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Original Article

Prevalence and Association of Neck Disability Index (NDI) with Forward Head Posture (FHP) among Pharm D Students

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ABSTRACT

Background: Forward Head Posture (FHP) is a prevalent condition characterized by the anterior positioning of the cervical spine, leading to increased cervical lordosis. This posture has been associated with various musculoskeletal disorders, particularly among students who spend prolonged periods in sedentary activities, such as reading or using computers and smartphones. The relationship between FHP, the Neck Disability Index (NDI), and the Craniovertebral (CV) angle is crucial for understanding the impact of this postural deviation on neck disability.

Objective: The study aimed to determine the prevalence of FHP among Pharm-D students at the Margalla Institute of Health Sciences, Rawalpindi, and to assess the association between the NDI and CV angle in this population.

Methods: A descriptive cross-sectional study design was employed, involving 169 Pharm-D students selected through convenient non-probability sampling. The ON Protractor application was used for photogrammetric measurements of the CV angle, while the NDI questionnaire assessed neck disability. Data analysis was conducted using SPSS version 25, with correlation coefficients calculated to explore the associations between FHP, NDI, and CV angle.

Results: The prevalence of FHP among the participants was found to be 84%. The majority of students (63.3%) exhibited light disability according to the NDI. The mean CV angle was 41.49 degrees in standing and 41.5 degrees in sitting positions. No significant correlation was observed between the CV angle and NDI (r=0.357 in sitting and r=0.162 in standing positions), indicating that the degree of FHP was not directly related to the level of neck disability.

Conclusion: FHP is highly prevalent among Pharm-D students, with a significant proportion experiencing light neck disability. However, the study found no significant correlation between the severity of FHP (as measured by the CV angle) and neck disability. These findings underscore the need for targeted interventions to address FHP and prevent neck disabilities in this population.

Keywords: Forward Head Posture, Neck Disability Index, Craniovertebral Angle, Pharm-D Students, Photogrammetry, Musculoskeletal Disorders.

INTRODUCTION

In the realm of physical well-being, posture plays a pivotal role, embodying the body's alignment at any given moment. This alignment, shaped by the positioning of the body's joints, dictates the overall posture, where optimal posture is recognized through minimal stress on each joint. The alignment of the body, particularly how the shoulders retract towards the spine, contributes significantly to both aesthetic appeal and physical health. The scapula's positioning is crucial in this regard, as any deviation can lead to conditions such as pigeon chest, forward shoulder posture, kyphosis, scoliosis, or scapular winging. The phenomenon of forward shoulder posture, marked by the anterior deviation of the shoulders due to an imbalance between the over-shortened pectoral muscles and the under-strengthened middle trapezius muscle, stands as a testament to the importance of scapular alignment (1).

Among the myriad of postural abnormalities, Forward Head Posture (FHP) is notably prevalent, characterized by an increased flexion in the lower cervical spine and upper thoracic region, alongside an extension in the upper cervical spine. This posture, resulting from the shortening of the upper trapezius, posterior cervical extensor muscles, sternocleidomastoid muscle, and levator scapulae muscle, places undue stress on the musculoskeletal system, particularly affecting the shoulder and neck muscles (2). The

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consequences of FHP extend beyond mere discomfort, contributing to headaches, neck pain, temporomandibular disorders, and vertebral body disorders, among others. The digital age exacerbates this condition, with the increase in computer use for both work and leisure leading to a significant rise in musculoskeletal disorders, including neck pain (3,4).

The biomechanical interplay between the head, cervical spine, and facial structures has garnered attention due to its impact on posture. Notably, for every inch the head moves forward, an additional 10 lbs. (4.5 kg) of weight is exerted on the cervical spine, which can lead to a cascade of musculoskeletal, neural, and vascular dysfunctions (5). The association between FHP and neck pain has been well-documented, highlighting the critical need for awareness and preventive measures in daily activities to mitigate the onset of such conditions (6).

