

Evaluation of the Carrying Angle in the Ethnic Assamese Community

Monjushree Chakravarty¹, Rashmi Rekha Bordalo²

^{1, 2} Department of Anatomy, Tezpur Medical College, Tezpur, Assam India.

ABSTRACT

BACKGROUND

Assam is in the North East of India. The earliest inhabitants of Assam were people who came from Southeast Asia. The ethnic communities constitute about 12 to 13 percent of the state population. The present study was undertaken to evaluate the carrying angle of the elbow in ethnic Assamese community.

METHODS

The study was conducted in the Department of Anatomy, Tezpur Medical College. Out of 225 students admitted in first semester M.B.B.S. in two consecutive years in Tezpur Medical College, 20 students belonged to different ethnic communities of Assam. The carrying angle of both the right and left upper limbs were measured in the twenty selected students. Evaluation was done following all legal formalities.

RESULTS

The mean carrying angle in males was 10.33 ± 1.56 in the right limb and 12.11 ± 1.72 in the left limb; in the females it was 11.73 ± 2.73 on the right side and 11.45 ± 3.26 degree on the left side.

CONCLUSIONS

The study was done to find the carrying angle of the elbow in the ethnic Assamese community. The results of this study will be of help in the diagnosis and treatment of deformity and injury around the elbow.

KEYWORDS

Carrying Angle, Elbow, Ethnic Assamese Community

Corresponding Author:

Dr. Monjushree Chakravarty,

Tezpur Medical College,

Tezpur, Assam, India.

E-mail: monjushree1968@gmail.com

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BACKGROUND

The carrying angle of the elbow is the lateral deviation of the long axis of the forearm from the long axis of the arm when the elbow is extended. The angle disappears when the elbow joint is fully flexed. The elbow joint is a compound synovial joint. It includes two articulations, (i) humeroulnar joint – between the trochlea of the humerus and the trochlear notch of ulna, (ii) humeroradial joint – between capitulum of humerus and head of radius. The trochlear is like a pulley where the medial and lateral flanges are not equal, the medial flange exceeds the lateral. The medial flange projects beyond the lower plane. The plane is about 2 cm beyond interepicondylar line and is tilted inferomedially.

The trochlear notch is not congruent with the trochlea of the humerus so when the limb is fully extended the medial part of the upper half of the notch is not in contact with the trochlea, and in flexion a lateral part loses contact. The carrying angle is the lateral deviation of the forearm from the arm. It is formed when the forearm is fully extended and supinated. The carrying angle that is formed is due to (i) projection of about 6 mm of the medial edge of trochlear of the humerus and (ii) due to the tilt of the superior articular surface of the coronoid process, so it is not at right angle with the long axis of the ulna. In full flexion the carrying angle disappear because the humerus and ulnar reach the same plane during full flexion.

The carrying angle is not seen in pronation of extended forearm because in pronation of extended forearm, the arm, forearm and hand are in the straight line. Due to the formation of the carrying angle, the ulnar border of the forearm does not come in contact with the lateral surface of the thigh. The carrying angle deviate the forearm laterally, thus allowing it to swing without coming in contact with the hip. The carrying angle is more pronounced in females. The wider carrying angle in females avoids rubbing of the forearm with the wider female pelvis while carrying loads.

In anatomy the carrying angle of the elbow is taken as the external angle between humerus and the ulna when the forearm is extended, which is an obtuse angle, but clinically the carrying angle is the measure of the lateral deviation of the long axis of the forearm from the long axis of arm, which is an acute angle. The carrying angle varies according to age: increases with age, gender: more in the female than the male, dominant limb: greater in the dominant limb and also varies with high.

It is considered abnormal if the carrying angle increases beyond normal, more so if it occurs in one limb. Cubitus valgus is a clinical condition where there is an increase in the carrying angle beyond average. In the management of various fractures around the elbow, knowledge of carrying angle is important. The study was done to observe the carry angle of the elbow of the ethnic Assamese community and compare the same with the different studies done by the previous workers around the world so as to help clinicians diagnose elbow deformities.

METHODS

The study was conducted in the Department of Anatomy, Tezpur Medical College. The evaluation of the 'carrying angle' of 20 students of Tezpur Medical College, belonging to the ethnic Assamese community.

The study was done following all legal formalities. The students involved in the study signed informed consent forms. The age of the student varying between 19 years to 23 years, and included both male and female student. A short history was taken to know the community they belonged to and also to know the dominant hand. They were also asked if they had any past history of pathology around the elbow. Clinical examination was done, where the elbows of the students were examined to see that it was normal and did not have any injury or pathology.

The students who had pathology and injury around the elbow were not taken in the study group. All the students in the study group, the right upper limb was the dominant limb. The students were asked to stand in the anatomical position-erect posture, looking straight with feet together, and their arms by the side of the body and palm facing forward. Their upper limbs were extended and in supine position. The midpoint between the lateral extremity of the anterior axillary fold and the prominence of the deltoid muscle was marked. The two epicondyles of the humerus were joined by a line and the midpoint was marked. Now the two midpoints were joined. This line represented the long axis of the arm. Another line was drawn from the midpoint of the epicondyles of the humerus to the tip of the middle finger. This line represented the long axis of the forearm. Now the line representing the long axis of the arm was extended distally. The angle of deviation of the long axis of the forearm from the long axis of the arm was measured with the help of the goniometer. (Figure 1).

