Head & Face Medicine

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Relationship of myofascial trigger points with related disability, anxiety, and depression in patients with migraine headaches

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Abstract

Background Migraine affects one in ten individuals worldwide and is the second leading cause of disability. Studies have shown an association between migraine and the musculoskeletal system, and myofascial trigger points (MTrPs) play an essential role. Additionally, those with myofascial pain have been proven to experience higher levels of depression and anxiety. Understanding the association between MTrPs and migraine is crucial for developing targeted treatment strategies. Additionally, recognizing the link between MTrPs and migraine-related depression and anxiety underscores the importance of a holistic approach to migraine management. By addressing both musculoskeletal and neurological factors, healthcare providers can provide more effective and personalized care for migraine patients. This study aims to determine the association between MTrPs with migraine-related disability, anxiety, depression, and migraine characteristics.

Methods This cross-sectional study included 68 migraine patients from an outpatient neurology clinic. The number of MTrPs was determined through examination by an experienced neurologist during a migraine-free period using the recommended international criteria. We evaluated anxiety and depression with the Hospital Anxiety and Depression Scale (HADS) and disability with the Migraine Disability Assessment Scale (MIDAS).

Results We enrolled 68 patients (22 males) with a mean age of 36.23 ± 9.63 years. The mean number of MTrPs was 2.75 ± 2.934. MTrPs were positively correlated with severity (CC: 0.576, *P*-value < 0.001). There was no association between MTrPs and HADS-D or MIDAS, but migraine patients with abnormal HADS-A scores had more MTrPs than patients with normal HADS-A scores (0.6 ± 0.84 vs 3.56 ± 3.11, *P*-value:0.013).

Conclusions The number of MTrPs is associated with higher anxiety levels and headache intensity. Further research could investigate the impact of MTrP-based therapies on anxiety among individuals suffering from migraines.

Keywords Migraine, Myofascial trigger point, Anxiety, Depression, Disability

Background

Migraine is a disabling disorder generally defined as a unilateral pulsating headache associated with photophobia, phonophobia, or nausea [1]. A large sample-sized multi-continent meta-analysis showed that the global prevalence of migraine is 11.6%, which means that one in ten people worldwide suffers from migraine [2]. Additionally, approximately 70% of patients referred to headache specialists suffer from migraine [3].

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Migraine impacts the quality of life of patients [4], and it is the second-highest cause of disability worldwide [5] and the leading cause of disability in women [6]. This disability (functional, physical, work-related, emotional, and financial disabilities) is related to the severity and frequency of headaches [4–9].

Studies have shown that neck pain is prevalent in patients with migraines [10, 11]. Moreover, there is an association between migraine and musculoskeletal system disorders [10, 11], and trigger points (TrPs) play an essential role in this association [12]. Addressing this relationship is crucial from both clinical and diagnostic perspectives. Recognizing neck pain as a frequently associated symptom of migraine could enhance diagnostic accuracy and streamline the time to treatment.

While migraines are indeed considered primary headaches with neurological origins, recent research, as suggested by Simon et al. has shed light on the potential role of musculoskeletal factors, particularly myofascial trigger points (MTrPs), in migraine pathophysiology. MTrPs are sensitive localized points in taut bands of muscles, for example, the trapezius and sternocleidomastoid muscle fibers, and they are associated with migraine [12–14]. TrPs can stimulate the trigeminocervical nucleus, causing migraine headaches [12–14]. Stimulation of an MTrP can have three possible outcomes; it can cause a headache (Active MTrP) or a local/radiating pain (Latent MTrP), and it can also cause neither (no trigger) [13].

Research suggests a complex interplay between migraine, anxiety, stress, and myofascial trigger points (TrPs), yet the exact nature of these relationships remains to be fully elucidated. Previous studies have shown that patients with myofascial and temporomandibular joint pain experienced depression, stress, and anxiety more than healthy individuals [15]. Concurrently, patients with depression and anxiety are more likely to experience muscle tenderness [16]. These findings may support the fact that higher stress and anxiety levels are associated with higher active TrPs in migraine patients. [17]. Palacios-Cena et al. demonstrated a positive association between stress, anxiety, and the presence of active TrPs in patients with tension headaches [18]. However, the specific connection between anxiety disorders and active TrPs in patients with migraines remains relatively unexplored.

This study investigates the relationship between MTrPs and migraine characteristics, migraine-related disability, anxiety, and depression in patients with migraines.

