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Clinical Research Article

An investigation of the relationship between cutaneous allodynia and kinesiophobia, gastrointestinal system symptom severity, physical activity and disability in individuals with migraine

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ABSTRACT

Background: To investigate the relationship between cutaneous allodynia (CA) and kinesiophobia, gastrointestinal system (GIS) symptom severity, physical activity, and disability, and to determine whether CA, pain, and disability were influencing factors for kinesiophobia, GIS symptoms, and physical activity in individuals with migraine.
Methods: The study included 144 individuals with migraine. CA, kinesiophobia, GIS symptoms, physical activity level, and migraine-related disability were evaluated with the Allodynia Symptom Checklist, the Tampa Kinesiophobia Scale (TKS), the Gastrointestinal Symptom Rating Scale (GSRS), the International Physical Activity Questionnaire-7, and the Migraine Disability Assessment Scale (MIDAS), respectively.
Results: The CA severity was only associated with TKS (r = 0.515; P < 0.001), GSRS-total (r = 0.336; P < 0.001), GSRS-abdominal pain (r = 0.323; P < 0.001), GSRS-indigestion (r = 0.257; P = 0.002), GSRS-constipation (r = 0.371; P < 0.001), and MIDAS scores (r = 0.178; P = 0.033). Attack frequency (P = 0.015), attack duration (P = 0.035) and presence of CA (P < 0.001) were risk factors for kinesiophobia. Attack frequency (P = 0.027) and presence of CA (P = 0.004) were risk factors for GIS symptoms.
Conclusions: There was a relationship between the CA and kinesiophobia, GIS symptoms, and disability. CA and attack frequency were found to be risk factors for kinesiophobia and GIS symptoms. Migraine patients with CA should be assessed in terms of kinesiophobia, GIS, and disability. Lifestyle changes such as exercise and dietary changes and/or pharmacological treatment options for CA may increase success in migraine management.

Keywords: Abdominal Pain; Central Nervous System Sensitization; Chronic Pain; Exercise; Headache; Hyperalgesia; Kinesiophobia; Migraine Disorders; Surveys and Questionnaires.

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INTRODUCTION

Migraine is a primary headache disorder characterized by moderate-to-severe headache attacks [1]. The prevalence of migraine in adults is approximately 11% [2]. Moreover, some accompanying symptoms and disorders in migraine sufferers, including cutaneous allodynia (CA), kinesiophobia, gastrointestinal symptoms, visual disorders, restless legs syndrome, and psychological problems, often increase disability and decrease quality of life [3].

CA is defined as the perception of pain despite painless stimulation of normal skin or the scalp. CA, a clinical marker of central sensitisation, is a potential risk factor for chronicity of migraine and is seen in about 80% of individuals with migraine [4,5]. According to Mete et al. [6], pain severity and anxiety levels were higher, and sleep quality was lower in migraine sufferers with CA compared to those without CA. In addition, CA was found to be associated with migraine attack frequency, severity, and other symptoms accompanying migraine, and it was emphasized that CA is an important symptom to be considered in individuals with migraine [7].

Kinesiophobia is an abnormal, excessive fear and avoidance of physical activity/exercise, which usually develops as a result of a painful experience or trauma [8]. It is thought that central sensitization is effective in the development of kinesiophobia [9]. A recent study found that most migraine sufferers experience kinesiophobia. However, there are limited studies examining the relationship between CA presence or severity and kinesiophobia in migraine [10]. Studies are needed to examine the factors affecting kinesiophobia in migraine sufferers.

In the literature, the brain and the gastrointestinal tract are strongly linked to neural, endocrine, and immune pathways [11]. The communication between the brain and the gut occurs bidirectionally. Evidence on the role of the gut microbiota in the gut-brain axis suggests that the gastrointestinal system (GIS) may be associated with neurological diseases such as migraine [12]. It has been reported in various studies that GIS disorders are more common in migraine sufferers than in non-migraine sufferers [13,14]. In the literature, it was explained that the presence of CA was associated with anxiety, depression, and chronic pain conditions (fibromyalgia, irritable bowel syndrome [IBS]) [15]. However, to the best of the authors' knowledge, there is no study investigating the relationship between the CA and the GIS symptoms in migraine sufferers. Furthermore, studies are needed to examine the factors affecting GIS symptoms in migraine sufferers.

