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Relation between the length of forearm and carring angle at elbow an observational study

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Abstract
Long axis of arm and forearm when elbow is in extension with palm facing upward forms an angle called carring angle. Variation in the angle has got significance. This study was done to find out the value of carring angle and its relation to age sex and length of forearm. Study was done on 60 adults 30 males and 30 females and it was found that average value of carring angle in males was 6.7 degree and in females it was 13.6 degree. It was also found that the carring angle and length of forearm is related inversely. All though changes in carring angle has only cosmetic value an evaluation of the same can help medical practitioner in the management of certain elbow disorders like elbow dislocation, supracondylar fracture etc.

Keywords: arm, elbow, carring angle, cosmetic value, elbow dislocation, supracondylar fracture

Introduction
Carring angle is an acute angle formed between long axis of humerus and ulna medially at the elbow joint. This angle is slightly greater in females than males. The angle is important for carring objects, walking and swinging. Average value of Carring angle in males is about 6.7 degree and in females it is about 10 to 15 degree. Carring angle is produced as a result of the configuration of trochlea of humerus and coronoid process of ulna. Medial flange of trochlea is 6 mm deeper than lateral flange. Superior articular surface of coronoid process of ulna is oblique to the long axis of ulna. These two factors produces normal valgus angulation between arm and forearm. Carring angle disappears in full flexion and during pronation.

Carring angle permits the arm to swing without contacting hip. Women on average have wider pelvis hence carring angle is more in females. Dominant limb in both sexes have more carring anglethan non dominant limb suggesting that natural forces acting on elbow modify the carring angle. An increase in carring angle beyond normal or decrease in carring angle beyond normal range is abnormal. Increased carring angle is called cubitus valgus and decreased carring angle is called cubitus varus. This is more abnormal when it occurs unilaterally. As there is natural difference in the range carring angle for males and females this study aims to evaluate the relation between carring Angle Length of forearm.

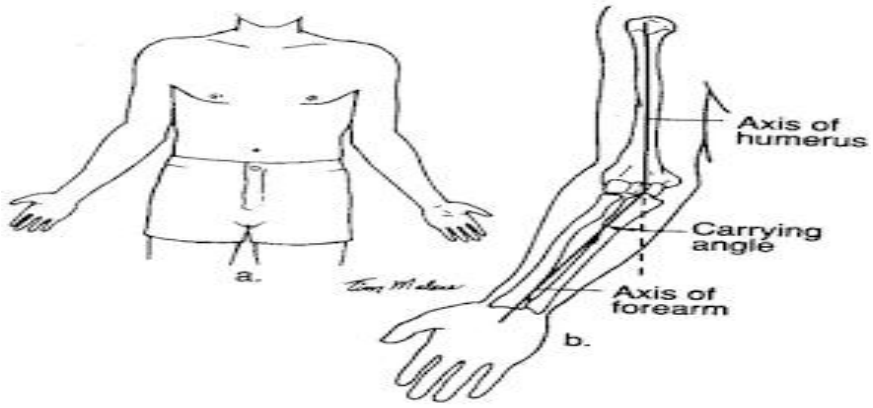

Fig 1: Carring angle between long axis of arm and forearm.

Methods
Study was performed on total 60 Young adults from Jamshedpur 30 males and 30 females. Carring angle was measured by the help of goniometer and length of forearm was measured by the help of measuring tape. Subject was asked to stand in anatomical position with elbow completely extended and supinated. One arm of goniometer was allinged along the long axis of arm. Other arm of goniometer was swng along till it line up along the long axis of forearm. The angle was than recorded.

Length of forearm was measured by the help of measuring tape. Distance between medial epicondyle of humerus and styloid process of ulna was recorded as the length of forearm.

All the measurement was done twice and average of the two readings were taken to reduce errors. The data collected was analysed statistically.

Fig 2: Measurement of carring angle by Gonimeter

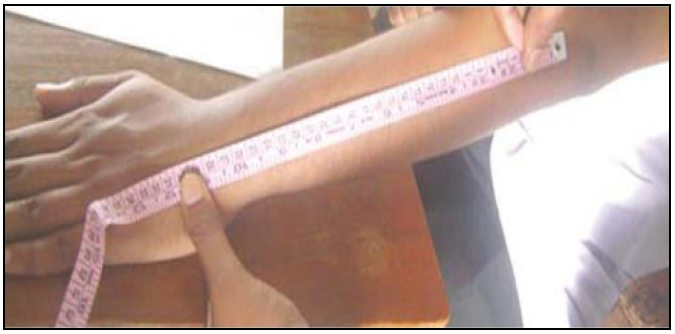

Fig 3: Measurement of forearm length

Results

Wide variability in the value of carring angle was found in males and females. The mean value of carring angle in males and females was 6.7 degree and13.5 degree for girls respectively. Length of forearm and carring angle were significantly related to each other. They were found to be related inversely i.e. if length of forearm increases carring angle decreases. The mean value of carring angle and there relation with length of forearm and personal height are shown in the tables.

Table 1: Mean value of Height, Length of forearm, Carring angle in males and females.

	Height in cm	Length of forearm in cm	Carring Angle
Girls	157.5±5.4	24.8±1.5	13.5±2.6
Boys	169.8±5	42.3±2.7	6.4±1.0

Table 2: Corelation of carring angle with length of forearm and height in females.

	Length of forearm in cm		Height in cm	
Carring angle of fe-males	≤ 25 cm	≥ 26 cm	≤ 157 cm	≥158 cm
	14.8±2.2	12.4±2	14.2±2.5	13.3±2.2

Table 3: Corelation of carring angle with length of forearm and height in males.

	Length of forearm in cm		Height in cm	
Carring angle of males	≤ 44 cm	≥ 45 cm	≤ 169cm	≥170 cm
	6.7±0.9	6.4±1	6.4±1.1	6.9±0.8

Discussion

The present study was conducted to measure the carring angle and to establish the relation between the carring angle length of forearm. It has been found that carring angle is greater in female than the male and this variation is due to biological reason (wider pelvis in female). The present study reveals that the length of forearm is more in males than the females. The value of carring angle is less in males than females. Even in the samegender the value of carring angle decreases with increase in length of forearm. Among the girls who have short forearm length the value of carring angle was very high. Which is an important finding of this study. This finding wassimillar to the finding of the study done by Khare *et al*. [12]. So in this study the author conclude that carring angle is more in females than males and the value of carring angle is inversely related to the length of forearm. Height of the individual do not have any significant impact on the value of carring angle. As the individual who have more height will have longer forearm as compared to short height individual height also has got indirect impact on the value of carring angle. Allthough changes in carring angle has only cosmetic value an evaluation of the same can help medical practitioner in the management of certain elbow disorders like elbow dislocation supracondylar fracture etc.

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