RESEARCH PAPER

Morphometrical analysis of upper facial skeleton with respect to craniometric points in South Indian dry skulls

Running title: *Morphometric analysis of upper facial skeleton in South Indian dry skulls*

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ABSTRACT

Introduction: The upper facial skeleton consists of 13 bones without considering the mandible. Measurement of facial skeleton either in the living subjects, dry skulls, or cephalograms is commonly used in the investigation of growth and development of face, jaw, and dentition. With this, the present study aimed to analyze the upper facial skeleton using morphometric analysis in South Indian dry skulls.

Aim: To analyse morphometrically the upper facial skeleton with respect to craniometric points in South Indian dry skulls.

Materials and Methods: A total of 30 dry human skulls of the South Indian population from the Department of Anatomy in Saveetha Dental College and Hospitals were used in the study. The morphometric parameters were measured using a digital Vernier caliper. The data was collected and represented in graphs. The data was analysed statistically by using t-test in Graph pad with 95% confidence interval.

Results: The present study has observed that the average distance between left frontotemporale to the right frontotemporale was 94.63 mm ± 5.1 mm, nasion to prosthion 58.08 ± 2.1 mm, left frontomalar temporale to right frontomalar temporale was 97.95 mm ± 3.5 mm, nasion to lowest point on lower border of nasal aperture was 52.44 ± 2.8.

Conclusion: The present study, thus, concluded that the morphometric knowledge of the upper facial skeleton is very important in anthropological, evolutionary studies, ethnic group comparisons, sex determination, and surgeries.

Keywords: Morphometry, Anthropology, facial surgeries, Frontal breadth, Sex determination.

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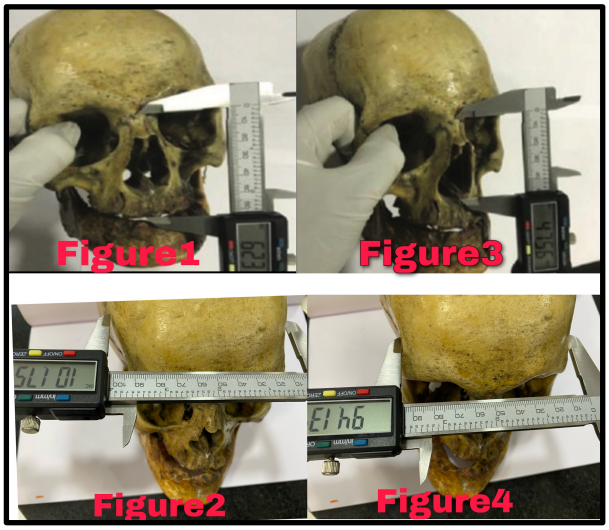
INTRODUCTION :

The face, unique for all individuals in the world. The facial skeletons such as the squamous part of the frontal bone, nasal bone, zygomatic, maxilla and mandible contribute to the skeletal framework. The craniometric points are very important to regions from which the measurements of the skull to be done. The morphometry is the quantitative analysis of form, that consists of size and shape ((1). Here are 13 bones that contribute to the formation of the upper facial skeleton((2)(3).They are a pair of nasal, lacrimal, maxilla, palatine, zygomatic, and vomer(4)(5).The craniofacial growth is directed by the functional and spatial demands of developing neighboring structures such as skeletal muscle includes facial muscles and masticatory muscles and other developing anatomical structures such as brain, eyes, and paranasal sinuses(4,6)

Carlson,1977, has shown in his study that since 1200 years, there have been many changes in cranial vault and facial skeleton(7) (8). Measurement of the upper facial skeleton either in the living subjects, dry skulls, or cephalograms is often used in the investigation of growth and development of face and dentitions (9,10). The best methodology that has yet been devised is the contemporary morphometric toolkit (11,12). Anthropometric studies are an integral part of craniofacial surgery and syndromology (13,14). The present study aimed to analyse morphometrically of the upper facial skeleton with respect to craniometric points in South indian dry skulls.

MATERIALS AND METHODS:

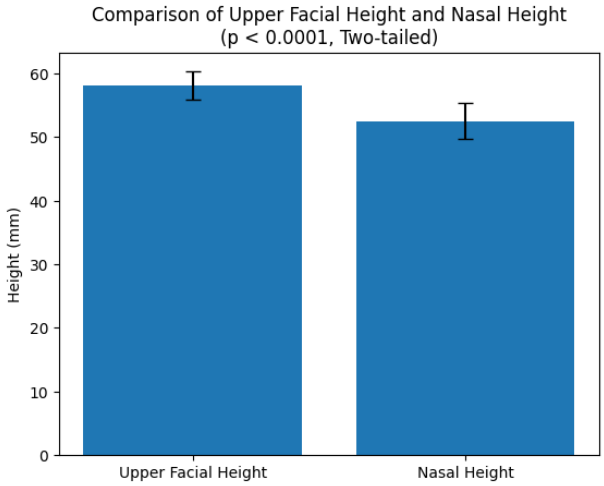
A total of 30 dry human skulls of the South Indian population from the Department of Anatomy in Saveetha Dental College and Hospitals were used to carry out this study. The parameters included in the study are measuring the distance between nasion to prosthion:Upper facial height (Figure1), distance between left and right frontotemporale:Minimum frontal breadth (Figure2), distance between left and right frontomalar temporales: Upper facial breadth (Figure4) , distance between nasion to lowest point on lower border of nasal aperture:Nasal height (Figure3). These parameters were measured using a digital Vernier caliper. The data are collected and represented in graphs.The data was analysed statistically by using t-test in Graph pad with 95% confidence interval.



