

Anthropometric measurement of lateral capitellohumeral angle through x-ray among children presenting in MGM Medical college and hospital

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Abstract

Background: Various radiological guidelines using anthropometric parameters are used to understand injuries in paediatric elbow and verify the degree of reduction after manipulation. Since Caucasian anthropometric parameters vary from those of Europeans and Mongoloids, their parameters cannot be generalized to our people. As a result, anthropometric parameters of elbow among children in the Indian population must be characterized. **Methods:** The study was conducted at OPD of Orthopaedics department, in M.G.M. Medical College. Our study population constituted the children age between 4 -12 years. The study was conducted from August 2019- February 2020. The sample size required for this study was 30. The outcomes of the study were, Lateral capitellohumeral angle. Age, Sex and side distribution of these two measures were assessed. Baseline value of LCHA in Bihar Population was outcomes. **Results:** The mean (SD) LCH angle was 46.1(±2.88) for all research participants. Male and female children had a mean (SD) LCH angle of 46.81±3.43 and 48.25±1.32, respectively. In other words, when comparing bihari children to children from other nations, the mean values of LCH angle are identical. The SD in our analysis is also nearly identical to that found in western literature. **Conclusion:** Our findings are in the middle of previous western research, which placed the lateral capitellohumeral angle between 41° and 56°. Bihari children's lateral capitellohumeral angles were similar to those of other western and Indian children.

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INTRODUCTION

Elbow joint is not a weight-bearing joint, it can be the most complex in the human body. The elbow is a synovial hinge joint made up mostly of the distal humerus and proximal ulna articulations. The proximal radius and the humerus,

as well as the proximal radius and the ulna, have articulations. The ulnohumeral, radiohumeral, and proximal radioulnar joints are the three articulations, respectively. Many upper and lower arm muscles cross or connect to at least one part of the elbow joint, so it's no wonder that the elbow joint is the second most often affected joint in sports-related injuries after the shoulder.¹ Nursemaid's elbow is one of the more common pediatric elbow injuries in children aged 6 months to 5 years. Also called radial head subluxation, it is usually caused by an abrupt pulling force on the hand or lower arm when the arm is outstretched, resulting in a displacement of the annular ligament. The annular ligament is responsible for holding the radius and ulna in close proximity and the proximal radioulnar joint. In this type of injury, neither the bone nor the ligament is necessarily damaged but instead have slipped out of their normal positioning. Upon injury,

the patient will be in severe pain that will typically subside quickly. Children will hold their arm on their lap or close against their body and refuse to use it. Treatment for elbow subluxation is non-invasive and can usually be done in an outpatient office by reducing the joint. There are two ways this is typically done. The first method is the supination flexion method. This is done by stabilizing the elbow with one arm while flexing the child's arm to the shoulder and supinating the arm simultaneously. You should feel the joint reduce with the stabilizing hand. The patient will be in some discomfort until joint reduction completes. Another method gaining popularity is the hyperpronation method; in recent studies, it has been found the hyperpronation method may have higher first-time success rates. Upon reduction, the discomfort usually subsides completely but Tylenol may be used for pain relief.² Shank *et al.*⁹ described the lateral capitellohumeral angle (LCHA) in the pediatric elbow as the angle between the humeral shaft and capitellum.³ After a supracondylar fracturing of the humerus, the LHCA is an indicator of sagittal plane orientation of the distal humerus. The angular interaction between the humeral shaft and the capitellum is measured on the lateral radiographic vision. Different techniques, such as LHCA, capitellar angle, humerocondylar angle, and angle of inclination, are used to determine the angle. The lateral capitellohumeral angle (LCHA) is perpendicular to the humerocondylar angle axis and determines the angle between the anterior humeral line and the capitellarphysis. The lateral capitellohumeral angle (LCHA) is the LHCA's geometric counterpart. Shank *et al.* found a mean value of 50.8 6.2 degrees in 71 average children as they assessed the LCHA. For LCHA measurements, they find good intra-observer reliability (0.67) but only average inter-observer reliability (0.37).^[3] In the pediatric elbow, the lateral capitellohumeral angle (LCHA) is the angle formed by the humeral shaft and capitellum. The lateral LHCA is a measurement of the distal humerus's sagittal plane orientation during a supracondylar fracture. The angular interaction between the humeral shaft and the capitellum is measured on the lateral radiographic vision.⁴ Different techniques, such as LHCA, capitellar angle, humerocondylar angle, and angle of inclination, are used to determine the angle. The lateral capitellohumeral angle (LCHA) is perpendicular to the humerocondylar angle axis and determines the angle between the anterior humeral line and the capitellarphysis. The lateral capitellohumeral angle (LCHA) is the LHCA's geometric counterpart. A mean value of 50.8 6.2 degrees has been published in various studies. The previous study indicated a temperature range of 41° to 49°. For LCHA measurements, they find good intra-observer reliability (0.67) but only average inter-observer reliability (0.37).

