Original Article

A STUDY OF NECK-SHAFT ANGLE IN MARDAN REGION KPK PAKISTAN

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ABSTRACT

Background: *The lengthy shaft axis and the femoral neck combine to generate the neck-shaft angle. It helps with hip joint mobility and contributes to hip stability. Understanding this angulation helps anthropologists not just in determining a person's sex but also in the diagnosis and treatment of hip fractures.*

Objectives: *The current study's goals were to enlighten the elderly Pakistani-KPK population about the morphometric feature of the proximal femur (neck-shaft angle), compare it bilaterally and in both sexes and compare it with findings from another study.*

Study design: *A Observational, cross-sectional study analyzing proximal femur neck-shaft angles in KPK.*

Duration and place of study: *This study was conducted May to October 2014 in Mardan, KPK,*

Methods: *This investigation was carried out from May to October 2014 at the radiology department of the Mardan Medical Complex Hospital in Mardan.*

Results: *Of the ninety-one cases, the mean age was 58.24 (6.49), with 55 (60.4%) male and 36 (39.5%) female. The right and left sides of the female population's mean neck-shaft angles were considerably greater than the male population's (p=0.009 and p=0.05, respectively). Overall, the population mean left neck-shaft angle was greater than the right side (p=0.05).*

Conclusion: *The current study finds that the neck-shaft angle considerably differed from other populations and varied with gender and side in both male and female Pakistani-KPK population members.*

Keywords: *Neck Shaft Angle, Proximal femur, Morphometry*

INTRODUCTION

The proximal femur neck-shaft angle varies between civilizations, which may help anthropologists and doctors assess hip fracture risk and treatment. The femur is the longest and most anatomically studied bone in the body. [1] The proximal femur has a head, neck, and shaft. Neck-shaft angle, collo-diaphyseal angle, cervical-diaphyseal angle [2], and angle of inclination are the angles between the femur neck and shaft long axis.2. Hip stability, lateral balance, and hip joint movements while walking depend on it [3]. The neck-shaft angle is large in infancy. It narrows to 135 degrees in maturity as the pelvis and height mature. The angle drops throughout growth but seldom changes beyond complete development, even in old age. Females have a narrower neck-shaft angle than men because their pelvis is larger and practically forms a right angle with the femoral body. Even within a person, neck-shaft angles might vary greatly. Environmental, genetic,

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cultural, and nutritional factors affect proximal femur geometry [4-8].

A shift in neck-shaft angle may suggest illness. Coxa Vara decreases neck-shaft angle while Coxa Valga increases it [9]. older adults with Osteoporosis have greater femoral neck fractures, although the risk rises with the problematic neck-shaft angle. Keats was the first to employ radiography to evaluate the angulations. However, Pearson [13] and Singh [14] measured them directly from the bones [15]. Cheng et al [16]. discovered that American skeleton neck-shaft angles averaged 125o using X-rays [16]. Hoaglund and Low compared neck-shaft angles using anterior-posterior radiographs [17]. In Caucasian men, the average neck-shaft angle was 1230 to 1610, and in women, 1150 to 1450. The average neck-shaft angle for Hong Kong Chinese men was 1350 (1150–1520), and for females, 1340. Male Caucasians had a greater neck-shaft angle than Hong Kong Chinese. Even within an ethnic group, neck-shaft angles vary regionally. Tahir et al. and Singh et al. found different mean neck-shaft angles throughout Nigeria. Many controversial studies have examined hip fractures and neck-shaft angles. In 2004, 232 hip X-rays from women with and without hip fractures were investigated in Turkey. In addition to typical proximal femur features, those with neck fractures showed higher neck-shaft angles.19 Another research found a reduced neck-shaft angle in femur neck fractures in Japanese and American populations, whereas a Swedish investigation found no link [6,20].

Table 1: Age distribution

	Gender	N	Mean	Std. Deviation
Age (in years)	Male	55	58.74	6.39
	Female	36	57.47	6.66
Total		91	58.24	6.49

The neck-shaft angle helps diagnose, treat, and follow up hip fractures, sliding upper femoral epiphyses, and hip developmental dysplasia. It also helps determine race. Understanding the usual asymmetry of the right and left neck-shaft angles may assist in evaluating individuals with pathological problems and executing corrective osteotomies for femur fractures. Complete hip replacement requires femoral components that match the femur's anatomy, according to Siwach [21] and Noble PC22. Biomechanical and physiological factors may induce avascular necrosis, nonunion, and malunion if the implant is insufficient [21]. A literature study found little about Pakistani neck-shaft angle and proximal femur geometry. Thus, this research examined proximal femur morphometry in 50–70-year-old Pakistanis. This research aims to assess the proximal femur neck-shaft angle in a pelvic radiograph. This study will compare results with others and provide morphometric information on the proximal femur of Pakistani 50-70-year-olds.

