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PREVALENCE OF FORWARD HEAD AND ROUNDED SHOULDER IN ATHLETES OF DIFFERENT AGE GROUPS.

Physiotherapy

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ABSTRACT

This study investigates how commonly forward head posture and rounded shoulder posture develop in athletes of various ages by evaluating the angles of the head and shoulders. In this cross sectional study 76 athletes of different age groups i.e, adolescent (age 12-17 yrs old, n=38) and adult group (age 18-24 yrs old, n=38) were included in the study. Overhead athletes were reviewed for inclusion and exclusion criteria. FHP and RSP in the standing position was evaluated using photogrammetry method (Kinovea software V 9.5.0). SPSS software was used to analyze the data. The data passed the normality test (Shapiro-Wilk test). The Prevalence of FHP & RSP of both the groups was calculated using percentage formula. To compare the two groups Independent T test was used. Statistical analysis revealed that adults have a notably higher forward head angle compared to adolescents, while the adolescent group exhibits a more pronounced forward shoulder angle. It can be concluded that adolescent athletes are more prone to get rounded shoulder posture and adult athletes are prone to forward head posture.

KEYWORDS

Overhead Sports, Rounded Shoulder Posture, Forward Head Posture, Throwing Athletes.

INTRODUCTION

Posture acts as a reflection of an individual's neuromuscular coordination and muscular balance. When we hear of the human posture we generally mean the posture which depends on the habits of individuals. So Posture is the way our body holds itself in a particular position. While assessing for posture, it can be categorized either as being "Correct Posture" or as "Faulty Posture". Optimal posture reduces joint and soft tissue strain, whereas improper alignment can intensify musculoskeletal stress.[1,2].The cervical spine's lordotic nature is significant and prolonged protraction can lead to alterations in head posture, ultimately resulting in forward head posture (FHP) and overall poor posture[3].

FHP is correlated with tightness of various muscles, including the upper trapezius(UT), splenius, semispinalis, and cervical spine's erector spinae, contributing to muscular imbalances[4]. Rounded shoulder posture (RSP) is linked to scapular alignment impairments, creating excessive stress and increasing muscle tone, particularly in the upper trapezius and pectoralis minor[2]. Suboptimal shoulder ROM is associated with upper limb injuries, particularly in overhead athletes with unique motion profiles[5].Postural alignment is implicated in sport performance with malalignment indicating potential muscle imbalances[6]. In high-level volleyball players, a shoulder region muscles strength imbalance between eccentric lateral and concentric medial rotators is associated with muscular weakness and scapular asymmetry, potentially contributing to shoulder injuries[7].

Muscle imbalance is also linked to functional impingement, altering muscular activation patterns in the glenohumeral and scapulothoracic regions, particularly in overhead athletes with subacromial impingement[8]. Children and adolescents commonly exhibit spinal postural deviations, with Forward Head Posture (FHP) and Protracted shoulders (PSs) posture being prevalent. These deviations are associated with upper quadrant musculoskeletal pain[9,15]. Young swimmers might experience the muscle imbalances in the shoulder girdle, with increased internal rotators and reduced supraspinatus strength in boys, emphasizing the importance of monitoring shoulder muscle balance in this population[10].Adolescent elite throwers face complex biomechanics predisposing them to various shoulder dysfunctions, presenting a challenge for sports medicine physicians[11]. High school students demonstrate significant differences in posture when carrying backpacks under various conditions, highlighting the impact on craniohorizontal and craniovertebral angles, sagittal shoulder posture, and anterior head alignment[12].

Utilization of postural assessment software offers an accurate and reliable method for posture evaluation, providing valuable insights for diagnosis, treatment planning, and follow-up in a clinical setting[12].The measurement of forward head posture (FHP) and rounded shoulder posture (RSP) traditionally involves the craniovertebral angle (CVA), considered the gold standard, utilizing lateral photographs and angle measurements for assessment[13].Ideal head and shoulder posture are quantitatively defined, with specific angles indicative of optimal alignment[14].

