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COMBINED EFFECT OF AEROBIC EXERCISE AND PROGRESSIVE RELAXATION TRAINING IN PATIENTS WITH MIGRAINE

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ABSTRACT

Background of the study: Migraine is a neurological condition which is characterized by recurrent headaches and neurological symptoms which are lasting for 04 – 72 hrs., with unilateral location and pulsating quality[2]. 01 out of 04 people in India have been seen to be suffering from migraine. Patients often request no pharmacological alternatives for the resolution of migraine[3]. Recent advances have shown that exercise and relaxation training affect migraine. But lack of combined exercise is more effective brought about the background of the study. The objective of this study is to determine the combined effect of aerobic exercise and progressive muscle relaxation training on migraines compared with neck-specific strengthening exercises. **Methodology:** This is the experimental study of pre-and post-test types with 30 subjects. Based on the inclusion criteria, individuals were divided into 2 groups, Group A (experimental group) and Group B (control group) with 15 samples in each group. In Group A aerobic exercise progressive relaxation exercises, and Neck specific strengthening exercises were given. Group B only received Neck-specific strengthening exercises. **Results:** Based on statistical analysis, the result of the present study shows there is a statistically significant difference in pre-test and post-test values in the MIDAS and 11-Point pain scale. The experimental group shows a reduction in the frequency in patients with migraine. **Conclusion**: The study concludes that the combined effect of aerobic exercise and progressive relaxation training shows a significant reduction in the frequency of migraines.

Keywords: Migraine, Aerobic exercise, Progressive relaxation training, Migraine Disability Pain Scale, 11-point pain scale.

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INTRODUCTION

Headache disorders are characterized by recurrent headache, and it is among the most common disorders of the nervous system. Headache is a painful and disabling feature of a small number of primary headache disorders like migraines, tension-type headaches, and cluster headaches. Amongst these, the migraine headache is ubiquitous, prevailing, disabling, and essentially treatable, but still under-estimated and under-treated[1].

Migraine is a neurological condition characterized by recurrent headache and neurological symptoms lasting for 04-72 hours, with unilateral location and pulsating quality. Attacks range from moderate to severe intensity that increases with daily routine and physical activity and is associated with nausea vomiting, photophobia, and phonophobia[2]. It has been termed the seventh disabler due to its impact on a patient's quality of life. It is the most frequent cause of headaches in children and adolescents[1]. In addition to these features, neck pain is quite common and is associated with a worse prognosis for these diseases[2]. Pathophysiology of migraine includes vascular and neurogenic theory, cortical spreading depression, and cortical hyper excitability:

The vascular theory was introduced by Thomas Willis where he explained that 'all pain is an action violated' and argued that pain from the headache is caused by the vaso-dilation of the cerebral and meningeal arteries.

The neurogenic theory focuses on the cause of pain and it is linked to the activation of the trigemino-vascular system.

Cortical spreading depression (CSD), a wave of neuronal hyperactivity followed by an area of cortical depression, accounts for the aura, and the headache depends on the activation of the trigemino-vascular pain pathway.

Hyperexcitability occurs due to factors such as diet, sleep alteration, and stress that predispose individuals to attack. Photic stimulation also triggers the migraine attack.

The most common triggers were emotional stress, sleep disturbance, and dietary factors. Sleep and stress were the triggering factors in patients with migraine with aura and the environmental factors were patients with migraine without aura.

Migraine affects an estimated 12% of the population. Global estimates are higher. Chronic migraine (CM) affects 1 to 2 percent of the global population. Approximately 2.5% of persons with episodic migraine progress to CMA migraine attack is divided into phases based on their temporal relationship to the headache. They are:

The premonitory phase- this precedes the headache.

The aura phase-which precedes or accompanies the headache

The headache phase -The postdrome phase – after the resolution of the headache.

Neck pain is a common migraine symptom that begins in the premonitory phase and continues through the postdrome phase. It might be an important contributor to the migraine-related disorder. Pathology of cervical spine structure is a rare cause of migraine, but frequent neck pain indicates a role for the upper cervical nerve in transmitting migraine pain. The pain input from the cervical nerve converges with pain from the trigeminal nerve on the second-order neuron in the brainstem and upper cervical spinal cord. A nerve tracing study showed that the branches of the trigeminal nerve can reach the neck muscles through the skull suggesting a role for trigeminal afferent migraine-related neck pain.

