BJHS
Birat Journal of Health Sciences

**ISSN:**

2542-2758 (Print) 2542-2804 (Online)

**ARTICLE INFO:**

Received Date: 13 July, 2025
Accepted Date: 10 August, 2025
Published Date: 31 August, 2025

**KEYWORDS:**

Anthropometry; head length; stature; correlation; medical students.

**CORRESPONDING AUTHOR:**

**Sanjib Kumar Sah**
Assistant Professor
Department of Anatomy
Birat Medical College Teaching Hospital, Tankisinuwari, Morang, Nepal
Email: drsanjibsahanatomy@gmail.com
ORCID: 0000-0001-8361-5497

Access the article online

**DOI:** 10.62065/bjhs698

**CITATION:**

Sah SK, Parajuli SB, Adhikari RK, Bhakta S. Correlation between the Stature and Head Length among Undergraduate Medical Students in a Medical College of Eastern Nepal. 2025; 10 (2): 69-73.



# Correlation between the Stature and Head Length among Undergraduate Medical Students in a Medical College of Eastern Nepal

***Sanjib Kumar Sah[1], Surya Bahadur Parajuli[2], Rakesh Kumar Adhikari[1], Shalini Bhakta[3]***

[1] Department of Anatomy, Birat Medical College Teaching Hospital, Tankisinuwari, Morang, Nepal
[2] Department of Community Medicine, Birat Medical College Teaching Hospital, Morang, Nepal
[3] Department of Community Medicine, Devdaha Medical College & Research Institute, Bhaluhi, Rupandehi, Nepal

## ABSTRACT

Introduction: Stature is a crucial parameter in forensic and anthropological sciences used for personal identification. It has a significant biological correlation with various body parts, including head length. The current study aims to determine whether a statistically significant relationship exists between the stature and head length of undergraduate medical students.

Objective: The objective of this study was to assess the correlation between the stature and head length among undergraduate medical students in eastern Nepal.

Methodology: A cross-sectional study was conducted from January 15, 2024 to January 30, 2024 at Birat Medical College Teaching Hospital, Tankisinuwari, Morang, Nepal. A total of 135 preclinical Nepalese medical students were selected using census sampling. Ethical clearance was taken from the Institutional Review Committee (IRC) of Birat Medical College Teaching Hospital. Informed consent was taken from individual students. A pro forma was used to record data. Stature was measured using a stadiometer and head length using a sliding caliper. The collected data was entered in Microsoft Excel 2016 and analyzed by SPSS version 25.

Results: The overall mean stature was 163.99±9.67 cm and mean head length was 18.08±0.91 cm. Males had a mean height of 171.42±6.32 cm and mean head length of 18.61±0.80 cm; females had 156.66±6.17 cm and 17.57±0.70 cm, respectively. A moderate positive correlation was found between stature and head length ($r = 0.532$, $p < 0.001$). Gender-wise, the correlation was weak and non-significant in males ($r = 0.10$, $p = 0.41$), and weak to moderate but significant in females ($r = 0.27$, $p = 0.02$).

Conclusion: A statistically significant moderate positive correlation exists between stature and head length among the students, more so among females.

## Introduction

Stature estimation has long been a crucial aspect of physical anthropology, forensic science, and human biology. It plays a significant role in the identification of individuals, particularly in scenarios involving fragmented, decomposed, or incomplete human remains. Stature is influenced by a variety of factors, including genetics, nutrition, sex, and environmental conditions.[1] Anthropometric research has consistently shown that certain body measurements correlate with stature, and among them, head length has emerged as a relatively reliable predictor.[2] In

forensic contexts, the ability to estimate stature from partial skeletal remains—such as the skull—is especially valuable during mass disasters or cases involving dismembered remains.[3] Head length, measured as the linear distance from the glabella to the inion, is relatively stable and less prone to postmortem alterations compared to other body parts, enhancing its utility in forensic reconstructions.[4] Previous studies have highlighted that the correlation between stature and head length varies across populations due to racial, geographical, and genetic differences. For example, strong positive correlations have been documented among Indian children and North Indian adults, suggesting head length could serve as a practical anthropometric parameter for stature estimation.[5,6]

Although some anthropometric data from Nepal exist—such as a study among Devdaha medical students which demonstrated a weak positive correlation between head length and stature,[7] and another study showing variation in head length and height across Rai and Limbu ethnicities in Dharan.[8] Likewise, recent efforts to estimate stature from facial dimensions in Eastern Nepal yielded low correlations ($r<0.3$), highlighting limited predictive value of mesofacial metrics alone.[9]

Therefore, focused research among a homogenous, healthy cohort of undergraduate medical students in Eastern Nepal is essential. Hence, the present study aims to assess the correlation between stature and head length among undergraduate medical students in a medical college in Eastern Nepal.