MATERIALS & METHODS

Ethical Review Committee approved the trial before it began. The radiology department of the Mardan Medical Complex Hospital in Mardan examined the pelvic radiographs of 91 participants aged 50–70 from May to October 2014. The inclusion criteria were a digital radiograph of the pelvis, hip joints, and left and right sides, with known sex and age. Pathological radiographs that might interfere with neck-shaft angle measurement were excluded. All historical data was collected via patient interviews with informed consent. The big toes contacted on their medial sides (femur in internal rotation of 15–30 degrees) at a routine object film distance of 5 cm and focused film distance of 92 cm in the anteroposterior digital radiograph.20, 23 and 24The neck-shaft angle was measured bilaterally in degrees using digital calipers at the neck-shaft junction.25,

Table 2: Nesck-shaft angle(in degrees) according to gender

		N	Minimum	Maximum	Mean	Std. Deviation	P Value
NSA Right (in deg.)	Male	55	120	145	134.10	5.93	0.009
Female		36	125	155	137.55	6.06	
Total		91	120	155	135.47	6.18	
NSA Right (in deg.)	Male	55	122	145	135.49	4.99	0.05
Female		36	125	154	137.88	6.5	
Total		91	122	154	136.43	5.77	

Table 3: Bilateral Neck-shaft angle in degrees

	N	Mean	Std. Deviation	p-value
NSA Right (deg.)	91	135.47	6.18	0.05
NSA Left (deg.)	91	136.43	5.77	

Table 4: showing neck-shaft angle (degrees) in various studies

Year	Author	Region	Age	Male	Female	Mean
1980	Hoaglund17	Hong Kong		135	134	
1999	Gnudi l34	Italy	62.8		122.6	
2000	Gomezl35	Spain	70.3		124.6	
2001	Massaki33	Japan		125.6	126.1	
2004	Pulkkinen47	Finland	73.7		128.3	
2004	Haava T20	Turkey				128.9(5.9)
2005	Nissen36	Denmark		131(5)	129(5)	
2007	Gozashti37	Iran				128(5.93)
2009	Mishara25	Nepal				132.6(8.3)
2009	Chiu CK38	Malaysia	53.0(2.5)	135.9(5.8)	136.0(5.6)	136.0(5.6)
2010	Masood U39	Pakistan(karachi)	33			130.3(6)
2011	Otsinyl40	Kenia	16-95	128.2(3.7)	126.1(3.2)	127.2(4)
2010	Udoaka AI41	Nigeria	50-59	132.3(5.47)	131.94(5.13)	
2011	Baharuddin42	Malaysia				132.3(3.4)
2013	Kaur P43	India(north-west)	39(9.3)	121.6(2.41)	121.6(2.41)	121.39(2.6)
2014	Bhattacharya44	India(Kolkata)	59(4.63)	125.53(2.18)	124.79(1.98)	
2014	Present study	Pakistan(KPK)	58.24(6.49)	135.49(4.99)	137.88(6.59)	

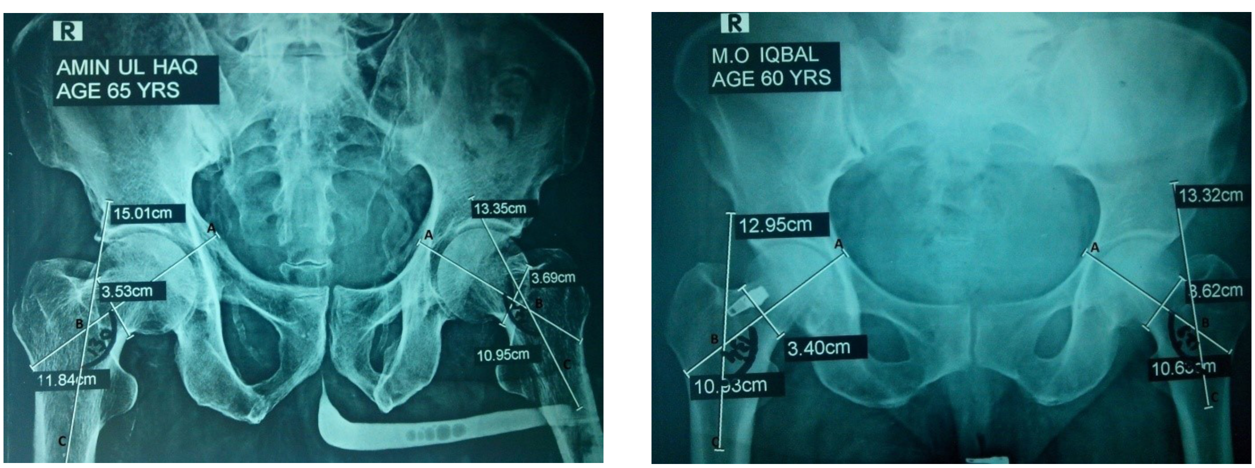

Figure 1: Geometrical parameters of proximal femur. Antero-posterior radiograph of hip joint showing neck-shaft angle ABC- the angle between the femur neck and shaft.

