Original Research Article

Sex Determination of Scapular Height and Breadth in the North Indian Population

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Abstract

The scapula is a triangular bone with thick edges and a thin centre. It articulates with the humerus at the glenohumeral joint and with the clavicle at the acromioclavicular joint on the posterolateral part of the thoracic wall. The aim of this study was to sex determination of scapular height and breadth in the north Indian population. Maximum scapular height is 136.05 ± 6.51 in male and 119.44 ± 5.16 in female and Maximum scapular breadth is 119.44 ± 5.16 in male, 92.93 ± 3.08 in female respectively. The present study sex determination of scapular height and breadth in the north Indian population clearly shows that males have significantly higher statistical values for all parameters when compared to females.

Keywords: Sexual Dimorphism, Glenohumeral Joint

Introduction:

When seeking to establish identity from skeletal remains, the right assessment of sex is critical, since it can limit the number of probable matches in half. Furthermore, estimating age from skeletal remains, particularly those of juveniles, is challenging. Traditionally, the skull, pelvis, and long bones have been used for identification, with metric procedures being used as a backup. Other bones in the body, on the other hand, may provide useful information on sex and ontogeny. As a result, the scapula was investigated in this study to learn more about its development and sexual dimorphism[1].

The scapula is a triangular bone with thick edges and a thin centre. It articulates with the humerus at the glenohumeral joint (shoulder joint) and with the clavicle at the acromioclavicular joint on the posterolateral part of the thoracic wall. Various muscles suspend it from the spinal column, ribs, and skull.

Sex determination is critical in forensic and medicolegal circumstances to establish an individual's identity. Essential skeleton bones should be present entire and undamaged for this purpose. The skull, pelvis, long bones, clavicle, patella, sacrum, and sternum are the bones on which sex determination investigations have been conducted[1,2,3].

The most common methods for determining sex are the skull and pelvis. However, using skulls and pelvis for sex determination has a disadvantage in that they do not produce trustworthy results when they are damaged. During forensic exams, the other bones indicated above are frequently absent or found incomplete[4,5].

In comparison to the other bones, the scapula is usually found in good condition. When we use suitable statistical approaches and scapular measurements, we may determine an individual's sex. Scapular measures can be used to determine sex in medicolegal cases, natural disasters, and other situations where the standard skeleton bones are either missing or broken[6,7].

The name scapula, which is a synonym for shoulder blade, comes from Latin [8]. Scapula is a little shovel that looks like a trowel. The scapula (shoulder blade) is a triangular flat bone that overlies the 2nd to 7th ribs on the posterolateral aspect of the thorax. Superior, lateral, medial borders, inferior, three processes, the spine, its continuation the acromion, and the coracoid process three angles superior, inferior, lateral, and three fossa supraspinatus, infraspinatus, sub scapular. The lateral angle is shortened, and the glenoid cavity is present for articulation with the humeral head[9].

The determination of the gender of human skeletal remains is an important first step in their identification and is required for subsequent analysis. In a review of the literature, it was discovered that sexual dimorphism exists in practically every bone of the human skeleton. According to previous research, the skull is the most dimorphic and easily sexed part of the bones after the pelvis, with a 92 percent accuracy rate. However, in the absence of an entire skull, the scapula, which is dimorphic, plays an important role in determining sex. The length, breadth, and slope of the glenoid fossa, coracoid, and acromion processes all show dimorphism in the scapula. A variety of investigations have been conducted to determine the sex of unidentified scapula discovered in skeletal remains. In comparison to descriptive qualities, metric analyses are typically found to be of greater use when determining skeletal sex because of their objectivity, accuracy, reproducibility, and lower level of inter and intra-observer errors[10].

The assessment of similarity between groups of items is an issue that researchers regularly face while analysing biological data. Researchers may derive diverse conclusions from the same results since qualitative methods may not provide statistical testing of group differences[11]. Morphological analysis is based on the observer's experience, and can be influenced by inter- and intra-observer mistakes, as well as standardisation and statistical analysis issues[12]. There are two techniques to determining sex: morphological and metrical[12]. Morphological techniques are qualitative in nature and are concerned with shape. The pelvis and cranium are generally involved in these methods. Metrical analysis is a type of quantitative analysis that focuses on bone dimensions. When the bones are fragmented or when studying long bones with little morphological changes, this method is frequently used[13]. Using discriminant function statistics, a set of measurements can be chosen to maximise sex diagnosis. One of the key drawbacks of this method is that standards are demographic specific, making it impossible to apply standards developed for

American or European people to populations in South Africa[12].

Geometric morphometrics, a different technique, has recently been utilised to successfully assess morphological similarities and differences in biological material[14,15]. This technique quantifies shape using x/y co-ordinates or landmarks, and is especially useful for investigating bulges and curves that are difficult to quantify using typical metric measurements[16,17,18].