Physical activity encompasses all movements of people including sports, exercise, and activities in daily life [16]. On the one hand, physical inactivity has been reported to be associated with a higher prevalence of migraine and a reduced pain threshold [17]. On the other hand, individuals with migraine report that vigorous physical activity usually triggers their attacks and worsens their pain [18,19]. The lifetime prevalence of migraine attacks triggered by activity was determined as 38%, and more than half of these individuals stated that they avoided physical activity because it triggered their attacks [20]. In addition, exercise therapy/graded physical activity is recommended for the treatment of central sensitization in many patients with chronic pain [21]. However, to the extent of the authors' knowledge, the relationship between CA, associated with central sensitization in migraine sufferers, and physical activity has not been investigated.

Migraine is associated with considerable functional disabilities and may lead to physical, psychological, and social consequences [22]. It was reported that migraine is one of the highest causes of disability in both men and women worldwide [1]. Individuals with migraine combined with CA were reported to have poorer response to acute treatment and a higher rate of progression to chronic migraine and more severe disability compared to individuals with migraine alone [7,23]. As a result, it is important to examine the relationships between migraine-related disability and CA severity, as this will provide insight into the pathophysiology of migraine.

Therefore, the primary aim of this study was to investigate the relationship between CA severity and kinesiophobia, GIS symptom, physical activity and disability in individuals with migraine. The secondary aim was to determine whether CA, pain and disability were influencing factors for kinesiophobia, GIS symptoms, and physical activity level in individuals with migraine. Firstly, it was hypothesized that CA severity would be associated with kinesiophobia, GIS symptoms, physical activity, and disability in individuals with migraine. Secondly, it was hypothesized that CA, pain and disability would be influencing factors for kinesiophobia, GI symptom severity, and physical activity level in individuals with migraine.

MATERIALS AND METHODS

1. Study design and participants

The present study was designed as a cross-sectional online survey. This study was conducted between November 2020 and April 2021. Individuals between the ages of 18 and 65 who were diagnosed with migraine by a neurologist in accordance with the criteria of the International Headache Society, who volunteered to participate in the study, and had at least three migraine attacks in the last three months were included in the study.

The exclusion criteria are as follows: other primary and/or secondary headaches, any neurological disease other than migraine, a rheumatological disease, an endocrine disease that may be associated with GIS symptoms, congenital GIS organ deficiency/loss, history of head and neck trauma, pathologies of the musculoskeletal system (lumbar and cervical disc herniation, *etc*.), diagnosis of fibromyalgia, neuralgia orany systemic disease, diagnosis of temporomandibular dysfunction, pregnancy, malignancy, mental and/or cooperation problems, serious psychiatric disorder, and illiteracy. Individuals were reached with the snowball sampling method.

2. Ethics approval and consent to participate

The study was approved by Ankara Yildirim Beyazit University Ethics Committee (approval no. 8), and was conducted in accordance with the principles of the Declaration of Helsinki. All participants were informed about the study and written informed consent was obtained.

3. Outcome measures

Physical and sociodemographic information was recorded. The mean attack severity during the headache attacks in the previous month was evaluated by the Numerical Pain Rating Scale, rated from 0–10 [24]. The average attack frequency (days/month) and duration (minutes) in the previous month were determined.

CA was assessed with the Turkish version of the Allodynia Symptom Checklist (ASC). The range score of the ASC is 0–24. Based on the ASC total score, CA is defined as absent (scores 0–2), mild (3–5), moderate (6–8), or severe (9–24) [25].

The kinesiophobia level was evaluated by the Turkish version of the Tampa Kinesiophobia Scale (TKS). The total score ranges from 17 to 68, where 17 indicates no kinesiophobia and 68 indicates severe kinesiophobia [26]. A cut-off point of 37 was determined for the TKS as ≥ 37 points indicate a high kinesiophobia level while < 37 points indicated a low kinesiophobia level [27].

