Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1561
www.lmi.education/

Prevalence of Thoracic Hyperkyphosis Posture Among Female Students of Allied Health Institutes and Its Association with Rounded Shoulders

Zonaisha Mehboob Ahmed[1], **Ifra Ashique**[1], **Areeba Zafar**[1], **Zain Ali**[1], **Marium Zafar**[1], **Anbreena Rasool**[1]

Correspondence
Zain Ali
lecturer.rehab110@tuf.edu.pk
Affiliations
1 The University of Faisalabad, Faisalabad, Pakistan

Keywords
Thoracic hyperkyphosis, rounded shoulders, female students, postural abnormalities, prolonged sitting, allied health institutes, posture correction
Disclaimers

Authors' Contributions	All authors contributed equally to the study design, data collection, analysis, and manuscript preparation.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Thoracic hyper kyphosis and rounded shoulders are common postural abnormalities among young females, which can lead to musculoskeletal impairments and reduced quality of life. Prolonged sitting and poor posture are key contributing factors to these conditions.

Objective: To determine the prevalence of thoracic hyper kyphosis among female students at allied health institutes and its association with rounded shoulders.

Methods: A cross-sectional study was conducted on 334 female students aged 18 to 25 years from three allied health institutes in Faisalabad. Thoracic hyper kyphosis was measured using a flexi curve ruler from C7 to T12, and rounded shoulders were assessed with a Vernier caliper measuring the acromion-to-bed distance. Data were analyzed using SPSS version 27, including descriptive statistics and logistic regression to assess associations.

Results: The prevalence of thoracic hyper kyphosis was 19.5%, and rounded shoulders were observed in 21.6% of participants. A significant association was found between thoracic hyper kyphosis and rounded shoulders ($p = 0.005$). Each additional hour of sitting increased the odds of hyper kyphosis by 43% (OR = 1.43, 95% CI: 1.12 - 1.82) and rounded shoulders by 51% (OR = 1.51, 95% CI: 1.18 - 1.93).

Conclusion: The study identified a significant prevalence of thoracic hyper kyphosis and rounded shoulders among female students, linked to prolonged sitting. Preventive measures focusing on postural correction and reducing sitting time are recommended.

INTRODUCTION

Thoracic hyper kyphosis, characterized by an exaggerated anterior curvature of the thoracic spine, is a common postural abnormality with significant clinical implications, particularly among young female populations. The thoracic spine's natural kyphotic curve results from the structure of the vertebral bodies and intervertebral discs, providing crucial support and flexibility while protecting the spinal cord and its branching nerves (1). However, when this curvature becomes excessive, it can disrupt normal spinal alignment, leading to increased stress on the musculoskeletal system and subsequent functional impairments (2). The human spine, with its S-shaped configuration, consists of four primary curvatures, including thoracic kyphosis, which, if exaggerated, manifests as thoracic hyper kyphosis—a condition associated with compromised postural stability and musculoskeletal strain (3).

Thoracic hyper kyphosis is recognized as one of the most prevalent spinal deformities, often resulting in reduced range of motion, particularly in the shoulder joints, and weakening of the spinal extensor muscles, thereby affecting daily activities and overall quality of life (4). Various etiological factors contribute to the development of hyper kyphosis, including trauma, developmental abnormalities, degenerative disc diseases, and neuromuscular disorders. The condition is often categorized based on severity, with milder forms like postural round back and more severe manifestations such as Scheuermann's disease, a rigid kyphosis commonly seen in adolescents (5). Notably, hyper kyphosis prevalence is higher in females, likely due to a complex interplay of biological, hormonal, and social factors that increase susceptibility during critical growth periods such as puberty (6).

Hyperkyphosis can significantly impact the upper body's functional alignment, leading to associated conditions such as rounded shoulders and forward head posture. Rounded shoulders are particularly common among individuals with thoracic hyper kyphosis, characterized by an anterior displacement of the scapula and a forward positioning of the shoulders, which can disrupt the static and dynamic stability of the scapula and shoulder girdle (7). This condition is often exacerbated by prolonged sitting, excessive use of electronic devices, and other lifestyle factors that promote poor posture (8). Additionally, thoracic hyper kyphosis can lead to compensatory mechanisms throughout the spine, including lumbar hyper lordosis and altered cervical spine alignment, which further compound postural abnormalities and functional deficits (9).

