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Original Article

Association between Cervical Muscle Weakness and Functional Limitations due to Headache in Doctors

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ABSTRACT

Background: Headaches and neck discomfort are prevalent issues, particularly among healthcare professionals, and are often related to muscular weaknesses and postural anomalies. The intricate relationship between cervical muscle strength and the frequency and intensity of headaches necessitates a deeper understanding for effective management and treatment strategies.

Objective: The primary objective of this study was to investigate the association between cervical muscle weakness and functional limitations due to headaches in doctors, considering the impact of long working hours and the physical demands of the medical profession.

Methods: A cross-sectional study was conducted among doctors working at Akhtar Saeed Trust Hospital, Farooq Hospital, and AMDC in Lahore from June to December 2022. Participants with conditions like fibromyalgia, history of head and neck trauma, or degenerative cervical spine disease were excluded. The strength of cervical muscles was assessed using Manual Muscle Testing, and the intensity of headaches was evaluated using the Headache Impact Test (HIT-6) questionnaire. The sample size was calculated to be approximately 150, with data analysis performed using SPSS version 25. The study employed descriptive statistics, Chi-square tests, and parametric tests to analyze the data.

Results: The study found significant correlations between cervical muscle strength and headache impact. Among participants with moderate cervical flexor strength, HIT scoring ranged from 30 in the 36-50 range to 28 in the 60-78 range. For strong cervical flexors, the range was 34 in the 36-50 to 6 in the 60-78 range. Similar patterns were observed in cervical extensors and side flexors. The Chi-square values were significant across all muscle groups (18.45 for flexors, 32.164 for extensors, 50.175 for right side flexors, and 45.30 for left side flexors), all with a p-value of 0.000.

Conclusion: The study demonstrates a significant association between cervical muscle strength and the impact of headaches, indicating that weaker cervical muscles are associated with higher headache frequency and severity. These findings suggest the need for targeted muscle strengthening and posture correction interventions among doctors to mitigate the risks of headache and neck discomfort.

Keywords: Cervical Muscle Strength, Headaches, Neck Discomfort, Doctors, Manual Muscle Testing, Headache Impact Test, Cross-Sectional Study.

INTRODUCTION

Headaches, a common and often debilitating condition, manifest as pain in the head and face, primarily triggered by sudden movements and changes in pain-sensitive brain regions. These pains, varying from throbbing to acute, result from complex interactions within the brain's intricate network, causing discomfort with a spectrum of characteristics and intensities (1, 2). Chronic headaches, characterized by intense to moderate pain that reoccurs, lead to varying discomfort levels in afflicted individuals, contributing to the chronic nature of the condition (3, 4). The frequency of these headaches classifies them as either episodic or chronic, and according to the International Headache Society (IHS), they are further categorized as primary (including migraine, tension type, and cluster headaches) or secondary (stemming from factors such as medication overdose or sinus problems) (5, 6, 7). Interestingly, headaches can emerge from cervical discomfort even in asymptomatic individuals, particularly when cervical muscles like the levator scapulae, sternocleidomastoid (SCM), trapezius, and paraspinal muscles are weakened or fatigued. This connection

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between headaches and neck muscle issues underscores the importance of addressing these factors for effective treatment (8, 9). Cervical muscles with structural and functional anomalies are less capable of generating and maintaining the necessary torque for optimal functioning. This inadequacy impacts both force output and precision, emphasizing the importance of overcoming these challenges to restore normal muscle function (10, 11).

Extended disuse or overuse of the upper trapezius can lead to weakness in the middle and lower trapezius, resulting in improper postural adaptations and pain (12). Individuals with neck pain and cervicogenic headaches often exhibit poor cervical muscle strength (13, 14). In patients with chronic migraines, muscular function is altered, requiring more time to reach peak levels during maximum isometric contractions. Understanding the impact of persistent migraines on the musculoskeletal system is crucial, as this altered muscle dynamic suggests potential implications for muscle contraction efficiency in those affected (15).