26 (Fig. 1) Radiologists measured neck-shaft angles. Age and gender were recorded on the patient's history sheet. SPSS (20.0) was used for descriptive statistics. Kolmogorov-Smirnov tests analyzed quantitative data normality. Since the data was normal, the t-test was employed to compare men and females and right and left. Statistical significance needed a p-value of 0.05 or less.

Antero-posterior radiograph of hip joint showing neck-shaft angle ABC- the angle between the femur neck and shaft.

RESULTS

With a mean age of 58.74(6.39) for men and 57.47(6.6) for women, the study population of 91 patients consisted of 55 (60.4%) males and 36 (39.6%) females. The population was 58.24(6.49) years old on average. Table 1

The average right neck-shaft angle for men was 134.10(5.93); for women, it was 137.55(6.06); and for the whole population, it was 137.47(6.18). The mean left neck-shaft angle was 136.43(5.77) for the entire population, 137.88(6.5) for females, and 135.49(4.99) for men. Table 2 The female population's right side had a substantially higher mean neck-shaft angle than the male population (p=0.009), and the female population's left side had a significantly higher mean neck-shaft angle than the male population (p=0.05). Table 2

On the left side, the mean neck-shaft angle of the total population was higher than on the right side (p=0.05). Table 3 Where p-value 0.05 was considered statistically significant

DISCUSSION

Classical literature states that babies have a neck-shaft angle of 1500, children 1400, adults 1250, and seniors 1200.27 The present research examined the neck-shaft angle in Pakistani Mardan residents aged 50–70 and compared it on digital radiography between men and women and between the right and left sides. Countries, regions, and even the same area have varied neck-shaft angles. Many authors have noted demographic differences [28-30]. Table no 4 Due to inheritance and exercise levels, neck-shaft grades vary throughout groups [7]. Other factors include lifestyle and cuisine [6].

According to Yoshioka, [31] Trincus and Tardieu [32], and Massaki [33], the mean neck-shaft angle in females was higher than that of males. In the current study, the mean neck-shaft angle was 1370, significantly higher than that of males (p=0.009) for the right and (p=0.05) for the left. Anderson et al. [28] found femoral neck-shaft angle sexual dimorphism in a comparative study. The mean neck-shaft angle in females was larger in 58.8% of 17 samples, suggesting lower activity than in men. A higher neck-shaft angle may indicate disease. Osteoporosis and abnormal neck-shaft angle enhance the risk of neck fractures in older people.[10, 11, 12], In another retrospective research of 100 patients, Chiuck et al.38 found that at 56 years old, women (n = 54) had a mean neck-shaft angle of 136(5.6), which was larger than men (46; NSA= 135.9). Population differences in proximal femur morphology may explain femur neck fracture rates. 8,31 Nakamura et al. (2008) and Yoshikawa et al. [31] examined Japanese and White American women's proximal femoral morphometry. They found smaller neck-shaft angles in Japanese women than in American women. These and other differences in femoral morphometry may explain hip fracture risk differences between populations. Japanese hip fractures were lower despite their decreased femoral neck mass.

In a cross-sectional investigation of 547 post-menopausal women over 69 with cervical spine hip fractures (88 cervical, 93 trochanteric, and 366 controls), Gnudieta l45 showed a greater neck-shaft angle. The left side neck-shaft angle was much larger than the right (p=0.05). Chibber and Singh [46] found that more left-handed people bear weight on their left sides. The left limb dominates. The right proximal femur metaphysic is less suited to movement and severe strain. In contrast, the left epiphysis provides moving and supporting function under normal conditions, according to Samaha et al [1]. Along with Anderson [28], Hoaglund [17], and Trinkaus [47], the present study found variable degrees of left leg robusticity in individuals.

CONCLUSION

The current study finds that in the senior Pakistani-KPK population, the neck-shaft angle varies with gender and side and differs from other groups, including those in the Western population. Thus, this study aids anthropologists in determining the sex of this area and illuminates the process of designing implants that meet the demands of Pakistani-KPK people. However, a larger-scale study with a broader age range of participants is required.

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