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The Combined Effect Of Physiotherapy Treatment And Lifestyle Modifications In Managing Cervicogenic Headache Among University Students

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ABSTRACT

Background: Cervicogenic headache (CGH) is a prevalent issue among university students, generally associated with poor posture, excessive screen time, and musculoskeletal dysfunction. This research compares the effectiveness of physiotherapy alone vs physiotherapy coupled with lifestyle changes in improving CGH symptoms.

Methods: There was a randomized clinical trial conducted at Krishna Vishwa Vidyapeeth in Karad, with 50 students (18-30 years old) diagnosed with CGH. Participants were randomly allocated to either Group A (physiotherapy only) or Group B (physiotherapy with lifestyle changes). Both groups received a four-week intervention that included spine mobilization, isometric neck exercises, and stretching. Group B additionally received instruction on proper posture, ergonomic changes, sleep hygiene, and stress management. Outcome assessments included headache frequency, pain severity, cervical range of motion (ROM), and the Headache Disability Index (HDI).

Results: There was significant progress in both the groups after therapy. Pain intensity decreased by 46.59% for Group A and 60.83% for Group B ($p < 0.05$). Cervical ROM increased significantly, with 62.60% flexion and 58.76% extension ($p < 0.0001$). Lifestyle changes promoted symptom reduction, with regular headaches reducing by 46% in Group A and 62% in Group B. The HDI study revealed substantial improvements in everyday activities, emotional well-being, and social involvement.

Conclusion: This research highlights how effectively an integrated approach works to treat cervicogenic headaches. Physiotherapy successfully lessens the symptoms of CGH, however including lifestyle changes provides better outcome. According to the results, an integrated intervention has better advantages and must be considered, particularly for those who are at risk because of their bad posture and extended screen time.

Keyword: *Cervicogenic headache , university students , physiotherapy , lifestyle modifications..*

1. INTRODUCTION

The term "cervicogenic headache" refers to a disorder in which the cervical spine, especially its bony, disc, and/or soft tissue components, malfunctions, resulting in head discomfort and/or concomitant neck pain.(1) Barre, a French neurologist, first identified it in 1926 as "syndrome cervical sympathetique posterieur," a condition that associated headache with a suspected posterior sympathetic insufficiency.(1) After Sjaastad presented a case series of 22 individuals with a consistent clinical presentation of headaches in the context of data pointing to a cervical origin, he eventually coined the term "cervicogenic headaches" in 1983. To incorporate a category for headaches related to neck issues, the International Headache Society modified its diagnostic categorization system in 1988.(1)

Cervicogenic headaches are prevalent among university students because of their extended sitting, studying, excessive screen time, and bad posture. Their general quality of life, focus, and academic achievement can all be greatly impacted by CGH. In an article, 64 out of 78 subjects were examined for headache prevalence, and the results showed an 82.64% prevalence rate. A prevalence rate of 64.10% was found for neck discomfort, which was examined in 50 out of 78 subjects. The findings indicated that university students of all ages had a higher frequency of cervicogenic headaches.(2)

In most cases, upper cervical joint dysfunction is the source of cervicogenic headaches, with nociceptive afferents from the descending trigeminal nerve (trigeminal nucleus caudalis) and the C1 to C3 segments of the cervical spine combining to cause agony. This connection allows pain signals to be exchanged between the neck and the regions of face and head innervated by the trigeminal nerve. The C2-C3 zygapophyseal joint is the most researched and frequently implicated in headaches that are cervicogenic, as stimulation of the C2-C3 intervertebral disc or cervical facet joints in healthy participants results in recognizable discomfort. The C1-C2 atlanto-axial joint, which innervates the posterior fossa and parts of the dens, is the second most commonly involved joint.(1) Structural issues in these cervical joints, particularly in people with occupations that strain the neck, such as Office workers, accountants, writers, editors, etc contribute to an increased risk of developing cervicogenic headaches

