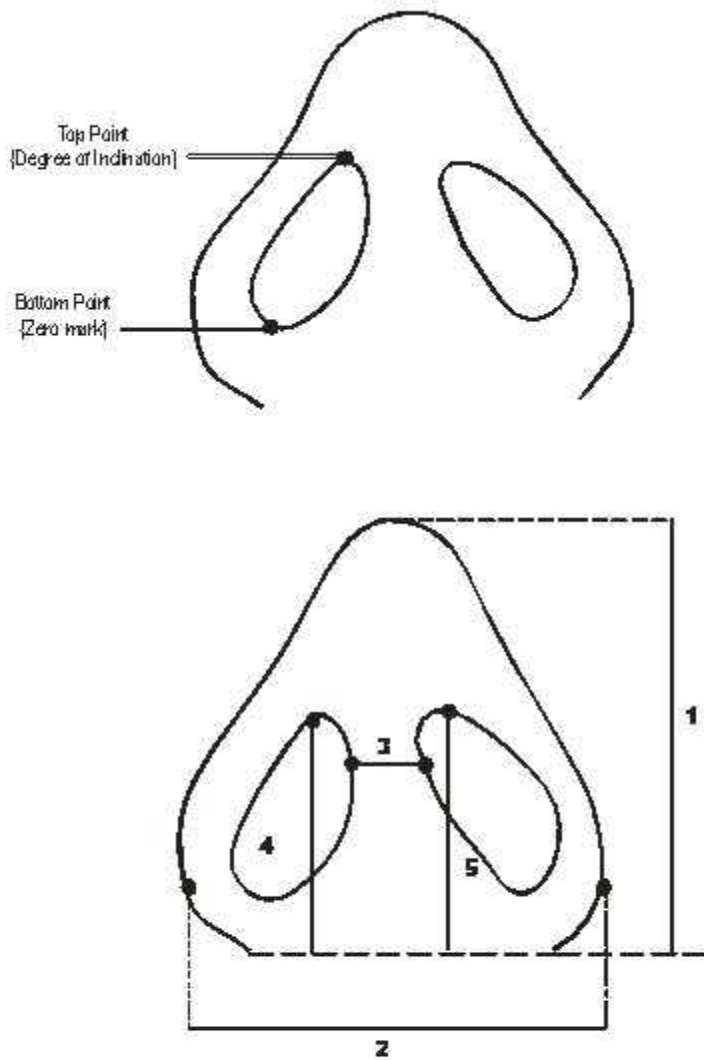
\*Significant values.

Measurements	Sex	N	Max (mm)	Min (mm)	Mean	SD	P
Upper facial height (UFH)	Male	572	93	50	67.8	7.5	0.05*
	Female	438	84	50	66.9	7.6	
Mid facial height (MFH)	Male	572	78	42	61.9	7.9	0.3
	Female	438	72	46	62.3	8.2	
Lower facial height (UFH)	Male	572	85	48	65.1	7.1	0.01*
	Female	438	83	50	64.2	6.2	

572 Males, 438 Females, \*Significant values.

Table 4: Facial Measurement By Sex





1. Nasal tip protrusion (NTP)
2. Width of the Nose (WN)
3. Width of the Columella (WC)
4. Length of the Columella (LCR)
5. Length of the Columella (LGL)

