ISSN (Print): 2663-9491 ISSN (Online): 2789-6897

Original Article

Correlation Between Body Mass Index and Carrying Angle Among Bangladeshi Adult Population

DOI: dx.doi.org

Md. Ashraful Kabir[1], Md. Masudur Rahman[2], Marjia Khatun[3]

Received: 01 OCT 2022
Accepted: 10 OCT 2022
Published: 14 NOV 2022

Published by:
Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh

ABSTRACT:

Context: *Carrying angle and body mass index (BMI) varies among individuals and it is significant in anatomy, forensic medicine, sports medicine and anthropology.*

Aim: *The purpose of this study was to determine whether the BMI of healthy adult of bangladeshi people had an impact on the carring angle of the elbow joint. This research was also aimed at determining the variation of carrying angle among adult male and female in Bangladeshi population.* ***Study design:*** *Cross-sectional descriptive study.* ***Place & period of study:*** *Department of anatomy , Sylhet M.A.G. Osmani Medical College, Sylhet during the period from July 2016 to June 2017.* ***Materials and Methods:*** *Three hundrad eight volunteers between the age of 18 to 60 years were investigated. The data were analyzed using the Statistical Package for the Social Sciences (SPSS 22). Regression analysis was performed to see the correlation. The unpaired t test was used to determine sex differences in carrying angle among the participants.* ***Results:*** *There was a significant difference of mean carrying angle of right (t=-6.866;p<0.001) and left (t=-8.031;p<0.001) side between male and female. There was non-significant negative correlation between right carrying angle (r= -0.046;p=0.422) and BMI. It was also observed non-significant negative correlation between left carrying angle (r=-0.062;p=0.275) and BMI.* ***Conclusion:*** *Non-significant negative correlation between carrying angle and BMI of the participants of both sides.*

Key Words: *Body mass index, Carrying angle, Bangladeshi adult population.*

1. *Associate Professor, Department of Anatomy, Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh*
2. *Lecturer, Department of Anatomy, Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh*
3. *Curator, Department of Anatomy, Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh*

(The Insight 2022; 5(1): 10-14)

NTRODUCTION

Body mass index (BMI) is calculated as weight in kilograms divided by the square of height in meters[8]. Underweight (BMI ≤ 18.5), Normal (BMI between 18.5 – 24.9), Overweight (BMI between 25–29.9), Obese (BMI ≥ 30). An overweight children have significantly more soft tissue around their elbow joints that may lead to decreased range of motion in the elbow joint caused by soft-tissue impediment so there is potential loss of elbow range of motion associated with increased BMI[10],[6]. Carrying angle is defined as the acute angle made by the median axis of the arm and that of fully extended and supinated forearm and thus it measures the lateral obliquity of the forearm. This angle which opens laterally is called the carrying angle and is about 170 (Supplementary angle 10) degree in the male and 167 (Supplementary angle 13) degree in female [12]. Anatomists consider the external angle between the humerus and the ulna as the carrying angle when the fore arm is fully extended and supinated. This diverges laterally making the angle obtuse in nature about 163 degree[13]. Clinicians however 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 an acute angle about 14 degree in males and 16 degree in females. This carrying angle also called supplementary angle. Supplementary angle (180^0- carrying angle) which is greater in female than males [7],[3],[1] .

Most studies have focused on the question of cause of formation of carrying angle [2]. Variation in carrying angle among age groups, gender and race has been reported in literature The difference in the carrying angle between male and female and considering it as a secondary sex character as well as its role in the sex determination are important issues in anatomy and anthropology researches [11].

So this study will help in determination of impact of BMI on Carrying Angle and how these two variables are connected with each other.

MATERIAL AND METHODS

Three hundrad eight volunteers between the age of 18 to 60 years were investigated. Stature meter was used to measure the height in centimeter. Height was measured in standing, erect, anatomical position from vertex to hill with bare foot and expressed in centimeter. Weight was measured by weight machine and expressed in kilogram. BMI (kg/m^2) was calculated as weight (kg) divided by Square of height (m^2) in meter. So,BMI=Weight in kilogram/Height in $meter^2$.