## Methodology

A cross-sectional study was conducted over a 15-day period spanning from January 15, 2024 to January 30, 2024, at Birat Medical College Teaching Hospital located in Tankisinuwari, Morang, Nepal. Prior to the commencement of data collection, ethical clearance was obtained from the Institutional Review Committee (IRC-PA-366/2024) of Birat Medical College Teaching Hospital. This ensured that the study adhered strictly to established ethical standards in research and that the rights, dignity, and confidentiality of all participants were safeguarded throughout the research process. The target population for this study included all preclinical MBBS students—specifically those in their First and Second Year of study—who held Nepalese citizenship and were officially enrolled at the institution during the study period. In total, 135 students fulfilled the eligibility criteria and were included in the study. A census sampling method was employed, which involved including every student who met the inclusion criteria, thereby eliminating the possibility of sampling bias and enhancing the representativeness of the data. Data collection was carried out using a structured and pretested pro forma that comprised two main sections: demographic information and anthropometric measurements. This tool had been refined through preliminary testing to ensure clarity, reliability, and relevance. The stature of each participant was measured in centimeters using a standard stadiometer, with the individual standing upright against a vertical measuring surface in the standard anatomical position. Head length was determined using a sliding caliper, measuring the straight-line distance between the glabella (the most prominent point on the forehead between the eyebrows) and the inion (the most prominent point at the back of the skull). Both measurements were taken carefully under standardized procedures and anatomical positioning and were recorded to the nearest 0.1 cm to ensure accuracy and consistency.[10] The principal investigator took the measurements but the intra-observer reliability was not checked which was the limitation. The multiple measurements were not taken to find the averaged to reduce the error was another limitation. After data collection, the measurements and demographic information were first entered into Microsoft Excel 2016 for initial data management and error checking. The cleaned dataset was then exported to the Statistical Package for the Social Sciences (SPSS) version 25 for statistical analysis. Descriptive statistics, including the calculation of mean and standard deviation, were computed for both stature and head length to summarize the central tendency and variability of the measurements. The data was checked for normality and found to have normal distribution. Hence, to evaluate the relationship between the two anthropometric variables, Pearson's correlation coefficient was calculated. A p-value of less than 0.05 was set as the threshold for statistical significance, indicating a meaningful correlation between stature and head length when this criterion was met.

## Results

Out of the total 135 study participants, 68 (50.4%) were female, indicating an almost equal gender distribution among the preclinical MBBS students included in the study. The overall mean stature of the participants was 163.99 ± 9.68 cm, reflecting moderate variability in height within the sample population. The mean head length was recorded as 18.08 ± 0.92 cm, indicating relatively less variation in this cranial measurement across individuals. The descriptive statistics for stature and head length are summarized in Table 1.

**Table 1:** Mean and standard deviation of stature and head length among study participants (n = 135)

| Variable | Mean±SD |
|---|---|
| Stature (cm) | 163.99±9.68 |
| Head Length (cm) | 18.08±0.92 |

A gender-wise comparison of the anthropometric measurements revealed notable differences between male and female students. The mean stature of male participants was 171.42 ± 6.32 cm, whereas female participants had a mean stature of 156.66 ± 6.17 cm, indicating a clear difference in height between the sexes. Similarly, the mean head length in male students was found to be 18.61 ± 0.80 cm, which was greater than that of female students, who had a mean head length of 17.57 ± 0.70 cm. These findings suggest that both stature and head length are significantly higher among males compared to females in the study population. The detailed gender-wise distribution of stature and head length is presented in Table 2.