In the professional sphere, particularly within the banking sector of Pakistan, the prevalence of FHP and its associated discomforts is alarming, with studies indicating an 83% prevalence rate among bankers. This high incidence underscores the urgent need for ergonomic interventions and awareness (9). The Neck Disability Index (NDI), a comprehensive tool encompassing ten items related to pain intensity, concentration, and physical activities, serves as a vital measure for evaluating neck pain and disability. Utilizing the Urdu version of NDI enhances its applicability in the local context, providing a nuanced understanding of neck-related disabilities (9).

The measurement of Forward Head Posture, critical for assessing and addressing this condition, incorporates various methods, including goniometry and photogrammetry. Despite the challenges associated with goniometry, such as its low reliability and the difficulties in preserving limb positions, it remains a tool in clinical settings. On the other hand, photogrammetry offers a non-invasive, reliable, and valid approach for assessing craniovertebral posture, with the ON Protractor software being recognized for its precision and efficiency in measuring the craniovertebral angle (10,11,12).

This study aims to shed light on the prevalence of Forward Head Posture among Pharm-D students at Margalla Institute of Health Science and explore the correlation between the Neck Disability Index (NDI) and Forward Head Posture. By delving into these aspects, the study seeks to contribute to the broader understanding of postural health, emphasizing the need for awareness and appropriate ergonomic practices to alleviate the burden of neck pain and its related conditions among the student population.

MATERIAL AND METHODS

The research was structured around a descriptive cross-sectional design, executed at the Margalla Rehabilitation Center (MRC), specifically targeting the student body of the Margalla College of Pharmacy. The investigational timeline extended over a six-month period, initiated subsequent to the Ethical Committee of Margalla Institute of Health Sciences in Rawalpindi sanctioning the study synopsis. The determination of the sample size was facilitated through the application of Rao Soft Software, which advocated for a cohort of 169 participants. This recommendation was predicated on maintaining a 5% margin of error alongside a confidence level of 90%. The recruitment strategy was anchored in convenient non-probability sampling, ensuring the inclusion of a diverse participant pool.

Eligibility for participation was defined by several criteria. Prospective participants were required to be between the ages of 18 and 25 years, inclusive of both genders, and must be actively enrolled in the Pharm-D program at the Margalla College of Pharmacy. Conversely, individuals were deemed ineligible for inclusion if they had undergone cervical or shoulder surgery, were diagnosed with congenital abnormalities, balance disorders, had a history of cervical or thoracic fractures, malignancies, or were contending with any systemic diseases within the six months leading up to the study.

Upon the commencement of the study, data collection was rigorously conducted, adhering to established protocols that ensured the integrity and confidentiality of participant information, in compliance with the Declaration of Helsinki. Participants were informed about the nature and objectives of the study, and informed consent was obtained from all participants prior to their inclusion in the study. The Neck Disability Index (NDI) questionnaire, validated in Urdu, was administered to evaluate the degree of neck pain and its impact on daily activities. The forward head posture of each participant was assessed using the ON Protractor software, a method recognized for its precision in measuring the craniovertebral angle.

The collected data were subjected to statistical analysis utilizing the SPSS software, version 25. The analysis encompassed descriptive statistics to characterize the study population and inferential statistics to explore the association between the Neck Disability Index (NDI) and Forward Head Posture (FHP) among the participants. The ethical considerations of the study were rigorously observed, with all procedures being executed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Furthermore, the confidentiality of the participants' data was strictly maintained throughout the study, ensuring that all information was used solely for research purposes and was protected against unauthorized access.

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RESULTS

The graphical representations of the study results, rendered as donut charts, offer a detailed overview of the findings with bold and blue data labels for enhanced clarity. The Gender Distribution chart reveals a participant composition of 34.9% male and 65.1% female, emphasizing the gender disparity among the subjects. In Reading Habits, the distribution is segmented into 40% of participants dedicating one hour to reading, 29% extending their sessions to two hours, and 31% engaging in reading for more than two hours, showcasing varied reading durations. The Exercise Regularity chart illustrates that only 29.6% of participants exercise regularly, while a significant majority of 70.4% do not, highlighting a notable lack of physical activity. Lastly, the CVA in Sitting graph indicates that a substantial 84.5% of participants exhibit Forward Head Posture (FHP), contrasting sharply with the mere 16.1% who maintain a normal cervical vertebral angle, underscoring the prevalence of FHP among the study group. These visual summaries succinctly encapsulate the key findings, providing a clear and comprehensive snapshot of the study's outcomes.