The carrying angle of the elbow was measured in full extension of the elbow and in complete supination of the forearm, with a protractor goniometer. The angle was recorded from the readout on the measurement plate of goniometer and expressed in degree.

The data were analyzed using the Statistical Package for the Social Sciences(SPSS 22). Regression analysis was performed to see the correlation. The unpaired t test was used to determine sex differences in carrying angle among the participants. A probable value (P) of less than 0.05 was considered statistical significant.

RESULTS

In the present study the age of the participants ranged from 18 to 60 years with the mean age of 29.87 ± 12.01 years. There were 150 (48.7%) male participants and 158 (51.3%) female participants. Mean carrying angle of right side was 162.94 ± 4.86 degree in participants of aged up to 20 years, 163.49 ± 4.49 degree in participants of aged between 21 to 40 years and 165.58 ± 4.32 degree in participants of aged between 41 to 60 years. There was a significant difference of mean carrying angle of right side among the different age groups (F=7.087; p<0.001).

Mean carrying angle of left side was 166.21 ± 4.57 degree in participants of aged up to 20 years, 166.61 ± 4.72 degree in participants of aged between 21 to 40 years and 168.42 ± 3.91 degree in participants of aged between 41 to 60 years. There was a significant difference of mean carrying angle of left side among the different age groups (F=5.299; p=0.005). Carrying angle was 163.75 ± 4.68 degree in right side and 166.85 ± 4.57 degree of left side. There was a significant difference of mean carrying angle of right and left side between male and female (t=-8.314; p<0.001).

Table-1: Comparison of carrying angle between right side and left side

Side	Carrying angle (^{0})		t-value	*p-value
	Mean	Standard deviation		
Right side (n=308)	163.75	± 4.68	t=-8.314	p<0.001
Left side (n=308)	166.85	± 4.57		

Unpaired 't' test was performed to see the association.

Correlation between BMI and carrying angle of left side: Figure-1, showed that there was non-significant negative correlation between BMI of the participants and carrying angle of left side (r=-0.062, p=0.275).

Correlation between BMI and carrying angle of right side: Figure-2, showed that there was non-significant negative correlation between BMI of the participants and carrying angle of right side (r=-0.046; p=0.422). Regression analysis performmed to see the correlation. P≤0.05 was deterimned as level of significance.

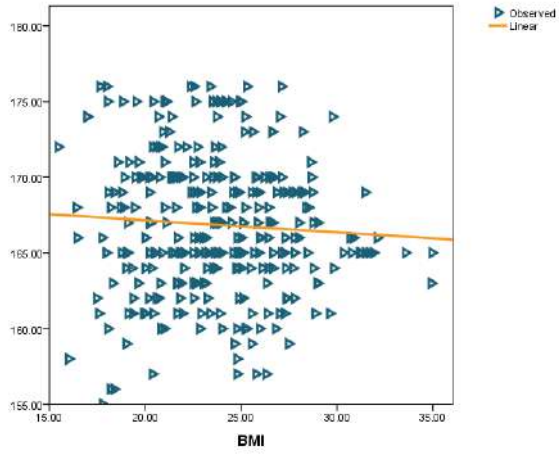

Figure-1: Correlation between BMI and carrying angle of left side (n=308)

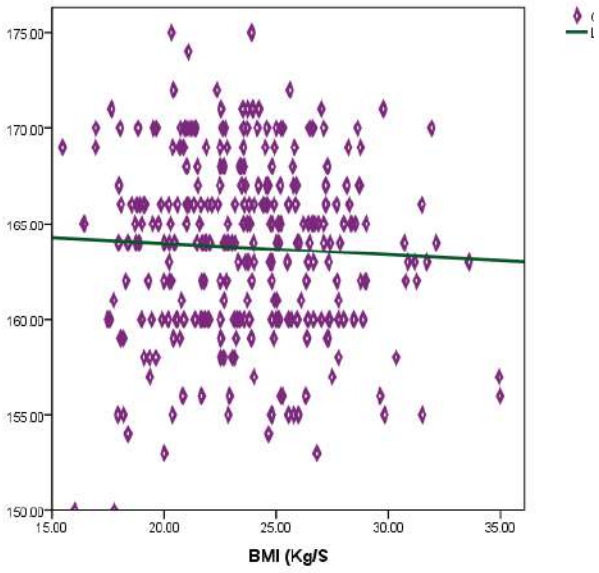

Figure-2: Correlation between BMI and carrying angle of right side (n=308)