Methods

Participants

This is a cross-sectional study based on 68 patients randomly selected from the neurology outpatient clinic of [redacted for anonymization] in Tehran, Iran, in 2020. The sample size was calculated based on a migraine prevalence of approximately 14% in our society, as reported by Farhadi et al. [19], with a significance level (α) of 0.05, a margin of error of 0.087, and an attrition rate of 10%, the calculated sample size required was approximately 68 participants. We enrolled patients with a diagnosis of migraine based on the third edition of the International Headache Society criteria (IHS) [1] by an experienced neurologist. We excluded patients with any other types of headaches, head and neck trauma, cervical disc herniation, cervical osteoarthritis, medication overuse headaches, systemic lupus erythematosus, rheumatoid arthritis, fibromyalgia, having a neural blockade in the last six months, and pregnant patients. All the study participants provided written informed consent before enrollment. All methods were performed in accordance with the relevant guidelines and regulations (Declaration of Helsinki) and approved by the Ethics Committee of the Tehran University of Medical Sciences (Ethics Code: IR.TUMS.IKHC.REC.1397.276).

Headache characteristics

We asked the patients about their headache characteristics in the last three months, including the number of days with headache, headache severity on a scale of 0 (no pain) to 10 (maximum pain) with a score of ≥ 7 considered as severe, affected site, duration of each attack, and the medications they used.

Myofascial trigger points

To find myofascial trigger points, an experienced neurologist examined the patients in a migraine-free period using the recommended criteria of a Delphi study by Fernández-de-Las-Peñas et al. [20], which was palpable Taut band, having hypersensitive spot, referred pain, or a local twitch response.

Migraine Disability Assessment (MIDAS) Questionnaire

The MIDAS questionnaire captures the missed days of work, school, or chores with 17 questions. The MIDAS score divides patients into the 4-point grading system, including grade I (0 to 5 scores) with little or no disability, grade II (6 to 10 scores) with mild disability, grade III (11 to 20 scores) with moderate disability, and grade IV (21 or greater) severe disability. We employed the Iranian version of the Migraine Disability Assessment Questionnaire validated by Zandifar et al. [21]

Hospital Anxiety and Depression Scale (HADS)

The HADS questionnaire contains 14 items and consists of two parts, one for measuring anxiety (HADS-A) and one for measuring depression (HADS-D). Each item is

rated on a four-point scale, with a maximum score of 21 for anxiety and depression. Scores between 0 and 7 are considered normal, 8, 9, and 10 are considered borderline, and scores higher than 11 represent a significant case of psychological morbidity. We employed the Iranian version of the Hospital Anxiety and Depression Scale validated by Montazeri et al. [22].

Statistical analysis

All statistical analyses were conducted using SPSS software. We used the mean and standard deviation for reporting quantitative variables and the frequency and relative frequency for reporting qualitative variables. The Mann–Whitney test was used to find a statistically significant difference between two unrelated groups. The Kruskal–Wallis test was used to compare several non-normally distributed groups. We used multiple linear regression to find the relationship between the number of MTrPs and HADS or MIDAS scores and Spearman correlation to find the relationship between the number of MTrPs and migraine characteristics after accounting for confounding variables such as sex, age, education, marital status, and occupation. P values < 0.05 were considered statistically significant.

Results

Patients

We enrolled 68 patients with migraine, consisting of 22 (32.4%) males and 46 (67.6%) females. The mean age was 36.23 ± 9.63 years, ranging from 16 to 62 years old. Out of 68 patients, 26 patients had episodic migraine, and 42 had chronic migraine. The mean severity of migraine was 8.05 ± 1.91, ranging from 4 to 10. The mean number of headaches in a month was 10.01 ± 5.50, and the mean headache duration was 28.26 ± 18.55 h, with a range of 2 to 72 h. The mean number of MTrPs was 2.75 ± 2.934, ranging from 0 to 10, with a median of 2 (IQR: 5). Table 1 shows the demographic and clinical characteristics of the study participants. Thirty-five patients were taking a prophylactic agent. However, there was no significant difference between HADS -A, HADS-D, and MIDAS scores regarding taking a prophylactic agent (P values = 0.902, 0.054, and 0.443, respectively).

Anxiety, depression, and disability related to migraine headache

The mean score for HADS-A was 11.86 ± 4.03, ranging from 4 to 21. A total of 14.7% of patients had normal HADS-A scores, 27.9% had borderline HADS-A scores, and 57.4% had significantly abnormal HADS-A scores.