GIS symptoms were evaluated by the Turkish version of the Gastrointestinal Symptom Rating Scale (GSRS). It allows the calculation of the total score in the GSRS, and the five sub-categories of the scale to be calculated separately (abdominal pain, reflux, diarrhea, indigestion, and constipation). The total score that can be obtained from the GSRS ranges from 0 to 105. Higher GSRS scores indicate more severe symptoms [28].

Physical activity level was evaluated with the Turkish version of the International Physical Activity Questionnaire (IPAQ-7). According to the IPAQ-7, physical activity levels are classified as physically inactive (< 600 MET-min/week), minimally active (600–3,000 MET-min/week), and active (> 3,000 MET-min/week) [29].

The disability level related to migraine was evaluated by the Turkish Migraine Disability Assessment Scale (MIDAS), a self-administered questionnaire. The MIDAS score is obtained by calculating the days when migraine sufferers reduce their performance or the days they cannot perform completely due to headaches. The total score of MIDAS is used to categorize patients in disability grades I to IV.The score ranges are as follows; Grade I = little or no disability (0–5 days); Grade II = mild disability (6-–10 days); Grade III = moderate disability (11–20 days), and Grade IV: severe disability (21 days or more) [30].

4. Sample size and statistical analyses

In this study, an error level of 0.05 was adjusted (0.05/2 = 0.025) because two correlation coefficients would be analyzed primarily for calculating the sample size. In the pilot study conducted in 20 individuals with migraine, the Pearson correlation coefficient was calculated as 0.355 between CA severity and kinesiophobia, and 0.367 between CA severity and GIS symptom severity. Accordingly, it was determined that at least 102 patients should be included in the study at the 0.025 type-1 error level and 0.20 type-2 error level in order to detect a weak linear relationship (r = 0.30) between the variables. The sample size was expanded by 20% to account for potential data losses, and 128 patients were determined to be adequate. The SPSS ver. 22 (IBM Co., Armonk, NY) program was used for statistical analysis. The variables were investigated using visual (histograms and probability plots) and analytical methods (Shapiro–Wilk test) to determine whether they were normally distributed.

Descriptive statistics of normally distributed variables are presented as means and standard deviations, non-normally distributed variables are presented as medians and interquartile range values, and categorical variables are presented as numbers and percentages. The Pearson correlation test was used to assess the relationships between the parameters. The variables affecting kinesio-

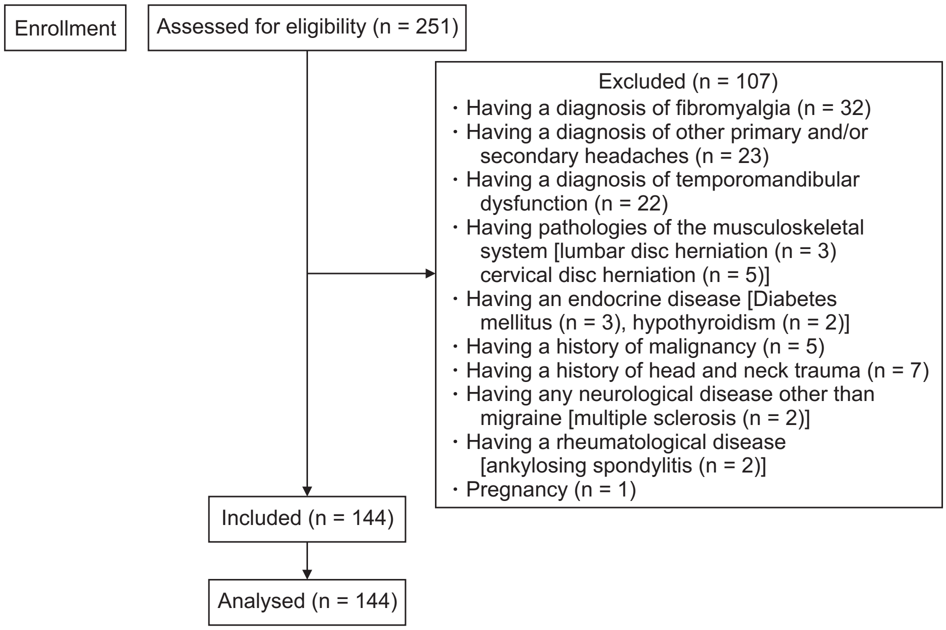

Fig. 1. Flow chart of participants.

