**ORIGINAL ARTICLE**

# Anthropometric Study of Upper and Lower Facial Height and Their Correlation in Adult Healthy Bangladeshi Buddhist Rakhain Ethnic Females

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## Abstract

**Background:** There is no available anthropometric data on the facial features of the Rakhain population of Bangladesh. **Objective:** The aim of the study was to describe a standard of normative facial anthropometric values related to the facial height of adult healthy Bangladeshi Buddhist Rakhain females. **Methodology:** This cross-sectional observational study was carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from January 2011 to December 2011 for a period of one (01) year. Adult healthy Bangladeshi Buddhist Rakhain females in the age group of 18 to 30 years were included as the study population. The standard of normative facial anthropometric values related to facial heights were measured by upper facial height (UFH) and lower facial height (LFH). **Results:** A total number of 100 adult healthy Bangladeshi Buddhist Rakhain females were recruited for this study. The mean with SD of LFH was 56.40($\pm$5.49) and the mean with SD of UFH was 46.68($\pm$3.34). LFH was significantly greater than UFH. **Conclusion:** In conclusion, the standard of normative facial anthropometric values related to LFH is significantly greater than UFH among the adult healthy Bangladeshi Buddhist Rakhain females. [*Journal of Current and Advance Medical Research, January 2023;10(1):31-34*]

**Keywords:** Anthropometric; upper facial height; lower facial height; Rakhain ethnic group

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## Introduction

Anthropometry is the study of comparative measurements of the human body[1]. The human face is a complex mosaic of lines, angles, planes, shapes, textures, and colours. The interplay of these elements produces an infinite variety of facial forms ranging from near-perfect symmetry to extreme disproportion[2]. Thus it is used for expression, appearance and identity amongst others. It is widely recognised as the feature which best distinguishes a person, often at first glance. According to Farkas et al[3] geographic variations in body size and shape in humans are well documented and also climatic adaptations and nutritional factors are found to be determinants of body shape and size.

The available anthropometric values related to this study are limited to Caucasians. Moreover, there is no available anthropometric data on the facial features of the Rakhain population of Bangladesh. The present study, therefore, is expected to make a

contribution in setting a standard of normative facial anthropometric values related to facial heights of the adult healthy Bangladeshi Buddhist Rakhain females. The results of this study are expected to be useful in age, sex and ethnic differentiation, in plastic, aesthetic and reconstructive surgery, orthodontics and forensic reconstruction as well as genetic counseling. The aim of the study was to describe a standard of normative facial anthropometric values related to the facial height of adult healthy Bangladeshi Buddhist Rakhain females.

## Methodology

**Study Settings and Population:** This cross-sectional observational study was carried out in the Department of Anatomy at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from January 2011 to December 2011 for a period of one (01) year. Participants of the study were adult healthy Bangladeshi Buddhist Rakhain ethnic females who were in the age group of 18 to 30 years. The following exclusion criteria were used to screen out the ineligible participants through history taking and physical examinations like mixed ethnic origin, congenital craniofacial anomaly, major craniofacial trauma, orthodontic treatment or craniofacial reconstructive surgery, malocclusion, common genetic, endocrine or neurological disorders, craniofacial diseases and abnormalities, growth related disorders and history of facial trauma/reconstruction surgery were excluded from the study.
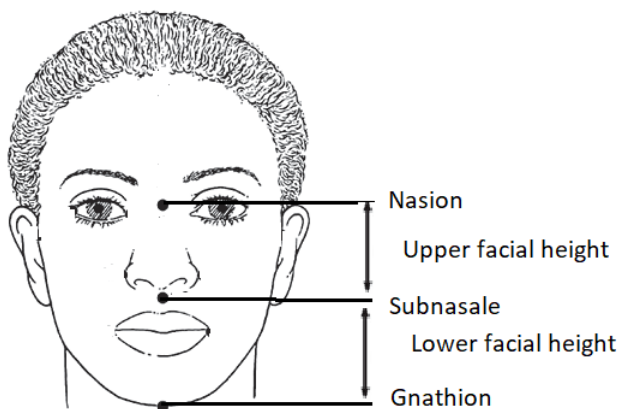