The mean score for HADS-D was 8.92 ± 3.73, ranging from 2 to 20. A total of 35.3% of patients had normal HADS-D scores, 39.7% had borderline HADS-D scores, and 25% had significantly abnormal HADS-D scores.

The mean MIDAS score was 23.44 ± 18.34, ranging from 3 to 70. A total of 14.7% of patients had little or no disability related to migraines, 17.6% experienced mild disability, 17.6% experienced moderate disability, and 50% of patients experienced severe disability related to migraines (Table 1).

Relationship of myofascial trigger points with anxiety

We found that the number of MTrPs can predict the HADS-A score after accounting for confounding variables such as sex, age, education, marital status, and occupation (standardized beta coefficient = 0.467, P value = 0.0002), and the number of MTrPs can explain 17.8% of the total variation in the HADS-A score.

Patients with abnormal HADS-A scores had more MTrPs than patients with normal HADS-A scores (P value = 0.015, Table 1). At the same time, there was no significant difference in the number of MTrPs in patients with borderline HADS-A and the other two groups (normal vs. borderline: P value = 0.446, borderline vs. abnormal: P value = 0.362).

Relationship of myofascial trigger points with depression

Our study showed that the number of MTrPs can predict the HADS-D score after accounting for confounding variables such as sex, age, education, marital status, and occupation (standardized beta coefficient = 0.269, P value = 0.020), and the number of MTrPs can explain 5.9% of the total variation in the HADS-D score. There was no significant difference in the number of MTrPs between the normal HADS-D, borderline HADS-D, and abnormal HADS-D groups.

Relationship of myofascial trigger points with migraine-related disability

We found that unlike HADS, the number of MTrPs cannot predict the MIDAS score after accounting for confounding variables such as sex, age, education, marital status, and occupation (standardized beta coefficient = 0.236, P value = 0.072), and there was no significant difference in the number of MTrPs between the four grades of MIDAS.

Relationship of myofascial trigger points with migraine characteristics

Patients with severe migraines had more MTrPs than patients with moderate migraines (P value < 0.0001). MTrPs had a positive correlation with migraine severity score (correlation coefficient: 0.576, P value < 0.001), while there was no significant difference in the number of MTrPs regarding chronic or episodic migraine, unilateral

Table 1 Characteristics and outcomes in patients with migraine and their relationship with the number of myofascial trigger points

Variables	Value[1]	N of MTrPs[2, 3]	*p* value
General characteristics			
Gender, Male	22 (32.4)		
Age, years	36.23 ± 9.63		
Marital status, Married	57 (83.8)		
Education			
Highschool	12 (17.6)		
Diploma	27 (39.7)		
Associate degree	7 (10.3)		
Bachelor	18 (26.5)		
Master	4 (5.9)		
Occupation			
Housewife	28 (41.2)		
Freelancer	19 (27.9)		
Employee	15 (22.1)		
Nurse	4 (5.9)		
Student	2 (2.9)		
Migraine characteristics			
Migraine type			0.149
Episodic	26 (38.2)	1.85 ± 2.11, 1.5 (2)	
Chronic	42 (61.8)	3.31 ± 3.24, 2.5 (6)	
Affected side			0.905
Unilateral	24 (35.3)	2.92 ± 3.29, 2 (6)	
Bilateral	44 (64.7)	2.66 ± 2.75, 2 (5)	
Migraine severity	8.05 ± 1.91		< 0.001*
Migraine severity groups			< 0.001*
Moderate	16 (23.5)	0.5 ± 0.89, 0 (2)	
Severe	52 (76.5)	3.44 ± 2.99, 2.5 (6)	
Migraine duration, hours	28.26 ± 18.55		0.114
N of migraine attacks in a month	10.01 ± 5.50		0.575
Outcomes			
HADS-A[4] score	11.86 ± 4.03		< 0.001*
HADS-A groups			0.013*
Normal	10 (14.7)	0.6 ± 0.84, 0 (1)	
Borderline	19 (27.9)	2.21 ± 2.63, 2 (4)	
Abnormal	39 (57.4)	3.56 ± 3.11, 4 (6)	
HADS-D[5] score	8.92 ± 3.73		0.020*
HADS-D groups			0.108
Normal	24 (35.3)	2.29 ± 2.88, 1 (5)	
Borderline	27 (39.7)	2.22 ± 2.24, 2 (5)	
Abnormal	17 (25)	4.24 ± 3.58, 5 (5)	
MIDAS[6] score	23.44 ± 18.34		0.072
MIDAS groups			0.447
No disability	10 (14.7)	2 ± 1.76, 2 (2)	
Mild disability	12 (17.6)	2 ± 2.33, 1 (5)	
Moderate disability	12 (17.6)	2 ± 2.25, 2 (4)	
Severe disability	34 (50)	3.5 ± 3.45, 2.5 (6)	

