

ORIGINAL RESEARCH ARTICLE

DETERMINATION OF SCAPULAR INDEX IN HUMAN SCAPULA

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ABSTRACT

Background: Scapula is the important flat bone which plays important role in movement of shoulder girdle. Scapular index can be used in comparative anatomy and manufacturing prosthetic products. Present study was carried out with objective to determine the scapular index.

Methods: Fifty adult scapula were collected from Department of Anatomy, Chitwan Medical College for study. Gender and ethnicity of scapula were undefined. Bony landmarks are well located. Scapular breadths and lengths were measured using digital vernier caliper. Scapular index was calculated. Statistical analyses were done using SPSS 16 software.

Results: Among the fifty scapulae, 52% contributes right sided scapula and 48% left sided scapula. Mean and standard deviation for scapular breadth were 95.84 mm and 3.843 mm respectively. Maximum number (48%) of scapula was found in the range of 90-<95 mm breadth followed by 95-<100 mm (19%) and 100-<105 mm (14%). Mean and standard deviation for scapular length was 129.28 mm and 11.83 mm respectively. Maximum (22%) of scapula was found in range of 120-<125 mm followed by 125-<135 mm (18%) and 135-150mm (5%). Mean and standard deviation for scapular index were 75.32 mm and 7.32 mm respectively. Maximum value (46%) of scapular index was found in the range of 70-<75% followed by 65-<70% (16%); 80-85% (14%); 90-<95% (10%); 60-65% (4%) and 85-90% (2%).

Conclusions: Scapular breadth, length and indices like scapular index can be used in comparative anatomy and manufacturing prosthetic products and procedure like prosthesis positioning.



INTRODUCTION

Scapula is a large triangular bone. It lies over the posterolateral chest wall. It covers the part of second to seventh ribs in vertical (craniocaudal axis). It has two surfaces: costal and dorsal. Superior, lateral and inferior are three scapular angles. Three borders of scapula are medial lateral and superior border, spinous, acromion and coracoid are three processes of scapula.

Scapula is also known as shoulder blade. Supero-laterally lateral angle of scapula contains glenoid cavity. The glenoid cavity receives head of humerus forming the glenohumeral joint (shoulder joint). Scapula is the component of pectoral girdle.¹

Scapular index is one of the important measurements of physical anthropometry. Scapular index is the ratio of anatomical scapular breadth divided by anatomical scapular length multiplied by 100. Anatomical scapular length is the distance between highest point of superior angle to the deepest point of inferior angle. Anatomical scapular breadth is the distance between center of glenoid cavity and a point which lies in the middle of vertebral borders of two lips of spine.²

The objective of the study was to determine scapular breadth and length, scapular index and compare with other population and races.

METHODS

The descriptive cross-sectional study was conducted on fifty dry adult scapulae available at Department of anatomy, Chitwan Medical College. A total of fifty scapulae of both right and left Sides were studied. The non-probability, purposive sampling technique was used. Only intact scapula was studied. Scapulae of pediatric age group are excluded. Measurements were taken in mm with the help of digital vernier caliper (Precision Tool Corporation, Pune, Maharashtra, India: 150 mm/6 inch; Stainless Steel Hardened Model). All measurements were taken by same investigator with the help of same digital vernier caliper. All measurement was taken three times to avoid observational biasness and calculated mean of them is recorded as data. Measurement was performed at same time period from 10 am to 12 noon to avoid diurnal variation. Data

are entered in epidata and analyzed using SPSS Version 16.

Method: - The scapula was placed on table and all points were marked and errors in the measurement were minimized. Measurements were taken by vernier caliper in mm; following points were marked as shown in Figure 1



Figure 1: Picture showing dorsal surface of scapula: (Red dot: Superior angle, yellow dot: Root of spine blue dot: Inferior angle) and Ocean green curve: Outer margin of glenoid cavity)



Figure 2: Picture showing measurement of scapular breadth (Green curve: margin of glenoid cavity, yellow curve: root of spinous process, red line: scapular breadth)



Figure 3: Picture showing measurement of scapular length (green curve: superior angle of scapula, red line: scapular length and yellow curve: inferior angle)

Measurements to be taken:

Scapular breadth: scapular breadth marked as red line is taken as the distance between yellow point and green curve.

Scapular length: scapular length is marked as red line is taken as the distance between yellow point and green curve. Each measurement was taken three times by same investigator at same time duration (10 am to 12 Noon) to minimize observational biasness and diurnal variation. Using these readings scapular index is calculated as follows; Scapular Index = (anatomical scapular breadth X100)/ anatomical scapular length X100. Data was analyzed and results were tabulated.

RESULTS

Total fifty scapula were observed in the study.

Table 1: Distribution of scapula according side (n=50)

Side of scapula	No. of scapula (N=50)
Right	26(52%)
Left	24(48%)

Among the fifty-scapula observed during study, 52 % contributes right sided scapula and 48% left sided scapula as shown in table no 1.

Table 2: Distribution of scapula according to breadth (n=50)

Scapular breadth (mm)	No scapula(N=50)
90- <95	24 (48%)
95- <100	19 (38%)
100-<105	7 (14%)

Regarding the scapular index the range of scapular breadth was 90-105mm. Mean and standard deviation were 95.84 mm and 3.84 mm respectively. Maximum number (48%) of scapula was found in the range of 90-95 mm(19%) and 100-105 mm(14%) as shown in table no.2

Table 3: Distribution of scapula according to length (n=50)

Scapular length (mm)	No of Scapula(N=50)
100-<105	3(6%)
105-<110	0(0%)
110-<115	3(6%)
115-<120	0(0%)
120-<125	11(22%)
125-<130	9(18%)
130-<135	9(18%)
135-<140	5(10%)
140-<145	5(10%)
145-<150	5(10%)

Regarding the scapular length the range of scapular length was 100-150 mm. Mean and standard deviation were 129.28 mm and 11.83mm respectively. Maximum (22%) of scapula was found in range of 120-<125 mm followed by 125-<135 mm (18%) and 135-150 mm (5%) as shown in table no 3.

