Comparative Study of Carrying Angle Between Dominant And Non-Dominant Limb In Normal Young Girls

Manju Kumari*, Kirti Mishra**

*Student Scholar,**Assistant Professor, Department Of Physiotherapy, School Of Medical And Allied Science, Sanskriti University Campus 28 K. M. Stone Mathura – Delhi Highway Chhata, Mathura, Uttar Pradesh- 281401, India

Abstract: Background: The angle subtended by the long axis of the arm and the long axis of forearm in the frontal plane when the elbow is fully extended and the forearm is supinated. Normal degree of Carrying angle is 5˚-15˚ but in females it is varies on 5˚-18˚. The apparent difference in gender may be because of increased joint laxity in females permitting a greater degree of extension. Comparative study of carrying angle between dominant and non-dominant limb in normal young girls. This study aimed comparison of between dominant and non-dominant limb data obtained by clinical method in 18 – 20 years normal young girls. Material And Methods: Carrying angle was measured in 141 students of girls in manual method with goniometer. Result: In girls carrying angle dominant limb was greater than non-dominant limb in girls. Conclusion: The study we conducted there is no significance difference in carrying angle among females in both dominant and non-dominant limb in young girls. [Kumari M Natl J Integr Res Med, 2022; 13(3):23-27, Published on Dated:10/05/2022]

Key Words: Carrying Angle, Younger Girls.

Author for correspondence: Manju Kumari, Ghaghara Kharsia, Dist:- Raigarh, Chhattisgarh, India, 496661. E-Mail: manjukumari882@gmail.com M: 8227932377

Introduction: The carrying angle of elbow is defined as the angle subtended by the long axis of the arm and the long axis of forearm in the frontal plane when the elbow is fully extended and the forearm is supinated[1].The apparent difference in gender may be because of increased joint laxity in females permitting a greater degree of extension[2].The evaluation of carrying angle value and its pathologic variations are important to identify the elbow deformities and in the diagnosis of various disease of the later and medial epicondyles[3]. In particular, the humerus axial rotation (HAR) is most affected by soft tissue (STA)[4,5,6,7].

Estimation error in HAR causes deviation of the angles in the shoulder and elbow joints and biases the range of motion of these joints. As a result, functional and clinical evaluation based on the joint motion becomes unreliable. Therefore, in order to obtain an accurate estimate of HAR, it is necessary to apply compensation to the joint angles produced by the markers or sensors attached to the human body. Leardini et al[8]. Supracondylar fracture of humerus is the most common fracture in the 1st decade of life[9,10]due to various causes mainly ligament laxity and anatomical structure of humerus tube to flat transformation at the lower end of humerus. Its incidence decreases with age[11,12]. Elbow fractures treatment in children remained a great challenge for surgeons since Hippocrates. Proper training is needed to adopt recent advances by young surgeons to deal with these challenges[13].There are two types of supracondylar fractures of humerus in children according to direction of distal fragment i.e. Extension type (97 %) and (03%)[14]. Gartland[15] classified this fracture into three types. Mechanism of injury is hyperextension, abduction or adduction of elbow during fall on dorsi flexed hand and flexed elbow16.

Normal carrying angle reference values can help us determine the cosmetically-acceptable limits of deformity in specific age groups of the studies that have reported on normal carrying angle reference values, few have focused on Kaewpornsawan et al. The volume 70,No.4: 2018 Siriraj Medical Journal 285 Original Article SMJ children[17].One study from Northern Thailand measured carrying angle in adults aged 18-35 years[17]. It is often reported that the carrying angle increases with age, and is greater in girls than boys[17,18,19]. The value and pathological variations of carrying angle are also important in the management of elbow fractures and in the diagnosis of the disease of lateral and medial epicondyles[20]. Nevertheless, clinicians commonly consider the smaller internal angle of deviation of the ulna from the long axis of the humerus to be the carrying angle of the elbow. This is acute

angle approximately 14°in male range 2-26 and 16°in female range 2-22.The carrying angle in this case is greater in female than male[20,21]. In such a position, the forearm does not lie in one line with the arm, but it deviates lateral to the arm axis forming this angle[22]. It is generally said that carrying angle is greater in females than in males and the difference has been considered to be due to ligamentous laxity at the medial elbow or asymmetrical bone growth[22].