To establish clear classification groups based on head and shoulder posture, the postural criteria were determined using the mean plus or minus one standard deviation from a sample of 310 volunteers. Participants with a forward head angle (FHA) of 36 degrees or less and a forward shoulder angle (FSA) of 22 degrees or less were categorized into the ideal posture group. Conversely, individuals exhibiting an FHA of 46 degrees or higher and an FSA of 52 degrees or higher were classified into the forward head and rounded shoulder posture group. Assignment to these groups required meeting both angle criteria. This methodology was employed to distinctly separate the two posture alignment groups for analysis.[16] There is enormous literature on the injury prevalence in various sports involving overhead activity and various factors and mechanisms involved in these injuries. These researches also explain the relation of neck posture and shoulder injuries in the general population.[1, 3, 6 ,7, 9, 12] A great deal of stresses are placed on the shoulder complex while performing overhead activities in sports that involve actions like throwing or hitting a ball because of repeated force generation, asymmetry in the loads or use of limbs. The development of postural defects like the forward head posture (FHP) and round shoulder posture (RSP) make the athletes more susceptible to shoulder injuries.[21,22] Adolescent overhead athletes displaying rounded shoulder posture were found to have reduced glenohumeral internal (medial) rotation, accompanied by increased humeral retro-torsion, thickening of the posterior capsule, greater external rotation of the glenohumeral joint, and a narrowing of the subacromial space.[17 18]. Previous studies found that adolescent overhead athletes are more prone to roundedshoulder posture as compared to other abnormal posture due to their adaptations in growing phase, heavy school bags, prolong usage of electronics[13, 16 ,19,20]. The biomechanical factors which are responsible for abnormal posture should also be investigated and the present study has been designed to fill this gap. The purpose of current study is to find out the prevalence of the forward head and rounded shoulder posture in different age group of overhead athletes.

Methodology

In this cross-sectional study, the effect size was determined to be 0.5 and level of significance was set at 0.05 with a power of test at 0.95. The sample size was computed using G Power software which came out to be 74. The study was carried out at the MYAS-GNDU, Department of Sports Science and Medicine, situated at Guru Nanak Dev University (GNDU), Amritsar. (Ethical Committee Number-1417/HG)

The inclusion criteria for this study was male athletes engaged in sports involving overhead activities, specifically including Handball,

basketball, volleyball, discuss throw, javelin throw, shotput, cricket, and archery. The participants were divided into two age groups: Adolescent (12 to 17 years) and Adults (18 to 24 years). Participants were required to practice overhead activities at least three times a week, possess a minimum of six months of sports experience, and have no recent history of upper limb injuries.

Athletes practicing overhead activities less than three times a week, those with a history of previous shoulder surgery, and individuals with less than six months of sports experience were excluded from the study. Demographic data of 74 participants was documented as name, age, gender, height weight. The head angle and shoulder angle were evaluated as per Photogrammetry Method (fig 1). Three anatomical bony landmarks were marked on the patient's body, including the acromion tubercle at shoulder, the tragus of the ear, and the spinous process of the C7 vertebrae of cervical spine. These served as our surface markers. A digital photograph was taken of the participants who were made to stand 23cm distant from the adjacent wall. The photography tripod with an iPhone 12 Mini camera was placed at 265cm away from the wall, these distances were measured by using an inchtape and the camera height was aligned with the participant's right shoulder. Participants were instructed to bend forward three times, followed by three repetitions of raising their hand overhead, and finally to stand in a neutral, relaxed position. The photograph was taken after a pause of 5 seconds. Finally, the photographs were transferred into the laptop, and Kinovea software (version 0.9.5) was used to measure the angle between the line joining the marked landmarks. (fig 1) To measure the forward head posture (FHP), the angle formed between the vertical line and the line joining the C7 spinous process and the acromion tubercle. To measure the rounded shoulder posture, the angle formed between the vertical line and the line joining C7 and the ear tragus was measured by the Kinovea Software(version 0.9.5).

