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ORIGINAL ARTICLE

Effect of physical activity level on pain, functionality, and quality of life in migraine patients

Migrenli hastalarda fiziksel aktivite seviyesinin ağrı, fonksiyonellik ve yaşam kalitesine etkisi

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Summary

Objectives: This study aimed to determine the physical activity (PA) level of individuals with migraine and examine its effects on pain intensity (PI), disability, and quality of life (QoL).

Methods: Individuals diagnosed with migraine between the ages of 18 and 55 were included in the study. PA levels are assessed by the International PA Questionnaire Short Form (IPAQ-SF), PI with the McGill Melzack Pain Questionnaire, disability with the Migraine Disability Assessment Scale (MIDAS), and QoL with the World Health Organization QoL Scale Short Form (WHOQOL-BREF).

Results: A total of 88 individuals, with a mean age of 34.11±10.51 years, were included in the study; 53.41% were low active (LA), 30.68% were moderate active (MA), and 15.91% were high active (HA). The physical health of LAs (p=0.047) was lower than that of MAs. General (p<0.001), physical (p<0.001), and psychological (p=0.003) health scores were lower than HAs. LAs had a higher disability (p=0.042) and PI (p=0.001) than HAs. There was a weak negative correlation between PA and PI (p=0.001) and disability (p=0.005), and a weak positive correlation between PA levels and social (p=0.007) and environmental (p=0.013) scores, and moderate positive correlations with physical (p=0.000), general (p=0.000), and psychological (p=0.000) scores.

Conclusion: It was observed that as PA levels increased, PI decreased, and functionality and QoL increased in patients with migraine. Ensuring exercise continuity seems to be effective for improving the negative effects of migraine.

Keywords: Disability; migraine; pain; physical activity; quality of life.

Özet

Amaç: Bu çalışmada, migrenli bireylerin fiziksel aktivite düzeylerinin belirlenmesi ve ağrı şiddeti, engellilik seviyesi ve yaşam kalitesi üzerindeki etkilerinin incelenmesi amaçlandı.

Gereç ve Yöntem: Çalışmaya 18-55 yaş arası migren tanısı almış bireyler dahil edildi. Uluslararası Fiziksel Aktivite Anketi Kısa Formu (IPAQ-SF), McGill Melzack Ağrı Anketi ile ağrı şiddeti, Migren Özürlülük Değerlendirme Ölçeği (MIDAS) ile engellilik ve Dünya Sağlık Örgütü Yaşam Kalitesi Skalası Kısa Formu (WHOQOL-BREF) ile yaşam kalitesi değerlendirildi.

Bulgular: Çalışmaya yaş ortalaması 34,11±10,51 yıl olan toplam 88 kişi dahil edildi; %53,41'i düşük aktif, %30,68'i orta aktif, %15,91'i yüksek aktifti. Düşük aktiflerin fiziksel sağlığı (p=0,047) orta aktiflerden daha düşüktü. Genel (p<0,001), fiziksel (p<0,001), psikolojik (p=0,003) sağlık puanları yüksek aktiflerden daha düşüktü. Düşük aktifler yüksek aktiflerden daha yüksek engelliliğe (p=0,042) ve ağrı şiddetine (p=0,001) sahipti. Fiziksel aktivite ile ağrı şiddeti (p=0,001) ve engellilik (p=0,005) arasında zayıf negatif korelasyon, fiziksel aktivite düzeyleri ile sosyal (p=0,007) ve çevresel (p=0,013) sağlık puanları arasında zayıf pozitif korelasyon ve fiziksel (p=0,000), genel (p=0,000) ve psikolojik (p=0,000) puanlarıyla orta düzeyde pozitif korelasyon vardı.

Sonuç: Migrenli hastalarda fiziksel aktivite düzeyi arttıkça ağrı şiddetinin azaldığı, fonksiyonellik ve yaşam kalitesinin arttığı gözlendi. Egzersiz devamlılığının sağlanması migrenin olumsuz etkilerini iyileştirmede etkili görünmektedir.