Migraine has two major subtypes: migraine with aura and migraine without aura. Migraine with aura which is characterized by transient focal neurological symptoms usually precedes or accompanies with headache. Some patients experience the premonitory phase occurring hours or days before the headache and headache resolution phase. Premonitory phase and resolution phase symptoms include hyperactivity, repetitive yawning fatigue, and neck stiffness.

Migraine without aura is a clinical syndrome that is characterized by specific features and associated symptoms such as unilateral location, pulsating quality moderate or severe pain intensity. During headache nausea, vomiting, photophobia, and phonophobia can occur[1].

Prophylactic treatment is used for patients with frequent migraine[3]. Prophylactic treatment such as beta-blockers, topiramate, or amitriptyline is recommended for patients suffering from three or more headache attacks a month. Medical prophylaxis is not well accepted by many migraine patients due to experienced or anticipated adverse events[4]. Exercise is recommended as a non-pharmacological treatment for the treatment of migraine. There is increasing evidence that physical activity reduces migraine frequency, pain intensity, and pain duration, and also improves the quality of life[5].

Aerobic exercise treatment has overall been shown to have a positive effect in preventing migraine attacks concerning its quantity, duration, and intensity. Aerobic exercise refers to exercise that is moderate intensity but undertaken for a long duration. Aerobic means with oxygen and refers to the use of oxygen in muscle’s energy-generating process[6].

Stress is a common headache trigger for the patient with migraine but there are relaxation techniques for migraine that help to manage stress and reduce migraine attacks. Progressive relaxation exercise is an evidence-based intervention that has been shown to reduce the frequency of migraine attacks as well as improve the general feeling of relaxation and well-being.

Incorporating lifestyle interventions like aerobic exercise and progressive relaxation exercise can also play a supportive role in reducing the frequency and severity of migraine attacks.

METHODS

The study used a Pre vs. Post experimental design. Colleges in and around Trivandrum and the outpatient department of Bethany Navajeevan College of Physiotherapy were used as study settings. Based on the inclusion criteria 30 subjects were selected in this study through purposive sampling.

The inclusion criteria include: age group of 19 - 25 is selected, Both sexes are selected, Select samples with MIDAS scores 0-20, Select samples with an 11-point pain scale of 6-0, Individuals who are willing to exercise, Individuals who are ready to avoid medication during exercise, Select samples have migraine without aura. Migraine with aura, Any other type of headache, Other neurological conditions, Epilepsy, History of trauma in the head, cervical, and face, Pregnancy, Disk degeneration in the cervical region, Trapezitis, Infective condition of the brain and spine, Lower extremity fracture are excluded from this study.

Based on the inclusion criteria, 30 subjects with migraine were included in this study. A brief explanation was given to the participants. After obtaining an informed consent form subjects were recruited into two groups. Group A- Are the experimental group and Group B - is the control group with 15 subjects in each group. Before the intervention, the pre- test was conducted on using MIDAS and an 11-point pain scale.

The intervention program was briefly explained to the subjects. Group A (the experimental group) was given aerobic and progressive relaxation exercises. Along with aerobic exercise and progressive relaxation exercise, Group A subjects were trained with neck-specific strengthening exercises. Group B (the control group) performed neck-specific strengthening exercises alone. Before the exercise, the participants were asked to rate their exertion on the Rate of Perceived Exertion scale. This number indicates the intensity of the activity allowing the participants to speed up or slow down the movements.

The scale takes seconds to complete. After scoring the RPE scale, the subjects performed aerobic exercise and progressive relaxation exercises. Group A was treated with aerobic exercise with a warm-up of 10 min, 30 min of exercise including jogging and walking, and 5 min of the cool-down period (total 50 to 1hr time taken) of 4 days a week for a total of 12 weeks.

Along with this progressive relaxation exercises were performed. Group B subjects were trained with neck-specific strengthening exercises performed in 2 sections. In the first stage relaxed supine and cervical extension, flexion, and rotation in prone on elbow position, 2 sets 10 repetitions, and sustained 10s. In the second stage both the flexor and extensor exercises with higher load using head weight as the load.

Head flexion was performed in a supine position removing the head stretcher and while performing neck extension individuals were instructed to maintain the neck in a neutral position and the body in the position of 4 supports. Each of the extensors was 3 sets of 15 repetitions at a time.

