https://doi.org/10.3329/cbmj.v15i2.91423

An Anatomical Study of Maximum Length and Neck Circumference of the Adult Human Fibulae in A Bangladeshi Population

*Biswas TR[1], Kar T[2], Moin S[3], Haque SMA[4], Mehataz T[5]

Abstract

A cross-sectional, descriptive type was done in the Department of Anatomy, Mymensingh Medical College, Bangladesh, from January to December of 2023, to determine the correlation between maximum length and neck circumference of adult human fibula in a Bangladeshi population. A total of 300 (152 right and 148 left) samples of dry adult human fibulae were taken as selected through purposive sampling technique. Fibulae bones having any pathological deformity or unossified and fractured bones were excluded from this study. Only fully ossified and intact bones are used. A metallic scale was used to measuring the maximum length of the fibula bones. The neck circumference of the fibula was measured by a measuring tape. The mean of maximum length of the fibulae were 34.32±2.05 cm on right side and 34.40±2.26 cm on left side, while the mean neck circumference of fibulae were 3.4±0.50 cm on right side and 3.59±0.55 cm on left side. Pearson correlation coefficient revealed that positive correlation exists between the maximum length and the neck circumference of the fibula (for right side r=0.016, p>0.05; for left side r=0.282, p<0.001).

CBMJ 2026 July: Vol. 15 No. 02 P:73-77

Keywords: Correlation, maximum length, neck circumference, fibula, Bangladeshi population

Introduction

Fibula is the slender lateral bone of the leg. The upper end of the fibula gives attachments to ligaments of knee joint but does not form a direct articular component of the knee joint.[1] The bone has an upper end, a shaft and a lower end.[2] Neck of the fibula is a constriction below the head, connecting the head with the shaft. The common peroneal nerve is related to the posterolateral aspect of neck of fibula and anterior tibial artery is also related on its medial aspect.[3] The shaft of the fibula has three borders and surfaces; each associated with a particular group of muscles. The three borders are anterior, posterior and interosseous; and three surfaces are-medial, lateral and posterior.[4] The borders of the shaft spiral, and the shape varies, due to pull of the attached muscles.[3,4] Medial (extensor) surface is narrow and lies between the anterior and interosseous borders. Lateral (peroneal) surface lies between the anterior and posterior borders. Posterior (flexor) surface is extensive and lies between the interosseous and posterior borders.[3,4] The anatomical data from this study helps in designing implants or selecting bone graft sizes. The osteometric data from the maximum length of the fibula helps to evaluate the nutritional status and overall development of an individual and the neck of the fibula is the site where the common peroneal nerve wraps around the bone, knowing the dimensions of this area helps in understanding the risk of nerve entrapment.

1. *Dr. Tithi Rani Biswas, Assistant Professor, Department of Anatomy, Army Medical College Jashore, Bangladesh.
2. Dr. Tanmoy Kar, MS Phase B, Community Ophthalmology Department, Bangabandhu Sheikh Mujib Medical University, Bangladesh.
3. Dr. Sharna Moin, Associate Professor, Department of Anatomy, Army Medical College Jashore, Bangladesh.
4. Dr. Shah Md. Atiqul Haque, Assistant Professor, Department of Anatomy, Mymensingh Medical College, Bangladesh.
5. Dr. Tasnova Mehataz, Indoor Medical Officer, Department of Anaesthesiology, Community Based Medical College Hospital Bangladesh, Mymensingh.

Address of Correspondence:
Email: tithi0081@gmail.com

Methods

This cross-sectional, descriptive study was carried out in the Department of Anatomy, Mymensingh Medical College, Bangladesh, between January and December of 2023. A total of 300 fully ossified dry human fibula, which were collected from 1st and 2nd years MBBS students and Department of Anatomy museum. Of 300 fibulae, 152 bones are right sided and 148 bones are left sided. A non-random purposive sampling technique was used for sample selection. The fibulae were of undetermined gender and age. Each fibula was assigned a serial number. Anatomical measurements were taken using a digital vernier calliper. The fibula bones which are intact, well-formed and fully ossified dry human fibula were included in this study. Any unossified, fractured bone or bones having congenital and tumours like abnormalities and/ any deformities were excluded.

The maximum length of fibula was measured from apex of head to the highest point of the tip of lateral malleolus by metallic scale. The one blade of the metallic scale was placed over the apex of the head of the fibula and another blade was placed at the highest point of tip of the lateral malleolus of the fibula. The length was expressed in cm. The neck circumference was measured by using flexible measuring tape in constricting part immediately below the head of fibula and also expressed in cm. Data was collected and recorded in the data sheet. Then data was scrutinized, compiled, coded and analyzed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as mean±SD (standard deviation) for continuous variables. Unpaired Student's t-test was used to compare variables between groups. Pearson correlation coefficient test was done. Statistical significance was set at <0.05.