Anahtar sözcükler: Ağrı; engellilik; fiziksel aktivite; migren; yaşam kalitesi.

Introduction

Migraine is a chronic disease consisting of recurrent headache attacks accompanied by neurological, gastrointestinal, and autonomic symptoms.[1] Headache may be accompanied by various symptoms such as nausea, vomiting, fatigue, dizziness, loss of appetite, muscle pain, photophobia, and phonophobia.[2] Migraine, which affects approximately 10–15% of the

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young adult population; in our country, the ratio is 16.4% in the age group of 15–55 years, and it is more common in women than in men.[3] Migraine affects the social, physical, professional, and academic lives of people negatively, and it causes a significant loss of workforce in society, especially because it is seen in highly productive young adults.[4] The treatment of migraine includes pharmacological and non-pharmacological approaches. The common goal of all treatments is to prevent migraine attacks before they occur, to prevent unnecessary drug use, to improve the quality of life (QoL) of individuals, and to minimize workforce loss. Non-pharmacological treatment methods for migraines include relaxation techniques, cognitive behavioral therapy, the use of electrophysical agents, and different types of exercise approaches.[5]

There is a general consensus that regular exercise should be included in the treatment of migraine patients. Whether there is a relationship between exercise dose and response in individuals with migraine is still an open issue due to inconsistent study designs and outcome measures in the current literature, and this question remains urgent. Clarity surrounding the role exercise can play in preventing migraines is urgently needed.[5,6] There are conflicting results in existing studies that reveal the positive and negative effects of PA and exercise training.[7–9]

In our study, we aimed to determine the physical activity (PA) level of individuals with migraine and examine its effects on pain, disability, and QoL. We hypothesized that with the increase in the PA levels of the individuals, there would be an improvement in their pain, disability, and QoL levels.

Material and Methods

This study was designed as a prospective, descriptive cross-sectional study and approved by the Istanbul Medipol University Institutional Non-Interventional Review Board for Human Subjects Committee (No. 10840098-604.01.1-12607). The procedures followed during the study were in accordance with the Helsinki Declaration of 2008.

Individuals

Individuals who applied to the neurology outpatient clinic of Golcuk Necati Celik State Hospital and were diagnosed with migraine by a specialist neurologist were included in the study. The individuals were informed about the purpose of the study, the average time they would spend answering questions, and the evaluation methods. Their signatures and approvals were obtained by reading the informed consent form.

For the purpose of power analysis, the G-Power 3.1 program was used. It was determined that a total of 88 individuals should be included in the study to reach 80% power with a margin of 0.05 error and an effect size of 0.30. Ninety-one individuals diagnosed with migraine between the ages of 18 and 55 were included in the study, but three were excluded because they could not complete the questionnaires properly, and the study was completed with a total of 88 participants.

In the study, individuals with migraine who do not have any orthopedic, neurological, or neuromuscular disease that may prevent PA and do not use regular medication except for migraine attacks were included. Individuals who had communication problems that did not allow the evaluation and who were pregnant were excluded from the study.

Outcome Measurements

The assessment scales were applied through face-to-face interviews with the participants. The demographic information of the participants was recorded with the "Demographic Information Form" prepared by the researchers. Individuals' PA level was assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF), pain intensity (PI) with the McGill Melzack Pain Questionnaire, disability with the Migraine Disability Assessment Scale (MIDAS), and QoL with the World Health Organization QoL Scale Short Form (WHOQOL-BREF).

IPAQ-SF consists of 4 separate sections and 7 questions. It includes questions about PAs that were done for at least 10 minutes a day in the last week. Metabolic equivalent minute score (MET-min) is used to determine the PA level, and it classifies a person's PA level as "low," "moderate," or "high," depending on frequency, duration, and intensity. The Turkish validity and reliability study of this questionnaire was conducted by Saglam et al.[10] in 2010, and written permission was obtained for its use in this study.