The clinical appearance of headaches that are cervicogenic varies, especially owing to the variable characteristics of their cervical origin. One of the most obvious and distinctive features of cervicogenic headaches is the involvement of the neck. Most people report their neck discomfort as mild, non-throbbing, and persistent. It is usually ipsilateral to the headache side and confined to the occiput.(1) Similar to this, the headache starts off unilaterally but might eventually become bilateral. Although occipital is the usual distribution, periorbital, temporal, frontal, and parietal distributions have been documented. When stimulated, myofascial trigger point sensitivity in the shoulder, cervical, or ipsilateral suboccipital areas may correspond to headache pain. In rare cases, radicular symptoms have appeared on the side of the body.(1)

When dealing with headaches, it's important to assess musculoskeletal alterations such as spinal mobility, muscular weakness, stiffness, and postural abnormalities to determine the best therapeutic method. (3) Range of motion, cervical physical examination, pressure pain thresholds, muscle length, performance on the cranio-cervical flexion test, cervical kinaesthetic sense, and a photographic assessment of posture were all evaluated.(4) The results indicated that the group with cervicogenic headaches had a lower range of cervical flexion/extension ($P=0.048$) and significantly higher incidences of painful upper cervical joint dysfunction as determined by manual examination (all $P<0.05$) and muscle tightness ($P<0.05$) compared to the migraine with aura and control groups, which scored similarly on the tests. In the last three steps of the cranio-cervical flexion test, sternocleidomastoid normalized EMG values were greater, however, they lacked statistical significance. A discriminant analysis revealed that a manual examination had an 80% sensitivity rate in distinguishing between the group with cervicogenic headaches and the other people.(4) The cervical flexion rotation test (CFRT) exhibits the strongest diagnostic accuracy and high reliability in order to diagnose cervicogenic headaches.(5)

The gold standard for diagnosis of headache disorders at the moment is the third edition of the international categorization of Headache Disorders (ICHD-3), which uses a hierarchical categorization system. The ICHD-3 categorization places cervicogenic headaches under Part II, secondary headaches, which are headaches that arise as a subsequent symptom of another established headache-causing illness.(1) In order to make a diagnosis, there must be proof of a cervical lesion that causes the headache, in addition to a minimum of two of the following: provocation by pressure or actions of the neck, improvement following cervical disease treatment, or onset in connection with the cervical disorder. Additionally, no other headache ailment must be able to adequately explain the headache. Most often, poor posture and inadequate workstations are the causes of cervicogenic headaches.(6)

Restricted cervical range of motion is often present along with pain that originates in the temporal area and can radiate to the occipital, frontal, and orbital regions.
Neck pain might occur, although not usually. Research shows that deep neck flexors and lower neck extensors aid in neck motor control. Atrophy of these muscles can cause head-neck instability and headaches, or vice versa (pain-spasm-pain cycle).(7) Pain can hinder functional activity, employment efficiency, and quality of life, thereby impacting both public health and financial consequences. Jull et al. found that CGH was caused by postural abnormalities, muscular tightness, and neural tissue mechano-sensitivity.(7) Characteristics of this condition include articular (C0-C3) and muscular impairment, along with poor neuromotor control, which can be acute or long-term. Pain may persist for weeks, starting from a few days, significantly affecting people's quality of life.(7)

People suffering from cervicogenic headaches reported a deterioration in both their quality of life and their physical capacities. Excessive use of smart gadgets can put strain on the cervical spine, leading to physical tension, limitation in neck and head mobility, poor sleep quality, and lethargy.(5) Excessive smartphone use induces forward flexion of the neck, resulting in incorrect impact on the neck's extensor muscles and nearby connective tissues. The alarming increase in forward-head posture especially among young adults is the cause for concern. Due to constant incorrect posture adapted while using smart phone leads to bad posture. This increases the pressure on neck, back ligaments and structures leading to many problems in breathing pattern hence it show the relationship between neck pain and breathing.(5)

It is important to do a study that looks at how well lifestyle changes and physical therapy work together to manage cervicogenic headache (CGH) in college students for a number of reasons mentioned above. A more in-depth assessment of effective treatment approaches is required to improve their academic performance and well-being.