Ethical clearance for this study was obtained from the Institutional Review Board (IRB) of Mymemsingh Medical College, Mymensingh, Bangladesh (MMC/IRB/2023/575).

Results

The maximum length of the right sided fibulae ranged from 29.5 cm to 39 cm. More than 84% samples were measured within the range of 32 cm to 37 cm. The maximum length of the left sided fibulae ranged from 28 cm to 43 cm. More than 87% samples were measured within the range of 33 cm to 38 cm (Fig. 1). The mean of maximum length of the fibulae were 34.32±2.05 cm on right side and 34.40±2.26 cm on left side respectively.

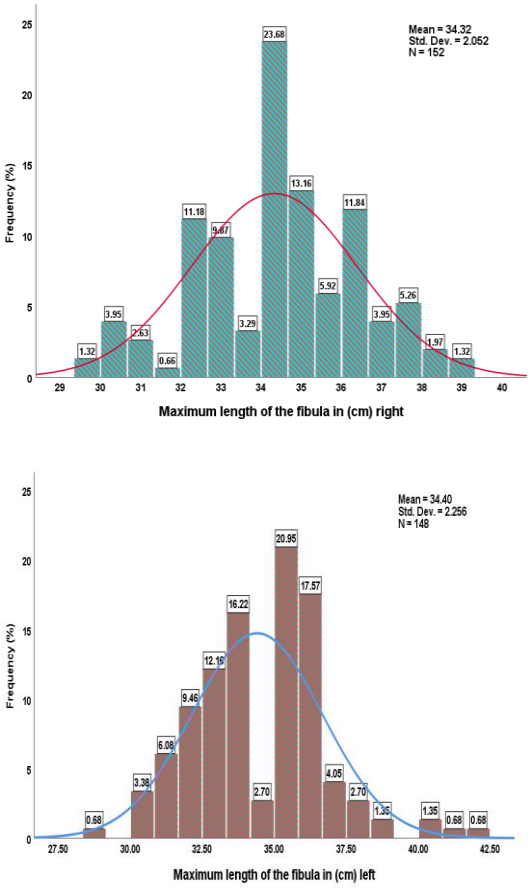

Fig. 1: Histogram showing the frequency distribution of the maximum length of fibulae.

The neck circumference of the right sided fibulae ranged from 2.5 cm to 5 cm. More than 91% samples were measured within the range of 3 cm to 4 cm. The neck circumference of the left sided fibulae ranged from 2 cm to 5 cm. More than 85% samples were measured within the ranged of 3 cm to 4 cm (Fig. 2). The mean neck circumference of fibulae were 3.4±0.50 cm on right side and 3.59±0.55 cm on left side respectively.

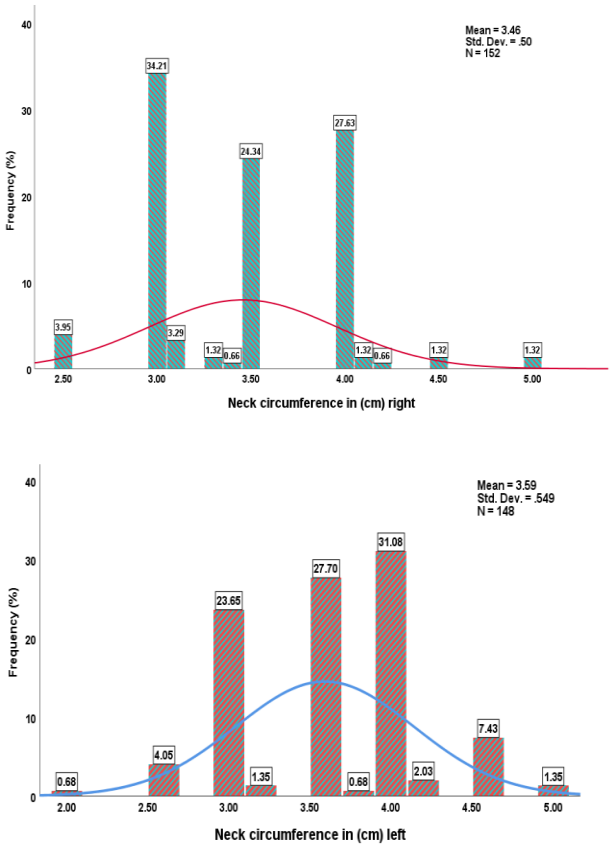

Fig. 2: Histogram showing the frequency distribution of the neck circumference of fibulae.