DISCUSSION

The present Study deals with the observation on carrying angle and its correlation with BMI. In this study carrying angle was 163.75 ± 4.68 degree in right side and 166.85 ± 4.57 degree of left side of both sex. There was a significant difference of mean carrying angle of between right and left side ($p<0.001$)of both sex. This result correlated with the study Paraskevas et al., (2004) also found carrying angle was significant differed between sides[9]. The present study revealed a BMI of 22.09±3.20 which falls in the normal weight category [14]. This study revealed that that there was non-significant negative correlation between BMI of the participants and carrying angle of right side ($r=-0.046$; $p=0.422$). This concurred with researchers who noted that carrying angle demonstrated no correlation with BMI[5]. This results suggest that carring angle was not affected by increased tissue mass around the elbow joint, but rather by changes in the bony anatomy of the elbow joint during maturation. But Ese et al., (2016) reported that there was a weak positive correlation between right carrying angle and BMI ($p<0.05$)[4]. This could be due to different methods,sample size used by different authors and due to racial difference of the population studied.

Conclusion: Non-significant negative correlation between carrying angle and BMI of the participants of both sides. The BMI of Bangladeshi adult population has no impact on carrying angle of the elbow joint.

Refferences

1. *Adhikari RK, Yadav SK, Karn A. 2017. A Comparative Study of Carrying Angle with Respect to Sex and Dominant Arm in Eastern Population of Nepal. Int J Cur Res Rev, 9(7),19-22.*
2. *ANIBOR Ese, OJIGHO Efe and OGBATORHO Tobore correlation between body mass index and carrying angle among adolescents in Abraka, Nigeria. Int. J of Forensic Med Invest | Mar 2016 | Vol. 2 | No. 1 | ISSN: 2489-027*
3. *Baskar S, Kumar S. 2013. Variations in Carrying Angle between Two Sexes on Complete Extension. J Phar Sci Res, 5(12), 269.*
4. *Ese A, Efe O, Tobore O. 2016. Correlation between body mass index and carrying angle among adolescents in Abraka Nigeria. Int J of Forensic Med Invest2(1), 13-16.*
5. *Golden DW, JM, Wojcicki Jhee JT, Gilpin SL, Sawyer JR, Heyman MB. 2008. Body Mass Index and Elbow Range of Motion in a Healthy Journal of Pediatrics Gastroenterology Nutrition, 46(2), 196–201.*
6. *Haslam DW, James WP. Obesity. Lancet. 2005; 366:1197–1209.*
7. *Khare GN, Goel SC, Saraf SK, Singh G, Mohanty C. 1999. New observations on carrying angle. Indian J Med Sci, 53(2), 61-67.*
8. *Must A , Anderson SE. Body mass index in children and adolescents: considerations for*

population-based applications. International Journal of Obesity. 2006; 30: 590–594.

9. *Paraskevas G, Papadopoulos A, Papaziogas B, Spanidou S, Argiriadou H, Gigis J. 2004. Study of the carrying angle of the human elbow joint in full extension: a morphometric analysis. Surg Radiol Anat, 26(1), 19-23.*
10. *Poirier P, Giles TD, Bray GA, Hong Y, Stern JS, Pi-Sunyer FX, et al. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss. Arterioscler Thromb Vasc Biol. 2006; 26:968–976.*
11. *S AK, Solanki S. 2015. Comparative Study of Goniometric and Radiographic Carrying Angle in Human. International Journal of Science and Research, 4(2), 292-294.*
12. *Snell RS. 2008. Clinical Anatomy by Region. 8th ed. USA: Williams and Wilkins Company; pp. 480*
13. *Standring S. 2008 Gray's Anatomy, The Anatomical Basis of Clinical Practise. 40th ed. Spain: Churchill Livingstone Elsevier. 2008, p 786-833. London, pp. 777-800, 831-845.*
14. *Yahia N,Achkar A,Abdallah A,Rizk S.Eating habits and obesity among Lebanese university students.Nutr J.2008;7:32*