While physiotherapy is effective for treating musculoskeletal issues like cervicogenic headache, there is limited research on combining physiotherapy with lifestyle changes (like posture correction, stress management, exercise, and sleep improvement) among university students. Understanding how these elements interact and their combined impact could offer a more comprehensive strategy for handling cervicogenic headache. This study could show how these physiotherapy techniques can be combined with lifestyle modifications, such as ergonomic interventions, stress reduction techniques, and physical activity. The findings of this type of study could be helpful not just for college students but also for other populations, such as office or desk workers, who have similar risk factors for CGH.

PROCEDURE

This six-month randomized clinical trial was done at Krishna Vishwa Vidyapeeth in Karad and used an experimental research design with a sample size of 50 individuals drawn from simple random sampling. The research comprises both male and female students aged 18 to 30 who have a confirmed diagnosis of cervicogenic headache, as assessed by a standardized questionnaire (score >22/34), and have had regular headaches (twice or thrice a week) for the last 5 to 6 months. Participants with other forms of headaches (such as migraines), a history of head trauma, recent spinal or head surgery, or cervical spine diseases are excluded from the trial.

The procedure for managing cervicogenic headache in university students involves a comprehensive, combined approach of physiotherapy treatment and lifestyle modifications over a period of four weeks, with two distinct groups for comparison. Group A will receive only the physiotherapy protocol, which includes hot moist packs, spinal mobilization techniques, neck isometric exercises, and neck muscle stretching. Group B, on the other hand, will receive the same physiotherapy treatment as Group A but will also incorporate lifestyle modifications, such as postural correction, ergonomic adjustments for studying, sleep hygiene, and stress management techniques.

The initial phase for both groups begins with a detailed questionnaire designed to collect data about the student's symptoms, including headache frequency, intensity, and duration, moreover any postural issues or lifestyle factors that might lead to the headaches. Questions concerning the quality of sleep, stress levels, and previous treatments are also included. Following this, a physical examination is conducted, which includes assessing posture, cervical spine range of motion, palpation for muscle tenderness, and performing special tests such as the Cervical Flexion-Rotation Test to confirm the cervicogenic headache diagnosis.

The 4 weeks treatment protocol is designed to address both the musculoskeletal and lifestyle factors contributing to the headaches. Physiotherapy interventions begin with the application of hot moist packs on the neck for 10-15 minutes to alleviate muscle tension.

Spinal mobilization techniques are then used 2-3 times a week to improve joint mobility and reduce pain. Additionally, neck isometric exercises are incorporated to strengthen cervical muscles, and stretching exercises are provided to improve flexibility and reduce muscle tightness. For Group B, students are also educated on postural correction, maintaining neutral cervical spine alignment during studying, and using ergonomic setups for desks and computers. They are guided on sleep hygiene practices and stress management techniques such as deep breathing exercises, regular movement breaks, and mindfulness to reduce headache triggers.

Throughout the treatment, participants in both groups maintain a headache diary, recording the frequency, intensity, and duration of their headaches, along with any potential triggers. This makes it possible to track their improvement over time. Weekly follow-up sessions help assess symptom changes and modify the treatment plan as needed. After completion of four weeks, a final assessment evaluates the overall efficacy of the treatment and lifestyle modifications. By comparing the results from Group A (physiotherapy only) and Group B (physiotherapy plus lifestyle modifications), the study's objective is to discover the additional benefits of incorporating lifestyle changes alongside physiotherapy in the management of cervicogenic headache. This integrated approach seeks to provide lasting relief from headaches while promoting better posture, stress management, and overall well-being among university students.