**Figure I: Landmarks and measurements on the human face[5]**

**Study Procedure:** The landmarks used for taking different physical measurements have been described by Kolar and Salter[6]. The landmarks in the study were defined as follows: (1) Nasion, it is the midpoint of the naso-frontal suture. In the lateral view, it represents the apex of the fronto-nasal angle; (2) Subnasale, it is the junction between the lower border of the nasal septum and the cutaneous portion of the upper lip in the midline; (3) Gnathion, it is the lowest point in the midline on the lower border of the chin. Upper facial height (UFH) is defined as the distance between nasion and subnasale. Lower facial height (LFH) is a distance between sub-nasale and Gnathion[7].

**Statistical Analysis:** The data was statistically analyzed by Statistical Package for Social Science (SPSS version 17.0) to determine the range, the mean and standard deviation and any significant correlation between upper and lower facial heights. After meticulous checking and rechecking, data was compiled and statistical analysis – measures of dispersion (mean, standard deviation) and the tests of significance (Unpaired Student's T test and $x^2$ test) were done using computer. 'P' value <0.05 was considered as significant.

**Ethical Measures:** Informed written consent was taken from each patient. Prior to consent they were explained in local language about the aim and purpose of the study. All participants were informed about the advantages and disadvantages of both procedures.

## Results

Table 1 shows linear measurement of Lower Facial Height (LFH), Upper Facial Height (UPH). It was found that mean of LFH was 56.40($\pm$5.49) and mean of UFH was 46.68($\pm$3.34). LFH were significantly greater than UFH.

**Table 1: Values of the Upper Facial Height (UFH) and Lower Facial Height (LFH) in the adult healthy Bangladeshi Buddhist Rakhain females (n=100)***

| Vertical Facial Height | Value (mm) | |
|---|---|---|
| | Range | Mean ($\pm$SD) |
| UFH (n − sn) | 41.02−55.19 | 46.68 ($\pm$3.34) |
| LFH (sn − gn) | 42.17−69.34 | 56.40 ($\pm$5.49) |

*n: nasion; sn: subnasale; gn: gnathion; †From paired t test; p $\leq$ 0.05 was considered as significant; S: Significant; UFH: Upper Facial Height; LFH: Lower Facial Height; Stident t Test was performed to see the level of significance; p value was 0.001

The most frequent variation (90%) was UFH smaller than LFH and 07% was UFH equal to LFH (Table 2).

**Table 2: Frequencies of Variation in Upper Facial Height (UFH) and Lower Facial Height (LFH) In the Adult Healthy Bangladeshi Buddhist Rakhain Females (n=100)***

| Variation | Frequency | Percent |
|---|---|---|
| UFH = LFH (n-sn = sn-gn) | 7 | 7.0 |
| UFH >LFH (n-sn > sn-gn) | 3 | 3.0 |
| UFH < LFH (n-sn < sn-gn) | 90 | 90.0 |
| **Total** | **100** | **100** |

*n (no. of participants)=100 females; n: nasion; sn: subnasale; gn: gnathion; †From paired t test; p ≤ 0.05 was considered as significant; S: Significant; UFH: Upper Facial Height; LFH: Lower Facial Height

## Discussion

It is known that the pattern of nutritional intake in people is influenced by several factors, and religion is one of them. Relethfordand Crawford studied on influence of religion on the genetic structure in the people of Northern Ireland using data regarding craniofacial measurements and reported that religion has a significant influence on genetic variations[8], and thus on craniofacial growth and development. The Rakhains are predominantly Buddhists. Therefore, to minimize the effect, if there be any, of difference of religion on the craniofacial variables, the participation in the present study was restricted to a single religious group, the Buddhists.

