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Study of Adults Femoral Neck Shaft Angle in Population of Darbhanga, Bihar

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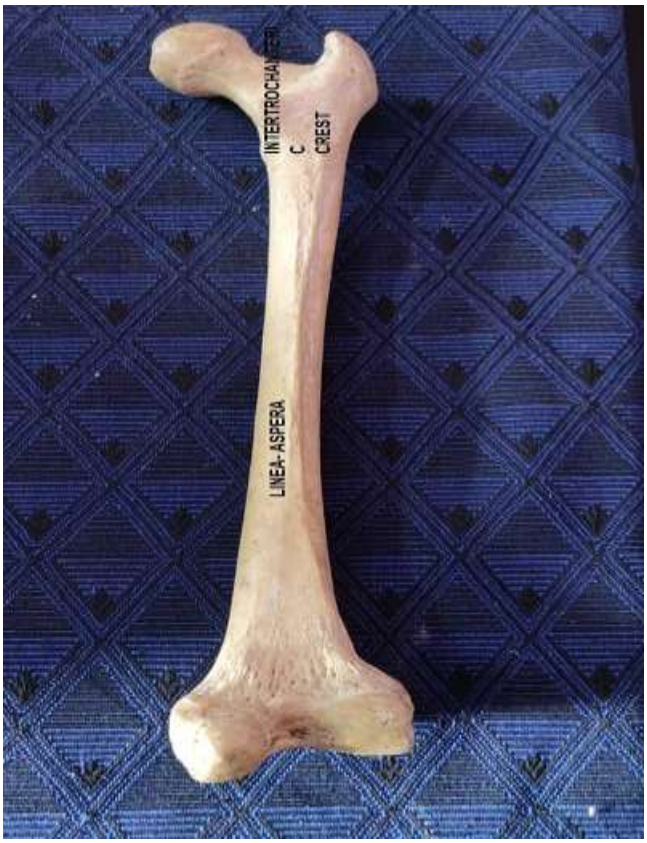
I. INTRODUCTION

The morphology of proximal femur , especially the relationship among the head , neck and proximal shaft has been a subject of interest and debate in orthopaedic literature dating back to at least middle of the 19 th century.(1)

The two well - know parameters have long defined this relationship, neck shaft angle also known as angle of inclination and neck version.



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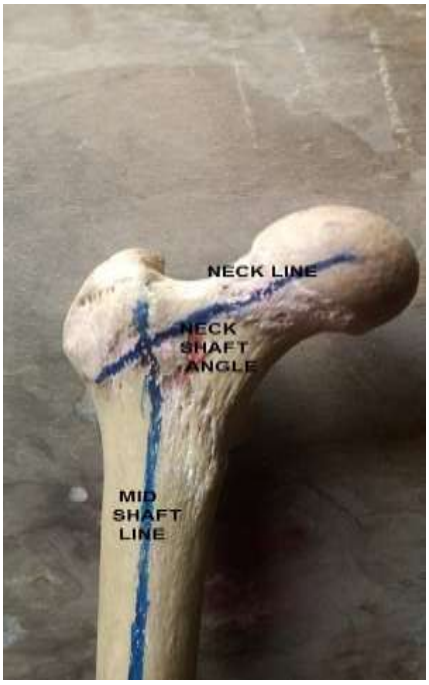
Femur also called as thighbone, upper bone of the leg or hind leg is longest , heaviest and strongest bone of the body .

The head forms the ball and socket joint with the hip (at the acetabulum) , being held in position by a ligament (ligamentum teres femoris) .

The neck of the femur is 5 cm long directed upward, medially and somewhat forwards ,it connects the shaft and head at 125 degree Which is efficient for walking.