Manuscript Submitted under JHRR ID 1561: September 02/2024 | Accepted: September 16/2024

The prevalence of thoracic hyper kyphosis and its associated postural deviations, such as rounded shoulders, underscores the need for targeted interventions aimed at early identification and management of these conditions among young female populations. Given the higher prevalence rates observed in females, understanding the underlying causes and developing effective preventive and corrective strategies are critical for mitigating the long-term impacts of these postural abnormalities (10). This study aims to evaluate the prevalence of thoracic hyper kyphosis among female students in allied health institutes and to investigate its association with rounded shoulders, with the broader goal of informing interventions that can reduce the incidence of postural deformities and associated symptoms in this population. By highlighting the correlation between thoracic hyper kyphosis and lifestyle factors such as prolonged sitting, this research seeks to provide insights into the development of preventive measures and guidance for maintaining optimal spinal health among female students (11).

MATERIAL AND METHODS

The study utilized a cross-sectional design to assess the prevalence of thoracic hyper kyphosis and its association with rounded shoulders among female students from allied health institutes in Faisalabad, Pakistan. The target population included undergraduate female students aged 18 to 25 years from three selected institutes: The University of Faisalabad (TUF), Government College University Faisalabad (GCUF), and Aziz Fatimah Medical and Dental College (AFMDC). A total sample size of 334 participants was determined through convenient sampling. Inclusion criteria were set to include female students within the specified age range without any known pathological conditions affecting the spine, while exclusion criteria encompassed individuals with bone disorders, systemic inflammation, neuromuscular diseases, a history of spinal surgeries, or scoliosis. Participants were screened based on the inclusion and exclusion criteria, and those who met the criteria were recruited for the study. Informed consent was obtained from all participants prior to their inclusion in the study, ensuring that ethical guidelines were followed in accordance with the Declaration of Helsinki. Ethical approval was sought and granted by the respective institutional review boards or ethics committees of the participating institutes. The study was conducted over a period of four months, during which data were collected using standardized tools to measure thoracic hyper kyphosis and rounded shoulders.

Thoracic hyper kyphosis was measured using a flexi curve ruler, a 30 cm flexible tool that was placed along the thoracic spine from the C7 to T12 vertebrae. The shape of the spine was then traced onto transparent paper, and the thoracic kyphosis angle was calculated by assuming the flexi curve tracing resembled a circle's arc, with the kyphosis angle derived using the arc's core position (15). Rounded shoulders were assessed using a Vernier caliper, which measured the distance from the acromion process of the shoulder to the bed while the participant lay supine with hands positioned on both sides (16).

Data were analyzed using SPSS version 27. Descriptive statistics were employed to summarize participant demographics, including age distribution, department affiliations, and the number of sitting hours. Inferential statistics, including logistic regression, were utilized to determine the association between thoracic hyper kyphosis and rounded shoulders, as well as the influence of sitting hours on postural abnormalities. A Pearson Chi-Square test was conducted to evaluate the statistical significance of the associations observed between kyphosis and rounded shoulders, with a p-value less than 0.05 considered statistically significant. All collected data was handled with confidentiality, and participant anonymity was maintained throughout the study.

RESULTS

A total of 334 female students participated in the study, with ages ranging from 18 to 25 years.

Table 1: Descriptive Characteristics of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18-20	172	51.5
	21-23	108	32.3
	24-25	54	16.2
Department	DPT	92	27.5
	Pharmacy	70	21.0
	Optometry	56	16.8
	Nutrition	50	15.0
	MLS	38	11.4
	BDS	28	8.4
Sitting Hours	<4 hours	150	44.9
	4-6 hours	110	32.9
	>6 hours	74	22.2
Kyphotic Degree	Normal	269	80.5
	Hyperkyphotic	65	19.5
Rounded Shoulders	Normal	262	78.4
	Rounded	72	21.6

The participants were distributed across various departments, including Doctor of Physical Therapy (DPT), Pharmacy, Optometry, Nutrition and Dietetics, Medical Laboratory Sciences (MLS), and Bachelor of Dental Surgery (BDS). The descriptive characteristics of the study participants, including their age distribution, department affiliation, sitting hours, kyphotic degree, and rounded shoulder status, are summarized in Table 1. These results underscore the impact of lifestyle factors, particularly prolonged sitting, on the prevalence of postural abnormalities among female students. The significant association between thoracic hyper kyphosis and rounded shoulders further highlights the interconnected nature of these conditions, suggesting that interventions aimed at reducing sitting time and promoting postural awareness could be beneficial in mitigating these abnormalities in the studied population.