Table 4: Distribution of scapula according to scapular index (n=50)

Scapular index (%)	No. of scapula(N=50)
60-<65	2(4%)
65-<70	8(16%)
70-<75	23(46%)
75-<80	4(8%)
80-<85	7(14%)
85-<90	1(2%)
90-<95	5(10%)

Scapular index shows the relationship of breadth and length as it is calculated from scapular breadth and length. The range of scapular index was 60-95%. Mean and standard deviation were 75.5 mm and 7.32 mm respectively. Maximum value (46%) of scapular index was found in the range of 70-<75% followed by 65-<70% (16%); 80-85% (14%); 90-<95% (10%); 60-65% (4%) and 85-90% (2%).

DISCUSSION

The present study deals with measurement scapular breadth, scapular length and scapular index in dry adult scapula of Nepalese origin. Similar studies have been conducted by different researchers in other races and groups of population. The findings of present study were compared with those of other studies. In present study scapular breadth ranges from 90-105 mm Scapular length in present study ranges from 100-150 mm. Scapular index ranges from 60- 95 percent.

Singal et al. conducted a study on one hundred sixty-two adult dry scapulae at Department of Anatomy, M.P. Shah Medical College, Jamnagar, India. The finding of the study showed that scapular breadth ranges from 80 -110 mm; scapular length ranges from 115-160 mm and scapular index ranges from 57-76.9 percent. The findings were similar with present study due to similar geographical distribution, topography, dietary pattern.³

Krishaina et al. conducted a study on fifty adult dry scapulae at Department of Anatomy, Kamineni Institute of Medical Sciences Narketpally. The study showed that scapular breadth ranged from 90.3 mm to 113.3 mm; scapular length 135 mm to 145 mm; scapular index 67.16 mm to 80.63 mm. The results of study were close proximity to the present study due to the similar geographical distribution, food habits.⁴

Nazir et al. conducted a study on sixty adult dry scapulae at Department of Anatomy, GMC Srinagar, Kashmir. The findings showed that scapular breadth ranged from 80 to 120 mm; scapular length ranged from 100 to 170 mm and scapular index ranged from 63.80 to 95 percent. The result is similar due to geographical and topographical similarities.⁵

Somesh et al. conducted a study on ninety-eight dry adult scapulae at Department of Anatomy, Father Muller Medical College, Mangalore, Karnataka India. The results showed that scapular breadth ranged from 83-112 mm, scapular length from 104.5 -165 mm and scapular index ranged from 55.02-87.08

percent. The similar results could be due to similar research methodology used for research, religion, geography and gender dimorphism.⁶

Biswas A performed a study on two hundred dry adult scapulae at Department of Anatomy at different medical college of West Bengal. Mean scapular length is 132.97mm +/-18mm, mean scapular breadth 97.96 +/-9.38 mm. and mean scapular index 75.61+/- 17.6 percent. These results could be similar to present research due to similar environmental condition, similar dietary pattern and habits.⁷

Jacynth sujitha J.et al performed a study on forty dry adult scapulae at Department of Anatomy of Rajah Muthiah Medical College, Annamalai University, Chidambaram, India. The value of scapular breadth 96.25 +/-13mm, scapular length 133 mm +/-13.08 mm and scapular index 72.66mm +/- 3.84 percent. These findings were similar with present study.⁸

Ericson P et al conducted a study on fifty intact dry adult scapulae at Bone Banks of Medical College of Telangana Region India. The result of study showed that scapular length ranged from 159.31 -118.11 mm and scapular breadth ranged from 82.7-115.51 mm. The results of study were similar with the present study.⁹

Varghese S et al. conducted a study on fifty dry human scapulae at Government T.D. Medical College Alappuza, Kerala. The study results showed that scapular breadth ranged from 73-113 mm, scapular length ranged from 110.3 to 149.9 mm and scapular index ranged from 61- 82.9 percent. The research findings were close to finding of present study.¹⁰

Parmar T et al conducted a study on sixty dry adult scapulae at Vyadehi Medical Sciences and Research Centre, Bangalore. The study showed that scapular breadth 79 +/- 8.64mm and scapular length 98+/-13.56 mm. These results were similar with the present study.¹¹

Seema S. et al conducted a study on 130 adult dry scapulae at Department of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Amritsar, Punjab, India. The study showed mean length of scapula was 142.45± 2.32 mm and mean breadth of scapula was 102.65± 0.21 mm. The results were in close proximity to the present research findings.¹²

The current study was done on human dry adult fifty scapulae to determine the various scapular indices. The sample size is limited. The sexual dimorphism of scapulae was not determined. Further in depth, detailed studies can be done to explore various human scapular measurements and indices with respect to age, sex and radiological findings. This may further help in determining the race just by using these indices which can be of importance to forensic experts and anthropologists.

CONCLUSION

Scapular breadth, scapular length and scapular index of present study was in close proximity with the findings of other study conducted earlier, due to similar geographical distribution, topography, dietary pattern and habits, similar research

methodology. The finding will be beneficial for orthopedic surgeons, forensic experts, shoulder prosthesis manufacturing industries anatomist and physical anthropologist.

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CONFLICT OF INTEREST: None

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