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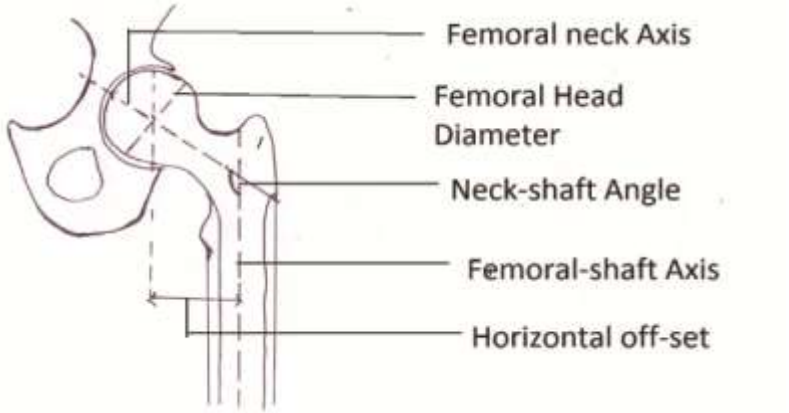


The shaft is somewhat convex forward and strengthened behind by a pillar of bone called linea aspera.

Two large prominences, or condyles , on either side of the lower end of femur forms the upper end of knee joint which is completed below by the tibia and patella .

Internally, the femur shows the development of arcs of bone called trabeculae that are efficiently arranged to transmit pressure and resist stress .

Human femur have been shown to capable of resisting compression forces of 800-1100 kg . (2)

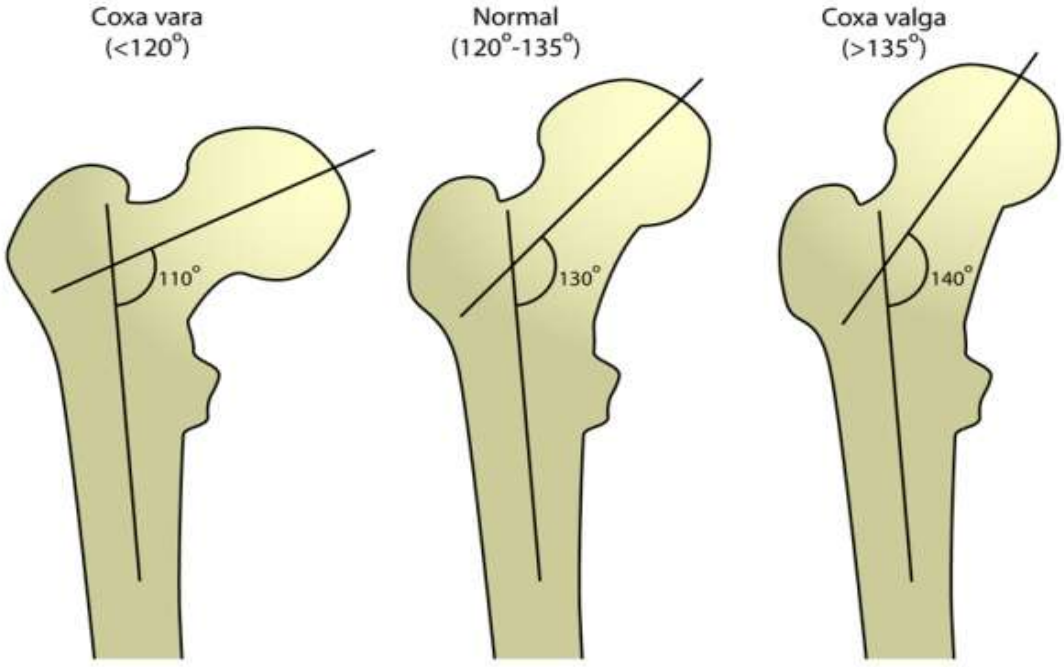
The neck shaft angle is defined as the angle between the long axis of shaft of femur and the long axis of femur neck.

The knowledge of neck shaft angle is important in diagnosis and treatment of fracture of upper end of femur .

Adequate size of length of neck is required to design prosthesis for restoration of normal neck shaft angle. (3)

In case of in appropriate selection of femur implant, there may be serious problems for patients in long run .