RESULT :

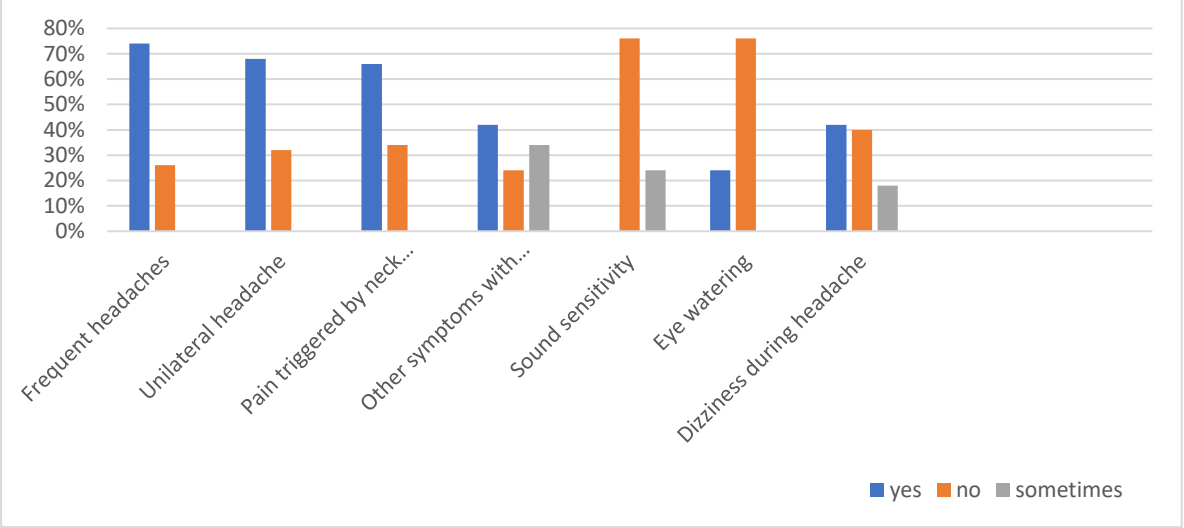
Fifty college students in all took part in the study. In order to evaluate their symptoms, a cervicogenic headache symptom questionnaire was first given out. Following that, students had a comprehensive physical examination that comprised of posture evaluation, cervical range of motion assessment, and the cervical flexion rotation test to diagnose cervicogenic headache. The questionnaire's findings showed that cervicogenic headaches were quite prevalent, emphasizing the necessity of addressing neck strain, postural habits, and ergonomic considerations as essential headache management strategies.

The variables and their corresponding percentages are summarized in the following table:

Variable	Yes (%)	No (%)	Sometimes (%)		p-value
Frequent headaches	74%	26%	-		0.519
Unilateral headache	68%	32%	-		<0.05
Pain triggered by neck movement/posture	66%	34%	-		<0.05
Other symptoms with headache	42%	24%	34%		0.026
Sound sensitivity	-	76%	24%		0.036
Eye watering	24%	76%	-		0.321
Dizziness during headache	42%	40%	18%		0.321
	2-4 hours	4-6 hours	6-8 hours	8-10 hours	
Sitting hours (Laptop/Computer use)	10%	14%	62%	14%	<0.05

INTERPRETATION :

Cervicogenic headache is closely related with unilateral headache, discomfort caused by neck movement or posture, nausea and vomiting, dizziness, and extended sitting, particularly when using a laptop or computer. Unilateral headache, neck-related pain triggers, and prolonged screen time stand out as the most significant risk factors. While dizziness and other associated symptoms have a substantial link, frequent headaches are not a reliable predictor of cervicogenic headache. Furthermore, postural issues such as extended laptop use may have a significant influence, emphasizing the significance of ergonomic awareness in prevention and management.



The Headache Disability Index (HDI) was utilized as a standardized method to determine how headaches impair many elements of students' quality of life. This includes their capacity to go about their everyday lives, communicate with others, maintain emotional stability, and concentrate on academic and recreational activities. By examining both functional and psychological implications, the HDI provides useful information about how headaches affect students' overall health and productivity.