The occurrence of severe headaches in people with hypermobile joints raises concerns about the relationship between increased joint flexibility and these headaches, highlighting the need for comprehensive understanding and treatment strategies for this condition (16, 17). Painful temporomandibular joint (TMJ) abnormalities have been linked with primary headaches, including migraines and tension-type headaches. This association suggests that individuals with these headache types might also experience concurrent TMJ discomfort, necessitating a holistic approach to manage these comorbidities (18, 19).

A reciprocal relationship exists between migraines and cervical impairment: cervical problems can induce headaches and vice versa. Addressing these related health issues requires considering the potential impact of migraine hypersensitivity when evaluating cervical impairments (20). The prevalence of headaches is high among different occupations, influenced by factors such as age, family history, physical activity, anxiety, blood pressure, working hours, and workplace environment (21, 22). Chronic regional pain often stems from myofascial pain, with cervicogenic headaches being exacerbated by myofascial trigger points that refer pain from the cervical region to the head and face. Proper diagnosis and treatment of cervical myofascial pain are integral to headache management (23, 24).

This study aims to evaluate the association between cervical muscle weakness and functional limitations due to headaches in doctors (25). Its purpose is to assist doctors in modifying lifestyle barriers, such as posture, neck pain, and headaches during extended working hours, to reduce the risk of pain and disability.

MATERIAL AND METHODS

In this cross-sectional study, conducted from June to December 2022, we explored the relationship between cervical muscle weakness and functional limitations due to headaches among doctors working at Akhtar Saeed Trust Hospital, Farooq Hospital, and AMDC in Lahore. We meticulously selected our participants, excluding those with fibromyalgia, a history of head and neck trauma, and degenerative cervical spine disease to ensure a homogenous study group. The strength of cervical muscles was evaluated using Manual Muscle Testing, a widely recognized technique for its reliability in measuring muscle strength. Concurrently, the intensity of headaches experienced by the subjects was assessed through the Headache Impact Test (HIT-6) questionnaire, an established tool in headache research for its effectiveness in quantifying headache severity and impact.

The sample size for this study was meticulously calculated to be approximately 150, adhering to the formula $N=N/(1+N(e2))$ with a 95% confidence level, assuming $=0.5p=0.5$. This size was deemed sufficient to provide a reliable representation of the study population while maintaining statistical efficiency. Data collection was conducted with strict adherence to ethical standards, ensuring the confidentiality and informed consent of all participants.

Upon completion of data collection, the gathered information underwent a rigorous analysis using SPSS version 25, a step-up from the initially proposed version 21, to utilize the latest statistical tools and methods for enhanced accuracy. Quantitative variables were presented using descriptive statistics such as mean, standard deviation, range, and visually interpreted through histograms. Categorical variables, on the other hand, were represented through frequencies, percentages, and cross-tabulations, with their distribution further illustrated using bar charts and pie charts. To discern the association between cervical muscle weakness and headaches, we employed a parametric test suited to our study design. Finally, the Pearson chi-square test, renowned for its efficacy in analyzing categorical data, was utilized to establish the statistical association between the variables in question.

RESULTS

In the comprehensive analysis of the association between cervical muscle strength and headache impact, several key findings emerged, as delineated in the respective tables.

Regarding the strength of cervical flexors, as detailed in Table 1, a notable variation was observed across different Headache Impact Test (HIT) scoring ranges. Among those with moderate strength of cervical flexors, 30 individuals fell into the 36-50 HIT scoring range, 27 in the 50-55 range, 14 in the 56-59 range, and 28 in the 60-78 range. Contrastingly, individuals with strong cervical flexors showed

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a different distribution: 34 in the 36-50 range, 8 in the 50-55 range, 3 in the 56-59 range, and 6 in the 60-78 range. The Chi-square value for this association was 18.45, with a highly significant p-value of 0.000, indicating a strong statistical correlation between the strength of cervical flexors and the impact of headaches.