[1] Categorical variables are presented as N (%), and quantitative variables are presented as the mean ± SD

[2] Data are presented as the mean ± SD, median (IQR)

[3] Myofascial trigger points

[4] Hospital Anxiety and Depression Scale-Anxiety

[5] Hospital Anxiety and Depression Scale-Depression

[6] Migraine Disability Assessment

[*] Significant *p*-value

or bilateral migraine, the number of migraine attacks in a month, and migraine duration (Table 1).

Relationship of anxiety, depression, and migraine-related disability with migraine characteristics

Patients with chronic migraines had higher HADS-A, HADS-D, and MIDAS scores than those with episodic migraines (P value ≤ 0.001, 0.003, 0.002, respectively). Patients with bilateral migraines had higher MIDAS scores than patients with unilateral migraines (P value ≤ 0.001). Moreover, patients with severe headaches had higher MIDAS scores than patients with moderate headaches (P value $= 0.023$, Table 2).

When we controlled for age, sex, marital status, education, and occupation to determine the relationship between HADS-A, HADS-D, MIDAS and migraine severity, migraine duration, and the number of migraine attacks, we found that the only significant correlations were between migraine duration and MIDAS score (P value $= 0.047$) and between the number of migraine attacks and HADS-A and HADS-D scores (P value $= < 0.001$, 0.004, respectively). There was also a positive correlation between migraine severity and HADS-A and MIDAS scores (P value $= 0.018$ and 0.003, respectively, Table 3).

Discussion

Migraine is a chronic neurological disorder characterized by mild to severe attacks of headache with reversible systemic and neurologic symptoms [1], and it impacts patients' quality of life [4].

We found that MTrPs were positively correlated with headache severity. We found no association between MTrPs and HADS-D or MIDAS, but the number of MTrPs was associated with higher anxiety levels.

Studies have shown a relationship between migraine and the musculoskeletal system [10, 11]. In 2006, Fernandez-de-las-Penas et al. [12] examined the trigger points and neck movements in unilateral migraines. This study found that people with migraines have more active TrPs than healthy people, but there is no difference between the two groups regarding latent TrPs.

Table 2 Relationship of anxiety, depression, and migraine-related disability with migraine characteristics

Migraine characteristics	HADS-A[1]		HADS-D[2]		MIDAS[3]	
	Median (IQR)	*P* value	Median (IQR)	*P* value	Median (IQR)	*P* value
Migraine types		< 0.001*		0.003*		0.002*
Episodic	9 (4)		7.5 (2)		15 (19)	
Chronic	14 (5)		9 (5)		24 (34)	
Effected side		0.515		0.287		< 0.001*
Unilateral	12.5 (6)		7 (9)		10 (12)	
Bilateral	11.5 (6)		8 (4)		24.5 (20)	
Migraine severity groups		0.063		0.539		0.023*
Moderate	9.5 (5)		8 (3)		10 (7)	
Severe	13 (17)		8 (4)		24 (20)	

[1] Hospital Anxiety and Depression Scale-Anxiety

[2] Hospital Anxiety and Depression Scale-Depression

[3] Migraine Disability Assessment

* Significant *p*-value

Table 3 Relationship of anxiety, depression, and migraine-related disability with migraine characteristics

Migraine characteristics	HADS-A[1]		HADS-D[2]		MIDAS[3]	
	CC[4]	*P*value	CC[4]	*P* value	CC[4]	*P* value
Migraine severity	0.297	0.018*	0.246	0.052	0.372	0.003*
Migraine duration	0.007*	0.956	0.009*	0.944	0.251	0.047*
N of migraine attacks	0.624	< 0.001*	0.359	0.004*	0.033*	0.799

[1] Hospital Anxiety and Depression Scale-Anxiety

[2] Hospital Anxiety and Depression Scale-Depression

[3] Migraine Disability Assessment

[4] Correlation coefficient

* Significant *p*-value

In 2017, Palacios-Cena et al. examined the association between TrPs and pain sensitivity in women with episodic migraines. The number of active TrPs (rather than latent TrPs) was negatively correlated with the pressure pain threshold. This suggests that active TrPs may play an important role in migraine sensitization processes [18].