phobia, GIS symptoms, and physical activity level (risk factors) were determined using multiple linear regression analysis, while the variables affecting physical activity level were determined using univariate regression analysis. Logarithmic transformation was performed to apply regression analysis to GIS symptoms. The statistical significance level was accepted as $P < 0.05$.

RESULTS

The study included 251 individuals with migraine. The study excluded 107 people who did not match the inclusion and exclusion criteria. As a result, 144 individuals with migraine completed the study (**Fig. 1**). Physical and demographic characteristics are presented in **Table 1** and clinical features of individuals with migraine are presented in **Table 2**.

It was found that CA severity was associated with TKS (r = 0.515, $P < 0.001$), GSRS-total (r = 0.336; $P < 0.001$), GSRS-abdominal pain (r = 0.323; $P < 0.001$), GSRS-indigestion (r = 0.257; $P = 0.002$), GSRS-constipation (r = 0.371; $P < 0.001$), and MIDAS scores (r = 0.178; $P = 0.033$). However, there was no relationship between CA severity and GSRS-reflux (r = 0.149; $P = 0.075$), GSRS-diarrhea (r = 0.072; $P = 0.391$), and the IPAQ-7 scores (r = 0.127, $P = 0.128$). In addition, there was no relationship between CA severity and GSRS-reflux (r = 0.149; $P = 0.075$), GSRS-diarrhea (r = 0.072; $P = 0.391$), or the IPAQ-7 scores (r = 0.127, $P = 0.128$) (**Table 3**).

Table 1. Physical and demographic characteristics of individuals with migraine

Physical and sociodemographic characteristics	Individuals with migraine (n = 144)
Age (yr)	31.0 ± 7.2
Body mass index (kg/m^2)	23.9 ± 4.6
Duration of migraine diagnosis (mo)	110.8 ± 95.2
Sex	
Female	110 (76.4)
Male	34 (23.6)
Educational status	
Primary school	3 (2.1)
Middle school	2 (1.4)
High school	15 (10.4)
Graduate	60 (41.7)
Postgraduate	64 (44.4)
Smoking status	35 (24.3)
Alcohol consumption	12 (8.3)
Family history	112 (77.8)

Values are presented as mean ± standard deviation or number (%).

The mean attack frequency ($P = 0.015$) and the mean attack duration ($P = 0.035$) in the previous month and having CA ($P < 0.001$) were found to be risk factors for kinesiophobia. The presence of CA had the highest influence on kinesiophobia, as determined by the beta coefficient. Kinesiophobia was found to be approximately 5 times more common in those with CA than in those without (**Table 4**). The mean attack frequency in the previous month ($P = 0.027$) and the presence of CA ($P = 0.004$)

Table 2. Clinical parameters of individuals with migraine

Clinical parameters	Individuals with migraine (n = 144)
ASC score	4.02 ± 3.9
Allodynia level	
None	62 (43.1)
Mild	31 (21.5)
Moderate	34 (23.6)
Severe	17 (11.8)
TKS score	38.08 ± 6.29
Level of kinesiophobia	
Low kinesiophobia	60 (41.7)
High kinesiophobia	84 (58.3)
GSRS overall score	43.82 ± 18.26
GSRS sub-scores	
Abdominal pain	9.04 ± 4.50
Reflux	5.83 ± 3.63
Diarrhea	6.68 ± 4.37
Indigestion	13.36 ± 6.76
Constipation	8.89 ± 5.40
IPAQ-7 score	1,572.59 ± 1,289.32
Physical activity levels (IPAQ-7)	
Inactive	38 (26.4)
Minimal active	88 (61.1)
Active	18 (12.5)
Pain characteristic	
Attack severity (NPRS)	7.84 (2.0)
Attack frequency (day/month)	6.68 (7.0)
Attack duration (min)	384.19 (210.0)
MIDAS score	29.20 ± 19.31
MIDAS degree	
Grade 1	6 (4.2)
Grade 2	15 (10.4)
Grade 3	40 (27.8)
Grade 4	83 (57.6)

