DOMAIN PUBLISHERS | DELTA STATE, NIGERIA

A PEER-REVIEWED BIANNUAL JOURNAL

DOMAIN HEALTH JOURNAL

VOLUME 2 | ISSUE 2

Where clinical science, basic medical science and public health intersect

RELEASE DATE: OCTOBER 2026

Editor-in-Chief: Prof (Mrs) Ese Anibor
Department of Human Anatomy and Cell Biology, Delta State University, Abraka, Nigeria

RESEARCH ARTICLE Original research | Anatomy and Dentistry

Anthropometric Analysis of the Lips of Ndokwa Females in Delta State, Nigeria

Ezewu T.[1] **and Edike J.O.**[2,*]

[1] Department of Oral Pathology and Oral Medicine, Faculty of Dentistry, Delta State University, Abraka, Nigeria.

[2] Department of Human Anatomy and Cell Biology, Faculty of Basic Medical Sciences, Delta State University, Abraka, Delta State, Nigeria.

ARTICLE INFORMATION

KEYWORDS

Anthropometry, lips, Ndokwa, females, Delta, Nigeria

CORRESPONDING AUTHOR

Edike J.O.

GSM: +2347039538523

Email: edikeoluchi800@gmail.com

ARTICLE HISTORY

Received: July 2026

Accepted: September 2026

Published: October 2026

HOW TO CITE

Ezewu T. and Edike J.O. (2026). Anthropometric analysis of the lips of Ndokwa females in Delta State, Nigeria. *Domain Health Journal*. 2(2).

ABSTRACT

Aim: The aim of this study is to determine selected anthropometric measurements of the lips among Ndokwa females in Delta State, Nigeria.

Materials and Methods: This descriptive cross-sectional study was carried out among 384 Ndokwa females aged 15–24 years from Ndokwa East, Ndokwa West and Ukwuani Local Government Areas of Delta State, Nigeria. Participants were selected using cluster sampling. Data were obtained using a structured questionnaire, while direct anthropometric measurements of the lips and lower third of the face were taken with a digital vernier caliper. The measurements obtained include upper lip height (Sn–Ls), lower lip/chin vertical measurement (Li–Me), intercommissural distance (Ch–Ch), total lip height, upper vermilion height (UVH), lower vermilion height (LVH), and lower facial height (Sn–Me). Data were analysed with the Statistical Package for the Social Sciences and Excel. Descriptive statistics include mean, standard deviation and coefficient of variation.

Results: The mean upper lip height (Sn–Ls) was 12.12 ± 1.57 mm, while the mean lower lip/chin vertical measurement (Li–Me) was 30.28 ± 4.95 mm. The mean intercommissural distance (Ch–Ch) was 42.41 ± 7.74 mm and the mean total lip height was 42.40 ± 5.35 mm. The mean upper and lower vermilion heights were 11.38 ± 1.49 mm and 12.39 ± 1.74 mm, respectively, while the mean lower facial height (Sn–Me) was 55.88 ± 7.66 mm. The intercommissural distance showed the highest coefficient of variation (18.25%), whereas upper lip height recorded the lowest coefficient of variation (12.99%). Differences were also observed in the measured dimensions across the age groups.

Conclusion: This study provides baseline anthropometric data on lip dimensions and related measurements of the lower third of the face among Ndokwa females aged 15–24 years in Delta State, Nigeria. The outcome of this study will serve as guide for anatomical, clinical, aesthetic and forensic experts.

INTRODUCTION

Anthropometry is concerned with the measurement of different parts of the human body and is an important aspect of anatomical research. It provides useful information on variations in body structure among individuals and populations. These variations may be influenced by factors such as age, sex, genetic background, nutrition and environmental conditions. Anthropometric measurements have applications in several areas, including medicine, forensic science and surgery, where accurate knowledge of body dimensions is required for assessment, identification and treatment (Eboh & John, 2023; Singh & Gupta, 2021).

Facial anthropometry is a branch of anthropometry concerned with the measurement of facial structures and their proportions. The human face is commonly considered in three vertical regions: the upper, middle and lower thirds. The lower third extends from the subnasale, located at the base of the nose, to the menton, which represents the lowest point of the chin. Assessment of these regions provides information about facial proportions, symmetry and overall facial form. Because facial dimensions may differ between populations, population-specific measurements are

important when describing facial morphology (Adebisi *et al*., 2021).