Normal neck shaft angle varies between 120 °to 140 °. The neck shaft angle when less than 120°the condition is known as Coxa Vara , where as when angle is more than 135 ° know as coxavalga. This angle is reduced with age .



In early infancy the neck shaft angle is 150 ° , in childhood 140 °, in adult 125 °and in elderly angle is about 120 ° (4)

According to the study of SP Tuck et al. Showed that men mean neck shaft angle of 130°+-3.3 range 121-138 , while women had a similar

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mean femur neck shaft angle of 128 degree of 128 ° +- 1.7 , range 119-137.

AIMS OF STUDY

To evaluate the range of normal angles of femur neck with shaft and sex difference which will be helpful for orthopaedic surgeons and forensic experts

II. MATERIAL AND METHODS

The present study was conducted on 50 dry femurs .

All bones obtained from our Anatomy Deptt and Forensic Deptt of Darbhanga Medical college.

We excluded damaged femur bone particularly damaged neck and head .

We included all bones having intact head and neck .

Neck shaft angle is defined as the angle between the long axis of shaft and long axis of neck of femur.

The angle is measured with help of hand held goniometer.

In this study the neck shaft angle was measured by marking long axis of shaft and long axis of neck .

The axis of the neck was drawn by taking two points , one at the Center of the head and other at the midpoint of the narrowest part of the neck , two points were joined and the line drawn joining them forms the axis of the neck.

The axis of shaft of femur was calculated by taking two mid points, one at upper and another at lower ends of the shaft , two points were joined to form the axis of the shaft of femur.

The line forming the axis of femur is extended upwards to intersect the axis of femur and the point at which both the line intersect each other forms the angle between them .

The angle is measured with help goniometer and angle was noted .

III. RESULTS

In this study, neck shaft angle was measured and recorded in 50 femurs.

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Among the 50 femurs, 30 were males and 20 were females .
The Minimum angle measured was 120 degree and maximum was 138 °.
The mean neck shaft angle of all femur were 130.20 °

The mean neck shaft angle in male was 130+- 5.5 and in female was 129+- 4 °.
The neck shaft angle was slightly higher in male femur bones than female bones , which is negligible (P-value > 0.05)

Table 1
Serial no. Length of femur .length of neck . Angle between them

Table 1: Showing the result of neck shaft angle .

	N	Minimum	Maximum	Mean	Std deviation
Neck shaft angle	50	120	138	130.21	4.27

Table 2

Table 2: Comparison of mean and standard deviation of neck shaft angle between male and famale.

	Sex	N	Mean	Std deviation
Neck shaft angle	Male	30	130.33	4.41
	Female	20	130.1	4.04

Specimen Bones Minimum Maxim
Male 30.
Female. 20

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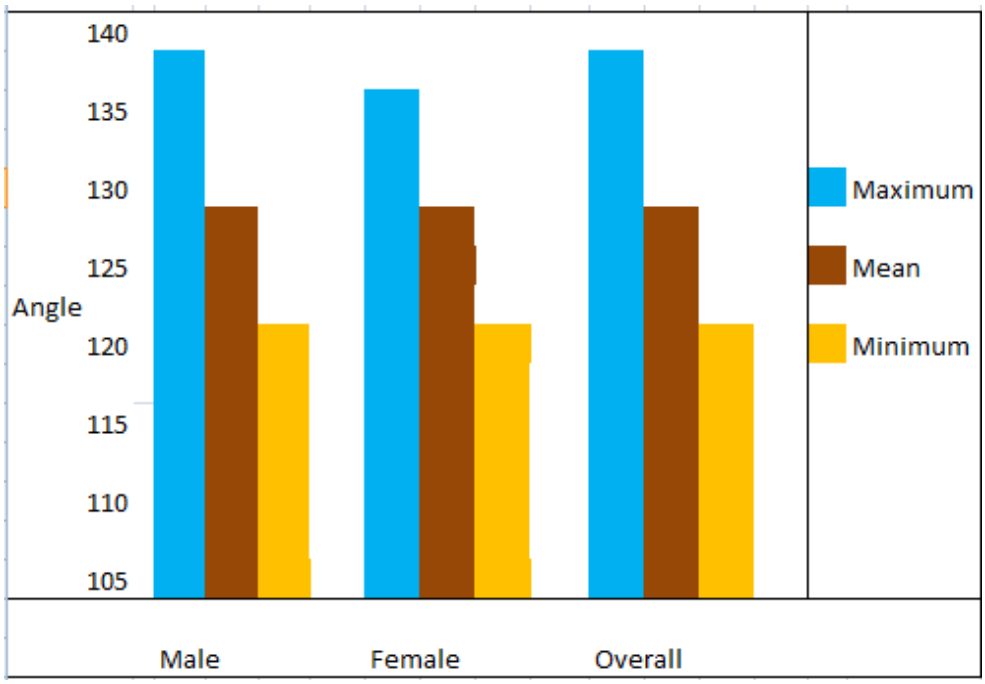

