

Original Research Paper

A study of variations in Carrying Angle Between Rural and urban regions of Haryanvi Population

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ABSTRACT:

Background: The elbow joint formed between the humerus within the top arm, and the ulna and radius inside the forearm are permits the hand to be stimulated toward and far by the body. while the arm is stretched beforehand, the humerus and forearm are not perfectly allied a deviation takes the area laterally closer to the lengthy axis of the arm, which is devoted to the “carrying angle”. **Aim and objective:** The aim of the objective is to compare the Carrying Angle Between Rural and Urban areas of the Haryanvi population. **Material and Methods:** The present observation consists of 230 (one hundred fifteen rural and one hundred fifteen cities) healthful humans from urban and rural areas of the Haryana location of the age group 12-40 years decided on. It was measurement by using a physical goniometer completed of flexible clear plastic having each fixed and movable hand. **Results:** our study observed that mean of the carrying angle becomes $12.68^{\circ} \pm 2.14^{\circ}$ in adult males and $15.34^{\circ} \pm 2.17^{\circ}$ in females in rural regions. The mean carrying angle became found to be $11.13^{\circ} \pm 1.89^{\circ}$ in adult males and $13.50^{\circ} \pm 2.24^{\circ}$ in females in city areas. mean carrying angles of males & females had been located to be extra in rural regions than in city areas and differences were statistically more significant ($p < 0.001$). **Conclusion** carrying angle was found large in rural areas and fairly urban regions of each intercourse and knowledge of measure of the angle and its differences are important whilst evaluating stressful elbow injuries in adults of rural and urban regions and other elbow disorders that require arthroplasties or reconstruction. The information in the present work may be useful for the valuation in comparison to pathologic conditions as well as inside the management of disorders of the elbow and its renewal after fractures and additionally beneficial as a forensic tool for sex determination. Our study data may be beneficial in anthropological studies, forensics, genetic studies, as well as in clinical practice.

Keywords: Carrying Angle, Rural, Urban, Goniometer, Haryana, Forensics.

INTRODUCTION:

angulation is an effect of a configuration of the articulating margins of the humerus and ulna which produce a regular valgus angulation of the forearm by the humerus (2). The angle is usually extra in females than in men and the distinction has been taken into consideration to be a secondary sexual feature (3-7). however, some people suggested no significant difference in the carrying angle of men and women of

any age organization (8-10). whether or not the carrying angle is the angle sustained at the medial facet or the lateral side is a protracted-debated issue. The cost received and whether it is more in men or women, consequently, relies upon the aspect measured. however, while the arm is extended inside the anatomical role, the longitudinal axis of the upper arm and forearm form a lateral angle at the elbow joint which is the angle of deviation (approximately 5° in

males and between 10° and 15° in females) at the medial facet. This angle is regarded because of the carrying angle by a few authors. the extent of the elbow joint is situated 2 cm underneath a line joining the two epicondyles. carry angle extended might also cause elbow instability and ache in the path of exercising. it can predispose to dislocations and growth the possibility of fracture across the elbow whilst falling on a stretched hand (11). The sort of fracture an infant sustains after a fall on a stretched hand is determined using the usage of the value of the carrying angle. now and again after recovery of certain fractures of the elbow, the carrying attitude may additionally moreover growth or lower abnormally, i.e. cubitus valgus or cubitus varus respectively (12). The carrying angle additionally shows a right-away relationship with the width of the pelvis. for this reason, a broader pelvis in girls is likewise attributed to being a reason for a much broader carrying angle in females (13). but, within the 3-5 years of age organization, a carrying angle is greater in men in comparison to girls (14). The carrying angle lets the arm swing without contacting the hips (15, 16). The angle is more within the dominant limb than in the nondominant limb of each sex, suggesting that natural forces acting at the elbow adjust the carrying angle (17, 18). natural forces performing at the elbow are distinct in rural and urban populations as it depends upon their working situation and way of lifestyle. the existing examination is designed to estimate the difference between the carrying angle of rural and urban regions of Haryana place.

MATERIAL AND METHODS:

In the present study total of 230 (one hundred fifteen rural and a hundred and fifteen city) asymptomatic, healthful humans of urban and rural areas of the Haryana region within the age group 12-40 years had been decided on. The carrying angle becomes measured by the usage of a manual goniometer complete from flexible strong plastic having secure and portable arms. The subject turned into requested to stand in an anatomical position, in a vertical posture with the toes collectively, arms with the aid of the perimeters, and the palm going through forward. The arm turned inside the long supine position. The constant arm of which placed on the median axis of the upper arm, and the transferrable arm is used to lie on the median axis of the forearm & the angle study on the goniometer. The present study was permitted by the Institutional Ethics Committee of IMCH and RC in Malwanchal university.