The lips occupy a prominent position within the lower third of the face and are important both functionally and aesthetically. They are composed principally of skin, muscle and mucous membrane, with the orbicularis oris forming an important muscular component. The lips participate in speech, food intake and facial expression, while their size, shape, width, height and symmetry contribute to the appearance of the face. Differences in these features may occur among individuals as a result of genetic, environmental and ethnic influences (Mensah *et al*., 2024; Ibrahim & Musa, 2022).

Several measurements may be used in the anthropometric assessment of the lips. These include upper and lower lip dimensions, total lip height and mouth width or intercommissural distance. Other measurements and proportional indices can also be used to describe the relationship between the lips and surrounding structures of the lower face. Such measurements have relevance in clinical fields including plastic and reconstructive surgery, orthodontics and maxillofacial surgery, where knowledge of facial dimensions and proportions contributes to treatment planning and the achievement of functional and aesthetic outcomes (Olatunji *et al*., 2023; Chen *et al*., 2022).

Facial measurements are not uniform across populations. Much of the available anthropometric information has been derived from European and Asian populations, and the application of such standards to African populations may not adequately account for population differences. For this reason, studies involving specific populations are necessary to establish measurements that more appropriately describe local facial morphology (Adeyemi *et al*., 2024).

Nigeria has considerable ethnic diversity, and differences in physical and facial features may exist between its various ethnic groups. Despite the importance of facial anthropometry, information remains limited for some Nigerian populations, particularly smaller or less-studied ethnic groups (Eze *et al*., 2023). The Ndokwa people of Delta State represent one such population. There is limited documented information on the anthropometric dimensions of the lips and lower third of the face among Ndokwa females, creating a need for population-specific data.

The absence of adequate population-specific measurements may limit the usefulness of generalized reference values in clinical, reconstructive and forensic applications. Accurate local data can provide a better basis for understanding facial variation and may contribute to anatomical research, clinical assessment and forensic identification. This is particularly relevant when facial measurements are interpreted in relation to ethnic and demographic background.

The present study therefore focused on the anthropometric analysis of the lips among Ndokwa females in Delta State, Nigeria. The study examined upper and lower lip dimensions, intercommissural distance, total lip height, lower facial height and vermilion measurements, as well as selected proportional relationships within the lower third of the face. It also considered variations in the measured dimensions among females aged 15–24 years. The outcome from this inquiry is of anthropological value and provides reference information for clinical, aesthetic and forensic procedures involving facial assessment.

MATERIALS AND METHODS

Ethical approval for the study was obtained from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, Delta State University, Abraka. The purpose and procedures of the study were explained to the participants, and only individuals who willingly consented to participate were recruited in April, 2026.

This descriptive cross-sectional study involved 384 Ndokwa females aged 15–24 years from Ndokwa East (Aboh), Ndokwa West (Kwale) and Ukwuani (Obiaruku) Local Government Areas of Delta State, Nigeria. Participants were selected using cluster sampling method based on the study criteria. The sample size of 384 participants was determined using the approach described by Araoye (2004). Individuals who are not from Ndokwaland, outside the specified age range, with facial deformities or injuries affecting the lips or lower face, or declined participation were excluded.

Data were collected using a structured questionnaire and a digital vernier caliper. The questionnaire was used to obtain relevant socio-demographic information, including age and confirmation of Ndokwa origin. Before measurement, participants were seated upright with the head maintained in a normal, relaxed position. Anthropometric measurements were taken from standard facial landmarks using the digital vernier caliper and recorded in millimetres. The measurements include subnasale to menton (Sn–Me), subnasale to labrale superius (Sn–Ls), labrale inferius to menton (Li–Me),

cheilion to cheilion (Ch–Ch), upper vermilion height (UVH) and lower vermilion height (LVH). The measurements were recorded on a structured data sheet.

The data were analyzed with the use of the Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Thus data collation, tabulation and presentation were carried out with the aid of SPSS and Microsoft Excel. Descriptive statistics including mean, standard deviation and coefficient of variation were calculated for the measured parameters.

RESULTS

Table 1: Age distribution of Ndokwa female participants

Age (years)	Frequency	Percentage (%)
15	51	13.28
16	36	9.38
17	42	10.94
18	31	8.07
19	28	7.29
20	48	12.50
21	38	9.90
22	29	7.55
23	35	9.11
24	46	11.98
Total	**384**	**100**

Table 1 summarizes the age distribution of the study populace. The 15-year-old group had the highest representation at 13.28% (51 subjects).