Pearson correlation coefficient revealed that positive correlation exists between the maximum length and the neck circumference of the fibula on both sides (for right side r=0.016, p>0.05; for left side r=0.282, p<0.001) (Fig. 3 & 4).

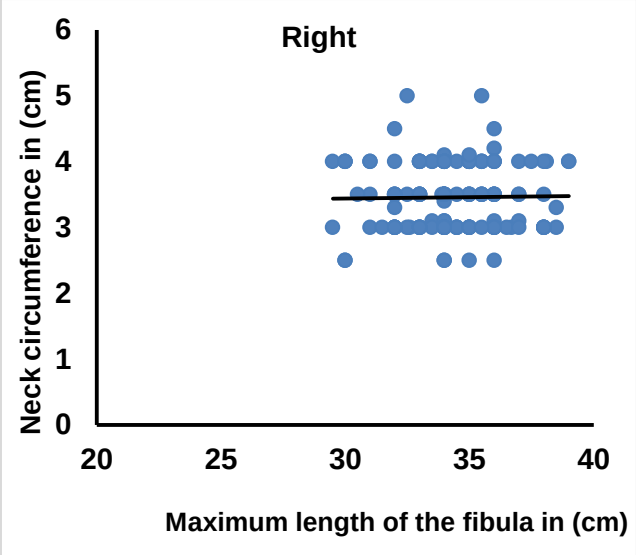

Fig. 3: Scatter diagram showing the correlation between maximum length and neck circumference of right sided fibula (r=0.016, p>0.05).

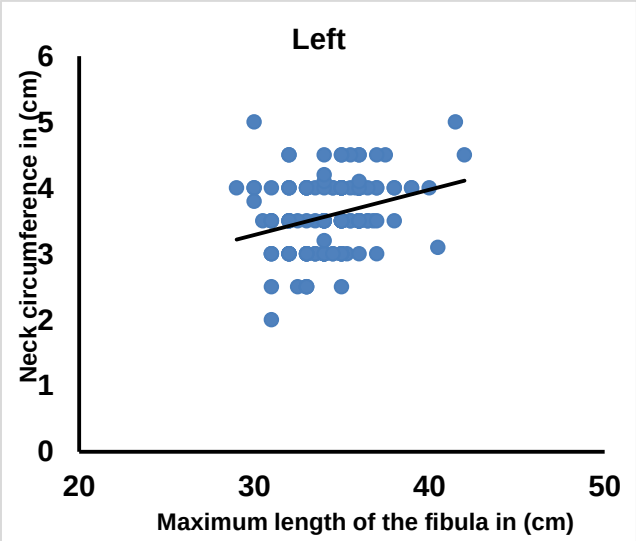

Fig. 4: Scatter diagram showing the correlation between maximum length and neck circumference of left sided fibula (r=0.282, p<0.001).

Discussion

In the present study, the maximum length of fibulae were found 34.32±2.05 cm on right side and 34.40±2.26 cm on left side. The mean values were

more or less similar to the findings of Mukhia *et al*. (33.21±1.42 cm on right and 33.06±1.52 cm on left),[5] Zahid, Shakir & Shireen (34.905±2.1985 cm on right and 34.690±23539 cm on left),[6] Wazir *et al.* (34.9±2.2 cm on right and 34.6±2.3 cm on left),[7] Sreekanth & Naik (35.8±2.6 cm on right and 34.2±2.2 cm on left side),[8] Gümüşburun *et al.* (34.56±0.14 cm on both sides),[9] Bhatti & Smith (35.41 cm on average),[10] and Aggarwal, Roy & Medda (35.1 cm on right and 34.39 cm on left side).[11] However, the mean values of the present study were lower than that of the findings of Naidoo *et al.* (36.36 ±0.238 cm on right and 38.042±0.301 cm on left),[12] Sinha *et al.* (35.86±2.441 cm on right and 36.64±2.537 cm on left),[13] Jayaprakash (35.8±2.72 cm on right and 35.68±2.2 cm on left side).[14] Mohan *et al.* (35.36±3.26 cm),[15] Sharma et al. (35.36±3.26 cm),[16] Borthakur, Kumar & Dada (35.4±2.14 cm),[17] and Lingamdenne (35.48±1.76 cm, and 35.96±2.93 cm for right and left respectively).[1] The mean values of the present study were a bit higher than that of the report of Vinay & Mangala Gowri (32.58 cm).[18]

In the present study, the mean of the neck circumference of fibulae were 3.4±0.50 cm on right side and 3.59±0.55 cm on left side. The mean values of the present study was very similar to the findings of Lingamdenne (3.39± 0.50 cm).[1]

Conclusion

Our data suggests that a positive correlation exists between the maximum length and the neck circumference of the fibula indicating that when the maximum length of the bone increases, the neck circumference of fibula also increases. This correlation is vital in orthopaedic and forensic contexts for reconstructing bone length, when only fragmented or partial remains, e.g., the upper end of the fibula is only available.