Values are presented as mean ± standard deviation, number (%), or median (interquartile range).
ASC: Allodynia Symptom Checklist, TKS: Tampa Kinesiophobia Scale, GSRS: Gastrointestinal Symptom Rating Scale, IPAQ-7: International Physical Activity Questionnaire-7, NPRS: Numeric Pain Rating Scale, MIDAS: Migraine Disability Assesment Scale.

were found to be risk factors for GIS symptoms. The presence of CA had the highest influence on GIS symptoms, according to the beta coefficient (**Table 5**). Furthermore, it was seen that the physical activity levels of individuals with migraine were not affected by pain characteristics, migraine-related disability, or the presence of CA (**Table 6**).

Table 3. The relationship between CA severity and kinesiophobia, GIS symptom severity, physical activity and disability level individuals with migraine

Clinical parameters	ASC score	
	r	*P* value
TKS score	0.515	< 0.001*
GSRS total score	0.336	< 0.001*
GSRS - abdominal pain	0.323	< 0.001*
GSRS - reflux	0.149	0.075
GSRS - diarrhea	0.072	0.391
GSRS - indigestion	0.257	0.002*
GSRS - constipation	0.371	< 0.001*
IPAQ-7 score	0.127	0.128
MIDAS score	0.178	0.033*

CA: cutaneous allodynia, GIS: gastrointestinal system, ASC: Allodynia Symptom Checklist, TKS: Tampa Kinesiophobia Scale, GSRS: Gastrointestinal Symptom Rating Scale, IPAQ-7: International Physical Activity Questionnaire-7, MIDAS: Migraine Disability Assesment Scale, r: Pearson correlation coefficient.
*$P < 0.05$.

DISCUSSION

This study put forward that there was a relationship between CA and kinesiophobia, GIS symptoms, and disability in individuals with migraine, whereas there was no correlation between CA and physical activity level. Moreover, CA and attack frequency were found to be risk factors for kinesiophobia and GIS symptoms in individuals with migraine.

Migraine sufferers commonly report avoiding movement or activity because physical movement, particularly head and neck activities, exacerbates pain during attacks [19]. Fear of pain arises from damaging beliefs and negative perceptions that pain is equivalent to harm. This fear of pain may also extend to a dread of movement, activity, or work [31]. As a result, kinesiophobia can be even more disabling than the pain. In individuals with chronic musculoskeletal pain, researchers have discovered that as their level of kinesiophobia increases, their pain severity and disability increase, and their quality of life decreases [31,32]. According to a recent study on the association between migraine and kinesiophobia, 53% of migraine sufferers had kinesiophobia, and mostly had negative views on movement. It was reported that this situation is not exclusively related to craniocervical movements [10]. In the present study, it was found that 58.3% of migraine sufferers had high kinesiophobia. According to these findings, migraine patients are prone to experience kinesiophobia.

Table 4. Determination of the variables affecting the kinesiophobia

Factors	b (95% confidence interval)	Beta	*P* value
Attack severity (NPRS)	0.376 (–0.319 to 1.072)	0.081	0.287
Attack frequency (day/month)	0.237 (0.047 to 0.426)	0.201	0.015*
Attack duration (min)	0.081 (0.006 to 0.156)	0.160	0.035*
MIDAS score	0.0154 (–5.30 to 5.40)	0.0473	0.995
CA presence	5.231 (3.374 to 7.089)	0.413	< 0.001*

Response variable: Tampa kinesiophobia scale.
b: regression coefficient, Beta: standardized beta coefficient, NPRS: Numeric Pain Rating Scale, MIDAS: Migraine Disability Assesment Scale, CA: cutaneous allodynia.
*$P < 0.05$, $R^2 = 0.521$, F = 10.274, $P < 0.001$.