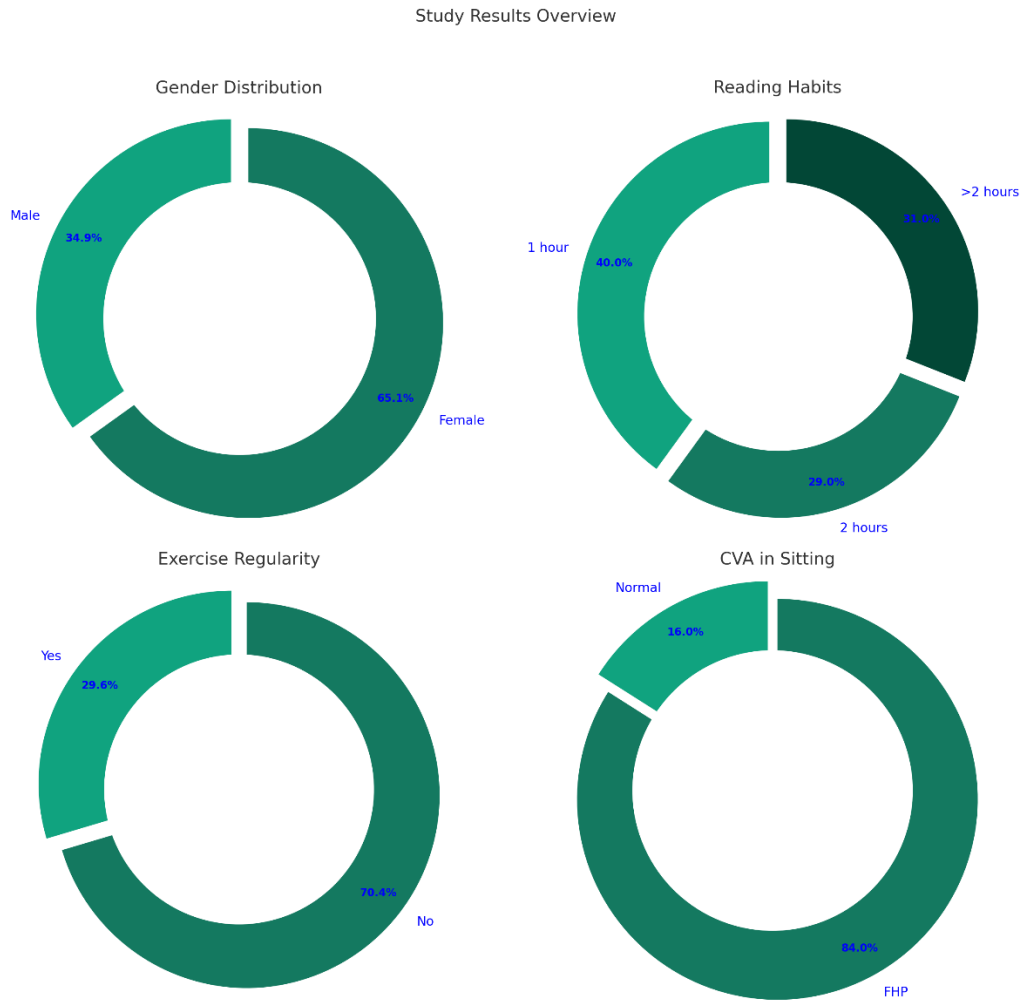

Figure 1 Demographic and Study Characteristics

Table 1 Neck Disability Index and Correlational Statistics

Disability Level	Percentage (%)	Position	Correlation Coefficient (r)
No Disability	1.2%	CVA Sitting	0.357
Light Disability	63.3%	CVA Standing	0.162
Moderate Disability	25.4%		
Severe Disability	4.1%		
Complete	5.9%		