METHODS

The study was conducted at OPD of Orthopedics department, in M.G.M. Medical College. Our study population constituted the children age between 4 -12 years. The study was conducted from August 2019-February 2020. The sample size required for this study was 30. The outcomes of the study were, Lateral capitellohumeral angle. Age, Sex and side distribution of these two measures were assessed. Baseline value of LCHA in Bihar Population was outcomes. On the lateral view of X-ray, a line was drawn along the anterior boundary of the distal humeral shaft (AHL) and a line was drawn along the capitellar physis, and the angle created between these two lines was determined using software. (Direct digitizer, S-7, version1.22.). Data was entered using the Statistical Package for Social Sciences (SPSS IBM) version 23.0, and correct entries were checked at frequent intervals. SPSS IBM version 21.0 was used to analyze the results. For qualitative variables, proportions were estimated, and for quantitative variables, the mean and standard deviation were calculated. We used independent t tests and chi square tests. The significance of the p value is set to <0.05.

RESULTS

Table 1: Age group distribution. (n=30)

Age Distribution	No of Cases	Percentage
4 – 6 Years	10	33.3
7 - 9 Years	16	53.4
10 – 12 Years	4	13.3
Total	30	100

The age of the study participants ranged from 4-12 years with mean (±SD) age was 7.2(±2.88) years. Majority 16(53.4%) of the patients were in the age group 7 - 9 years and 10 patients (33.3 %) were in the age group of above 4 - 6 years, and 13.3% (4 patients) were the age group was 10- 12 Years. Among total 30 participants, 22(73.4%) were males and 08 (26.6%) were females.

Table 2: Side of elbow measured. (n =30)

Laterality	No of Cases	Percentage
Right Side	21	70.0
Left Side	09	30.0
Total	30	100

Table 3: Distribution of study participants according to LCH angle. (n=30)

LCH angle	Minimum	Maximum	Mean(SD)
	42	54	46.1(±2.88)

The mean and(SD) Value of LCH angle among the study children is 46.1(±2.88)

Table 4: Age wise Distribution of study participants among LCH angle. (n=30) (ANOVA)

Age Distribution	Mean	SD	p Value
4 – 6 Years	46.28	±2.11	0.412
7- 9 Years	47.22	±2.48	
10 – 12 Years	48.41	±1.32	

Analysis was done to find any difference in LCH angle with respect to age group using ANOVA. It was found that there existed no statistical difference in angles p Value 0.412.

Table 5: Sex wise Distribution of study participants among LCH angle. (n=30)

Age Distribution	Mean	SD	p Value
Male	46.81	±3.43	0.03
Female	48.25	±1.32	

Analysis was done to find any difference in LCH angle with respect to sex group using independent t test.. It was found significant statistical difference in angles p Value 0.03.

DISCUSSION

The aim of this research was to look at anthropometric measurements of the Lateral Capitellohumeral Angle using radiology (X-ray) in children who came to our hospital. A total of 30 patients were included in this report. The children in the study ranged in age from 4 to 12 years old, with a mean and SD age of 7.11 ± 1.89 years. Among total 30 participants, 22(73.4%) were males and 08 (26.6%) were females. A total of 125 children aged 3–13 years old were included in a study by Awasthi B *et al.*⁵ A research by Sehgal M *et al.*⁶ looked at a similar age range. Williamson *et al.*⁷ conducted another study of the same age group. As a result, the age demographic of our sample matches that of previous research, and the results of the studies can be correlated. Shank *et al.*³ performed a study in Seattle on 71 elbow radiographs of children aged 0 to 12 years and found that the mean Lateral capitellohumeral angle was $51^{\circ} 6^{\circ}$ in average elbows. Males had a mean lateral capitellohumeral angle of $50.8 6.20$, females had a mean of $50.1 6.170$, and the mean lateral capitellohumeral angle according to laterality was $50.8 6.20$ for the left side

and $71 6.610$ for the right side. Age, hand, or sex had little effect on the values in their research. The mean (SD) for lateral capitellohumeral angle in Indian children aged 3 to 13 years was 49.75 in a study by Awasthi B *et al.*⁵ This previous Indian research had a value that was very close to ours. Our findings are in the middle of previous western research, which placed the lateral capitellohumeral angle between 41° and 56° . The SD in our analysis is also nearly identical to that found in western literature. In other words, the mean LCH angle values in Bihar children are comparable to those in other nations.

CONCLUSION

Our findings are in the middle of previous western research, which placed the lateral capitellohumeral angle between 41° and 56° . Bihari children's lateral capitellohumeral angles were similar to those of other western and Indian children.

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