Material & Methods: Comparative study was conducted on 141 students aged between 18 – 20 years at Sanskriti University 20 March 2022 to 20 April 2022. Before to the conducted of this study consent was obtained directly from the subjects.

Inclusion Criteria: (a) Younger girls (b) Age group between 18-20 years (c) Underweight girls: Normal weight girls, Overweight girls, Obese girls (d) Willing to become a part of the study.

Exclusion Criteria: (a) Cubitus valgus of previously (b) Cubitus varus of previously. (c) Dislocation of arm, forearm and arm (d) Carpal tunnel syndrome (e) Golfer's elbow (f) Alcoholic (g) Smoker (h) Upper arm infection (i) Any kind of upper limb both side deformity or disease (j) Diabetes (k) Sports person (l) Polio / post polio residual paralysis any recent history of surgery upper limb both side less than 6 month. (m) Any recent history of major and minor bone fracture of upper climb both side less from 6 month. (n) Subject should not be involved in any form of structural training eg- gym, swimming, etc. Material used Goniometer. (o) No any deformity and fracture etc.

Material Used: Goniometer, Scale. Methods: After selection of subjects, An assessment was performed fulfilling the inclusion and exclusion criteria, The subject was requested to sign the consent from prior to the study, The present study total 141 student of Sanskriti University were selected, They belong to various states and range from 18 to 20 years, Subject was asked to avoid any kind of upper limb injury or infection, Carrying angle were measured using a goniometer, The test this was ensured that subject should not have any kind of hand deformity, disorder disease, syndrome, etc, Before the test 15 minute rest period was given to relax or comfortable, Carrying angle was performed by manually. The test was performed in normal / general room, the arm of the goniometer were kept at a straight line, Goniometer's measurement plate placed at the fulcrum of one elbow. One arm of the goniometer was aligned along the middle of the person's upper arm; the process was repeated to the other elbow.

Figure 1: Measurement of Arm By The Scale In Longitudinal Way And Also Mark Of The Elbow Joint In This Figure Show

Figure 2: Measurement of Forearm By Scale In Longitudinal Way And Also Mark In The Hand In This Figure Show

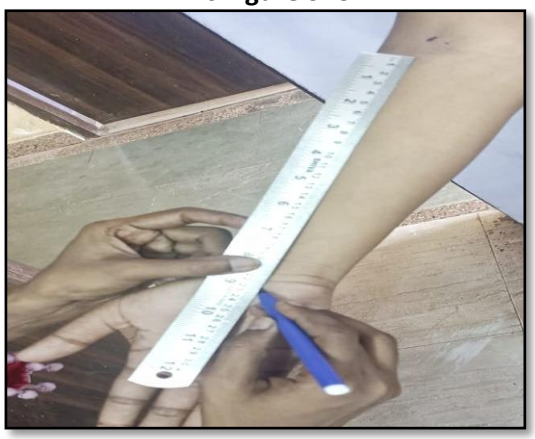


Figure 3: Measurement of Forearm By The Scale In Longitudinal Way And Also Mark Of The Elbow Joint In This Figure Show

Figure 4: Measurement of The Carrying Angle By The Big Goniometer Of The Elbow Joint In This Figure Show

Figure 5: Measurement of Carrying Angle By The Big Goniometer Of The Elbow Joint In This We Found The Degree Of Carrying Angle In Limb In This Figure Show

Statistical Analysis: The continuous parameters were expressed as the mean with standard deviationusing independent student's t – test. All statistical analysis were carried out no significance and p – value – 0.9118.

Results: This study included 141 students of normal young girls.