**Table 2:** Gender-wise mean and standard deviation of stature and head length (n=135)

| Gender | n | Stature (cm) (mean ± SD) | Head Length (cm) (mean ± SD) | p-value |
|---|---|---|---|---|
| Male | 67 | 171.42 ± 6.32 | 18.61 ± 0.80 | <0.05 |
| Female | 68 | 156.66 ± 6.17 | 17.57 ± 0.70 | |

The relationship between stature and head length was assessed separately for male and female participants, as well as for the total study population, using Pearson's correlation coefficient. Among male participants, the correlation between stature and head length was found to be very weak (r = 0.10) and not statistically significant (p = 0.41). This suggests that there is no meaningful linear association between these two anthropometric variables in males. In contrast, among female participants, the correlation was weak to moderate (r = 0.27) and statistically significant (p = 0.02), indicating a modest yet meaningful positive relationship between head length and stature in females. When analyzing the entire sample population (n = 135), a moderate positive correlation was observed between head length and stature (r = 0.532), with a highly significant p-value (<0.001). This implies that, overall, an increase in head length tends to be associated with an increase in stature, although the correlation is not strong enough to imply a perfect relationship. The summary of these correlation findings is presented in Table 3.

**Table 3:** Pearson Correlation coefficient between head length and stature (n=135)

| Gender | Correlation Coefficient (r) | p-value |
|---|---|---|
| Male | 0.10 | 0.41 |
| Female | 0.27 | 0.02 |
| Total | 0.532 | <0.001 |

## Discussion

The present study demonstrated a statistically significant moderate positive correlation between stature and head length among undergraduate medical students, with gender-specific variations. The overall Pearson correlation coefficient (r = 0.532, p < 0.001) supports existing evidence that cranial dimensions, particularly head length, possess predictive value in estimating stature. Notably, the correlation was stronger and statistically significant among females (r = 0.27, p = 0.02), while it was weak and not statistically significant in males (r = 0.10, p = 0.41). These findings suggest that head length may serve as a more reliable anthropometric proxy for stature estimation in females than in males within this population.

These results align with several studies conducted across South Asian populations. A study conducted in Rajasthan, India, reported a significant correlation between head length and stature, reinforcing the reliability of this relationship for forensic and anthropometric assessments in regional populations.[11] Likewise, another study confirmed that head and face measurements, including head length, could be effectively utilized to predict height in forensic anthropological cases, especially when skeletal remains are incomplete or fragmented.[12] This is consistent with studies conducted in other South Asian populations, such as research from the Punjab region in India, where a significant association was also observed between head length and stature.[13] Similarly, a study reported comparable findings among Nepalese dental students, reinforcing the validity of cranial metrics as indicators of stature in the Nepalese context.[14]

Further supporting this, a study emphasized the value of cranial anthropometry in forensic medicine due to the durability of the skull and the consistent relationships between cranial measurements and stature across populations.[1] This is further supported by a study where a significant correlations between head length and stature in the Kori population of North India, underscoring the generalizability of these associations in different ethnic and regional groups.[15]

Sex-based differences in anthropometric correlations are well documented in the literature. Factors such as differential growth rates during puberty, sex hormone influences, and variations in skeletal development likely contribute to the observed discrepancies between males and females.[16] Females often display more consistent cranial dimensions and less inter-individual variability, potentially enhancing the strength of correlations between head length and stature. Males, on the other hand, may demonstrate broader ranges in both cranial and height measurements, which can dilute the strength of linear associations in statistical analyses. The observed sex-based differences in this study are consistent with prior research that highlights the influence of biological and hormonal factors on growth patterns.[17] In contrast, males typically show a broader range of skeletal development and cranial variation, potentially diluting statistical correlations.

The forensic and anthropological utility of head length as an estimator of stature is particularly noteworthy. The skull is among the most resilient skeletal structures, frequently surviving in situations involving environmental degradation, mass disasters, or criminal investigations. In such scenarios, head length can offer a practical and accessible metric for stature estimation when only partial remains are available.[18] Moreover, such correlations are invaluable in archaeological studies and anthropological research, where fragmented remains must be reconstructed or analyzed.