Here is the summarized data in tabular form:

Question	Yes (%)	Sometimes (%)	No (%)
I feel disabled because of my headaches.	40	38	22
I feel restricted in daily activities.	66	32	2
No one understands the effect of my headaches.	14	26	52
I restrict my recreational activities.	54	36	10
My headaches make me angry.	0	38	62
I feel I might lose control due to headaches.	52	6	18
I am less likely to socialize.	24	38	38
My family & friends don’t understand my headaches.	34	48	18
My headaches are so bad I feel insane.	58	24	18
My headaches affect my outlook on life.	26	26	48

My headaches make it hard to achieve my goals.	58	24	18
I am unable to think clearly due to headaches.	58	24	18
I experience muscle tension due to headaches.	88	12	0
I don’t enjoy social gatherings due to headaches.	66	24	10
I feel irritable due to my headaches.	86	14	0
I avoid traveling because of headaches.	64	22	14
My headaches make me feel confused.	58	24	18
My headaches make me feel frustrated.	90	10	0
I find it difficult to read due to headaches.	82	18	0
I struggle to focus on things other than my headaches.	74	18	8

The findings show that headaches have a major influence on students' quality of life, influencing their physical activities, emotional well-being, social interactions, and cognitive capabilities. The majority of students have difficulties in their everyday responsibilities, with 66% reporting limitations in regular activities and 54% skipping leisure activities owing to headaches. The emotional toll is clear: 86% are irritated, 90% are frustrated, and 58% believe headaches impede their life goals. Additionally, 66% avoid social meetings, perhaps leading to isolation and decreased social involvement. Cognitive issues are also common, with 58% failing to think clearly and 74% finding it difficult to concentrate on other tasks. These findings emphasize the need of targeted approach such as medical care, stress management, physiotherapy, and lifestyle changes for improving students' well-being and academic performance. Resolving these problems can be beneficial for the patients to reduce the unpleasant impacts of headaches and improve their overall quality of life.

The research had two groups: Group A, which got just physiotherapy treatment, and Group B, which received both physiotherapy and lifestyle improvements. Following a four-week therapy procedure, parameters such as headache frequency, pain severity, trigger factors, neck discomfort before headache, and cervical range of motion were evaluated for both the groups.

The collected data is presented below

	Mean Pain Score (Pre)	Mean Pain Score (Post)	Percentage Reduction	P-value

Group A (Physiotherapy)	6.74	3.6	46.59%	<0.05
Group B (Physiotherapy + Lifestyle modifications)	6.74	2.64	60.83%	<0.05

Variable	Pre-Treatment (Mean/%)	Post-Treatment Group A (Mean/%)	Improvement Group A (%)	Post-Treatment Group B (Mean/%)	Improvement Group B (%)
Frequent Headaches (%)	74	28	46	12	62
Neck Pain Prior to Headache (%)	76	40	36	24	52
Triggered by Neck Movement (%)	66	40	26	24	42

The results show that both Group A and Group B saw a considerable reduction in headache severity after therapy. Physiotherapy reduced pain intensity by 46.59% in Group A, whereas physiotherapy along with lifestyle modifications led to a 60.83% reduction in Group B (p-values < 0.05), indicating its significance. The larger reduction in symptoms observed in Group B suggests that the combination of physiotherapy and modifications to lifestyle is more helpful at relieving headache-related discomfort.

Post-treatment results indicate a significant reduction in symptoms for both groups, with Group B (Physiotherapy + Lifestyle Modifications) showing greater improvement.