In girls carrying angle dominant limb was greater than non-dominant limb in girls (table 1).

In females, carrying angle of dominant limb was 11.2127 and non-dominant was 11.1702(table2).

Though it has not been documented, when comparing dominant and non-dominant limb. We have use t – test and its value = 0.110.

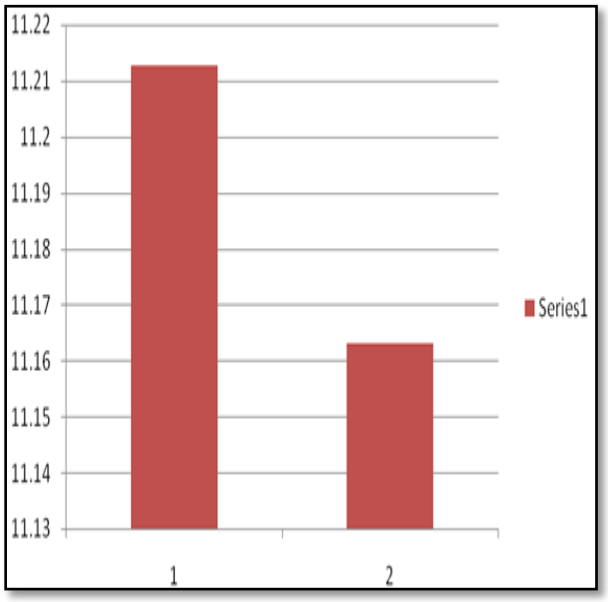
Table 1: Shows Pooled Mean And Standard Deviation Of Carrying Angle Of Dominant And Non-Dominant Limb

Total Volunteers	Right Arm	Left Arm	P Value
141	11.2127	11.1702	0.9118

Table 2: Comparison In Values Of Carrying Angle Of Females Of Normal Young Girls

	Right Arm	Left Arm	P value
Females	11.2127	11.1702	0.9118

Graph 1: Difference Of Dominant And Non Dominant Limbs



This is a Bar Graph, Bar graph 1 represent Mean A = 11.2127 this is show of dominant limb and Bar Graph 2 represent Mean B = 11.1702 this is show of non-dominant limb. There is no significance difference.

Discussion: Beals (1976) he observed greatest value in girls because in girls has ligament laxity present and also explained more carrying angle in right side dominant hand[24].Most of the author said that carrying angle is higher in dominant limb in both male and female than the non-dominant limb because on the elbow natural force act to modification of carrying angle[25].

Author says that dominant hand of upper limb is more than the non- dominant of upper limb because significantly greater volunteer age >14 years than Of those aged <- 14 years and girls rank is more than boys[26,27,28].Most author says that greater carrying angle in woman than man

due to wider pelvis and small shoulders[29]. Author carrying angle is greater in girls than in boys, both male and female peoples. Khare et al says because is not correlate with pelvis and secondary sexual characteristics.

However, there is overlap of carrying angle in both sex[30,31]. Carrying angle is higher in female than male because according to literature findings[32,33,34,35]. Author says carrying angle of non-dominant hand is greater than dominant hand because correlation with this carrying angle of left hand and right hand with height[23,36]. Author says that right side carrying angle is more than the left side because there is no significance[37,38,39]. Carrying angle of dominant limb is greater than non-dominant limb because natural force act on the elbow to modification of the carrying angle[40]. We observed in our study, there is no significant difference in both upper extremity.

Conclusion: From the study we conducted there is no significance difference in carrying angle among females in both dominant and non-dominant limb in young girls. Right side carrying angle is more than left side. There is no significant relationship between carrying angle and weight in our study in girls. Less sample size.

There is no uniformity according to BMI etc. For the future, this study evaluates the carrying angle and records the measurement that will be helpful in elbow disorders and in reconstruction. It also helps orthopaedic surgeon for deformity and in paediatric surgery. We have not considered parameters like height, weight and BMI. So, one can do further research and study on the basis of such parameters. In future more sample size should be taken for this study, etc.