A study highlighted the feasibility of using minimal cranial measurements—including head length—in low-resource forensic contexts to produce statistically significant stature estimates.[19] Another study also validated the effectiveness of cephalometric indices in stature estimation among the Western Uttar Pradesh population.[20]

Additionally, such correlations are indispensable in archaeological and anthropological contexts. Fragmented or partial skeletal remains often represent the only biological data available for reconstructing life histories, necessitating reliable proxies such as cranial dimensions for stature estimation.

## Conclusion

This study identified a statistically significant moderate positive correlation between stature and head length among undergraduate medical students in Eastern Nepal, with a more prominent association observed among female participants. These findings suggest that head length may serve as a useful anthropometric parameter for estimating stature, especially in females. The practical implication of this correlation lies in its potential application in forensic and anthropological scenarios where only partial skeletal remains, particularly the skull, are available. While the results are promising, the limited scope of the sample necessitates further research to confirm the consistency of these findings across more diverse populations.

## Recommendations

Future studies should aim to include a larger and more diverse sample, encompassing various ethnic, regional, and socioeconomic backgrounds across Nepal. Conducting multi-centric research would improve the generalizability of the findings and help account for population-specific variations in anthropometric characteristics. Additionally, incorporating a broader set of cranial and skeletal measurements—such as head breadth, facial dimensions, or limb lengths—may enhance the predictive accuracy of stature estimation models. Further research should also focus on evaluating the practical applicability of head length-based stature estimation in real-life forensic casework and medico-legal investigations within the Nepalese context.

## Limitation Of The Study

This study was conducted at a single academic institution with a relatively small and homogenous group of participants, all of whom were young adult medical students. This limited diversity restricts the applicability of the results to the wider Nepalese population. The participants also shared similar academic, nutritional, and socioeconomic profiles, which may have influenced the anthropometric outcomes. Furthermore, the cross-sectional nature of the study does not allow for assessment of age-related or longitudinal changes in head and body measurements. These factors collectively limit the extent to which the findings can be generalized to broader or more varied populations.

## Acknowledgement

The authors extend their heartfelt appreciation to the undergraduate medical students of Birat Medical College for their enthusiastic participation and cooperation during the study. We are also grateful to the Department of Anatomy for logistical support and to the Institutional Review Committee of Birat Medical College Teaching Hospital for their guidance and ethical oversight throughout the research process.

## Conflict of Interest

The authors affirm that there are no conflicts of interest, financial or otherwise, that could have influenced the design, execution, analysis, or reporting of this study. No personal or professional relationships with other individuals or organizations have affected the objectivity or integrity of the research presented.

## Financial Disclosure

This research was entirely self-funded by the authors and did not receive any financial support, grants, or sponsorship from governmental, non-governmental, academic, or commercial entities. All costs related to data collection, analysis, and manuscript preparation were borne by the authors independently, ensuring full autonomy and transparency in the research process.

## References

1. Krishan K. Anthropometry in forensic medicine and forensic science. Internet J Forensic Sci. 2006;2(1):1-8. DOI: 10.5580/1dce

2. Jasuja OP, Singh G. Estimation of Stature From Hand and Phalange Length. Journal of Indian Academy of Forensic Medicine. 2004;26(3):100-106. DOI: 10.1177/0971097320040305

3. Mansur DI, Haque MK, Karki RK, Khanal K, Karna R. Estimation of stature from foot length in adult Nepalese population and its clinical relevance. Kathmandu Univ Med J (KUMJ). 2012;10(37):16-19. DOI: 10.3126/kumj.v10i1.6907 PMID: 22971855

4. Wankhede KP, Anjankar VP, Parchand MP, Kamdi NY, Patil ST. Estimation of stature from head length and head breadth in central Indian population: an anthropometric study. Int J Anat Res. 2015;3(1):954-957. DOI: 10.16965/ijar.2015.125

5. Bansal H, Badiye A. An estimation of correlation between the head length and the stature of the children aged between 6-10 years. Res J Forensic Sci. 2013;1(2):1-5. Available from: https://www.isca.me/FORENSIC_SCI/Archive/v1/i2/1.ISCA-RJFS-2013-002.pdf