Table 3
Comparison of neck shaft angle of present study with previous study .

Author	Year	Sample size	population	Method	Neck shaft angle	Standard deviation
Syed Imran Sultan	2017	150	Maharashtra	X-ray	133.3	--
Cornelius S Fischer	2019	3226	Pomerania , Poland	MRI	127	--
Rajiv Ranjan Sinha	2017	60	Bihar	Dry bones	130.82	4.86
Gattu Praveen kumar	2018	50	Kerala	Dry bones	127.48	--
Present Study	2021	50	Darbhanga	Dry bones	130.20	4.27

IV. DISCUSSION-

The neck shaft angle is frequently used for Diagnostics , pre operative planning, and therapy (Srisaarn et al 2019) , but no consensus on threshold or reference ranges exists to date .

In addition, various associations with sex and age are described, while other possible associations have rarely been investigated.

Our study may have been limited by the use of hand held goniometer but our results were similar to most of the Indian authors .

The mean neck shaft angle in present study is 130.5°, is almost similar to study by Rajiv Sinha et al (5) with mean value of 130.82 ° but our results is lower than earlier Indian studies of Syed Imran Sultan et al (6)with mean neck shaft angle of 133.3+-6.83 °

Whereas it is higher than earlier study of cornelius S Fischer et al of 127 ° (7) and study by Gattu Praveen Kumar et al (8) having mean value of 127.48 ° of neck shaft angle of femur

Sex difference with respect to neck shaft angle was observed in present study .

The mean neck shaft angle in male was 130.5 degree and slightly lower in female 129.5 ° .

Similar higher values for male in comparison to female were observed by Kaur , Otsianyi, Baharuddin, Nissen . (9)

The femoral neck shaft angle shows considerable variation both within and between human populations.

Anderson JY in their study of 30 different populations group , there are considerable pattern of increased mean angles with an increasingly sedentary existence.(10)

In different ethnic groups the physique , habits and genetic makeup varies so a anthropometric dimensions is quite different among the western and Indian cultures.

Neck shaft angle are very high (150 °) in neonates and then gradually decreases during development reaching adult values during adolescence (11)

V. CONCLUSION-

In the present study , data collected from 50 dry bones from Darbhanga Medical college were analysed and compared with those of previous studies of different regions of world.

30 femurs were classified as male and 20 were female

The mean neck shaft angle was 130.20 .

The neck shaft angle ranges between 120 degree to 138°.

The average neck shaft angle found in male was 130+- 5.5 ° and in female was 129+- 4 °.

There is no significant difference between male and female neck shaft angle .

The present study may be useful in the department of orthopaedics in diagnose and treatment of fracture around the proximal femur. Also useful in forensic anthropology for determining racial variations .

The angle is increased in congenital subluxation and dislocation of hip , cerebral palsy , poliomyelitis and idiopathic scoliosis and decreased in post traumatic coxa vara due to mal united neck of femur and inter trochantric fracture

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