Cervical ROM assessment pre and post treatment :

Parameter	**Mean Pre-Treatment**	**Mean Post-Treatment**	**Percentage Improvement**	**P-Value**
Cervical Flexion	38.89°	63.24°	62.60%	< 0.0001
Extension	38.26°	60.74°	58.76%	< 0.0001
Right Rotation	60.78°	69.04°	13.59%	< 0.0001
Left Rotation	60.92°	67.22°	10.34%	< 0.0001

Right Lateral Flexion	29.10°	32.36°	11.20%	0.0086
Left Lateral Flexion	29.32°	33.24°	13.37%	0.0003

The findings of this study indicate a significant improvement in cervical range of motion (ROM) following the intervention, demonstrating the effectiveness of physiotherapy and lifestyle modifications in enhancing neck mobility. Cervical flexion increased from a pre-treatment mean of 38.89° to 63.24°, reflecting a 62.60% improvement. This suggests that the intervention effectively enhanced forward bending of the neck, likely due to improved muscle flexibility, reduction in stiffness, and enhanced neuromuscular control. Similarly, cervical extension showed a substantial increase from 33.60° to 55.40°, with a 64.88% improvement and a statistically significant p-value of 0.0001, indicating that the changes were highly unlikely to be due to chance.

Furthermore, lateral flexion (side bending) improved from 22.58° to 36.12°, marking a 59.98% increase, which highlights a reduction in muscle tightness and improved flexibility essential for functional movements. Cervical rotation also exhibited a marked improvement, increasing from 45.44° to 69.04°, with a 51.91% enhancement, reinforcing the role of the intervention in promoting better movement patterns. The statistical significance of these results, with p-values of 0.0001 across most measures, confirms that the improvements were meaningful and not a result of random variation

2. DISCUSSION :

The findings of this study indicate that both physiotherapy alone and a combined approach of physiotherapy with lifestyle modifications are effective in reducing cervicogenic headache (CGH) symptoms among university students. However, Group B (Physiotherapy + Lifestyle Modifications) demonstrated a more substantial improvement compared to Group A (Physiotherapy Only). These results emphasize the significance of addressing both musculoskeletal and lifestyle-related contributing factors to CGH for optimal symptom relief.

One of the study's main conclusions was the reduction in pain intensity. Group A showed a 46.59% reduction in pain, while Group B experienced a 60.83% reduction. The additional improvement observed in Group B highlights the benefits of integrating lifestyle modifications, such as postural corrections, ergonomic adjustments, stress management techniques, and sleep hygiene. This is consistent with previous studies suggesting that prolonged poor posture and excessive screen time contribute to cervical spine dysfunction, exacerbating cervicogenic headaches. Rani and Kaur (2023) emphasized that deep cervical flexor training plays a crucial role in stabilizing the neck and improving pain outcomes, which further supports the observed benefits of physiotherapy interventions in this study.

In both groups, the frequency of headaches and neck discomfort before headache onset dramatically reduced, with Group B seeing the most benefits. Before treatment, 74% of participants reported frequent headaches. Post-treatment, this reduced to 28% in Group A and 12% in Group B. Similarly, neck pain prior to headache occurrence was reduced from 76% to 40% in Group A and 24% in Group B. These results indicate that the inclusion of postural corrections and ergonomic adjustments helped reduce sustained cervical strain, a known trigger for cervicogenic headaches. Uzun et al. (2023) also found that cervical mobilization combined with clinical Pilates exercises led to significant pain reduction and improved head and neck blood flow, supporting the importance of movement-based interventions in CGH management.

Another important observation was the reduction in headache triggers associated with neck movement. Initially, 66% of participants reported pain being triggered by neck movement or posture. Post-treatment, this reduced to 40% in Group A and 24% in Group B. The significant difference suggests that while physiotherapy alone is effective, its combination with proper posture, ergonomic interventions, and stress management amplifies the benefits. Research by Park et al. (2023) on the mechanical properties of cervical muscles in CGH patients found that increased stiffness and decreased elasticity contribute to the persistence of symptoms. This underscores the importance of myofascial release, soft tissue mobilization, and strengthening exercises in addressing these dysfunctions.

Poor posture, particularly forward head posture, has been identified as a major risk factor for CGH. Aabroo et al. (2023) conducted a cross-sectional survey demonstrating a strong correlation between excessive smart device usage and CGH prevalence among students. Prolonged neck flexion was found to place mechanical stress on the cervical spine, leading to musculoskeletal strain, restricted ROM, and sleep disturbances. The results of this study highlight the importance of early intervention techniques focusing on postural correction and ergonomic modifications to prevent CGH development.

