

Femoral Neck Shaft Angle of Bangladeshi Adult Females

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Abstract:

Femoral neck shaft angles (FNSAs) are an important measure for the assessment of the anatomy of the hip and planning of operations in the upper part of femur. From a bio-mechanical standpoint bone geometry is related to the body weight. Geometric parameters like the diameter of the femoral head and neck, the length of neck and the femoral neck shaft angle are determinant factors that increase in frequency and seriousness in osteoporotic patients. Objective of the study was to measure the right and left femoral neck shaft angles of adult Bangladeshi male from radiographs of this region. Study may provide a base line data of femoral neck shaft angle of Bangladeshi adult female so that adequate planning preparation and preoperative selection of orthopaedic implant for surgeries involving the femoral neck can be taken. This was a cross-sectional analytical study which involved measuring the femoral neck shaft angles (FNSAs) of anterior posterior views of the 60 female pelvis, showing the hip joint and proximal part of femur of both sides. Radiographs of adult female pelvis was commented as a normal study by the radiologist were taken as study materials. Femoral neck shaft angles (FNSAs) were measured by goniometer. Female neck shaft angle of the femur (FNSAs) have revealed that there is no significant difference in FNSAs between right and left side.

Keywords: Femur, neck-shaft-angle.

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Introduction:

The femur is the largest and strongest bone in the body. The hip joint is formed by the head of femur and acetabulum. The angle is known by

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many names including neck shaft angle (NSA), collodiaphyseal angle (CDA), diaphysio-femoral angle, angle of inclination or Mikulicz angle and caputcollum-diaphyseal angle.¹ This angle is necessary to enable the femoral shaft to swing clear of the pelvis during mobility². The neck shaft angle varies with age, stature and width of the pelvis. When this angle is $>135^\circ$ the condition is known as coxavalga. When angle is $<120^\circ$ it is known as coxavara. The angle of femoral neck reduces with aging. In early infancy the neck shaft angle is about 150° , in childhood 140° , in adult it is about 125° and in elderly about 120° ³.

The angle of the femoral neck-shaft-angle (FNSA) varies and it is noticed to be smaller in female.⁴

The neck shaft angle has an important role in gait as it clears femoral shaft off the pelvis during the swing phase.⁵ Anatomical study of femur serves helpful data to understand different aspect of clinical disease condition, including fixation of femoral neck fracture, changes in osteoporosis, associated congenital anomaly as well as medicolegal cases.⁶ It is also

helpful in designing and bioengineering construction of orthopaedic implants and hip prosthesis.

Material and Methods:

A cross-sectional analytical study was carried out for measuring the neck shaft angles from radiograph of adult female. The radiographs were collected from different medical college hospital of Dhaka city. X-ray anterior-posterior (AP) view of the pelvis showing both hip joints and upper femora were selected. The radiographs selected were those with no visible pathology and were commented as normal by the radiologist. The measurement were carried out with the aid of viewing box and single hand held 360° goniometer. The measurement were done by two researchers and the average value was recorded as the final value. Method of measurement femoral neck shaft angle (Fig 1)

To measure the femoral neck shaft angle, longitudinal axis of neck and longitudinal axis of shaft were determined.

- A. Longitudinal axis of neck: To find out the longitudinal axis of neck lowest limit of head circumference was determined then midpoint of intertrochanteric line was determined. Line joining this two points is neck axis. Then neck axis was extended to cut shaft axis (Fig 1).
- B. Longitudinal axis of shaft: Is the line joining the midpoint of the shaft below the lesser trochanter up to the greater trochanter. (Fig 1).

- C. Femoral neck shaft angle (FNSA): Intersection between the longitudinal axis of neck and the longitudinal axis of shaft (Fig 1).

Results:

A total 60 FNSAs were analyzed from 30 adult female patients. The value of FNSA of female ranges from 114° to 138° with a mean of 130.99±5.02°; the mean value for the right and left side for adult female were 130.05±5.62° and 130.94±6.43° respectively (Table-1).

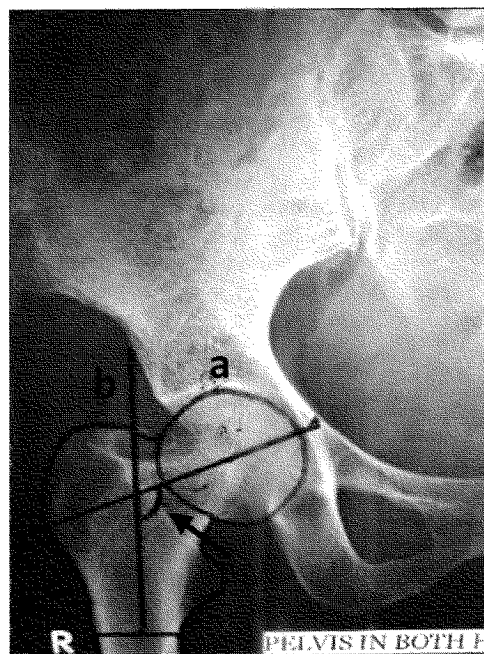


Fig.-1: Arrow showing femoral neck shaft angle (FNSA) .
Line a: longitudinal axis of neck
Line b: longitudinal axis of shaft

Table-I

Values of the adult female neck shaft angle right and left sides

Parameter	Lowest value(°)	Highest value(°)	Modal FNSA (°)	Mean±SD value(°)	P value
Right NSA	121	134	130	130.05±5.62	0.0001
Left NSA	121	135	130	130.94±5.43	

Table-II

Comparison of FNSA of present study with other foreign studies.

Sl.no	Authors	Year	Sample size	Population	Method	FNSA Mean ±SD	P value
1	M lequesne	2004	112	French	X- ray	131.8°±4.4	0.0001
2	PF Umebese	2005	110	Nigerian	X- ray	130.8°±4.4	
3	M Inam	2011	70	Pakistan	X- ray	131°±5.6°	
4	Present study	2017	60	Bangladeshi	X- ray	130.99°± 5.02°	

Discussion:

The studies on neck shaft angles have been done in different authors in different parts of the world. Variations in neck shaft angle has been found and this can be attributed to varying level of activity, genetics, race, diet and lifestyle.^{7,8} In the present study, the mean value FNSAs were $130.05^{\circ} \pm 5.62^{\circ}$ and $130.94^{\circ} \pm 6.43^{\circ}$ on the right and left side respectively. There were no significant differences on the right and left FNSA in the present study which was similar to the most of the other author (Table-II). The importance of FNSAs lies in diagnosis, treatment of various orthopaedics condition like developmental dysplasia, osteoarthritis of hip, slipped capital femoral epiphysis and various valgus or varusosteomies.⁹ The rotation and version of the femoral neck to the femoral condyles and its projection on the anterior posterior radiograph influence the implant choice during total hip arthroplasty hence the rotational influences has to be considered using biplanner radiograph.^{10,11} It is hoped that these morphometric finding on FNSA could be of some use possibly in designing prosthesis for Bangladeshi population.

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