The carrying angle of elbow was measured by applying one arms of the goniometer on the long axis of the arm and the other on the long axis of the forearm with the limb fully extended and in supine position (Figure 2).

The carrying angle of both the right and the left elbows was measured. The value of the angles was recorded and statistically analyzed for Mean and SD.

RESULTS

The study was done to find the value of the carrying angle of the elbow in the ethnic community of Assam. The results of the study are given as follows. The mean carrying angle in the male was 10.33 ± 1.56 in the right limb and 12.11 ± 1.72 in the left, the range varying between 6 to 12 degree in the right and 10 to 15 degree in the left side. The mean carrying angle in male is 11.22 degree. The mean carrying angle in the female was 11.73 ± 2.73 in the right side and 11.45 ± 3.26 degree in the left. The range is between 7 to 15 degree in the right and 6 to 15 degree in the left side. The mean carrying angle in the female is 11.59

degree. The difference of the carrying angle between male and female was 0.37 degree.

Male		Female	
Right	Left	Right	Left
10.33 + / - 1.56	12.11 + / - 1.72	11.73 + / - 2.73	11.45 + / - 3.26

Table 1. Carrying Angle in Degrees with SD Value

Authors	Mean	Male	Female
Paraskevas et al. ¹	12.88 ^o + / - 5.92	10.97 ^o + / - 4.27	15.07 ^o + / - 4.95
K Sharma et al. ²		Right -4.5509 ^o Left -7.3059 ^o	Right -4.9545 ^o Left 7.8030 ^o
Rajesh B et al. ³		6.70	13.6 ^o
Ravi Kumar Biradar ⁴		9 - 12 ^o	13 - 15 ^o
Chinweife K.C et al. ⁵		Right -12.30 ^o + / - 1.88 Left -10.99 ^o + / - 1.87	Right 13.82 ^o + / - 1.65 Left 12.55 ^o + / - 1.76
Present study	11.22 ^o	Right -10.33 ^o + / - 1.56 Left 12.11 ^o + / - 1.72	Right -11.73 ^o + / - 2.73 Left 11.45 ^o + / - 3.26

Table 2. Carrying Angle in Degrees Reported by Different Authors

Authors	Difference of the Carrying Angle between Male and Female
Potter (1895) ⁶	5.8 ^o
Mall (Oz) ⁷	3.5 ^o
Nagel and Fick ⁸	2 ^o
WB Atkinson et al. ⁹	1.8 ^o
Present Study	0.37 ^o

Table 3. Difference in Value of the Carrying Angle in Degrees between Male and Female



Figure 1. Goniometer



Figure 2. Measurement of the Carrying Angle

DISCUSSION

The carrying angle is the lateral deviation of the forearm from the arm when the forearm is fully extended and

supinated. The carrying angle formed due to the projection of the medial edge of the trochlear about 6 mm beyond the lateral edge of the trochlear and also due to the superior articular surface of the coronoid process which has a slant, so it is not at right angle with the shaft of the ulna. "The carrying angle disappears when the elbow is flexed because the slant of the two articular surfaces is same when the elbow is flexed Grey's Anatomy.¹⁰"

In this study, the carrying angle was found in the ethnic Assamese community with the view to help clinicians in the diagnosis and the treatment of pathology around the elbow, in this part of the country. Several workers found the carrying angle in different communities, but no studies were found related to this particular study group. In the present study, it was observed that the mean carrying angle in the male was 10.33 + / - 1.56 in the right limb and 12.11 + / - 1.72 in the left and the mean carrying angle in the female was 11.73 + / - 2.73 in the right side and 11.45 + / - 3.26 degree in the left, but Paraskevas et al.¹ reported the mean carrying angle to be 12.88 degrees + / - 5.92: 10.97 degrees + / - 4.27 in men and 15.07 degrees + / - 4.95 in women. "It is seen that different authors have found different values of the carrying angle, as shown in Table 1. It has been documented by different authors like Dey S. et al.¹¹ that the carrying angle is greater in females than in males. Potter HP et al.⁶ and Atkinson WD et al.⁹" considered the difference in male and female as a secondary sexual characteristic. In the present study, the carrying angle was higher in the female than the male. Several workers like G. Paraskevas et al.¹⁰ and Dey. S et al.¹¹ found that the carrying angle was higher in the dominant limb, while Sharma K et al.² reported that the carrying angle was higher in the non-dominant side. In the present study no such observations were seen related to the dominant or non-dominant side. The difference of value in the carrying angle between male and female in our study is 0.37 degree which is smaller than the 5.8" reported by Potter (1895),⁶ but it is closer to 1.8 reported by WB Atkinson et al.⁹ The difference reported by different workers are listed in Table 2.

CONCLUSIONS

In the present study the carrying angle was determined in the ethnic Assamese community and was compared with other studies. It has been reported by several workers that the carrying angle is more in females than in the males; this is also seen in the present study. Several workers found that the carrying angle was higher in the dominant limb while others found it higher in the non-dominant limb, but in the present study no such observation was seen related to dominant or non-dominant limb. It was noted that there is regional variation in the value, which brings to light that environmental factors may play a role in the variation. Further studies in this field can be undertaken to study the carrying angle in different age groups in the ethnic Assamese community.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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