Figure 1: Surface Measurement of the soft Nose

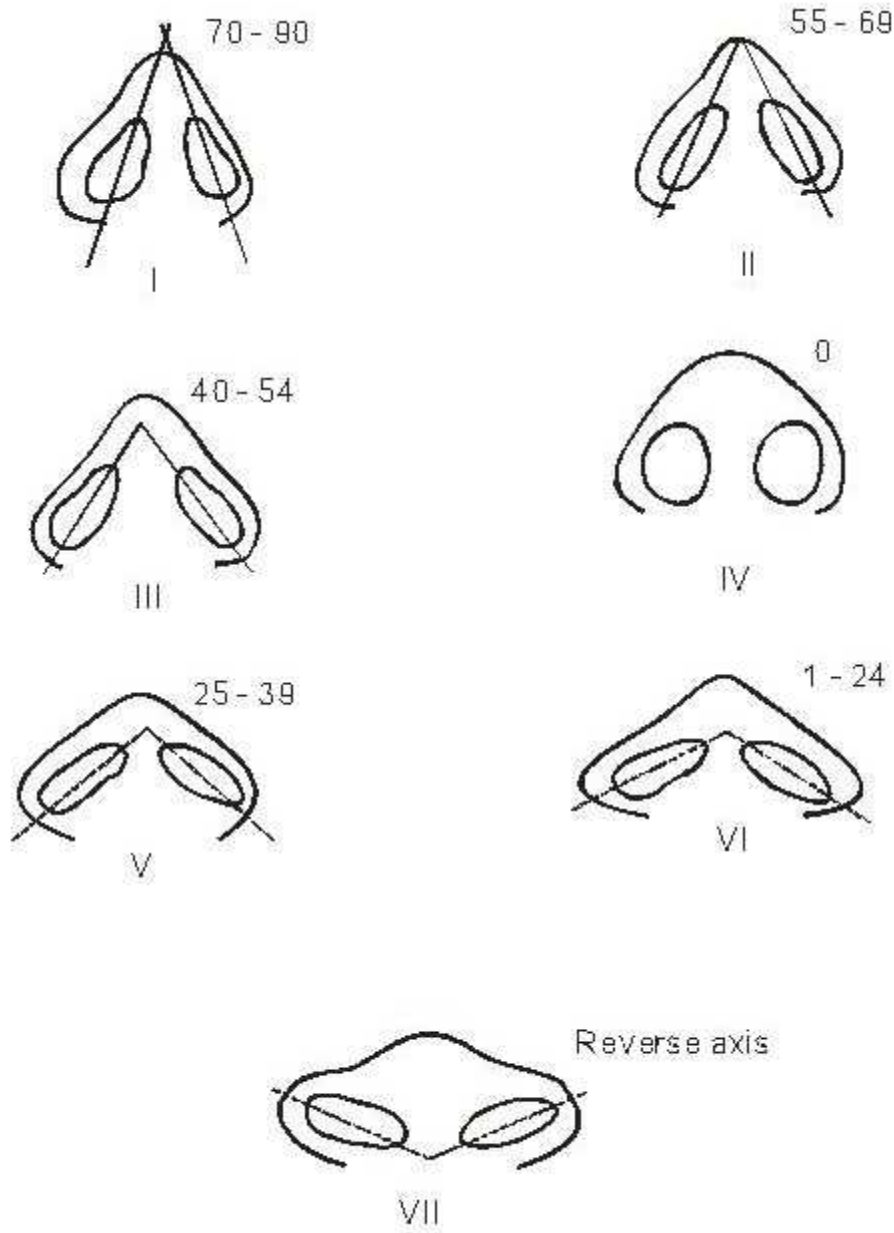


Figure 2: Nostril Type – Modified Topinard System Showing the average inclination of the medial longitudinal axis.

## Discussion

Anthropometry is the study of human body measurements, whereas morphometry is measurement of the external form.<sup>14</sup> Anthropometry of the face has always been interesting subject for artist and plastic surgeon, various modalities has been adopted to evaluate the dimensions of the nose and face but none stand out comprehensive.

The photogrammetric study involves taking measurements from life-size frontal and lateral view photographs of the head; however, its usefulness is limited due to errors resulting from improper positioning, in the marking technique or in identification of the land marks. However, good pre-operative and post-operative photographs are essential for rhinoplasty.<sup>15,16,17</sup> In cephalometric analysis of the nose, the radiographs were taken with the head held in natural position with the teeth occluded and both lips relaxed, measurements were obtained from the references points marked on the radiographs. However, the variability in the facial expression especially in the mobile parts of the face as well as improper positioning may affect the soft tissue measurements. Despite these, lateral cephalometric analysis has the advantage of simultaneously imaging the soft tissue profile and facial skeleton.<sup>11,18,19,20,21</sup> Direct measurement technique (morphometry) performed manually with such instruments as calipers and measuring tapes were reliable but could be flawed with human measurement error.<sup>7,22</sup> The three-dimensional measurements(3D-Scan) was found to be more reliable, data from the 3D-scanned images can be used to derive all of the traditional anthropometric measures, such as linear distances and angles and surface contours but its use is limited because of cost.<sup>13</sup> In this study a direct morphometric measurements on 1010 adult Nigerians was carried out. The traditional measurement technique was preferred over other anthropometric measurements because of the reliability and cost effectiveness especially in our environment.

The mean length of the nose in this study was 47.6(4.9)mm was similar to studies by Olutu et-al<sup>22</sup>, Garandawa et-al<sup>23</sup>, 46.4(7.9)mm,46.6(5.2)mm respectively, but significantly shorter in length according to the findings of Akpa et-al<sup>24</sup>, with PJ<sup>12</sup>, Amet et-al<sup>25</sup> who found the mean length of the nose to be 62.2mm, 55.0mm, 56.9mm respectively. The mean width of the nose in

this study was 42.2(3.7)mm, 33.6mm was found among the Turks, most Caucasians had narrower nose compared to blacks. <sup>7,26</sup> Typically negroid nose is platyrrhine, characterized by flaring of the alar nasi, broad nose base and thick columella as confirmed in this study. <sup>26</sup>

Nostril type V(25%) and VI(41.3%) were found to be most common in the study group, this is similar to the findings of Farkas et-al <sup>7</sup> who found that 50% of the negros in their study had nostril type VI. Nostril type III found in this study was very similar to the Caucasian nose found by Farkas, whereas Nostril type VII had all the characteristic of the negroid nose.

There was no sex differences in most of the measurements carried out in this study (Tables I & II), this is in contrast to studies by Olutu <sup>22</sup> Oladipo <sup>27</sup> who reported higher value ( $p < 0.005$ ) of all parameters in males compared to females.

The vertical facial measurements varied significantly ( $p < 0.005$ ), this is similar to the study by farkas <sup>4</sup> who found equality of no more than two parts of the face. The mean upper facial height was longer than the mean lower facial height in this studies, the reverse was reported by Bormah on young Turkish adults. <sup>28</sup> Height does not influence most of the nasal measurements but correlates the facial measurements in this study in contrast to the work of Kelso as reported by Farkas, most tall individual had relatively longer nose length. <sup>7</sup>

The factors responsible for the variations in the size, shape and length of the nose could include genetic factors, <sup>7</sup> race, tribe and environmental climatic conditions <sup>29</sup> with narrower noses being favoured in cold and dry climates and broader noses in warm and moist environment as a consequence of natural selection in human evolution <sup>30</sup>

Conclusion: Parameters evaluated in this study provides important data for forensic medicine, physical anthropometry data base and to guide surgeons in rhinoplasty, nasal reconstruction on adult Nigerian.

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