Statistical analysis:

The data collected were statistically analyzed using a student t-test.

Table no.1, shows that the mean carrying angle of the Haryana rural area in women and men is 12.68 and 15.34 while the mean carrying angle in males and females is 11.13 and 13.5 respectively inside the 12-40 age institution of the Haryana urban region. there has been a significant difference in the carrying angle of the two aspects of upper limbs both in women and men and a significantly greater carrying angle was found in females. The mean carrying angles of the rural and urban regions of the Haryana region are shown in Table no.1 and Table no.2 Mean carrying angle for each side by type of constitution

Table 1: Mean Carrying Angle of the Haryana Region

Sexes	Carrying angle (degree) Mean±SD		P -Value
	Rural Area	Urban Area	
Female (n=115)	15.34±2.17	13.50±2.24	p<0.01
Male (n=115)	12.68±2.14	11.13±1.89	p<0.01

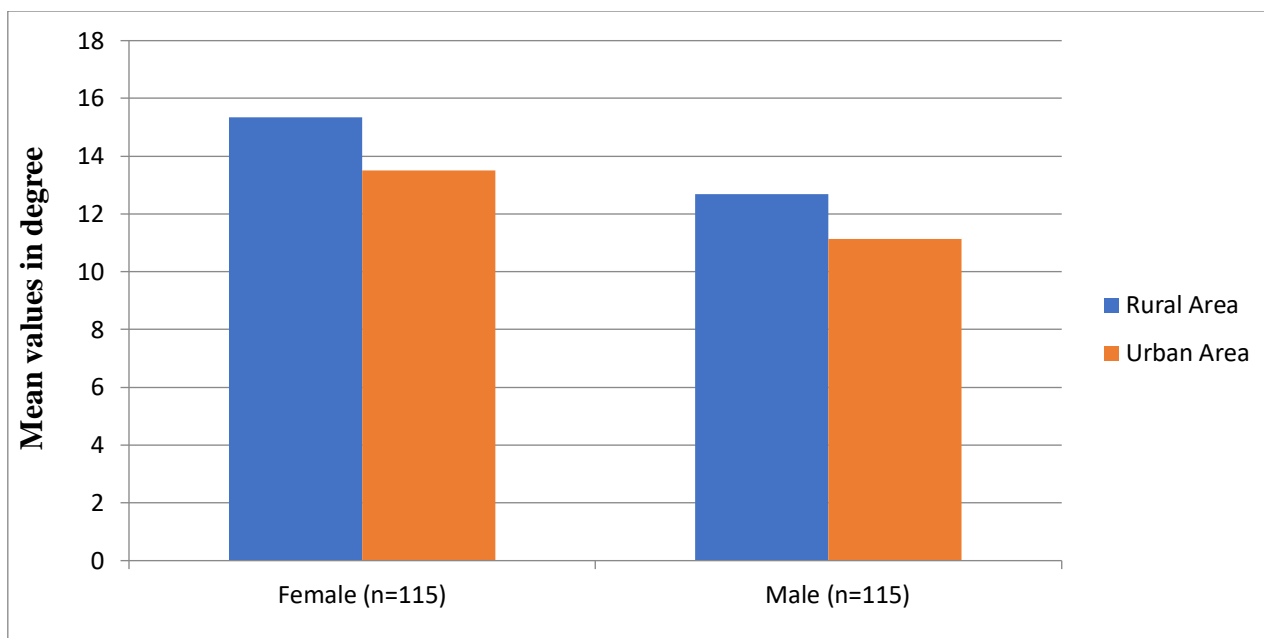


Table 2 Mean carrying angle for each side by type of constitution

% Of sample		Angle (°)	
		Right	Left
Men			
Slender	38.2	10.87	9.15
Athletic	50.4	13.81	12.67
Obese	11.4	16.65	14.66
Women			
Slender	31.7	14.25	12.16
Athletic	47.7	16.89	15.57
Obese	20.6	21.47	18.98

DISCUSSION:

In the present study, the mean of carrying angle changed to $12.68^{\circ} \pm 2.14^{\circ}$ in adult men and $15.34^{\circ} \pm 2.17^{\circ}$ in women in rural areas. The mean of the carrying angle becomes located be $11.13^{\circ} \pm 1.89^{\circ}$ in men and $13.50^{\circ} \pm 2.24^{\circ}$ in women in urban regions. The mean carrying angle will become better for women and men in rural areas and moderately urban areas. In similar studies, Khare GN et al. study found a cross-sectional observation on carrying attitudes in Varanasi in 200 men and 200 women. The mean of the carrying angle was found to be 13.56° in adult males and 16.92° in females (19). Purkait R et al. found that dry bones in essential India identify the sexually dimorphic features

in the bones of the elbow joint which makes the carrying attitude an intercourse indicator. The examination included 40 humeri (20 grownup men and 20 women) and 160 ulnae (100 men and 60 women). Measurements of the humerus (Trochlear angle and Inclination attitude of Olecranon fossa) and 3 measurements of the ulna (Olecranon-Coronoid attitude, length, and width of inferior medial trochlear notch) have been studied. The dimensions on the humerus did not show any sex distinction. but, scale of the ulna showed statistically that significant differences in male and woman bones. Olecranon-Coronoid angle showing excessive sexual dimorphism can be one of the reasons for different values of the carrying angle detected in the sexes. The olecranon-

Coronoid angle of a woman's ulna suggests that the plan of the Olecranon process can be relatively large in women compared to men (20). This ends up additionally advanced supported by using the use of Ruparelia S et al (21). Zampagni ML et al. 2008 studied the carrying angle in 37 adults (17 person men and 20 females) aged forty-one to eighty-one years with the use of an Electro-Goniometer and determined a mean value of 12.39° in adult men and 12.9° in women. The difference was statistically no longer enormous (22). Ruparelia S et al. in 2010 carried out a cross-sectional take a look at in Gujarat. They measured the angle in 333 individuals (one hundred sixty men and 173 girls) elderly 17 to 22 years and determined an average fee of 6.9° in adult men and 11.8° in women. It was considerably extra in women than in adult males (21) which is much like that positioned in the present study. Kothapalli J et al. 2013 studied found the carrying angle in 220 subjects (one hundred ten men and a hundred and ten females) aged 18-22 years belonging to Karnataka and Andhra Pradesh and observed a mean value of 12.09° in men and 13.54° in women. It became greater in women than in men (23). 17.02° in males and 17.77° in females and the difference was statistically not significant (24). Rana G *et al.* 2013 conducted a study on the Carrying angle in 30 males and 30 females of the age group 18-25 years in Nepal and found it to be greater in females than in males in both methods. Similarly, Niyati Airan *et. Al.* also found the mean right Carrying angle was found to be 8.71°±2.54° in men and 12.31°±2.53° in women. The mean left Carrying angle was found to be 8.06°±2.77° in men and 11.76°±2.73° in women. Mean right Carrying angle and mean left Carrying angle was found to be more in women than in males and differences were highly significant. The Carrying angle is significantly more in women as compared to men and the difference has been considered to be a secondary sexual individual (25). Sharma k *et. Al.* studies found that the carrying angle is more in women than in men and it increases at the time of puberty. The carrying angle is more in the central arm than in the central arm and the carrying angle is not inversely related to the height of the person (26). Thus, the carrying angle of the dominant limb of the male was inversely proportional and that of the non-dominant limb of the male and both the central and central limb of the women were found to be directly proportional to the height of an individual in our present study.

Strength and Limitations of the Present Study

There are a few limitations of the study. In the present study, 12-40 years ages subjects participated in the research. Hence, in the feature, we would like to include an increase in the number of participants to reach a concrete conclusion. The Present study given an impact on understanding the Knowledge of carrying

angle is of considerable importance in clinical Medicine, Anatomy, and Surgery (Orthopaedics and Paediatrics units in particular).

CONCLUSION:

The Present Study was found to be more in rural regions relatively urban areas of both sexes and our data on the dimension of the carrying angle and in adults of rural and urban regions and other elbow disorders that need reconstruction or arthroplasties. The statistics in the Present work may be useful for the evaluation in comparison to pathologic conditions as well as in the management of disorders of the elbow and its reconstruction after fractures and additionally useful as a forensic tool for sex determination. Knowledge of carrying angle is of giant importance in clinical medicine, anatomy, and surgical procedure (Orthopaedics and Paediatrics devices in particular).