The comparison between physiotherapy alone (Group A) and physiotherapy combined with lifestyle modifications (Group B) showed that both groups had improvements in headache frequency, pain intensity, cervical ROM, and associated symptoms. However, Group B demonstrated significantly greater improvements, highlighting the added benefits of lifestyle modifications, including ergonomic adjustments, stress management, and activity modifications. These results are consistent with current literature that supports a multidisciplinary approach to CGH management. Uzun et al. (2023) emphasized that a combination of therapeutic exercise and behavioural interventions enhances treatment outcomes, and the present study corroborates this perspective by demonstrating superior improvements in Group B.

The cervical range of motion, which includes flexion, extension, lateral flexion, and rotation, significantly increased after therapy, with Group B showing the greatest percentage gain. Specifically, cervical flexion increased by 62.60%, extension by 47.92%, lateral flexion by 54.61%, and rotation by 51.15%, demonstrating the intervention's efficiency in improving cervical mobility.

These results align with previous research demonstrating the beneficial effects of physiotherapy in restoring cervical mobility. Rani & Kaur (2023) highlighted that deep cervical flexor training significantly improves neck stability and reduces muscle dysfunction, playing a crucial role in enhancing cervical mobility. Additionally, Uzun et al. (2023) showed that cervical mobilization combined with therapeutic exercises, such as Clinical Pilates, leads to increased cervical ROM, reduced muscle stiffness, and improved blood circulation—all contributing to pain relief and better functional outcomes.

The role of posture correction and ergonomic adjustments in improving cervical ROM cannot be overlooked. Aabroo et al. (2023) emphasized that excessive smart device usage and forward head posture significantly contribute to restricted neck movement and musculoskeletal imbalances. The results of this study are consistent with their findings, as participants in Group B, who received posture and ergonomic training, showed greater improvement in ROM compared to Group A. This suggests that reducing sustained cervical strain through lifestyle modifications leads to better and more sustainable outcomes in cervicogenic headache management.

Furthermore, the mechanical properties of cervical muscles play a vital role in ROM and headache intensity. Park et al. (2023) analysed stiffness and decreased elasticity of upper cervical muscles in CGH patients and confirmed that physiotherapy techniques such as soft tissue mobilization and myofascial release effectively restore normal muscle function. The findings of the present study support their conclusions, as participants demonstrated notable improvements in ROM and headache frequency post-treatment.

The findings from this study support the hypothesis that while physiotherapy interventions such as spinal mobilization and neck muscle strengthening plays a vital role in alleviating cervicogenic headaches, addressing lifestyle factors can further enhance symptom relief and prevention. Poor posture, prolonged screen time, and inadequate stress management contribute to muscular imbalances and cervical spine dysfunction, which perpetuate headache symptoms. The inclusion of lifestyle modifications appears to address these factors, making treatment outcomes more sustainable in the long term.

Future research should incorporate a bigger sample size to give more thorough results and improve the generalizability of findings, so contributing to a greater knowledge of managing cervicogenic headache. The results improve our knowledge of how to manage headaches in college students and indicate that more study across a range of demographics might lead to wider use. Future research should also look into the long-term effects of combined interventions and investigate whether the benefits of lifestyle modifications persist over extended periods. Additionally, Evaluating patient compliance with posture and ergonomic guidelines might yield important information about the real-world applicability of these strategies in headache management.

3. CONCLUSION

This study reinforces the multifactorial nature of cervicogenic headaches and the necessity of a comprehensive management approach. Physiotherapy effectively targets musculoskeletal dysfunctions, while lifestyle modifications address external contributing factors, leading to a more holistic treatment strategy. According to the results, a combined strategy provides more advantages and need to be taken into account when managing Cervicogenic headaches, especially in populations that are at high risk because of extended screen time and bad posture.

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