The aim of this study was to sex determination of scapular height and breadth in the north Indian population

Material and Methods

The present study Morphometric analysis of scapula to determine sexual dimorphism was conducted on 300 scapulae of unknown sex, of which 195 male bones and 105 female bones were found in the current study. The bones were be already present in the Department and had been collected from dissected cadavers.

Following Parameters were Measured

1. Maximum scapular height
Maximum distance between the highest point of the superior angle and the lowest point of the inferior angle.

2. Maximum scapular breadth
Maximum distance between the point on the longitudinal axis of the glenoid cavity and the point on the prolongation of the inferior boundary of the dorsal margin of the spine.

Results:

This was observed that the average (Mean ± SD) of maximum scapular height was found in male 136.05 ± 6.51 and in female 119.44 ± 5.16. and the Mean ± SD of maximum scapular breadth was found in male 100.21 ± 5.2 and in female 92.93 ± 3.08. The maximum scapular height and maximum scapular breadth were found significantly higher in male comparison to that in the female, with a p value of < 0.001.

Table 1: Comparison of maximum scapular height (MSH) and maximum scapular breadth (MSB)

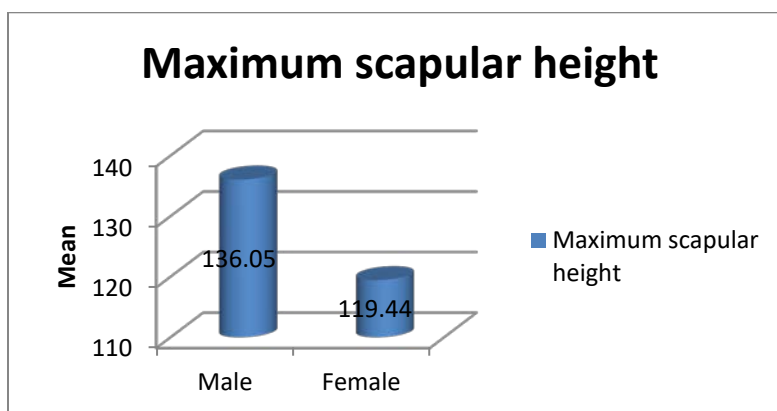| Variable	Male (cm)	Female (cm)	p – Value
	Mean ± SD	Mean ± SD	
Maximum scapular height	136.05 ± 6.51	119.44 ± 5.16	0.001
Maximum scapular breadth	119.44 ± 5.16	92.93 ± 3.08	0.001

Figure 1: Represents the maximum scapular height in the form of bar diagram.
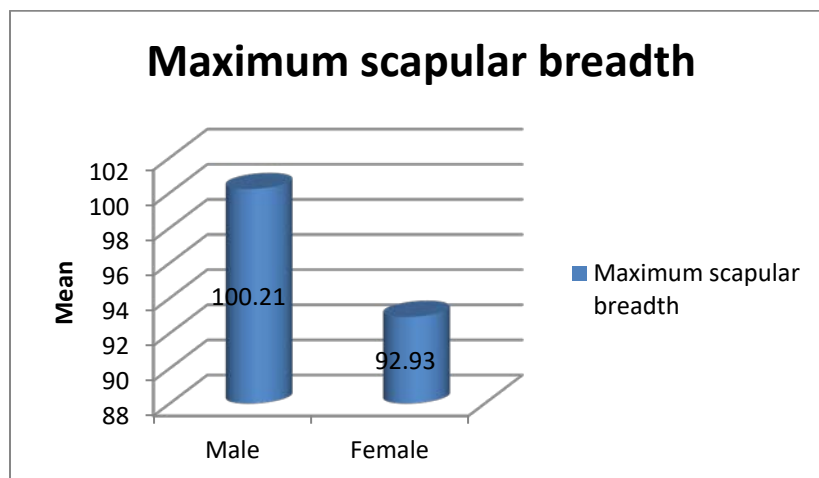
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Figure 2: represents the maximum scapular breadth in the form of bar diagram.

Discussion

The mean ± SD concentration of maximum scapular height and maximum scapular breadth was found significantly higher in male comparison to that in the female, with a p value of < 0.001. These findings were concordant with the results of the studies, which were previously done by Patel et al., (2013)[19], Macaluso (2011)[20], Dabbs et al., (2010)[21] and Scholtz et al., (2010)[22] determined the sex of scapula and established baseline parameters for the North Indian population. In contrast to males and females, all of the parameters were highly significant. In comparison to females had lower value of maximum scapular height and maximum scapular breadth and males had higher standards of maximum scapular height and maximum scapular breadth.

Conclusion

The present study sex determination of scapular height and breadth in the north Indian population clearly shows that males have significantly higher statistical values for all parameters when compared to females. These characteristics are valuable not just in medico-legal practice, but also to anatomists and orthopaedic surgeons.

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