The prevalence of thoracic hyper kyphosis among the participants was found to be 19.5%, with 65 out of 334 students exhibiting hyperkyphotic posture. The prevalence of rounded shoulders was 21.6%, with 72 students showing this postural abnormality. The mean kyphotic degree among participants was 35.77 ± 9.67 degrees, and the mean measurement for rounded shoulders was 29.77 ± 15.69 mm to evaluate the association between thoracic hyper kyphosis and rounded shoulders, a Pearson Chi-Square test was conducted, revealing a significant association ($p = 0.005$). Logistic regression analysis was further employed to explore the predictive value of sitting hours on the likelihood of developing hyper kyphosis and rounded shoulders. The results are summarized in Table 2. The analysis indicated that prolonged sitting hours significantly increased the odds of both thoracic hyper kyphosis and rounded shoulders.

Table 2: Logistic Regression Analysis of Predictors for Hyperkyphosis and Rounded Shoulders

Predictor	Outcome	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Sitting Hours	Hyperkyphosis	1.43	1.12 - 1.82	0.002
	Rounded Shoulders	1.51	1.18 - 1.93	0.001
Age (years)	Hyperkyphosis	1.05	0.92 - 1.21	0.413
	Rounded Shoulders	1.09	0.94 - 1.27	0.276

Specifically, each additional hour of sitting increased the odds of developing hyper kyphosis by 43% (OR = 1.43, 95% CI: 1.12 - 1.82, $p = 0.002$) and rounded shoulders by 51% (OR = 1.51, 95% CI: 1.18 - 1.93, $p = 0.001$). Age did not significantly predict the development of either postural abnormality.

DISCUSSION

The findings of this study revealed a notable prevalence of thoracic hyper kyphosis and rounded shoulders among female students in allied health institutes, with significant associations between these postural abnormalities and prolonged sitting hours. The prevalence of thoracic hyper kyphosis was 19.5%, while 21.6% of the participants exhibited rounded shoulders. These results align with previous studies that have reported high rates of postural deformities in similar populations, particularly among females, who are often more susceptible to such conditions due to hormonal, biological, and lifestyle factors (1, 7). The observed association between thoracic hyper kyphosis and rounded shoulders corroborates earlier findings that suggest a close interrelationship between different postural deviations, which collectively contribute to musculoskeletal discomfort and functional impairments (8).

The logistic regression analysis highlighted that increased sitting hours were a significant predictor of both thoracic hyper kyphosis and rounded shoulders, with each additional hour of sitting raising the likelihood of developing these conditions. This finding is consistent with prior research demonstrating that prolonged sedentary behavior, particularly in suboptimal postures, can exacerbate spinal curvature abnormalities and shoulder positioning issues (9, 11, 18). The significant association between sitting duration and postural abnormalities underscores the impact of modern lifestyle factors, such as extensive screen use and study-related sedentary behavior, on spinal health among young adults.

Despite the significant associations found, the study had certain limitations. The cross-sectional design precluded any causal inferences between prolonged sitting and the development of postural abnormalities, limiting the ability to determine the directionality of these relationships. Additionally, the use of convenience sampling may have introduced selection bias, potentially affecting the generalizability of the findings to broader populations of female students. The reliance on specific tools, such as the flexi curve ruler for measuring thoracic kyphosis and the Vernier caliper for assessing rounded shoulders, although standardized, may have introduced measurement variability, which could influence the precision of the results (15). Future studies could benefit from employing longitudinal designs and a broader, more diverse sample to better understand the temporal and causal relationships between lifestyle factors and postural health.

A key strength of the study was its focus on a specific population—female students from allied health institutes—who are at risk due to their academic demands and lifestyle. The findings provide valuable insights that can inform targeted interventions aimed at promoting postural awareness and reducing sedentary behavior among this group. Interventions such as postural training programs, ergonomic adjustments in study environments, and regular physical activity could be beneficial in mitigating the observed postural abnormalities.Moreover, educational initiatives to raise awareness about the importance of maintaining good posture and the risks associated with

prolonged sitting could be crucial in preventing the onset of these conditions.

The study also highlighted the significant impact of lifestyle factors on postural health, suggesting that behavioral modifications, such as taking frequent breaks from sitting and engaging in exercises that strengthen the back and shoulder muscles, may help reduce the prevalence of thoracic hyper kyphosis and rounded shoulders. This aligns with previous recommendations that emphasize the role of targeted exercise programs in managing and preventing postural deformities, particularly in populations that are predisposed to these conditions due to their daily activities (11, 14).