The McGill Melzack Pain Questionnaire, developed by Melzack and Targerson in 1971, consists of 4 parts and is calculated over 0–78 points. In the first part, the patient is asked to mark the area of pain on a body chart. In the second part, there are descriptive phrases that examine pain, and the patients are asked to mark the words that most accurately describe their pain. In the third part, there are words to determine the change in pain with time, the continuity of pain, its frequency, and factors that increase and decrease pain. In the fourth part, the patient is asked questions to determine the severity of the pain. The Turkish validity and reliability study of this questionnaire was conducted by Bicici in 2010.[11]

MIDAS is used to measure headache-related disabilities. It investigates the effect of headaches in the last three months and consists of five questions. The MIDAS score is obtained by calculating the days that reduce or completely avoid plus days in which productivity was reduced by half or more of missed work or school days, or missed household chores days, missed non-work activity days in the last 3 months. The Turkish validity and reliability study of this questionnaire was performed by Ertaş et al.[12] in 2004. According to the MIDAS, little or no disability indicates 0–5 days of loss, mild disability 6–10 days, moderate disability 11–20 days of loss, and severe disability 21+ days of loss.

Developed by the World Health Organization (WHO), WHOQOL-BREF consists of 26 questions that measure the perception of an individual's well-being. This scale measures physical health, psychological health, social relationship, and environmental well-being. The Turkish validity and reliability study of this questionnaire was conducted by Eser et al.[13] in 1999.

Table 1. Demographic information of individuals n=88

Parameters	n	%
Age, Mean±SD		34.11±10.51
Height, Mean±SD		167.80±9.05
Body weight (kg), Mean±SD		70.39±15.08
Sex		
Female	54	61.4
Male	34	38.6
Marital status		
Married	48	54.5
Single	40	45.5
Educational status		
Primary school	7	8.0
Middle School	10	11.4
High school	20	22.7
Short-cycle tertiary education	7	8.0
Bachelor's degree	38	43.2
Masters and doctoral degree	6	6.8
Alcohol and tobacco consumption		
Yes	35	39.8
No	53	60.2
Family history of migraine		
Yes	57	64.8
No	31	35.2
Course of migraine		
<1 year	10	11.4
2–5 years	16	18.2
6–9 years	17	19.3
More than 10 years	45	51.1
Medication use during an attack		
Yes	68	77
No	20	23
Attack duration		
1–8 h	28	31.8
9–24 h	32	36.4
1–4 days	28	31.8

SD: Standard deviation; n: Number of cases.

Statistical Analysis

Analysis of the study results was performed using the "Statistical Package for Social Sciences" (SPSS) Version 22.0 (SPSS Inc., Chicago, IL, USA) statistical program. While assessing the study data, descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, and maximum) were used, and the distribution of the data was evaluated with the Shapiro-Wilk test. Chi-square analysis was used to determine the relationship between qualitative data. Kruskal–Wallis test and Mann–Whitney U test were used in comparison of three or more groups that did not show a normal distribution of quantitative data, and one-way ANOVA and Tamhane's T2 post hoc tests were used in cases of a normal distribution. A Spearman correlation test was used for data not normally distributed. The strength of correlations was considered weak if they were 0.2–0.4, medium if they were 0.4–0.6, and high if they were 0.6–0.8. The statistical significance level was taken as $p<0.05$.