In the case of cervical extensors, as shown in Table 2, the distribution pattern was again insightful. Participants with moderate strength in this muscle group were fewer across all HIT scoring categories, with 9 in the 36-50 range, 11 each in the 50-55 and 56-59 ranges, and 22 in the 60-78 range. Those with strong cervical extensors were more numerous, particularly in the lower HIT scoring ranges: 55 in the 36-50 range, 24 in the 50-55 range, 6 in the 56-59 range, and 12 in the 60-78 range. The statistical analysis yielded a Chi-square value of 32.164 and a p-value of 0.000, reinforcing the significant association between the strength of cervical extensors and headache impacts.

Table 1 Association Between Strength of Cervical Flexors and Headache Impact Test Scoring

Headache Impact Test Scoring	36-50	50-55	56-59	60-78	Chi-square	P-value
Strength of Cervical Flexors						
Moderate	30	27	14	28	18.45	0.000
Strong	34	8	3	6		

Table 2 Association Between Strength of Cervical Extensors and Headache Impact Test Scoring

Headache Impact Test Scoring	36-50	50-55	56-59	60-78	Chi-square	P-value
Strength of Cervical Extensors						
Moderate	9	11	11	22	32.164	0.000
Strong	55	24	6	12		

Table 3 Association Between Strength of Cervical Side Flexors (Right) and Headache Impact Test Scoring

Headache Impact Test Scoring	36-50	50-55	56-59	60-78	Chi-square	P-value
Strength of Cervical Side Flexors (R)						
Moderate	5	8	11	24	50.175	0.000
Strong	59	27	6	10		

Table 4 Association Between Strength of Cervical Side Flexors (Left) and Headache Impact Test Scoring

Headache Impact Test Scoring	36-50	50-55	56-59	60-78	Chi-square	P-value
Strength of Cervical Side Flexors (L)						
Moderate	6	11	10	25	45.30	0.000
Strong	58	24	7	9		

The strength of the right cervical side flexors, as presented in Table 3, also showed a distinct pattern. For those with moderate strength, the numbers were 5, 8, 11, and 24 across the HIT scoring ranges of 36-50, 50-55, 56-59, and 60-78, respectively. In contrast, those with strong right side flexors had higher counts in the lower HIT score ranges, with 59 in the 36-50 range, 27 in the 50-55 range, 6 in the 56-59 range, and 10 in the 60-78 range. The Chi-square value was notably high at 50.175, with a p-value of 0.000, indicating a significant correlation.

Finally, the analysis of the left cervical side flexors, detailed in Table 4, revealed a similar trend. Among participants with moderate strength in these muscles, the numbers were 6, 11, 10, and 25 for the HIT scoring ranges of 36-50, 50-55, 56-59, and 60-78, respectively. Those with strong strength in the left side flexors showed higher numbers in the lower scoring ranges, with 58 in the 36-50 range, 24 in the 50-55 range, 7 in the 56-59 range, and 9 in the 60-78 range. The Chi-square value was 45.30 with a p-value of 0.000, further emphasizing the significant relationship between the strength of these muscles and the impact of headaches.

These results collectively underscore the significant association between the strength of various cervical muscles and the intensity of headache impacts, as reflected in the diverse distributions across different HIT scoring ranges.

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DISCUSSION

The study's findings revealed a substantial correlation between neck muscle strength and factors related to headaches and neck discomfort across various motion directions. This significant positive correlation underscores a discernible relationship between the frequency of headaches and the strength of neck muscles. Specifically, the research identified an association between higher cervical muscular strength and a reduction in neck-related impairment, along with more intense neck discomfort and frequent headaches. This highlights the intricate connection between the clinical features of headaches and the strength of neck muscles, providing valuable insights into how muscular factors may influence the occurrence and severity of headaches and neck discomfort (27). Notably, this study also shed light on the critical aspects of weak muscle strength and abnormal postures that limit the activity of doctors.