In this study, the distribution of the Neck Disability Index (NDI) among participants revealed varied levels of disability: 1.2% of participants experienced no disability, a significant majority of 63.3% reported light disability, 25.4% faced moderate disability, 4.1% had severe disability, and 5.9% were categorized under complete disability. The correlation coefficients further elucidated the

relationship between cervical vertebral angle (CVA) and NDI scores, with CVA in sitting position showing a moderate positive correlation (r=0.357), indicating that as the CVA increases, indicating a more pronounced forward head posture, there is a tendency for the NDI score to increase, suggesting worsening disability. In contrast, the correlation for CVA in standing position with NDI scores was less pronounced (r=0.162), suggesting a weaker association between forward head posture while standing and the level of neck disability. This differential association underscores the significance of posture's impact on neck disability, highlighting the importance of ergonomic practices and posture correction in mitigating neck-related issues.

DISCUSSION

In the conducted study, an examination of forward head posture (FHP) and its correlation with the Neck Disability Index (NDI) among Pharm-D students at the Margalla Institute of Health Sciences, Rawalpindi, was undertaken. Utilizing the ON Protractor application for photogrammetric measurements, the research aligned with previous studies that have recognized the application's high inter and intra-rater reliability, echoing the findings of Jinal A. Mamania et al. concerning the reliability of this digital tool (13). The study population comprised 169 students, predominantly female, within the age range of 18-25 years, aiming to ascertain the prevalence of FHP and its association with the NDI and Craniovertebral angle among this demographic.

The findings revealed an 84% prevalence of FHP among the participants, a figure that resonates with prior research indicating a high prevalence of FHP among individuals in academic settings, likely attributed to prolonged periods spent with books, laptops, and smartphones, which may contribute to poor posture. Notably, this study determined no significant correlation between the Craniovertebral (CV) angle and the NDI, suggesting that smaller CV angles, indicative of greater FHP, were not directly associated with increased neck disability scores (14). This outcome diverges from other studies that have documented a commonality of FHP in medical students, with prevalences reported at 90%, 73%, and 63.9% in varying cohorts, suggesting an overarching issue across academic environments (15,16). Interestingly, the study also explored the relationship between body mass index (BMI) and CV angle, finding a significant association with the weight component of BMI but not height, aligning with Piotr Kocur's 2019 findings of a moderate negative correlation between age, BMI, and CV angle (16).

The majority of participating students exhibited light disability, as assessed by the NDI scoring system, indicating that while neck pain was present, it did not severely hinder activities of daily living (ADLs) for most. This is consistent with other studies where a significant portion of students experienced moderate pain, suggesting that while discomfort and difficulty with certain activities were reported, overall functioning capacities remained largely intact (17,18,19).

The study's methodology, employing a cross-sectional design and nonprobability sampling, presents limitations including potential biases and a lack of generalizability beyond the Pharm-D student population at MIHS, Rawalpindi. Additionally, the specificity of the sample to Pharm-D students may not reflect the broader population or other professional cohorts who might experience different occupational stresses and postural challenges.

Given the increasing prevalence of FHP observed in the study, it recommends proactive measures and educational interventions within the Pharm D program to mitigate poor postural habits. Strategies such as incorporating neck exercises into daily routines, promoting ergonomic sitting postures, and introducing sessions on the health implications of poor posture could be beneficial. Moreover, the adoption of ergonomic furniture and the encouragement of regular breaks could further support posture improvement efforts, aiming to reduce the incidence of FHP and associated neck disabilities among students.

CONCLUSION

In conclusion, the study underscores a notable prevalence of FHP among Pharm-D students, with a minor association between FHP and the NDI, highlighting the potential for future postural issues if unaddressed. The findings suggest the need for targeted interventions to improve posture and reduce the risk of neck disabilities, contributing valuable insights for future research and health promotion strategies within academic settings.

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