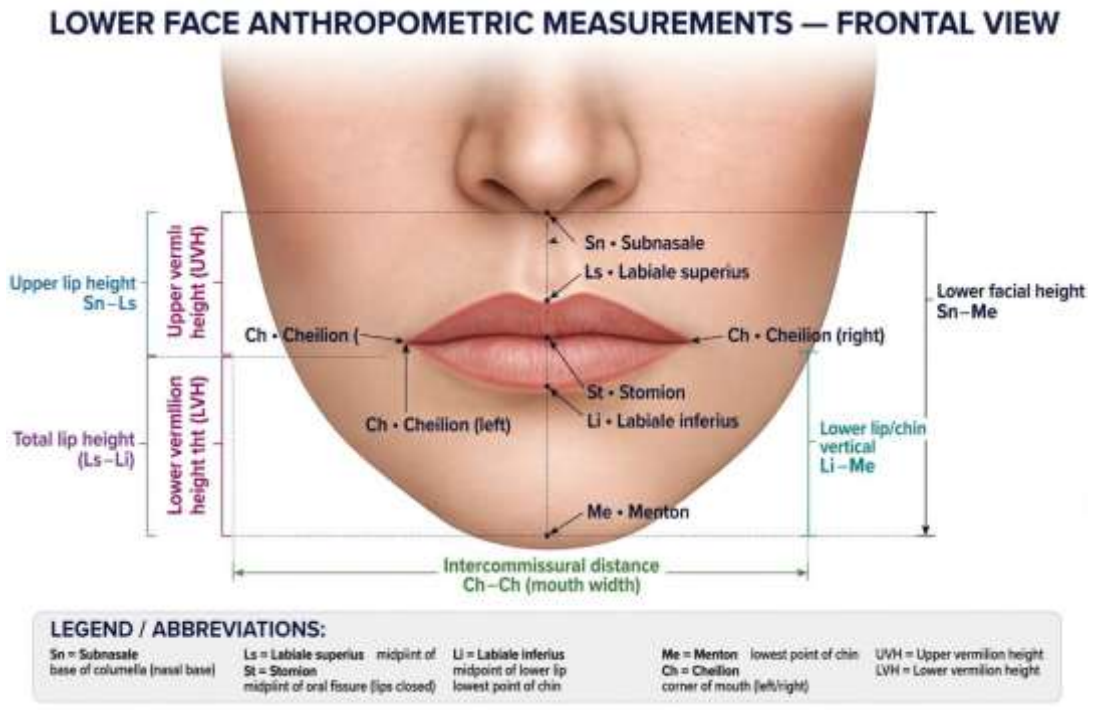

Figure 1: Schematic illustration of lower facial and lip anthropometric measurements in the frontal view.

Table 2: Descriptive statistics of lip and lower facial anthropometric measurements among Ndokwa females

Measurement	N	Mean	SD	Minimum	Maximum
Upper lip height (Sn–Ls)	384	12.12	1.57	8.08	20.10
Lower lip height (Li–Me)	384	30.28	4.95	17.22	49.69
Mouth width (Ch–Ch)	384	42.41	7.74	22.69	71.67
Total lip height	384	42.40	5.35	27.24	61.58
Lower facial height (Sn–Me)	384	55.88	7.66	30.66	89.29
Upper lip vermilion height	384	11.38	1.49	3.43	17.57
Lower lip vermilion height	384	12.39	1.74	5.14	18.00

Key: N = number of participants; SD = standard deviation; Sn = subnasale; Ls = labiale superius; Li = labiale inferius; Me = menton; Ch = cheilion. Measurements are reported in millimetres (mm).

Table 2 shows that the mean lower facial height (Sn–Me) recorded is 55.88 ± 7.66 mm, while average mouth width (Ch–Ch) and total lip height are 42.41 ± 7.74 mm and 42.40 ± 5.35 mm respectively. Lower lip vermilion height (12.39 ± 1.74 mm) is slightly larger than upper lip vermilion height (11.38 ± 1.49 mm).

Table 3: Proportional relationships

Proportion	N	Mean	SD	Minimum	Maximum
Upper : Lower lip height ratio	384	0.409	0.075	0.172	0.835
Total lip height / Lower facial height	384	0.765	0.096	0.514	1.527

Table 3 divulged the proportional relationships with a mean upper-to-lower lip height ratio of 0.409 ± 0.075.