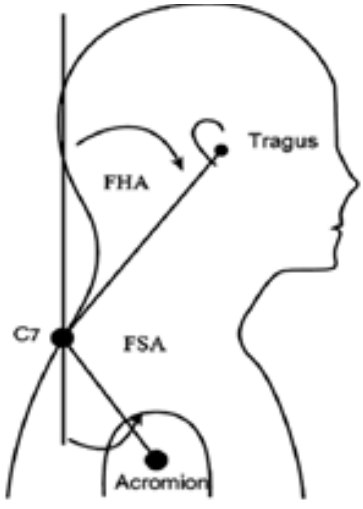
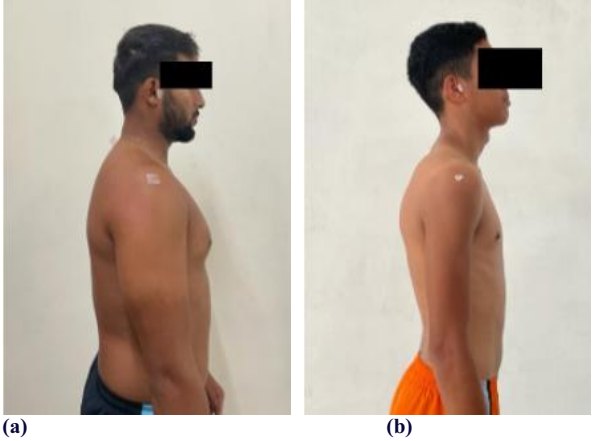


Fig. 1: To measure the forward head posture, the angle formed between the vertical line and the line joining the C7 spinous process and the acromion tubercle. To measure the rounded shoulder posture, the angle formed between the vertical line and the line joining C7 and the ear tragus was measured by the Kinovea Software(version 0.9.5).



(a) (b)

Fig 2 : Photogrammetry method used for data collection of (a) adult and (b) adolescent group.

RESULTS & DISCUSSION

The prevalence of forward head posture and rounded shoulder posture in the adolescent and adult groups was determined using a percentage calculation. Data analysis was performed with SPSS software (IBM version 27.0.1). The Shapiro-Wilk test assessed the normality of the data, which met the assumption of normal distribution. Consequently, an Independent T-test was applied to compare the two groups, with the significance threshold set at 0.05.

Table 1 : The demographic details of Adult Group and Adolescent Group with their means and standard deviations

	Adult Group	Adolescent Group
Demographic Variables	Mean (SD)	Mean (SD)
Age (years)	21.65 (±2.39)	15.7 (±1.32)
Height (centimeters)	176.7 (±7.071)	162.546 (±15.543)
Weight (kgs)	73.027 (±12.68)	53.541 (±17.759)

Table 2 : Mean Values of head angle and shoulder angle of adult and adolescence group

Group	Variables	No. Of cases	No. of Participants	Percentage
Adult Group	Forward Head Posture	13	37	35%
	Rounded Shoulder Posture	08	37	22%
Adolescent Group	Forward Head Posture	11	37	29.7%
	Rounded Shoulder Posture	09	37	24.2%

Table 3 : Forward Head Posture and Rounded Shoulder Posture's prevalence by Percentage Formula for adult group and adolescent group.

	Group	N	Mean	Std. Deviation	Std. error mean
Head angle	Adult	37	***44.091***	6.2443	1.02656
	Adolescence	37	40.900	6.3139	1.03901
Shoulder angle	Adult	37	39.118	9.9343	1.63319
	Adolescence	37	***43.586***	8.3371	1.37062

Table 4 : Comparison of head angle and shoulder angle between adult group and adolescent group.

T-test For Equality Of Means				95% confidence interval of theDifference		
Variables	T	P	Mean Difference	Std. Error Difference	Lower	Upper
Head Angle	2.186	**.032**	3.19189	1.459	.2816	6.102
Shoulder Angle	-2.136	**.036**	-4.46757	2.092	-8.05	.4475

The T-test revealed a statistically significant difference in forward head angle between the adult and adolescent groups ($p < 0.03$). Additionally, a significant difference was observed in shoulder angle between the two groups ($p < 0.03$).

The present research was designed to evaluate head and shoulder angles in overhead athletes, with the objective of determining how frequently forward head posture (FHP) and rounded shoulder posture (RSP) occur across different age groups. The study further sought to identify which group is more susceptible, in order to highlight potential preventive strategies against joint and muscular dysfunctions in the future..