6. Singh P, Kulshreshtha V, Singh P, Prakash V. An estimation of correlation between maximum head length and the stature of human adults of North India. J Anat Sci. 2017;25(2):6-9. Available from: https://journals.indexcopernicus.com/api/file/viewByFileId/587475.pdf

7. Pandey N, Chaudhary DM, Yadav SK. Estimation of Stature from Head Length and Head Breadth in Undergraduate Medical Students: An Anthropometric Study. Med J Eastern Nepal. 2024;3(01):4-7. DOI: 10.3126/mjen.v3i01.67437

8. Shrestha O, Bhattacharya S, Jha N, Dhungel S, Jha CB, Shrestha S, et al. Cranio facial anthropometric measurements among Rai and Limbu community of Sunsari District, Nepal. Nepal Medical College journal. 2009;11(3):183-5. Available from: https://pubmed.ncbi.nlm.nih.gov/20334066

9. Timsinha S, Pokharel D, Shah RK, Parajuli SB, Khan SA. Estimation of Stature From Facial Dimensions. A CrossSectional Study Among Nepalese Medical Students in Eastern Nepal. Birat J Health Sci. 2023;8(3):2192-7. DOI: 10.62065/bjhs517

10. Roche AF, Martorell R, editors. Anthropometric standardization reference manual. Champaign (IL): Human Kinetics Books; 1988. 192 p. Available from: https://books.google.com/books/about/Anthropometric_Standardization_Reference.html

11. Kumar S, Garg R, Mogra K, Choudhary R. Prediction of stature by the measurement of head length in population of Rajasthan. J Evol Med Dent Sci . 2013;2(14):2334-40. Available from: https://jemds.com/data_pdf/11_santhosh%20kumar.pdf DOI: 10.14260/jemds/536

12. Duyar İ, Pelin C, Atamtürk D. Do the measurements of head, face, and sternum predict body height in forensic anthropological cases? Euras J Anthropol. 2018;9(2):49-56. Available from: https://dergipark.org.tr/en/download/article-file/807030

13. Seema, Mahajan A. Estimation of personal height from the length of head in Punjab zone. Int J Plant Anim Environ Sci. 2011;1(3):205-209. Available from: https://www.fortunejournals.com/ijpaes/admin/php/uploads/76_pdf.pdf

14. Manandhar B, Shrestha R. Estimation of body height from head length among dental students of a dental college. JNMA J Nepal Med Assoc. 2018 Oct 31;56(213):861-865. DOI: 10.31729/jnma.3751 PMID: 31065121 PMCID: PMC8959364

15. Kamal R, Yadav PK. Estimation of stature from different anthropometric measurements in Kori population of North India. Egypt J Forensic Sci. 2016;6(4):468-477. DOI: 10.1016/j.ejfs.2016.12.001

16. Hall JG, Allanson JE, Gripp KW, Slavotinek AM. Handbook of Physical Measurements. 2nd ed. New York: Oxford University Press; 2007. Available from: https://beshg.be/storage/app/media/MaNaMa%20course/Presentations%20course%202023/Day%205/epdf.pub_handbook-of-physical-measurements-2nd-edition.pdf

17. Krishan K, Kumar R. Determination of stature from cephalo-facial dimensions in a North Indian population. Legal Medicine. 2007;9(3):128-133. DOI: 10.1016/j.legalmed.2006.12.001 PMID: 17306595

18. Madea B. Handbook of Forensic Medicine. 1st ed. Chichester (UK): Wiley-Blackwell; 2014. 1312 p. Available from: https://catalog.nlm.nih.gov/discovery/fulldisplay?vid=01NLM_INST:01NLM_INST&docid=alma9916194623406676

19. Hinduja S, Tamgadge S, Tamgadge A. Odontometry and skull anthropometry: A possible tool for stature estimation using minimum armamentarium. Int J Forensic Odontol. 2018;3(1):6-11. DOI: 10.4103/ijfo.ijfo_19_17

20. Reddy M, Reddy V, Wadhwan V, Venkatesh A. Correlation and estimation of stature from cephalofacial measurements: A study on Western Uttar Pradesh population. J Forensic Dent Sci. 2018;10(2):101-106. DOI: 10.4103/jfo.jfds_30_16 PMID: 30745787 PMCID: PMC6344788