In the present study, the mean of UFH and LFH were 46.68 (±3.34) and 56.40 (±5.49), respectively. A significant difference ($p < 0.05$) was found in the mean of UFH and LFH in Rakhain population. Baral et al[7] also found statistically significant differences of the UFH and LFH proportions among the different racial groups. In 2006 Obaidi[9] also observed that there was certain variation in facial height among dentoskeletal groups.

**Table 3: Comparisons of the Rakhain Female Mean Values of UFH and LFH with the Means of Other Female Population Groups**

| Different Ethnic Group | Age Group | Sample Size | Reference | Mean UFH (n–sn) | Mean LFH (sn-gn) |
|---|---|---|---|---|---|
| Korean American | 18 to 30 Years | 30 | Choe et al[10] | S | L |
| Thai | 18 to 30 Years | 30 | Farkas et al[3] | S | S |
| Japanese | 18 to 30 Years | 30 | Farkas et al[3] | L | L |
| Indian | 18 to 30 Years | 30 | Farkas et al[3] | S | S |
| Indian American | 18 to 30 Years | 30 | Husein et al[11] | S | S |
| Turkish | 18 to 25 Years | 228 | Bozrik et al[12] | S | L |
| Azerbaiian | 18 to 30 Years | 30 | Farkas et al[3] | L | L |
| Bulgarian | 18 to 30 Years | 30 | Farkas et al[3] | L | S |
| Czech | 18 to 30 Years | 30 | Farkas et al[3] | L | L |
| Croatian | 18 to 30 Years | 30 | Farkas et al[3] | S | S |
| German | 18 to 30 Years | 30 | Farkas et al[3] | L | L |
| Greek | 18 to 30 Years | 30 | Farkas et al[3] | L | L |
| Slovak | 18 to 30 Years | 30 | Farkas et al[3] | S | S |
| African American | 18 to 30 Years | 30 | Porter and Olson[5] | S | L |
| Angolan | 18 to 30 Years | 30 | Farkas et al[3] | S | S |
| Zulu | 18 to 30 Years | 30 | Farkas et al[3] | S | L |

*S (Similar): Rakhain females' mean value is similar to that of the mentioned population (varying by 10% or less). L (Lower): Rakhain females' mean value is lower than that of the mentioned population; H (Higher): Rakhain females' mean value is higher than that of the mentioned population; UFH: Upper Facial Height; LFH: Lower Facial Height

No data on the Rakhain population on any of these variables are available in the scientific literature to compare with the present data. However, data from other populations have been drawn from different studies to make comparisons of means.

The comparisons of the Rakhain female mean values of UFH and LFH with the means of other female population groups were analyzed. The mean values of UFH and LFH in the Rakhain females were similar (S) to those in the Thai, Indian, Indian

America, Croatian, Slovak and Angolan populations mentioned. However, the Rakhain females had lower values (L) than Japanese, Azerbaijan, Czech, German and Greek female populations. The Rakhain females did not show higher means than any of the population mentioned.

## Conclusion

In conclusion the standard of normative facial anthropometric values related to LFH is significantly greater than UFH among the adult healthy Bangladeshi Buddhist Rakhain females. The findings of this study may help to establish the facial height in adult healthy Bangladeshi Buddhist Rakhain females which will be helpful for treatment planning in orthodontic and reconstructive surgery. Furthermore, the data of the present study are useful in standardizing a Bangladeshi Buddhist female Rakhain database of facial variables. Discussions comparing these data with corresponding data from other populations may also be useful as well as proper use in surgery, orthodontics and forensic reconstruction are possible.

**Conflict of Interest**
The authors have no conflicts of interest to disclose

**Contributions to authors:** Hossain S, Iqbal M prepared the manuscript from protocol preparation upto report writing. Iqbal M, Yeasmin F, Begum F, Sultana R have revised the manuscript. Hossain S has prepared the manuscript. All the authors have involved from protocol preparation up to manuscript writing & revision.

**Data Availability**
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

**Ethics Approval and Consent to Participate**
Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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