References

1. *Lingamdenne PE. Evaluation of osteometric parameters of fibula and talar facet morphometry in Telangana region. Ind J Clin Anat Physiol. 2019;6(4):497-502.*
2. *Garg K, Sontakke YA, Mittal PS, Chandrupatla M. eds. BD Chaurasia's Human Anatomy. Regional and Applied. Dissection and Clinical. Vol. 2. Lower Limb, Abdomen and Pelvis. 10th ed. New Delhi: CBS Publishers & Distributors; 2024.*
3. *Devi VS. Inderbir Singh's Textbook of Anatomy. Vol. 2. Lower Limb, Abdomen and Pelvis. 7th ed. New Delhi: Jaypee Brothers Medical Publishers; 2018.*
4. *Spinner RJ, Krych AJ, Bernard CD. Knee and leg. In: Standring S, Anand N, Catani M, Collins P, Crossman AR, Gleeson M, et al. eds. Grays Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier; 2021.*
5. *Mukhia R, Poudel PP, Mansur DI, Wahekar K. Morphological and morphometrical study of dry fibula at medical college of Western Nepal. J Karnali Acad Health Sci. 2022;5(1):258.*
6. *Zahid A, Shakir MA, Shireen R. Morphological and topographical anatomy of diaphyseal nutrient foramina of dried Pakistani fibulae. J Coll Physicians Surg Pak. 2015;25(8):560-3.*
7. *Wazir NU, Haris M, Baseer N, Haris S, Deeba F, Khan MJ. Morphometrical analysis of diaphyseal nutrient foramina of adult human dry fibulae. Med Forum. 2022;33(3):113-5.*
8. *Sreekanth C, Naik IV. The morphological and morphometric study on diaphyseal nutrient foramina of dry human fibula bones. IOSR J Dent Med Sci. 2019;18(10):55-60.*
9. *Gümüşburun E, Adiguzel E, Erdil H, Ozkan Y, Gulec E. A study of the nutrient foramina in the shaft of the fibula. Okajimas Folia Anat Jpn. 1996;73(2-3):125-7.*
10. *Bhatti NA, Smith C. Nutrient foramen of fibula in relation to distal end: potential implications for vascularised bone graft surgery. Int J Hum Anat. 2019;1(4):29-32.*

11. *Aggarwal P, Roy R, Medda S. Variations in nutrient foramen in the long bones of lower limb. Ind J Clin anat Physiol. 2022;9(1):35-41.*

12. *Naidoo N, Ishwarkumar S, Lazarus L, Pillay P, Satyapal KS. Osteometry and morphology of the human fibula: a South African study. Int J Morphol. 2015;33(3):1071-7.*

13. *Sinha P, Mishra SR, Kumar P, Gaharwar A, Sushobhana. Morphology and topography of nutrient foramina in fibula. Ann Int Med Dent Res. 2016;2(6):7-12.*

14. *Jayaprakash T. Morphologic study of diaphyseal nutrient foramina in dried fibulae and its clinical implications. Int J Res Med Sci. 2016;4(9):3887-90.*

15. *Mohan K, Devaraj B, Ramanathan S, Rethinasamy M. Morphometric study of nutrient foramen in the long bones of lower limb. Int J Anat Res. 2017;5(2.3):3943-8.*

16. *Sharma MD, Mathur A, Nagar AK, Barjatiya R, Chauhan P, Shekhawat S. Study of morphometric variations in the nutrient foramina of fibula in Central Rajasthan. Ind J Clin Anat Physiol. 2016;3(1):65-71.*

17. *Borthakur D, Kumar R, Dada R. Clinical relevance of nutrient foramina of fibula: a morphometric study. Clin Ter. 2023;174(3):261-5.*

18. *Vinay G, Mangala Gowri SR. Anatomical study of the nutrient foramen of lower limb long bones in South Indian population. Ind J Clin Anat Physiol. 2017;4(2):222-4.*