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# GENDER WISE VARIATION IN FEMORAL NECK ANTE-VERSION IN OUR SOCIETY

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**Abstract:**

***Aim:*** *To determine gender wise variation in femoral neck ante-version by anatomic method.*

***Study Design:*** *A Descriptive cross-sectional study.*

***Place and Duration:*** *In the Anatomy department of Sir Syed College of Medical Sciences for Girls, Karachi for one-year duration from March 2019 to March 2020.*

***Methods:*** *250 dry femora were examined, including 209 male and 41 female types, 103 right bones and 108. Left. The angle of femoral neck ante version was determined by the Kingsley and Olmsted method, measuring the angle between the long axis of the femoral neck and the transverse retrocondylar line (coronary plane) taken as the axial plane of the femoral axis.*

***Results:*** *The calculated mean angle was 8.12 ± 9.8 with the range of 60.3. Female bones had a lower mean 6.70 ± 12.09 and narrower range (47) than male bones (8.40±9.39 and range of 60.5 respectively).*

***Conclusion:*** *In our society there was a gender difference in femoral neck ante version values. The overall mean of femoral ante version determined is very different from Western, African, and most of the Asian populations and is very close to the Pakistani society.*

***Key words:*** *Arthroplasty, Femoral neck ante version, femoral neck axis.*

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## INTRODUCTION:

The femur is one of the most-studied bones in the human skeleton. The morphology of the proximal femur, especially the relationship between the head, neck and proximal axis, was the subject of interest and discussion in orthopedic literature dated at least the mid-nineteenth century[1-3]. Due to evolutionary changes in the locomotion apparatus, the human femur, especially the proximal end, is subject to various mechanical forces and body loads that give the femur complex anatomical features[4-5]. These anatomical features include different social classes, differences in different ethnic groups, different geographical distribution, gender differences, and even differences within the same person. A wide range of literature is devoted to anatomy, sex, racial polymorphism and age changes. In the femur, the anterior-femoral (FNA) angle has long been one of the most studied and studied topics in the world[6-7]. A range of more than two standard deviation errors is often taken as implying "torsion", and is considered as abnormal[8].

## TOOLS AND METHODS:

This descriptive cross-sectional study was conducted at the Anatomy department of Sir Syed College of Medical Sciences for Girls, Karachi for one-year duration from March 2019 to March 2020. The inclusion criterion consisted of adult dry femurs from surrounding villages, regardless of gender and origin. Adult femurs are selected on the basis of complete ossification of proximal and distal epiphyses and apophyge's, as can be seen with the naked eye. Pediatric femur and people with disease symptoms (deformed femur, osteophytes in the head and dysplastic head) are excluded. The data was collected after obtaining the consent of the relevant department managers in the work environment, after full explanation of the purpose and procedure of the audit and asking the ethics committee for permission. Data were collected from the above-mentioned department. The dead bodies, which were the source of the study of dry femur, belonged to surrounding villages, which was discussed and confirmed by the heads of those departments whose physical features and clothing were identified. Each femur was examined for gender (male and female) and lateral (right and left) determination. The gender was determined on the basis of bone size, muscle attachment prominence and femoral head size. It is larger in men and has prominent muscle attachments with a larger femoral head size than in women. The side determination is straight with a larger trochanter and intervertebral notch on the back of the femur and femoral head towards the pelvis. The anterior-femoral angle was measured by the Kingsley and Olmsted method, which is considered the most accurate. In this method, the femur was placed on a smooth, flat, horizontal surface, so it was supported at three points, i.e. in the posterior direction of the two femoral condyles and in the posterior direction of the larger trochanter. Then two smooth blocks were placed, whose thickness was exactly the same as the thickness of the fixed goniometer arm to the neutral ("0") mark from the horizontal surface - one under the femoral condyles and the other under the posterior aspect of the greater trochanter. The anterior and posterior width of the neck was determined at the proximal and distal ends of the femoral neck using a Vernier caliper, and taking half of this on both the proximal and distal points with the help of a ruler held along the mounted Vernier caliper were marked and joined to the surface of the femur, thus determining the true longitudinal axis of the femur. Then 2 mm Kirschner wire was placed along this line with clay glue, which represented the central axis of the neck. The goniometer has now been installed to measure the angle of the femoral ante version. One goniometer arm is located along the horizontal surface and the other arm is parallel to the wire. The angle formed in this way is taken as the "antero-femoral angle". For greater precision, two readings were taken for each femur, and then their arithmetic means were calculated.

The data collected in the proforma were entered into the SPSS statistical software (version 17) and analyzed. The mean values, ranges and standard deviations (SD) were calculated for continuous variables, such as the measurement of the femoral ante version. Frequency and percentages were calculated for categorical variables such as gender and femur side.