Table 5. Determination of variables affecting gastrointestinal system symptoms

Factors	b (95% confidence interval)	Beta	*P* value
Attack severity (NPRS)	0.032 (–0.019 to 0.084)	0.105	0.214
Attack frequency (day/month)	0.016 (0.002 to 0.030)	0.201	0.027*
Attack duration (min)	0.001 (–0.005 to 0.007)	0.029	0.728
MIDAS	–0.003 (–0.007 to 0.001)	–0.133	0.147
CA presence	0.205 (0.068 to 0.342)	0.243	0.004*

Response variable: Gastrointestinal Symptom Rating Scale.
b: regression coefficient, Beta: standardized beta coefficient, NPRS: Numeric Pain Rating Scale, MIDAS: Migraine Disability Assesment Scale, CA: cutaneous allodynia.
*$P < 0.05$, $R^2 = 0.330$, F = 3.376, $P = 0.007$.

Table 6. Determining the factors affecting the physical activity level

Factors	b (95% confidence interval)	Beta	*P* value
Attack severity (NPRS)	–0.006 (–0.093 to 0.081)	–0.009	0.890
Attack frequency (day/month)	0.016 (–0.006 to 0.038)	0.088	0.160
Attack duration (min)	0.004 (–0.015 to 0.024)	0.029	0.644
MIDAS score	0.002 (–0.004 to 0.008)	0.046	0.461
ASC score	0.012 (–0.016 to 0.040)	0.055	0.382

Response variable: International Physical Activity Questionnaire (IPAQ-7) with logarithmic transformation.
b: regression coefficient, Beta: standardized beta coefficient, NPRS: Numeric Pain Rating Scale, MIDAS: Migraine Disability Assesment Scale, ASC: Allodynia Symptom Checklist.

Kinesiophobia has the potential to prevent participation in physical activity, which can be important in management of migraine. Therefore, the presence of kinesiophobia in migraine patients should be taken into account by clinicians and the therapeutic decisions should be evaluated from this aspect as well.

Currently, it is recommended that kinesiophobia be approached in a larger perspective than simply as "fear of pain". Kinesiophobia is considered to be mainly caused by biological and psychological factors [8,10]. Additionally, central sensitization has recently been highlighted as a mechanism that may contribute to the development of fear-avoidance behaviors [9]. Benatto et al. [10] stated that kinesiophobia in individuals with migraine is positively associated with increased CA severity. Similarly, in the present study, it was found that the severity of CA was associated to kinesiophobia in a different population.

Furthermore, advanced age, low education levels, increased pain intensity, low self-efficacy, and emotional issues were identified as risk factors for kinesiophobia in some disease groups (knee problems and chronic low back and neck pain) [33,34], whereas no study examined risk factors of kinesiophobia in individuals with migraine. In the present study, it was seen that attack frequency, duration, and the presence of CA were risk factors for kinesiophobia in migraine patients. Additionally, kine-

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siophobia was about 5 times higher in migraine patients with CA than in those without CA. Given that the majority of individuals in this study had CA symptoms, it is feasible that CA, which is a common symptom of neural sensitization, causes migraine sufferers to engage in misbehaviors such as avoidance or fear of activity. Furthermore, protracted and frequent attacks can amplify this cycle. In this regard, it may be useful for clinics to considerthat kinesiophobia and CA are related in migraine patients and that patients with CA are more prone to developing kinesiophobia.

CA and GIS symptoms are common in individuals with migraine [13,14,35]. It is known that especially central sensitization has been attributed to a variety of gastrointestinal and extraintestinal symptoms. Midenfjord et al. [36] found that the presence and severity of central sensitization were associated with GIS symptoms. Furthermore, according to Tietjen et al. [15], the presence of CA, linked to central sensitization, is associated with anxiety, depression, fibromyalgia, chronic fatigue syndrome, and IBS. In the present study, it was also seen that there was a correlation between CA and the GIS symptoms such as abdominal pain, indigestion, and constipation in migraine sufferers. These findings may be due to the common pathophysiological mechanisms of CA and GIS symptoms. However, no association was found between CA severity and the intensity of some GIS symptoms (diarrhea andreflux). As a consequence, the association between CA and GIS in migraine is quite complicated, and many various factors, such as migraine type and chronicity, may affect the authors' findings. Further studies are needed to evaluate different migraine groups in this aspect.