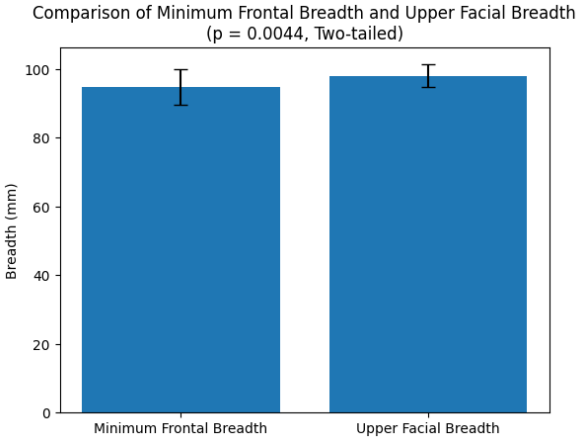
RESULTS:

The present study has observed from the graphs-1, 2 and 3, that the average distance between following parameters. They are 1)right and left fronto temporale is 94.62 mm±5.13 mm-minimum frontal breadth, 2)nasion and prosthion is 58.08 mm±2.17mm-upper facial height, 3)right and left fronto malure temporale is 97.95 mm±3.30 mm-upper facial breadth, 4)nasion and lowest point on the border of the nasal aperture is 52.44 mm±2.81mm-nasal height.

The present study analysed the above mentioned parameters by using t-test in Graph pad. In graph 1, it was observed that there was a significant difference observed between upper facial height and nasal height, the p-value was less than 0.000, upper facial height and nasal height, the two tailed p-value was less than 0.0001.



Graph1- Depicts that between the (1) upper facial height and (2) nasal height. The upper facial height is 58.08 mm with a standard deviation of 2.17 mm represented by an error bar and the nasal height is 52.44 mm with a standard deviation of 2.81mm represented. There was a significant difference observed between upper facial height and nasal height, the two tailed p-value was less than 0.0001.



Graph 2- Depicts that between (1) minimum frontal breadth, (2) upper facial breadth.The minimum frontal breadth is 94.62 mm with a standard deviation of 5.13 mm represented and the upper facial breadth is 97.95 mm represented with a standard deviation of 3.30 mm. There was a significant difference observed between minimum frontal breadth and upper facial breadth, the two tailed P value equals 0.0044.

DISCUSSIONS:

The process of measuring the external shape and dimensions of the living body is called morphometry (15,16). This helps in anthropology, evolutionary studies, sex determination, syndromology and surgeries (17). Similar to our study's findings,we have seen that phylogeny and size significantly contribute to variation in skull shape,(18) considerable variations in bill and cranium shape and size of law closing muscles have been reported (19,20). The Chinese have greater facial measurements when compared to Malay and Indians(21).

Similar to the results of our study, the distance between Nasion to Prosthion in a previous study is 58.08mm with a standard deviation of 2.1mm (22,23). Also, the present study found that mean nasal height for Jats and Sindhis were 56.42±3.70 & 55.84±4.61 respectively (24–26). In the study it was observed that there was a significant difference observed between upper facial height and nasal height, the two tailed p-value was less than 0.0001 and minimum frontal breadth and upper facial breadth, the two tailed P value equals 0.0044 (Graph 1 & 2).

It was observed in the previous study that in a Jordanian population, estimates of dimorphism are highly variable (8,27,28) and the present study observed the importance of craniometric points and morphometric knowledge (13).

Similar to the results in the present study, in a previous study it was noticed that assessment of morphometric parameters helped to analyze changes in adults.(4) The present study observed that there's a markedly different craniofacial shape of males and females and also that the growth of facial features is a marker of body growth (29–31) and it is useful to investigate therapeutic and growth related changes(32–34) (35). Limitation of this study was that it was performed on only a small sample and does not represent the whole population. Future scope of the study is to plan for analysing large samples and interpret with new findings.

CONCLUSION :

The present study, thus, concluded that the morphometric knowledge of the upper facial skeleton is off utmost important in anthropological, evolutionary studies, sex determination, and surgeries.

AUTHOR CONTRIBUTIONS:

Ms.Hooriyah : Literature search,Data Collection,Manuscript Writing.

Dr.Dinesh Premavathy : Study design,Data verification,Manuscript Drafting, Manuscript correcting.

CONFLICT OF INTEREST:

None to declare.

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