The result of the present study showed that the mean value of head angle is greater in adult group as compared to adolescent group (table 2). It was shown that the prevalence of Forward Head Posture was 35% in adult group and the prevalence of Forward Head Posture was 29.70% in adolescent group (table 3). For the comparison of forward head angle in both adult group and adolescent group of overhead athletic population the independent T-test was done and it was found that the statistically significant difference was present in forward head angle($p=0.032$) between adults and adolescents where adult group showed a greater forward head angle as compared to adolescents (table 4). According to Singla et al. (2015), cervical posture was analyzed in two groups: collegiate students and collegiate basketball players. Using a photogrammetric approach, the researchers assessed craniovertebral angle and sagittal head tilt. Their findings indicated significant differences in forward head posture between the groups, suggesting that athletic participation may influence cervical

alignment. In a related investigation, Aginsky et al. (2016) examined the relationship between posture and isokinetic shoulder strength in male water polo players at the club level. Postural alignment was evaluated using a posture grid, while the strength of the shoulder rotator muscles was measured with a Biodex System 3 isokinetic dynamometer. Over five repetitions both concentrically and eccentrically were performed at 60°/second. The observed postural deviations included forward head posture, rounded shoulders, increased thoracic kyphosis, elevated non-dominant shoulder, and mild scapular winging. These findings suggest that male water polo players commonly exhibit rounded shoulders and forward head posture, often accompanied by weakness in the external rotator muscles. This combination potentially heightens their risk for shoulder injuries. The results align with the conclusions of previous studies on this population.

On the other hand, the prevalence of Rounded Shoulder Posture was 22% in adult group and the prevalence of Rounded Shoulder Posture was 24.2% in adolescent group (table 3). For the comparison of Rounded shoulder angle in both adult group and adolescent group of overhead athletic population, the independent T-test was done and it was found that the statistically significant difference was present in shoulder angle (p=0.036) between adults and adolescents(table 4). Adolescent group showed a greater forward shoulder angle as compared to adult group (table 2). Micheal M et. al., conducted a Cross-sectional study to examine shoulder adaptations resulting from overhead throwing in young athletes. Thirty-six boys aged 8 to 12 years who participated in organized youth baseball were studied. The findings indicated that the dominant shoulder in these young players exhibited decreased internal rotation of the glenohumeral joint alongside an increased degree of humeral retrotorsion. The authors concluded that these structural adaptations in younger athletes mirrored those commonly reported in older baseball players, suggesting the necessity for further research in youth populations[18,23,24]. The findings of this study suggest that adolescent overhead athletes are at increased risk for greater muscle load, degenerative disc disease, back pain, and chronic shoulder conditions. These risks are commonly linked to poor head and shoulder posture, which contributes to the heightened muscle strain and musculoskeletal disorders observed in this group[2]. These abnormalities can be prevented by the prehabilitaton by limiting the progression of the head angle in them. In adolescence group the result showed that they have increased shoulder angle than the adults. Evidence from prior studies suggests that adolescents between 12 and 17 years often experience shoulder girdle muscle imbalances, typically characterized by stronger internal rotators and weaker external rotators, as well as reduced trapezius strength in female athletes. According to the recent literature, the factors leading to the results of present study are maybe due to the muscle imbalances of shoulder girdle, this can be a major factor to prevent the increased rounded shoulder posture in adolescence group of overhead athletes than the adult group. These findings align with previous research emphasizing the impact of poor posture on musculoskeletal health, particularly in overhead athletes[1]. The prevalence rates underscore the importance of early intervention and targeted interventions to address posture-related issues in both adult and adolescent populations[3].

Conclusion and Future Scope

The overall prevalence of forward head posture and rounded shoulder posture was found to be 35% and 22%, respectively, in the adult group. In the adolescent group, these prevalences were 29.7% and 24.3%, respectively. The significant prevalence and difference in forward head posture among adults, along with the high prevalence and difference in rounded shoulder posture among adolescents, indicate the need for ergonomic assessment and targeted interventions to improve health and performance in overhead athletes across both age groups. The findings from this study can enhance treatment protocols for overhead athletes with shoulder injuries and contribute to preventing injury recurrence. The results also emphasize the importance of addressing postural issues during shoulder pain rehabilitation to avoid re-injury. A limitation of the study is that it included only male participants and did not cover all overhead sports due to participant availability constraints.

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Conflicts of interest:
There are no conflicts of interest to disclose in this study.

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