Table 4: Mean anthropometric measurements according to age group

Age	Sn–Ls	Li–Me	Ch–Ch	Total lip height	Sn–Me	UVH	LVH
15	11.29	27.44	37.47	38.73	48.22	10.90	12.23
16	11.86	28.26	38.49	40.12	50.86	11.28	12.33
17	11.79	28.81	38.88	40.60	52.84	10.98	12.56
18	12.63	30.67	43.02	43.30	55.48	11.28	12.99
19	12.36	30.32	41.73	42.68	56.85	11.47	12.25
20	12.45	31.06	44.81	43.51	59.02	11.50	12.14
21	12.42	30.86	44.43	43.29	58.70	11.59	12.60
22	12.25	31.61	45.18	43.86	59.12	11.83	12.66
23	11.98	32.74	45.81	44.71	59.30	11.59	12.36
24	12.49	32.04	45.66	44.53	60.46	11.62	12.06

Note: Sn–Ls = subnasale–labiale superius (upper lip height); Li–Me = labiale inferius–menton (lower lip/chin vertical measurement); Ch–Ch = cheilion–cheilion (mouth width); Sn–Me = subnasale–menton (lower facial height); UVH = upper vermilion height; LVH = lower vermilion height. All values represent mean dimensions in millimetres (mm).

Table 4 shows the variation in mean facial parameters across individual age groups from 15 to 24 years. Vertical lower facial dimensions increased steadily with age, as seen in mean lower facial height (Sn–Me) increase from 48.22 mm at age 15 to 60.46 mm at age 24. Mouth width similarly expands across the age groups, rising from 37.47 mm at age 15 to 45.66 mm at age 24.

Table 5: Mean, standard deviation and coefficient of variation of anthropometric measurements among Ndokwa females

Measurement	Mean	SD	CV (%)
Lower facial height (Sn–Me)	55.88	7.66	13.70
Upper lip height (Sn–Ls)	12.12	1.57	12.99
Lower lip/chin vertical measurement (Li–Me)	30.28	4.95	16.36
Mouth width (Ch–Ch)	42.41	7.74	18.25
Upper vermilion height (UVH)	11.38	1.49	13.07
Lower vermilion height (LVH)	12.39	1.74	14.07

Key: SD = standard deviation; CV = coefficient of variation.

Table 5 shows that mouth width (Ch–Ch) exhibited the highest degree of variability among the study group at 18.25%, followed by lower lip/chin height at 16.36%. Upper lip height (Sn–Ls) showed the lowest variability at 12.99%, indicating it is the most stable parameter across subjects.

DISCUSSION

This study assessed the anthropometric characteristics of the lips among 384 Ndokwa females aged 15–24 years in Delta State, Nigeria. The mean upper lip height (Sn–Ls) was 12.12 mm, Li–Me was 30.28 mm, mouth width (Ch–Ch) was 42.41 mm, total lip height was 42.40 mm, upper vermilion height was 11.38 mm and lower vermilion height was 12.39 mm. The slightly greater lower vermilion height suggests that the visible lower vermilion was marginally greater in vertical dimension than the upper vermilion. These findings provide population-specific information on lip morphology and support previous reports that lip and facial dimensions vary among ethnic and population groups (Ibrahim & Musa, 2022; Mensah *et al*., 2024).

The mean mouth width and total lip height were numerically similar, but they represent different anatomical dimensions. Mouth width describes the horizontal distance between the oral commissures, whereas total lip height represents a vertical measurement of the lip region. The mean lower facial height (Sn–Me) was 55.88 mm. The total lip height-to-lower facial height ratio was 0.765, while the upper-to-lower lip height ratio was 0.409. These proportional measurements provide additional information on the relationship between the lips and surrounding lower facial structures. Previous studies have emphasized the importance of facial proportions and population-specific measurements in understanding facial morphology (Adebisi *et al*., 2021; Rahman *et al*., 2021; Olatunji *et al*., 2023).