Table 2. Average values of parameters evaluated according to PA levels

Parameters	Activity level			p
	Low active (n=47)	Moderate active (n=27)	High active (n=14)	
IPAQ-SF, Median (range)	396.00 (435.00)	1386.00 (1935.00)	3562.00 (5859.00)	**0.000**[b]
McGill Melzack Pain Questionnaire, Mean±SD	76.49±8.45	69.37±15.57	63.07±13.79	**0.003**[a]
MIDAS, Median (range)	17.00 (36.00)	12.00 (29.00)	5.00 (21.00)	**0.025**[b]
QoL-overall health, Median (range)	50.00 (75.00)	62.50 (62.50)	68.75 (50.00)	**0.000**[b]
QoL-physical health, Median (range)	57.14 (71.43)	71.43 (42.86)	75.00 (32.14)	**0.000**[b]
QoL-psychological, Median (range)	54.17 (62.50)	66.67 (45.83)	75.00 (50.00)	**0.002**[b]
QoL-social relationship, Median (range)	66.67 (91.67)	66.67 (66.67)	70.83 (50.00)	0.089
QoL-environmental, Median (range)	55.56 (41.67)	63.89 (41.67)	562.50 (55.56)	0.055

a: Tamhane's T2 *post-hoc* test, p≤0.05; b: Kruskal-Wallis and Mann-Whitney U tests, p≤0.05; n: Number of cases; SD: Standard deviation; MIDAS: Migraine Disability Assessment Scale; IPAQ-SF: International physical activity questionnaire short form; QoL: Quality of life.

Results

A total of 88 individuals diagnosed with migraine, with a mean age of 34.11±10.51 years, 54 women and 34 men, were included in the study. Demographic, clinical, and sociodemographic information about the individuals is shown in Table 1.

The findings regarding the PA level, pain levels, functional levels, and QoL of the participants are shown in Table 2. When the PA levels of the individuals were classified, it was seen that 53.41% of them were low active (LA), 30.68% were moderate active, and 15.91% were high active (HA). The pain levels, functional levels, and QoL of the participants classified according to their PA level, mean values, and statistical differences are given in Table 2.

The physical health of LAs (p=0.047) was lower than that of MAs. All other QoL scores of LAs except social relationships and environment were lower than SAs (general health; p<0.001, physical health; p<0.001, psychological health; p=0.003). LAs had higher disability (MIDAS; p=0.042) and pain levels (p=0.001) than SAs. There was no statistically significant difference in any parameter between MAs and SAs (p>0.05) (Table 2).

The findings of the correlation analysis between the PA levels of the patients and other parameters are shown in Table 3. There was a weak negative correlation between PA levels,pain level (p=0.001, rho=-0.351) assessed by McGill Melzack, and disability level (p=0.005, rho=-0.296). There was a weak positive correlation between PA levels and social (p=0.007, rho=0.288) and environmental (p=0.013, rho=0.264) parameters of QoL and moderate positive correlations with physical health (p=0.000, rho=0.536), general health (p=0.000, rho=0.462), and psychological parameters (p=0.000, rho=0.442) (Table 3).

Table 3. The relationship between physical activity and other parameters

Correlations with physical activity	p	rho
McGill melzack pain questionnaire	**0.001***	-0.351
MIDAS	**0.005***	-0.296
QoL-overall health	**0.000***	0.462
QoL-physical health	**0.000***	0.536
QoL-psychological	**0.000***	0.442
QoL- social relationship	**0.007***	0.288
QoL-environmental	**0.013***	0.264

*: P<0.05; rho: Spearman correlation coefficient; MIDAS: Migraine Disability Scale; QoL: Quality of life.

Discussion

As a result of our study to determine the PA levels of individuals with migraine and to investigate the effects of PA levels on pain, disability level, and QoL, it was observed that as PA levels increased, PI decreased, functionality increased, and QoL increased in patients with migraine. Studies involving large populations have concluded that lower levels of PA are associated with higher migraine prevalence and frequency.[14,15] In our study, as an indicator of these results, it was found that individuals with migraine were mostly sedentary (53.41% LA, 30.68% moderately active, 15.91% HA).