Data for the MIDAS and 11 Point pain scale was recorded and analyzed using SPSS Version 29

Fig 1. Patient receiving progressive relaxation exercise

Fig 2.Patient receiving aerobic exercise

Fig3. Patient receiving neck specific strengthening exercise

Comparison of Pre Test V/S Post-Test Score of Midas and 11-Point Pain Scale in Experimental Group

SCALE		No. of samples	Median	IQR	Mean Rank	Sum of Rank	Z	P
MIDAS	PRE-TEST	15	11	10-12	8	120	-3.432	<.001
	POST-TEST	15	6	4-7				
11- POINT PAIN SCALE	PRE- TEST	`15	4	4-5	8	120	-3.690	<.001
	POST- TEST	15	2	2-3				

Analyzed by Wilcoxon signed-rank test

Table 1 Within the group comparison of MIDAS and 11-point pain scale

Table 1 shows the pre-test vs. post-test values of the Migraine Disability Assessment Scale and 11-point pain scale in the experimental group. In the pre-test of MIDAS, the Median was 11, and the inter-quartile ranges were: 10-12, and in the post-test, the Median was 6, and the inter-quartile ranges were: 4-7. The pretest vs. post-test mean rank was 8, the sum of ranks 120, Z value -3.432, and P value <.001 which shows that there is a statistically significant difference between the pre and post-test values of MIDAS in the experimental group. Also, the result shows that the post-test value of MIDAS is higher than the pre-test value of MIDAS in the experimental group.In the pre-test of the 11-Point pain scale, the Median was 4, and the interquartile range was 4-5. In the post-test value, the Median was 2 and the interquartile range was 2-3. The pre-test vs. post-test mean rank was 8, and the sum of ranks120, Z value -3.690, and P value <.001 which shows that there is a statistically significant difference between the pre-test and post-test value of the 11-point pain scale in the experimental group. Also, the result shows that the post-test value of the11-point pain scale is higher than the pre-test value of the 11-point pain scale in the experimental group.

Comparison Of Pre-Test V/S Post-Test Scores Of Midas And 11- Point Pain Scale In Control Group

Scale		No. of samples	Median	IQR	Mean rank	Sum of rank	Z	P
MIDAS	PRE-TEST	15	11	8-14	8	120	-3.487	<.001
	POST-TEST	15	9	7-12				
11- POINT PAIN SCALE	PRE-TEST	15	5	4-6	8	120	-3.873	<.001
	POST-TEST	15	4	3-5				

Analyzed by Wilcoxon signed-rank test

Table 2 Within-group comparison of MIDAS and 11-point pain scale in the control group

Table No 2 shows the pre-test vs. post-test MIDAS and 11-point pain scale in the Control group. In the pre-test of MIDAS, the Median was 11 and the inter-quartile ranges were: 8-14. In the post-test, the Median was 9, and inter quartile ranges were: 7-12. The pre-test vs. post-test mean rank was 8, the sum of ranks 120, Z value -3.487, and P value <.001 which shows that there is a statistically significant difference between the pre-test and post-test values of MIDAS in the control group. Also, the result shows that the post-test value is higher than the pre-test value of MIDAS in the control group. In the pre-test value of the 11-point pain scale, the Median was 5, and the inter quartile ranges were: 4-6. In the post-test, the Median was 4, and the inter quartile ranges were: 3-5. The pre-test vs. post-test mean rank was 8, the sum of ranks 120, Z value -3.873, and P value <.001 which shows that there is a statistically significant difference between the pre-test and post-test values the of 11-point pain scale in the control group. Also, the result shows that the post-test value of the 11-point pain scale is higher than the pre-test value of the 11-point pain scale in the control group.

Comparison Of Pre-Test V/S Post-Test Scores Of Midas And 11- Point Pain Scale Between Experimental And Control Group

cales	Group		No. of samples	Median (IQR)	Mea n rank	Sum of rank	U value	Z value	P value
MIDA S	PRE - TEST	EXP	15	11 (10-12)	15.60	234.0 0	111.0 0	-.063	.950
		CNTL	15	11 (8-14)	10.20	231.0 0			
	POST -TEST	EXP	15	6 (4-7)	15.40	153.0 0	33.00	- 3.32 5	<.00 1
		CNTL	15	9 (7-12)	20.80	312.0 0			
11- POINT PAIN SCALE	POST -TEST	EXP	15	4 (4-5)	12	193	73.5	- 1.68 5	.092
		CNTL	15	5 (4-6)	18.10	271			
	POST -TEST	EXP	15	2 (2-3)	9.87	148	28	-3.60	<.00 1
		CNTL	15	4 (3-5)	21	317			

Analyzed by Mann-Whitney U test

Table 3 Comparison of MIDAS and 11-point pain scale in experimental and control group