Differences were observed in several measurements across the 15–24-year age range. Mouth width increased from 37.47 mm at age 15 to 45.66 mm at age 24, total lip height increased from 38.73 mm to 44.53 mm, and Li–Me increased from 27.44 mm to 32.04 mm. In contrast, upper lip height and the vermilion measurements fluctuated across the age groups rather than showing a continuous increase. This suggests that age-related differences were more evident in mouth width, total lip height and broader lower facial dimensions than in individual lip components. However, because the study was cross-sectional, these differences represent variations between age groups and cannot be interpreted as direct changes occurring within the same individuals.

The coefficient of variation showed differences in the degree of individual variability. Mouth width had the highest coefficient of variation (18.25%), followed by Li–Me (16.36%), while upper lip height had the lowest (12.99%). Thus, mouth width was relatively more variable among the participants, whereas upper lip height was comparatively consistent. This individual variation agrees with previous findings of differences in facial and lip morphology among Nigerian ethnic populations (Bello *et al.*, 2022; Okeke *et al*., 2023; Adeleke & Balogun, 2025).

The findings have potential relevance to anatomical, anthropological, orthodontic, reconstructive, aesthetic and forensic procedures. Accurate measurements of lip height, mouth width and vermilion dimensions can provide useful baseline information for assessing facial proportions and symmetry (Olatunji *et al*., 2023; Okorie *et al*., 2023). However, the present measurements should be regarded as reference data for Ndokwa females aged 15–24 years rather than universal standards for all Nigerian females.

Overall, the study provides population-specific anthropometric data on the lips of Ndokwa females. The findings show that lower vermilion height was slightly greater than upper vermilion height, mouth width had the greatest relative variability, and upper lip height was the most consistent measurement. Age-related differences were more apparent in mouth

width, total lip height and Li–Me, while some individual lip measurements fluctuated across the age groups. These findings contribute to the limited anthropometric information available for the Ndokwa population.

CONCLUSION

The lips of Ndokwa females aged 15–24 years possess anthropometric characteristics that vary among individuals and across the different age groups studied. Across the 15–24-year age range, mouth width, total lip height and the broader lower facial measurements generally showed higher mean values among the older age groups, although individual lip measurements did not all follow a continuous pattern of increase.

The lower vermilion was slightly greater in mean height than the upper vermilion. The proportional measurements further provided information on the relationship between the different lip dimensions and the lower facial region. Mouth width showed the greatest relative variability among the measured parameters, whereas upper lip height showed the least variability.

Overall, the study provides population-specific baseline anthropometric information on the lips of Ndokwa females aged 15–24 years. The findings contribute to the available anthropometric data on Nigerian populations and may provide useful reference information for further anatomical, anthropological, clinical and forensic studies involving lip morphology and facial proportions.

REFERENCES

Adebisi S. S., Oladipo G. S., & Oyeleke S. A. (2021). Facial anthropometric analysis among adult Nigerians. Journal of Morphological Sciences, 38(2), 85–92.

Adeola A. A., & Ibe S. N. (2020). Facial proportions among young adults in Nigeria. Nigerian Journal of Anatomy, 13(1), 21–28.

Bello S. A., Musa A. U., & Abdullahi M. (2022). Evaluation of facial indices among Nigerian populations. West African Journal of Anatomy, 14(1), 33–41.

Eze C. U., Okoye I. J., & Nwankwo C. C. (2023). Anthropometric variations among ethnic groups in Nigeria: Implications for clinical practice. West African Journal of Anatomy, 14(2), 60–68.

Ibrahim M. B., & Musa H. U. (2022). Morphological variations of the lips among African populations. International Journal of Anatomy and Research, 10(3), 8500–8506.

Mensah K. B., Owusu E., & Boateng P. (2024). Lip morphology and facial aesthetics: A comparative study across populations. Anatomy Research International, 2024, 1–9.

Olatunji A. O., Ogunlade S. O., & Akinola O. B. (2023). Clinical relevance of facial anthropometry in reconstructive surgery. Nigerian Journal of Plastic Surgery, 19(1), 22–29.

Okeke T. C., Eze C. U., & Nwankwo C. C. (2023). Anthropometric variations in facial structures among Nigerian ethnic groups. West African Journal of Anatomy, 14(3), 72–80.

Okorie E. O., Umeh C. N., & Obi P. C. (2023). Clinical applications of facial anthropometry in reconstructive surgery. Nigerian Journal of Plastic Surgery, 19(2), 30–38.

Rahman M. M., Islam S., & Karim M. R. (2021). Anthropometric evaluation of facial proportions in different populations. Journal of Anatomy and Society, 30(2), 101–108.