In the cross-sectional part of Varkey et al.'s[15] study, one of the world's largest epidemiological studies, it was observed that migraine and non-migraine headache were more common in the group reporting low PA, out of a total of 46,648 participants who had not used drugs. Molarius et al.,[16] who conducted a randomized Swedish population study of 43.770 men and women aged 18–79 years, showed that physically inactive individuals had a higher prevalence of migraine and/or recurrent headaches than physically active individuals. Numerous studies report a significant reduction in PI and the beneficial effects of exercise on the frequency and duration of migraine attacks.[7,17–19]

Compared to healthy controls, patients with migraine have lower beta-endorphin levels, and even lower levels in chronic migraine patients.[20] The concentrations of these endogenous opioids are lower during a migraine attack than in the pain-free period, and their levels increase at the end of the attack. Beta-endorphin appears to inhibit the release of substance P in the peripheral nervous system and thus reduce the transmission of pain pathways, while in the central nervous system, it modulates pain by exerting a presynaptic effect to inhibit GABA release.[21,22] On the other hand, Köseoglu et al.[17] showed that beta-endorphin levels of 40 female migraine patients without aura doubled after exercise compared to before, resulting in fewer headache days.

In the results of our study, there were significant differences in pain, disability, and many parameters of QoL between LA and HA individuals, while the only differences were in physical health parameters in LA and moderately active individuals. These results support the necessity of exercising for longer periods to obtain migraine-related benefits. This may be related to the fact that the significant increase in beta-endorphins,[23] which has been reported as the mechanism of action of exercise on improvement in migraine presence in previous studies, occurs only when the anaerobic threshold is exceeded or when the exercise is extended to approximately 50 min.[22,24] In light of these results, we may suggest that beneficial effects can be achieved by increasing the number of training days per week for performing short-term and high-intensity exercises or by reducing the number of training days per week with performing long-term moderate-intensity exercises for achieving high PA levels.

In the migraine literature, it has been shown that regular exercise provides benefits to migraine duration, frequency, and intensity through different healing mechanisms, such as the suppressive effect of regular exercise on inflammatory mediators that increase with the presence of migraine, an increment in cerebral blood flow by causing retinal arteriolar dilation, an increase in pain threshold through stress hormones such as growth hormone, and improving physical fitness.[4,25]

Overall, the available data do not indicate that one type of exercise is more effective than another for preventing migraines. However, most exercise training applied in studies consists of three sessions per week that meet minimum intensity thresholds.[5] It has been suggested that applying an exercise plan consisting of a combination of cross-training, cycling, and brisk walking, the intensity of which is determined by the Borg scale and performed for 45 min three times a week, may be effective alone in the patient population with comorbid tension-type headache and neck pain.[26] Köseoğlu et al.[17] used treadmill training, which was planned according to the exercise capacity of the individuals, and found a significant reduction in the number of monthly migraine days.

There are studies in which migraine patients report exercise as a triggering factor for their attacks and suggest that certain exercises may be a trigger for migraine-type attacks.[4,27,28] Although the pathophysiology of exercise-induced migraine triggers is still not fully understood, mechanisms associated with insufficient evidence, such as an increase in brain lactate levels, an increase in systolic blood pressure, and cardiac output, have been reported, and the occurrence of exercise-induced migraine may cause cessation of exercise.[22,28] For these reasons, it has been reported that migraine patients exercise less than the general population and are more likely to participate in complementary and alternative medicine practices such as yoga.[29] In the results of our study, the difference between minimally active and moderately active individuals was only in the physical health parameter, but the fact that the parameters did not differ between moderately active and HA individuals suggests that it may be beneficial for individuals with migraines to be active, albeit at a low level.