In contrast to the methodology employed in the research by Armijo-Olivo et al., which evaluated flexor strength in a supine position and was limited to women with an average age of 32, our study included a broader age range of participants, from 20 to 60 years, focusing on doctors with long working hours. The gender-neutral nature of our study adds a layer of complexity to the understanding of the association between flexor strength and related factors, contrasting with studies that did not find a significant link, possibly due to their inclusion of both genders (28).

Further research with an average participant age of 28 years employed a different approach, evaluating strength in a seated position, unlike our study which incorporated a wider demographic including both genders. This highlights the importance of considering diverse methodologies and participant demographics when interpreting and comparing findings from various studies (29). In our study, individuals with a mean age of 26 years had their cervical muscle strength measured, contributing to a broader understanding of muscular strength dynamics in relation to headaches.

Another study suggested that the relationship between pain and force production might vary based on the source of pain. It pointed out a significant, albeit weak, correlation in a sample with combined chronic pain conditions (neck pain plus temporomandibular disorders), despite the absence of correlation in those with only neck pain (30). Our study's tests revealed that weaker muscles tend to cause headaches more frequently and severely, while stronger muscles are less prone to fatigue and pain.

Bakal Da et al. found a negative relationship between cervical range of motion, neck pressure-pain threshold, and migraine in cases of neck muscular weakness. This study delineated a detailed relationship, indicating that an increase in migraine incidence is accompanied by an increase in neck impairment and a decrease in cervical range of motion, pressure-pain threshold, and neck muscular strength. These findings highlight the multifaceted link between migraine and various neck health parameters, emphasizing the need to understand these associations for developing targeted therapies that address both migraine symptoms and musculoskeletal deficits (31). In contrast, our study reports a positive correlation between neck weakness and headache.

Corroborating with previous research, our study also found that headache frequency and neck pain intensity are moderately correlated with neck muscle strength, particularly in extension and lateral flexion (32). This aligns with the conclusion that cervical muscle weakness is a contributing factor to headaches in doctors and patients with headaches and tension-type headaches.

Previous studies have shown that individuals with neck pain typically exhibit weaker flexor and extensor muscle strength, highlighting the importance of addressing these muscle imbalances in treating neck discomfort. The observed decline in both muscle groups underscores the close relationship between musculoskeletal factors and neck pain (33). However, our study concluded that the majority of patients with headaches had weaker neck flexors but comparatively stronger neck extensors and side flexors.

The study, while comprehensive, is not without limitations. The cross-sectional design limits the ability to establish causality. Future studies could benefit from a longitudinal approach to better understand the dynamics of these relationships over time. Additionally, incorporating a wider range of occupations could provide a more generalized understanding of the relationship between cervical muscle strength and headaches.

In conclusion, the study not only corroborates existing research but also adds new dimensions to the understanding of the complex interplay between cervical muscle strength and headache-related factors. These insights are vital for developing more effective, targeted interventions for individuals suffering from headaches and neck discomfort, particularly in the medical profession.

CONCLUSION

In conclusion, this study elucidates the significant association between cervical muscle strength and the frequency and intensity of headaches and neck discomfort, particularly among doctors with long working hours. The findings reveal that higher cervical muscular strength correlates with reduced neck-related impairments and more intense neck discomfort and frequent headaches, highlighting the complex interplay between musculoskeletal strength and headache characteristics. This research not only reinforces the importance of considering muscular factors in the clinical evaluation and management of headaches but also underscores the

need for targeted therapeutic interventions focusing on muscle strengthening and postural correction. These insights hold substantial implications for healthcare professionals, particularly in guiding the development of preventative and rehabilitative strategies to alleviate headache and neck discomfort among individuals in high-stress, physically demanding occupations like medicine.

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