Additionally, age, being female, wrong eating habits, low physical activity, anxiety, insomnia, and cigarette-alcohol consumption are among the risk factors for GIS symptoms [37,38]. Although GIS symptoms are common in migraine sufferers [14], no report on risk factors for GIS symptoms in migraine exists. The present study found that attack frequency and CA were risk factors for GIS symptoms, with CA being the most influential variable. As a result of the present study, it was once again shown that CA is a significant symptom to consider in migraine.

In the literature, it was reported that migraine sufferers exhibited less physical activity not only during attacks but also between attacks [39]. It still remains unclear whether low physical activity is a consequence or a cause of migraine [40]. In the present study, similar to the literature, only 12.5% of individuals with migraine were found to be physically active. Many variables including biological, psychological, cultural, and social factors might influence the level of physical activity [41]. Additionally, it is remarkable that more than half of the individuals participating in this study had kinesiophobia. The fear of moving may have affected the physical activity levels of migraine sufferers.

During a migraine attack, worsening of headaches with routine physical activities that increase intracranial pressure is a common sign of peripheral sensitization [42]. In fact, the majority of those who reported activity-induced migraine attacks stated that they quit exercising in order not to trigger their attacks [20]. Such intracranial hypersensitization involves sensitization of the nociceptors that innervate the meninges [42]. Some migraine symptoms have been related to CA, which is caused by the sensitization of neurons, receiving pain impulses from intracranial and extracranial structures [7,43]. However, to the best of the authors' knowledge, no study has investigated the relationship between CA and physical activity in migraine sufferers. According to the findings in this study, there was no relation between the severity of CA and physical activity level. These results may have stemmed from the evaluation of physical activity level by subjective methods. Additionally, multiple factors such as physical, psychological, and social may affect the level of physical activity [41]. The present study was conducted during the COVID-19 pandemic. Therefore, the procedures such as social isolation and quarantine during the pandemic may potentially have had an impact on the results. In the future, it is recommended that this issue be explored in a more detailed context.

CA is common in patients with migraines and associated with migraine progression. The chronicity of migraine can also negatively affect disability [7,23]. In addition, it was reported that CA exerts some effect on disability independent of pain itself, and this relationship is partially driven by stress [44]. In the present study, it was also found that there was a correlation between CA and migraine-related disability. Therefore, the correlation between CA and disability in migraine patients should be taken into account by clinicians and these parameters should be evaluated in the management of migraine.

There were a few limitations in this study. Firstly, valid and reliable subjective assessment methods (IPAQ-7 *etc.*) were used in this study. Further studies can use more objective assessment methods (pedometer, accelerometer *etc.*). Secondly, in this study no classification was made between different types of migraine. Whether the results that were obtained change between migraine types (episodic and chronic migraine, *etc.*) should also be investigated in the future studies. Finally, solely the presence of CA, pain characteristics, and disability status were used to assess the variables that affect kinesiophobia, GIS symptoms, and physical activity level in migraine sufferers. In future studies, it may be useful to look into the effects of other variables on kinesiophobia, GIS symptoms, and physical activity levels in migraine sufferers, because migraine has a multifactorial pathogenesis.

As a result of this study, it was found that there was a relationship between CA severity and kinesiophobia, GIS symptoms, and disability in individuals with migraine, whereas there was no correlation between CA and physical activity level. Additionally, CA and attack frequency were found to be risk factors for kinesiophobia and GIS symptoms. Migraine patients with CA should be assessed in terms of kinesiophobia, GIS and disability. Moreover, lifestyle changes such as exercise and dietary changes and/or pharmacological treatment options for CA may increase success in migraine management.

DATA AVAILABILITY

Data files are available from Harvard Dataverse: https://doi.org/10.7910/DVN/CNQUDK.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

Hafize Altay: Project administrantion; Seyda Toprak Celenay: Study conception.

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