For these patients, low-impact or non-aerobic exercise, such as yoga, may also benefit and may be helpful, particularly in the prevention of primary headache syndromes,[30] along with other conditions frequently associated with migraine, such as fibromyalgia, anxiety, and depression.[5] In addition to the few studies in the literature showing that high-intensity and long-term exercises are more effective in increasing endorphin-like substances, the tendency of patients with migraine to exercise at low levels shows the need for studies comparing different-intensity exercise training.[25,28]

Domingues et al.,[31] in a cross-sectional study involving 480 medical students, reported that the level of migraine-related disability was significantly lower in those who exercised regularly compared to those who did not exercise when evaluated with MIDAS scores. Lemmens et al.,[32] in which they searched 265 articles and included six studies as appropriate in a meta-analysis and review, provided moderate evidence that aerobic exercise can lead to a reduction of 0.6 migraine days per month.

Compared with topiramate therapy (25 mg/week–max.200 mg/day) and tricyclic antidepressants, aerobic exercise and relaxation therapy have been shown to be equally effective in terms of attack frequency and number of migraine days.[7] Considering that pharmacological treatment has undesirable side effects such as weight changes, memory loss, and fatigue, aerobic exercise seems to be a valuable alternative for reducing the number of days with migraine.[33–35] Santiago et al.[19] showed that aerobic exercise combined with a standard preventative medication improves migraine control in patients with chronic migraine and that exercise for patients with chronic migraine is a valuable adjunct to a standard pharmacological prevention strategy.

It has been reported that 94% of people with migraine experience tension-type headache[36] as a comorbidity, while 89.3% also experience neck pain.[33] This has been found to worsen the prognosis of migraine[36] and increase the level of disability.[37] Exercise can be applied to increase low baseline plasma endorphins[17] or even as part of an umbrella treatment strategy for those with neck pain and/or tension headache comorbidities.[26] People with migraines and co-existing tension headaches and neck pain may need more individually tailored interventions to increase PA levels and improve psychological well-being, perceived stress, and personal well-being.[22] In our study, it was observed that the number of painful migraine days in LA individuals was higher than that of HA individuals, and the level of disability due to migraine decreased due to the increase in PA levels for all individuals. Individuals who do regular PA and exercise may experience migraine attacks less frequently and at low intensity; it is thought that it would be beneficial to recommend personalized exercise programs in addition to pharmacological treatment or for those who want to avoid the side effects of pharmacological approaches.

Migraine is extraordinarily common and burdensome; the accompanying economic impact and its impact on QoL are significant.[38] In our country, the prevalence of migraine was reported in 2013 at around 16.7% in 2013.[39] The incidence of migraine in our country is much higher than in other countries due to the effect of genetic background and environmental factors, and it has been reported as 2.98% in women and 1.93% in men.[39,40] Exercise can be used for the management of various chronic pain conditions, as well as for reducing migraine and comorbid symptoms such as depression, anxiety, and sleep disorders that can affect QoL.[4,38,41] As a result of our study, it has been observed that LA individuals have a lower level of psychological health compared to HA individuals.

In a study, beside improving flexibility, strength, and coordination, it was shown that patients in the yoga group had psychological effects such as reducing stress and anxiety, improving mood, reducing headache frequency, PI, and symptomatic drug use, and lower anxiety and depression scores.[42] It is important to ensure that individuals are active by including them in regular exercise to improve psychological health, especially in patients who experience psychological effects accompanying chronic migraine and exercise-induced migraine attacks. PA alone has not been recommended as a migraine prevention strategy in previous studies, and it has been reported that multidisciplinary treatments are superior to a single treatment option in long-term pain disorders and migraine.[6]

Limitations

The limitations of the study were that the effects of the presence of possible comorbidities such as neck pain and tension-type headaches that may accompany migraine were not investigated, and the study did not reflect the total migraine population because it was conducted from a single center.

Conclusion

It may be wise to consider suggesting low-intensity exercises and yoga-like practices to avoid triggering migraine attacks with exercise and to ensure exercise continuity. Future research may aim to compare the effects of different exercise types or different exercise intensities on migraine recovery.

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Ethics Committee Approval: The İstanbul Medipol University Non-Interventional Clinical Research Ethics Committee granted approval for this study (date: 29.03.2019, number: 10840098-604.01.1-12607).

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