Acknowledgement: I Manju Kumari would like to express my gratitude to my thesis advisor Dr. Kirti Mishra, Department of Physiotherapy. My sincerely thanks to Umesh Sharma, Department of mathematics. I would also like to thank Dr. Apoorv Narain Dwivedi, HOD, and Department of SMAS. I would like to thank my parents for always supporting me and my heartily thanks to my senior Tabassum Parveen MPT student for her unconditional help of Sanskriti University.

References:

1. Jyothinath Kothapalli, Pradeepkumar H. Murudkar, Lalitha Devi Sierra. The Carrying Angle Of Elbow: A Correlative and Comparative Study. International Journal of Current Research and Review, 2013; 5(7):71-76 .
2. Khare GN, Goel SC, Saraf SK, Singh G, Mohanty C. New observations on carrying angle. Indian J Med Sci. 1999;53:61–67.
3. Maria L. Zampagni, Daniela Casino, Stefano Zaffagnini, Andre A. Visani, MaurilioMarcacci. Estimating the Elbow Carrying Angle With an Electrogoniometer: Acquisition of Data and Reliability of Measurements. He lioOrthopedics, 2008; 31. 3.
4. Schmidt R, Disselhorst-Klug C, Silny J, et al. A markerbased measurement procedure for unconstrained wrist and elbow motions. J Biomech 1999;32:615-621.
5. Cutti AG, Paolini G, Troncossi M, et al. Soft tissue artefact assessment in humeral axial rotation. Gait Posture 2005;21: 341-349.
6. Cutti AG, Cappello A, Davalli A. In vivo validation of a new technique that compensates for soft tissue artefact in the upper-arm: Preliminary results. Clin Biomech 2006;21:S13- S19.
7. Roux E, Bouilland S, Godillon-Maquinghen AP, et al. Evaluation of the global optimisation method within the upper limb kinematics analysis. J Biomech 2002;35:1279-1283.
8. Leardini A, Chiari L, Della Croce U, et al. Human movement analysis using stereophotogrammetry - Part 3. Soft tissue artifact assessment and compensation. Gait Posture 2005;21: 212-225.
9. Eliason EL. Dressing for supracondylar fracture of humerus. JAMA 1924;82:1934-5.
10. Wilson PD. Fractures and dislocation in the region of elbow. Surg Gynecol Obstet 1933; 56: 335-59.
11. Henrikson B. Supracondylar fracture of humerus in children. Acta Chir Scand 1966;36:9-12.
12. Abraham E, Powers T-Vitt. Excremental hyper extension of supracondylar fracture in monkeys. Clin Orthop 1982;171:309-18.
13. Gillingham BL, Rang M. Advances in children elbow fractures (editorial). J Pediatr Orthop 1995;15:419-21.
14. McIntyre W. Supracondylar fracture of humerus. In: Eltts RM (ed) Management of paediatric fractures. New York: Churchill Livingstone, 1994: 167-91.15.
15. Gartland JJ. Management of supracondylar fracture of humerus in children. Surg: Gynecol Obstet 1959;109:145-54.