REFERENCES:

1. Snell RS. Clinical Anatomy, 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2004:551.
2. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MW, Greys Anatomy, 38th Ed, Churchill Livingstone, London, 1995. pp. 642 -643.
3. Potter HP. The obliquity of the arm of the females in extension. *J Anat Physiol* 1895;29:488-492.
4. Atkinson WD. Elftman H. The carrying angle of the human arm is a secondary sex character. *Anat Record* 1945; 91:49-53.
5. Aebi H, Ellbogenwinkel DER, Geschlecht SB, Hüftbreite KU. *Acta Anat* 1947; 3:228-264.
6. Keats TE, Teeslink R, Diamond AE, Williams JH. Normal axial relationship of the major joints. *Radiol* 1966; 87:904-908.
7. Baughman FA, Higgins JV, Wadsworth TG, Demaray MJ. The carrying angle in sex chromosome anomalies. *JAMA* 1974; 230:718-720.
8. Steel FLD, Tomalinson JDW. The carrying angle in man. *J Anat* 1958; 92:315-317.
9. Smith L. Deformity following supracondylar fractures of the humerus. *J Bone Joint Surg* 1960; 42:235-238.
10. Beals RK. Normal carrying angle of the elbow. *Clin Orthop* 1976; 110:194-196.
11. Jyothinath Kothapalli1, Pradeepkumar H. Murudkar1, Lalitha Devi. The carrying angle of the elbow- a correlative and comparative study. *Int J Cur Res Rev*, 2013/ Vol 05 (07)
12. Norman SW, Christopher JKB, O'Connell PR, editors. Bailey and Love's Short Practice of Surgery. 25 ed. London: Edward Arnold (Publishers) Ltd; 2008

13. Baskar S, Kumar S. Variations in Carrying Angle between Two Sexes on Complete Extension. *J Pharm Sci and Res.* 2013; 5(12):269.
14. Dey S, Mandal L, Kundu B, Mondal M, Sett TK. Carrying angle of the Elbow: Its Changes from Childhood to Adulthood: Morphometric Study in Eastern India. *Indian Journal of Basic and Applied Medical Research.* 2013 8(2):823-30.
15. Steel F, Tomlinson J. The carrying angle in man. *J Anat* 1958; 92:315-7.
16. Van Roy P, Baeyens JP, Fauvart D, Lanssiers R, Clarijs JP. Arthro-kinematics of the elbow: a study of the carrying angle. *Ergonomics* 2005; 48:1645–56.
17. Rai J, Prakash S, Singhal V. Carrying angle in Indian girls and boys. *Indian journal of orthopedics.*1980; 14:170-174.
18. Keats TC, Teeslink R, Diamond AE, Williams JH. Normal axial relationship of major joints. *Radiology.*1996; 87:904-907.
19. Khare GN, Goel SC, Saraf SK, Singh G, Mohanty C. New observations on carrying angle. *Indian J Med Sci.* 1999; 53(2):61-7.
20. Purkait R, Chandra H. An anthropometric investigation into the probable cause of formation of carrying angle: a sex indicator. *JIAFM.* 2004; 26:14-20
21. Ruparelia S, Patel S, Zalawadia A, Shah S, Patel SV. Study Of Carrying Angle and Its Correlation with Various Parameters. *NJIRM.* 2010; 1(3):28-32.
22. Zampagni ML, Daniela Casino, Stefano Zaffagnini, Visani Andre A, Maurilio Marcacci. Estimating the Elbow Carrying Angle with an Electrogoniometer: Acquisition of Data and Reliability of Measurements. *Orthopedics.* 2008; 31(4):370-7.
23. Kothapalli J, Murudkar PH, Seerla LD. The Carrying Angle of Elbow- A Correlative and Comparative Study. *Int J Cur Res Rev.* 2013; 5(4):71-6.
24. Beals RK. The normal carrying angle of the elbow. A radiographic study of 422 patients. *Clin Orthop Relat Res.* 1976;119(Sep):194-6.
25. Niyati Airan, Anil Kumar Dwivedi, A comparative study of carrying angle among males and females in Garhwal region of Uttarakhand, *Table of Content Volume 6 Issue 2 - May 2018*
26. Sharma K, Mansur DI, Khanal K, Haque MK. Variation of carrying angle with age, sex, height, and special reference to side. *Kathmandu Univ Med J (KUMJ).* 2013 Oct-Dec;11(44):315-8.