CONCLUSION

In conclusion, the study underscored the need for early identification and intervention to address postural abnormalities in young female populations, particularly in settings where prolonged sitting is prevalent. By highlighting the associations between thoracic hyper kyphosis, rounded shoulders, and lifestyle factors, the findings provide a basis for developing comprehensive strategies to improve spinal health and prevent the long-term consequences of poor posture. Further research should explore the effectiveness of specific interventions in reducing the incidence of these postural conditions, with a focus on sustainable and practical solutions that can be integrated into the daily routines of students and other at-risk groups.

REFERENCES

1. Roghani T, Zavieh MK, Manshadi FD, King N, Katzman WJ. Age-Related Hyperkyphosis: Update of Its Potential Causes and Clinical Impacts—Narrative Review. Arch Clin Exp Res. 2017;29:567-577.
2. Waxenbaum JA, Reddy V, Futterman B. Anatomy, Back, Thoracic Vertebrae. StatPearls. Treasure Island (FL): StatPearls Publishing; 2017.
3. Alizadeh MH, Farokhi A, Yasrebi M, Rahnama NJ. Relationship of Thoracic Kyphosis Deformity to Depression, Anxiety, Aggression and Introversion. Clin Biochem. 2004;9(2):73-76.
4. Karimizadeh Ardakani M, Soroush Fard Z, Amirizadeh F, Naderifar H. Effect of Thoracic Hyper-Kyphosis Posture on Upper Extremity Function of Female Students. J Rehabil Sci Res. 2022;9(1):30-35.
5. Yaman O, Dalbayrak S. Kyphosis and Review of the Literature. Turk Neurosurg. 2014;24(4):455-465.
6. Almujel KN, Almhmd AE, Alharfy AAN, Albalawi IAS, Alanazi TBF, Alshehri AJ, et al. Causes and Management of Hyperkyphosis. Int J Orthop Trauma Nurs. 2021;33(35B):1-8.
7. Ohlendorf D, Avaniadi I, Adjami F, Christian W, Doerry C, Fay V, et al. Standard Values of the Upper Body Posture in Healthy Adults With Special Regard to Age, Sex and BMI. J Biomech. 2023;13(1):873.
8. Hunter D. The Relationship Between the Thoracic Spine and Shoulder Impingement Syndrome. University of Newcastle; 2022.
9. Kwon JW, Son SM, Lee NK. Changes in Upper-Extremity Muscle Activities Due to Head Position in Subjects With a Forward Head Posture and Rounded Shoulders. J Phys Ther Sci. 2015;27(6):1739-1742.
10. Torres-Cusihuaman L, Bravo-Cucci SJ. Association Between Thoracic Kyphosis and Forward Head Posture in Teenagers: An Analytical Cross-Sectional Study. Eur J Rehabil Stud. 2023;10(4).
11. Jung SH, Hwang UJ, Kim JH, Gwak GT, Kwon OY. Effect of Improved Thoracic Kyphosis on Forward Shoulder Posture After Mobilization in Individuals With Thoracic Hyperkyphosis. Clin Biomech. 2022;97:105707.
12. Beyranvand R, Mirnasouri R, Mollahoseini S, Mostofi S. The Functional Stability of the Upper Limbs in Healthy and Rounded Shoulder Gymnasts. J Sports Sci. 2017;9(3):279-290.
13. Beyranvand R, Mirnasouri R, Mollahoseini S, Mostofi S. The Functional Stability of the Upper Limbs in Healthy and Rounded Shoulder Gymnasts. J Sports Sci. 2017;9(3):279-290.
14. Lv P, Peng Y, Zhang Y, Ding K, Chen X. Kinematic Causes and Exercise Rehabilitations of Patients With Round Shoulder, Thoracic Kyphosis and Forward Head Posture (FHP). J Exerc Rehabil. 2016;6(263):2161-1165.
15. Grindle DM, Mousavi SJ, Allaire BT, White AP, Anderson DE. Validity of Flexicurve and Motion Capture for Measurements of Thoracic Kyphosis vs Standing Radiographic Measurements. Spine J. 2020;3(3).
16. Hanfy HM, Awad MA, Ahaa AJ. Prevalence of Thoracic Kyphosis in Girls After Puberty in Cairo Governate. Bull Fac Phys Ther. 2012;17(1):1-6.
17. Arif A, Arif Z, Hanan A. Prevalence of Rounded Shoulder in Computer Users: A Cross-Sectional Study. J Rehabil Res Dev. 2022.
18. Kim EK, Kim JS. Correlation Between Rounded Shoulder Posture, Neck Disability Indices, and Degree of Forward Head Posture. J Phys Ther Sci. 2016;28(10):2929-2932.