



SEXUAL DIMORPHISM OF FEMUR IN COASTAL AREAS OF KARNATAKA.

Anatomy

Dr. Vijay Kumar R Waghmare* Associate Professor, Department Of Anatomy. Karwar Institute of Medical Sciences, Karwar. *Corresponding Author

Dr. Rupali V. Waghmare Assistant Professor, Department of Physiology. Karwar Institute of Medical Sciences, Karwar.

ABSTRACT

Sex determination is relatively easy if the entire skeleton is available, pelvis and skull are the most reliable bones for this purpose. However, in medico-legal cases one does not always have a complete pelvis or skull. Therefore it is important to be able to assess sex from the other parts of the skeleton also. Sexual dimorphism of maximum length of femur is studied by several workers in different populations. Material for the present study consisted of 136 male (67 of right & 69 of left side) and 48 female (23 of right & 25 of left side) human adult femora from the skeletal collection of Anatomy department, from Karwar Institute of Medical Sciences, Karwar. Mean value of maximum length was higher in male as compared to female. Calculated t-value and P value showed that the difference in the mean maximum length in male and female was statistically highly significant with $P < 0.001$.

KEYWORDS

femur, maximum length, sexual dimorphism

INTRODUCTION:-

The determination of sex from skeletal remains is immensely important medico-legally as well as anthropologically. Sex determination is relatively easy if the entire skeleton is available, pelvis and skull are the most reliable bones for this purpose. [1] However, in medico-legal cases one does not always have a complete pelvis or skull. Therefore it is important to be able to assess sex from the other parts of the skeleton also. Sexual dimorphism of maximum length of femur is studied by several workers in different populations [Singh & Singh, (1972) in Varanasi zone India², DiBennardo R. and Taylor J. V. (1979)³, Dittrick J. and Suchey J. M. (1986) in the Prehistoric Central California skeletal remains⁴, Iscan M.Y. and Shihai D. in Chinese femora⁵, Steyn M. and Iscan M. Y. (1997) in South African whites⁶, King C.A., Iscan M. Y. and Loth S.R. (1998) in Thai femur⁷, Leelavathi N. et al (2000) in femora from Karnataka⁸, Purkait R. and Chandra H. (2002) in Indians⁹. So, present study was carried out to ascertain sexual dimorphism of maximum femoral length in populations of coastal areas of Karnataka.

MATERIAL AND METHODS

Material for the present study consisted of 136 male (67 of right & 69 of left side) and 48 female (23 of right & 25 of left side) human adult femora from the skeletal collection of Anatomy department, from Karwar Institute of Medical Sciences, Karwar. Maximum length was measured with Femur on Osteometric board in such a manner that medial condyle touches the short vertical wall; the moveable cross-piece should touch the highest point of the head. Maximum vertical distance between upper end of head of femur and the lowest point on femoral condyle was measured. Each bone was measured thrice and measurement was repeated by two independent observers, mean of these observations was taken as a final reading to nullify any intra and inter-observer error. Data collected was tabulated and analyzed statistically sidewise & sex wise.

RESULTS

Right femur: The maximum length of right male femur varied from 395mm to 506mm (Mean: 451.81 & S.D.: 23.94) and of right female femur varied from 376mm to 473mm (Mean: 417.48 & S.D.: 19.74). Mean value of maximum length was higher in male as compared to female. Calculated t-value and P value showed that the difference in the mean maximum length in male and female was statistically highly significant with $P < 0.001$. By demarking points, definite sexual classification in male right bone (>476.70) was 13.43% (no=09) and in female right bone (<379.99) was 4.35% (no=1). b. Left femur: The maximum length of left male femur varied from 395mm to 507mm (Mean: 453.35 & S.D.: 22.54) and of left female femur varied from 381mm to 469mm (Mean: 420.44 & S.D.: 21.35). Mean value of maximum length was higher in male as compared to female. Calculated t-value and P value showed that the difference in the mean maximum length in male and female was highly statistically

significant with $P < 0.001$. Definite sexual classification in male left bone (>484.49) was 7.25% (no=5) and in female left bone (<385.73) was 8.00% (no=2). Differences in the value between right & left male and right & left female were not statistically significant, so were not evaluated further.

DISCUSSION-

Mean value of maximum length was higher in male as compared to female. Calculated t-value and P value showed that the difference in the mean maximum length in male and female was highly statistically significant with $P < 0.001$ on both side. For right male bone calculated range (mean \pm 3S.D.) was 379.99-523.63 and for right female bone it was 358.26-476.70. Based on these calculated range, we can statistically fix a measurement above which no female bone can be found and another measurement below which no male femora can be seen, these measurements can be termed as demarking points. 11 With the help of these demarking points, right femur with maximum length more than >476.70 mm can be correctly classified as a male and right femur with maximum length less than <379.99 mm can be correctly classified as a female.