## RESULTS:

Most 250 femurs were male 205 (83.6%), and the distribution of right and left was almost the same, i.e. 128 (51.2%) and 122 (48.8%), respectively. (Tables 2 and 3). The average FNA for the whole sample was 8.12 ± 9.8 (Table 1). A significant difference was observed for the mean and standard deviation of the male (8.40±9.39) and female (6.70 ± 12.09) bone (Table 3). The female bone type has a much narrower range (47 compared to 60.5), but a higher standard deviation (partly due to the lower number in the sample). The extremes of FNA value belonged more to the male type femora (Table 4).

The study showed that about 70% of the male femurs had 0 to 20 degrees FNA, and 101 bones (40.4%) showed 5 to 15 FNA, and almost 40% showed 3 to 15 FNA.

**Table 1: Cumulative Results for FNA***

| | FNA |
|---|---|
| N[a] | 250 |
| Minimum | -32 |
| Maximum | 39.69 |
| Mean | 9.6 |
| SD** | 11.5 |
| Range | 71.7 |

**Table 2: Sex wise distribution of the femora (n=250)**

| Gender | Frequency | %age |
|---|---|---|
| Male | 209 | 83.6 |
| Female | 41 | 16.4 |

**Table 3: Gender wise analysis for FNA***

| | Male | Female |
|---|---|---|
| N[a] | 209 | 41 |
| Mean | 9.2 | 12.3 |
| SD** | 10.4 | 22.7 |
| Minimum | -29 | -35 |
| Maximum | 37.04 | 50.3 |
| Range | 66.9 | 86.6 |

**Table 4: Gender wise distribution of FNA***

| FNA* | Male (N [a]) | Female (N [a]) |
|---|---|---|
| < -10 | 5 | 2 |
| -10 to -2 | 31 | 4 |
| -1 to 1 | 6 | 0 |
| 2 to 5 | 24 | 3 |
| 6 to 10 | 45 | 5 |
| 11 to 15 | 32 | 3 |
| 16 to 20° | 32 | 2 |
| > 20 | 14 | 3 |

## DISCUSSION:

Correct knowledge of femoral anti-aversion, prostheses and preoperative planning for total hip replacement surgery is extremely important in selecting patients for hip pathology and all lower limbs, and anthropological studies. Although new methods using computed tomography (CT) have been shown to be accurate to within ± 1 °, there is no universal consensus to find the femoral neck axis and femoral condyle axis[9-10]. Therefore, predicting anteversion in dry bone is still considered the most accurate method. Because we use the same measurement method that Kingsley and Olmsted used, it is better to compare our results with specific authors[11-12]. The median value calculated by Kingsley for women was higher than for men, and the range was almost the same for both sexes. This is contrary to this study. In this study, the retroversion group (20.8%) belonged to more femurs than the Kingsley and Olmsted study (14.5%) [13-14]. In addition, unlike this study (23.7%), the Kingsley study has more crowds than the average (over 26% in the 5-10-degree range). This may be due to the larger sample size compared to this study[15-16]. Another difference is the highest value in females (8.11) compared to men (7.97 °). Other authors have set higher FNA values for women. Maheshwari et al and Jain et al. Calculated higher than men by computed tomography[17-18]. Similarly, Aitkinson and colleagues said that women are taller than men (8 vs 7). In these studies, the ends of the negative and positive values are documented by this study. When comparing different studies, the difference between the results is significant. This may be partly due to differences between measurement methods and partly due to differences between races, age and gender[19-20]. Therefore, the large variation in the FNA angle size of the femur of an adult human can be considered a proven fact, which makes it extremely difficult to determine what will be considered normal[21-22]. Therefore, some authors receive an average of 15-20 degrees, others average 12 degrees, and similarly, some authors received a normal average

value for the western community, from 11.9 to 25. Gender change is a reality reflected in almost all FNA studies, some of which are illustrated here and tested in this study[23-24]. Most studies showed a relatively higher FNA compared to men in both Western and Asian data, including Pakistan studies[25]. However, compared to another Asian study comparing its results with a much larger sample, its results can be verified because both have similar results. The mean FNA results in Caucasian males were 14 (4-36) and females 16 (7-28). The average FNA for men was 14 (4-36) and 16 (7-28) for women in Hong Kong, China[26-27]. The smaller sample size, lack of paired femurs, and the rarity of female femurs are limitations of this study. Due to cultural trends, female reproductive organs are rarely available for donation to anatomical museums across the country. If a fairly large female sample was available, the results would be different for the population.

## CONCLUSION:

In our society there were gender differences for the value of the ante version of the femur. The overall average fixed version of the femur is very different from the Western, African and most Asian populations, and is very close to Pakistani society.

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