16.Cotton FJ. Elbow fractures in children. Ann Surg 1902;35:252-69.
17.Sudasna S, Seripantuwongsa V. The range of motion of the elbow,wrist and finger joints of the people of the northern part of Thailand. J Thai Orthop Assoc. 1985; 10: 93-122.
18.Baughman.FA, Higgins JV, Wadsworth TG, Denmaray M. The carrying angle in sex chromosome anomalies. JAMA. 1945;230:718-20.
19.Balasupramanian P, Madhuri V, Muliyil J. Carrying angle in children: a normative study. J Pediatr Orthop. 2006;15B:37-40.
20.Khare GN, Goel SC, Saraf SK, Singh G, Mohanty C. New observations on carrying angle. Indian J Med Sci. 1999:53(2):61-7.
21.Harring JA, Tachdjian's paediatic orthopaedics, Vol 3. 3 Edn. Philadelphic pa ; WB Saunders co; (2002): 2164 – 2168.
22.Vichard Lim, Natasha Ashley Jacob. The carrying angle of elbow, An Anthropometric Study on the Carrying Angle of Elbow among Young Adults of Various Ethinicities in Malaysia, Nat J of Int Res Med. 2014; 5(6):2230-9969.
23.Ruparelia S, Patel S, Zalawadia A, Shah S, Patel S.V. Study of carrying angle and its correlation with various parameters. National journal of integrated research in medicine. 2010; 1(3): 0975-9840.
24.Beals, R. K. 'Normal carrying angle of the elbow'. Clin. Orthop. 1976: 110 : 194-196.
25.Mudasir Ahmad Bhat1 ,Tanveer Ahmad Bhat2 ,Parvez Ahmad Ganie3 , Wajahat Ahmad Mir4 (2019) Comparative Study of Carrying Angle between Dominant and Non Dominant Limb in Kashmiri Population.
26.Emami MJ, Abdinejad F, Khodabkshi S, Amini M & Naseri B. The normal carrying angle of the elbow in Shiraz. Med J Islamic Rep Iran 1998, 1(12), 37-39.
27.Tukenmez M, Demirel H, Percin S, Tezeren G. Measurment of the carrying angle of the elbow at ages six and fourteen years. Acta Orthop Traumatol Turc 2004, 38(4), 274-76.
28.Kumari KL & Sekhar RC. A comparative study of carrying angle between children and adult in Andhra population. J Dent Med Sci 2016, 15(6), 33-36.
29.Tullos HS, Schwab G, Bennett JB, Woods GW. Factors influencing elbow instability. Instr Course Lect 1981;30:185-99.
30.Tükenmez M, Demirel H, Perçin S, Tezeren G. Measurement of the carrying angle of the elbow in 2,000 children at ages six and fourteen years. Acta Orthop Traumatol Turc 2004;38:274-6.
31.Steel FL, Tomlinson JD.The carrying angle in man.J Anat 1958;92:315-7.
32.Khare GN, Goel SC, Saraf SK, Singh G, Mohanty C. New observations on carrying angle. Indian J Med Sci 1999;53:61-7.
33.Steel FL, Tomlinson JD. The carrying angle in man. J Anat 1958;92:315-7.
34.Zampagni ML, Casino D, Zaffagnini S, Visani AA, Marcacci M. Estimating the elbow carrying angle with an electrogoniometer: Acquisition of data and reliability of measurements. Orthopedics 2008;31:370.
35.Ahmet Kürsad Acikgöz1 ,Raciha Sinem Balci1 ,Pinar Göker1 ,Memduha Gülhal Bozkir1 , Evaluación del Ángulo de Desplazamiento del Codo en Individuos Sanos(2018).
36.Terra BB. Evolution of the carrying angle of the elbow: A clinical and radiographic study. Acta Ortop Bras. 2011; 19(2):79-82.
37.Beals R K. The normal carrying angle of the elbow. A radiographic study of 422patients.Clin. Orthop. 1976;119 :194-196.
38.Smith L. Deformity following Supracondylar fracture of the humerus. J Bone Joint SurgAm. 1960; 42:1668.
39.Tachdijan MO. Fractures and dislocations. In: Herring J, Herring JA, Tachdjian MO, eds. Tachdjian's Pediatric Orthopedics. Vol 4.2nd ed. Philadelphia, Pa: WB Saunders Co; 1990:3013-3373.
40.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 2013;44:315-318.

Conflict of interest: None

Funding: None

Cite this Article as: Manju Kumari, Kirti Mishra. Comparative Study Of Carrying Angle Between Dominant And Non-Dominant Limb In Normal Young Girls. Natl J Integr Res Med 2022; Vol.13(3): 23-27