However if the length is between 379.99mm and 476.70mm, sexing was not possible due to overlapping. With the demarking points, definite sexual classification in male right bone (>476.70) was 13.43% and in female right bone (<379.99) was 4.35% For left male bone calculated range was 385.73-520.97 and for left female bone it was 356.39-484.49. With the help of these demarking points, left femur with length more than >484.49 mm can be correctly classified as a male and right femur with length less than <385.73 mm can be correctly classified as a female. However if the length is between 484.49 mm and 385.73 mm, sexing was not possible due to overlapping. With the demarking points, definite sexual classification in male left bone (>484.49) was 7.25 % and in female left bone (<385.73) was 8%. Dimensionally the adult male: female ratio is about 100: 92, i.e. female measurements are about 92% of male measurements, this does not precisely hold for the entire living body¹. Generally male bones are longer and massive and this difference is reflected by the greater values of the mean maximum femoral length in male on both the sides. Comparison of maximum femoral length of male between present study and other studies has been shown. The Mean maximum male femoral length value in present study was 451.81(right) & 453.35(left). In other studies it varies from 429.4 to 477.7. Mean maximum femoral length in present study was lower than the American Blacks³ & South African Whites⁶; was higher than the Thai⁷ & Chinese femora⁵ and it correspond with the value seen in American Whites³, Californian sample⁴ and sample from Bhopal¹⁰. Table: 3 illustrated Comparison of maximum length of female between present study and other studies. Mean femoral length in female in present study was 417.18(right) & 420.44(left). In other studies it vary from 397-443. While mean maximum female femoral length in present

study was lower than the American Blacks³ & South African Whites⁶; was higher than the Thai⁽⁷⁾, Chinese⁽⁵⁾ and sample from Bhopal⁽¹⁰⁾ and was similar to the value in American Whites³ and Californian sample⁴. This difference in mean femoral length in between populations may possibly be a result of factors affecting bone morphology like genetic constitution, diet, nutrition status, environment and physical activity. The revealed that most marked difference between the present study and other studies is the low percentage of correct sexual classification in present study. This could be explained on the basis of statistical method applied. these will give the maximum and minimum values the range of which covers 99.75% of population of that area.

CONCLUSION:-

Mean values of maximum length of normal human adult femora from coastal areas of Karnataka region, in male were 451.81 mm (Right) & 453.35 mm (Left) and for female were 417.48 mm (Right) & 420.44 mm (Left). It identified 13.40% of right male femora, 7.25% of left male femora, 4.35% of right female bones and 8.00% of left female bones.

REFERENCES:

1. Krogman, W. M. and Iscan, M. Y. Human Skeleton in Forensic Medicine. 2nd Edition, Charles C. Thomas, Springfield, 1986.
2. Singh S. P. and Singh S., The sexing of adult femora: Demarking points for Varanasi zone, Journal of the Indian Academy of Forensic Sciences 1972 B; 11:1-6.
3. DiBennardo R. and Taylor J. V., Classification and misclassification in sexing the black femur by discriminant function analysis, American Journal of Physical Anthropology 1982; 58: 145-151.
4. Ditttrick J. and Suchey J. M., Sex determination of prehistoric central California skeleton remains using discriminant analysis of the femur and humerus, American Journal of Physical Anthropology 1986; 70: 3-9.
5. Iscan M.Y. and Shihai D., Sexual Dimorphism in the Chinese Femur. Forensic Science International June 1995; 74(1-2): 79- 87.
6. Steyn M. and Iscan M. Y., Sex determination from the femur and tibia in South African whites, Forensic Science International 1997; 90: 111-119.
7. King C.A., Iscan M. Y. and Loth S.R., Metric and comparative analysis of sexual dimorphism in the Thai Femur. Journal of Forensic Science 1998; 43(5): 954-958.
8. Leelavathy N, Rajangam S, Janakiram S., Thomas IM, Sexing Of The Femora. Indian Journal of Anatomical. Society of India, 2000; 49(1) 17-20.
9. Purkait R. and Chandra H., Sexual Dimorphism in Femora: An Indian Study. Forensic Science Communications 2002 July; 4(3): 1-6.
10. Singh I.P. & Bhasin M.K., Manual of biological anthropology in Osteometry, 1st Edition, Kamla-Raj Prakashan, Delhi, 2004, pp: 79-83.