



A Study of Carrying Angle of Elbow Among Young Adults of Jammu & Kashmir

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Abstract

Introduction - carrying angle is the angle between the median axis of arm with the median axis of fully extended & supinated forearm. This angle is important for swinging of arm during walking & carrying objects. There is variability in the carrying angle among different age groups, gender and races. Current study was done to evaluate carrying angle in young adults of J&K. The study was conducted in 150 (75 male and 75 female) healthy MBBS students of Government medical college Jammu after obtaining informed consent. Measurements for carrying angle were taken in both the arms of volunteers. Goniometer was used to measure the carrying angle. Carrying angle was more in females than males (15.2 in females and 12.9 in males) however it was not statistically significant. The carrying angle was more on the dominant side in both the gender i.e. in males right side 13.09, left side 11.2 and females right side 16.54, left side 14.9. All subjects were right handed. No significant sexual dimorphism found though carrying angle was more in females and also on dominant side in both the sexes.

Key Words

Carrying angle, Goniometer, Sexual Dimorphism

Introduction

The transverse axis of the elbow joint is directed medially and downwards. Because of this the extended forearm is not in straight line with arm but makes an angle of about 13 degrees with it. This is known as carrying angle (1). Carrying angle fits the elbow into the waist when the arm is at the side and it is significant that the obliquity of the ulna is more pronounced in women than men. However, the line of upper arm & forearm becomes straightened out, when the forearm is in the usual working position of almost full pronation (2). This angle disappears when the elbow joint is fully flexed (3).

The carrying angle is caused partly by projection of the medial trochlear edge about 6 mm beyond its lateral edge and partly by the obliquity of the superior articular

surface of the coronoid, which is not orthogonal to the shaft of ulna (4).

Carrying angle is considered to be an important secondary sexual characteristic feature as it is more in females than males. This is because of wider hips and narrow shoulders in females. Moreover females are comparatively shorter than males and proximal end of ulna angulates more & medial edge of trochlea grows larger in a shorter person (5). The obvious difference in carrying angle between male & females may also be due to joint laxity in females permitting a greater degree of extension (6).

The present study was carried out to determine carrying angle in young population of Jammu & Kashmir

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and to determine sexual dimorphism if present.

Material & Methods

A total of 150 healthy, asymptomatic medical students of first professional MBBS, Government medical college Jammu were taken for the study after informed consent. Amongst them 75 were females & 75 were male students. All of them were in the age group of 18 to 21 years. This particular group of subjects was selected because of easy selectivity.

The carrying angle was measured with the help of goniometer. The fixed arm of the goniometer was placed on the median axis of the upper arm & the movable arm was adjusted so as to lie on the median axis of the forearm. The angle so obtained between the two arms of the goniometer was read. The carrying angle was measured on both (right & left) sides of each individual. Volunteers were asked whether they were right or left handed. All the readings so obtained were tabulated and compared with the previous studies.

Results

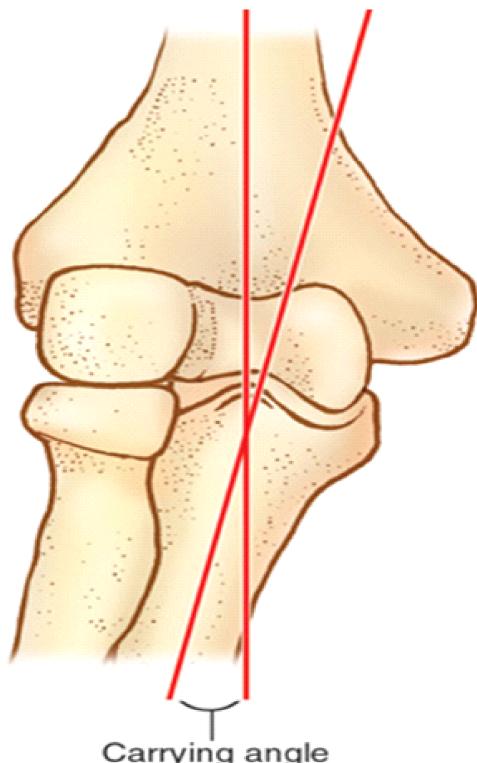
A study was conducted to determine carrying angle in 150 medical students of Government medical college Jammu after obtaining informed consent. The mean ages of the study volunteers were 19.9 years for males and 19.8 for females. The results were tabulated in *table - 1*. All the students were in the age group of 18 to 21 years. No significant sexual difference was not found in the carrying angle in our study. It was 12.9 in males and 15.2 in females. The study revealed significant difference

Table1. Showing Age & sex Wise Carrying Angle

SEX	SIDE	CARRYINGANGLE (DEGREES)		AGE(YEARS)	
		RANGE	MEAN \pm SD	RANGE	MEAN \pm SD
MALE	RIGHT	6-23	13.09 \pm 5.67	18-21	19.9 \pm 1.35
	LEFT	6-20	11.20 \pm 5.54		
FEMALE	RIGHT	5-28	16.54 \pm 7.45	18-21	19.8 \pm 1.36
	LEFT	5-26	14.90 \pm 6.61		

between the carrying angle of right and left arm among both males and females. The carrying angle however was more on the dominant (all subjects were right handed) side in all 150 students. In males on right side 13.09, left side 11.2 and in females right side 16.54, left side 14.9.

Fig 1 Showing Carrying Angle



Discussion

Anatomically the carrying angle in human adults is approximately 100 in men and 130 in women. Increased carrying angle may lead to elbow instability and pain during exercise or in throwing activities of sports, may reduce function of elbow flexion, predispose to risk of elbow dislocation and increased evidence of elbow fracture when falling on the outstretched hand and fracture of the distal humeral epiphysis (7).

There is significant difference between the carrying angle in males and females as observed by Vischard et al (6) and Ruparelia et al (8) (*Table-2*). On the contrary we observed no sexual dimorphism in the present study. This is in accordance with the observations made by Keats et al (9) and Raichandani et al (10) (*Table-2*).

Table 2. Comparative Analysis of Various Studies

STUDY	CARRYING ANGLE IN MALES	CARRYING ANGLE IN FEMALES
Vichard et al (6)	6.02	10.37
Ruprelia et al (8)	6.9	11.8
Keats et al (9)	11.0	13.0
Raichandani et al (10)	11.8	13.42
Present study	12.9	15.2

We also observed that the carrying angle was more on the dominant side which was right side in all the 150 students. This observation is in accordance with study by Emami et al (11) and Tukenmez et al (12). The angle is greater in the dominant limb than the non dominant limb of both sexes, suggesting that natural forces acting on the elbow modify the carrying angle and this difference is considered as a secondary sexual characteristic (13), may imply more laxity of the ligament at the medial elbow and bony remodeling to adapt more stress in the dominant hand (14).

Conclusion

Findings of our study suggest that though the carrying angle is more in females it was not statistically significant. As for as dominant nondominant arm is concerned, it is more on dominant side.

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