Table 3: shows the comparison of pre-test and post-test values MIDAS and 11-point pain scale between an experimental group and the control group. The pre-test values of the experimental group for MIDAS were, Median (inter quartile range) 11(10-12), mean rank 15, 60 and the sum of rank 234. The pretest values of the control group were, Median (inter quartile range) 11(8-14), the mean rank 10.20, and the sum of ranks 231. The pretest Mann-Whitney U value was 111, the Z value was -.063, and the P value was .950 which shows that there is no significant difference in pre-test values of MIDAS between experimental and control groups. Post-test test values of the MIDAS experimental group were median (inter quartile range) 6(4-7), mean rank 15.40, and the sum of ranks 153.

The post-test values of the control group were median (inter quartile range) 9(7-12), mean rank 20.80, and the sum of ranks 312. The posttest Mann-Whitney U value was 33, the Z value was -3.325, and the P value was < .001 which shows that there is a statistically significant difference in post-test values of MIDAS experimental and control groups. Also, the result shows that the post-test value of MIDAS in the experimental group is higher than the post- test value of MIDAS in the control group.

The pre-test values of the experimental group for the 11-point pain scale were Median (inter quartile range) 4(4-5), mean rank 12, and the sum of rank 193.5. The pretest values of the control group were, Median (inter quartile range) 5(4-6), the mean rank 18.10, and the sum of ranks 271. The pretest Mann-Whitney U value was 73.5, the Z value was -1.685, and the P value was .092 which shows that there is no significant difference in pre-test values of the 11-point pain scales between experimental and control groups. Post-test test values of the 11-point pain scale experimental group were median (inter quartile range) 2(2- 3), mean rank 9.87, and the sum of ranks 148. The post-test values of the control group were median (inter quartile range) 4(3-5), mean rank 21, and the sum of ranks 317. The posttest Mann-Whitney U value was 28, the Z value was -3.600, and the P value was <.001 which shows that there is a statistically significant difference in post-test values of the 11-point pain scale in experimental and control groups. Also, the result shows that the post-test value of the 11-point pain scale in the experimental group is higher than the post-test value of the 11-point pain scale in the control group.

DISCUSSION

Migraine is a chronic neurological condition that causes severe and often debilitating headaches. These headaches are typically accompanied by symptoms such as nausea, vomiting, sensitivity to light and sound, and visual disturbances[2]. The main cause of migraine is vasodilatation of cerebral and meningeal arteries activation of the trigemino-vascular system, cortical spreading depression, and cortical hyper excitability. The migraine attacks last for hours to days and significantly disrupt a person's daily activities. It has been termed the seventh disabler due to its considerable impact on the QOL of the patient. It is the most frequent cause of headaches in children and adolescents[1].

The purpose of the study is to find out the combined effect of aerobic exercise and progressive relaxation training for migraines with neck-specific strengthening exercises. The result of the present study shows that the combined effect of aerobic exercise and progressive relaxation training helps to reduce the frequency of migraine days in patients with migraines. After 12 weeks of interventions 4 days per week at 45min per session) There was a significant difference in pre and post-test values of the Migraine Disability Assessment scale and 11-point pain scale scores compared with the experimental and control groups.

30 subjects fulfilling inclusion criteria were included in the study and they are divided into two groups. The experimental group and control group with 15 subjects each and each

subject explained the procedures of the interventions and possible risks involved. The pre- test was conducted on the experimental and control group by MIDAS and an 11-point pain scale. After a brief demonstration, the experimental group received aerobic exercise and progressive relaxation training 4 days per week for a period of 12 weeks. After a brief explanation and demonstration control group received a neck-specific strengthening exercise, 3 sets of 15 repetitions. Post-test was conducted on the experimental and control group by MIDAS and an 11-point pain scale.

In the statistical analysis, the pre-test values of the experimental group for MIDAS were, Median (inter quartile range) 11(10-12), mean rank 15.60, and sum of ranks 234. The pretest values of the control group were, Median (inter quartile range) 11(8-14), the mean rank 10.20, and the sum of ranks 231.

The pretest Mann-Whitney U value was 111, the Z value was -.063, and the P value was 0.950 which shows that there is no significant difference in pre-test values of MIDAS between experimental and control groups. Post- test values of the MIDAS experimental group were median (inter quartile range) 6(4-7), mean rank 15.40, and the sum of ranks 153. The post-test values of the control group were median (inter quartile range) 9(7-12), mean rank 20.80, and the sum of ranks 312. The posttest Mann-Whitney U value was 33, Z value was -3.325; P value was < .001 which shows that there is a statistically significant difference in post-test values of MIDAS experimental and control groups. Also, the result shows that the post-test value of MIDAS in the experimental group is higher than the post-test value of MIDAS in the control group.

The pre-test values of the experimental group for the 11-point pain scale were Median (inter quartile range) 4(4-5), mean rank 12, and the sum of rank 193.5. The pretest values of the control group were, Median (inter quartile range) 5(4-6), the mean rank 18.10, and the sum of ranks 271. The pretest Mann-Whitney U value was 73.5, the Z value was -1.685, and the P value was .092 which shows that there is no significant difference in pre-test values of the 11-point pain scales between experimental and control groups. Post-test test values of the 11-point pain scale experimental group were median (inter quartile range) 2(2- 3), mean rank 9.87, and the sum of ranks 148. The post-test values of the control group were median (inter quartile range) 4(3-5), mean rank 21, and the sum of ranks 317. The posttest Mann-Whitney U value was 28, the Z value was -3.600, and the P value was <.001 which shows that there is a statistically significant difference in post-test values of the 11-point pain scale in experimental and control groups. Also, the result shows that the post-test value of the 11-point pain scale in the experimental group is higher than the post-test value of the 11-point pain scale in the control group.

The statistical findings clearly show that the combined effect of aerobic exercise and progressive relaxation training has a greater effect in reducing the frequency of migraines and thereby improving daily living which is important for their successful social integration.

Aerobic exercises involve activities that increase the heart rate and breathing. Regular aerobic exercise has been shown to have several positive effects on migraine sufferers. Aerobic exercise improves circulation; aerobic exercise can promote better blood flow to the brain, which may help to reduce the frequency of migraine triggered by the blood vessel constriction.

Aerobic exercise triggers the release of endorphins which are natural mood lifters and stress reducers since stress is a common trigger for migraines. Exercise is known to increase plasma beta-endorphin levels and subsequently pain threshold in healthy individuals. Decreased levels of beta-endorphins have been detected in migraine patients both in blood and CSF. Exercise-induced changes to depression, anxiety, and stress reactivity may be mediated by alterations to neurotransmitters including endorphin[6]. There is one study by Koseoglu et.al in the literature investigating the relationship between beta-endorphin clinical parameters of migraine and the effects of exercise. This study evaluated the pre and post-exercise endorphin levels and migraine headache parameters and indicated that basal plasma beta-endorphin level was negatively correlated with the total duration of the attacks during the assessment period. The exercises were found to have beneficial effects on all migraine parameters including intensity, duration, and frequency, and also to increase the beta-endorphin level after an exercise period of 6 weeks.

Inadequate sleep is a common migraine-triggering factor. Aerobic exercise can help reduce migraine occurrence by improving sleep patterns and better sleep quality.

Progressive relaxation training is a technique that involves tensing and then relaxing different muscle groups in the body promoting a deep state of relaxation. This method helps to reduce overall muscle tension and can be especially helpful for individuals whose migraines are triggered by muscle tension and stress.

Progressive muscle relaxation training is helpful in stress reduction by directly targeting and reducing physical tension in the body, which can help to alleviate stress-induced migraine. Progressive relaxation training provides the mind-body connection. The practice of progressive relaxation fosters a better understanding and control of bodily sensation making it easier for the individual to recognize easing signs of an impending migraine.

Both aerobic exercise and progressive relaxation training can be beneficial for managing migraines. Engaging in these activities regularly and incorporating them into an overall. A migraine management plan enhances the quality of life of migraine sufferers and helps to reduce the frequency and severity of migraine episodes. The analysis found that both aerobic exercise and progressive relaxation training resulted in reduced migraines and their severity. The combination of these interventions was more effective than each intervention alone.

CONCLUSION

The statistical analysis shows that there is a statistically significant difference in the frequency of pre-test and post-test values of the experimental and control groups. The experimental groups showed a reduction in the frequency of migraine days in patients with migraine.

Thus the study concludes that the combined effect of aerobic exercise and progressive relaxation training is more effective in reducing the frequency in patients with migraines. Therefore the study rejects the null hypothesis

Ethical Approval: Ethical clearance has been obtained from the institutional ethical committee of Bethany Navajeevan College of Physiotherapy, Trivandrum, Kerala, and Reference number BNCP/N/2021/05.

Conflict of Interest: There was no conflict of interest to conduct this study

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