The mean number of myofascial trigger points was 2.75 in our study, 3.6 in the Fernández et al. study [12], 6.9 in the Ferracini et al. study in 2016 [23], and 4.3 for episodic migraine and 4.8 for chronic migraine in the Ferracini 2017 study [17]. This disparity could be attributed to the fact that the samples in these studies had different characteristics, like more patients with severe migraine.

We investigated the relationship between MTrPs and migraine characteristics, and the only significant association between the number of MTrPs and migraine features was a positive correlation between MTrPs and migraine severity. Conversely, in two prior research studies, Ferracini et al. discovered no relationship between MTrPs and migraine severity [17, 23]. In individuals with tension-type headaches, however, Fernández et al. reported an association between the presence of MTrPs and headache intensity [24]. Knowing this could be important because we could focus on treatments based on myofascial trigger points when dealing with more severe migraines.

We discovered no correlation between MTrPs and migraine duration or frequency. This finding agrees with two earlier studies by Ferracini et al. [17, 23] but is in discord with Calandre et al. [25]. This discrepancy highlights the complexity of the relationship between MTrPs and migraine and underscores the need for further research to elucidate the underlying mechanisms.

Several studies have investigated the association between TrPs and anxiety. Palacios-Cena et al. investigated the relationship between active TrPs and anxiety, depression, and the level of disability in patients who suffer from tension-type headaches. The number of active TrPs is associated with anxiety [18]. In a study published in 2019, Mendez-Cigaran et al. discovered an association between the number of activated TrPs and anxiety in women with tension headaches. These observations agree with our findings, which indicated that the number of MTrPs was higher in migraine patients with anxiety [26]. Studies have also shown that anxiety levels can influence the physiological recovery of the muscles engaged in MTrPs [18], supporting our findings. This could indicate that patients with anxiety could benefit from treatments based on myofascial trigger points.

There has also been research on the association between TrPs and depression. According to our data, the number of MTrPs in patients with abnormal HADS-D scores did not differ significantly from that in patients with normal HADS-D scores. This conclusion is consistent with Palacios-Cena et al. [18], who found no correlation between TrPs and depression in patients with tension headaches, and Hasuo et al. [27], who found no association between depression and the number of TrPs in healthy adults but did discover a relationship between alexithymia and TrPs. Despite these findings, Celik et al. [28] reported a correlation between TrPs and depression severity in healthy individuals. This disparity could be attributed to the relatively low representation of patients exhibiting abnormal HADS-D and MIDAS scores in our study cohort. Future investigations may benefit from exploring this aspect in greater detail to provide a more comprehensive understanding of its implications.

The results of our study showed that the number of MTrPs was not significantly different between the four groups of MIDAS (no disability, mild disability, moderate disability, and severe disability). Ferracini et al. [17] conducted a 2017 study to examine head and neck TrPs in 143 female patients with migraines. Similar to our findings, this study showed no relationship between the number of TrPs and migraine-induced disability. Although Ferracini [17] and we found no association between MTrPs and MIDAS, randomized trials showed that repetitive peripheral magnetic stimulation (rPMS, a therapy based on MTrPs) helped improve MIDAS [29, 30]. This could be related to the fact that both our study and Ferracini's study used a cross-sectional study design.

These findings could also hold significant clinical relevance. When encountering a migraine patient with severe anxiety, it becomes imperative to consider examining MTrPs as part of the assessment. Additionally, suggesting MTrP-based treatments such as physical therapy or relaxation techniques tailored to address both migraine symptoms and associated anxiety can potentially yield more effective outcomes.

More research with higher levels of evidence and larger sample sizes is needed to establish an association between MTrPs and migraine headaches. Future research confirming this association suggests that migraine treatment techniques based on MTrPs could be helpful, especially in patients suffering from more severe migraines.

One limitation of this study is the small sample size. The other limitation is that patients were recruited from a single outpatient neurology clinic and this may introduce selection bias, as individuals seeking treatment might exhibit different characteristics compared to the general population. The small number of patients with mild and moderate migraines is another limitation of our study. Further studies could include a larger sample size, more centers, and more patients with mild and moderate migraines. Further research on the relationship between anxiety, depression, disability, and myofascial trigger points (MTrPs) in migraine patients would greatly benefit

from including a diverse representation of individuals with varying degrees of anxiety, disability, and depression. Ensuring a balanced ratio of migraine patients with and without severe anxiety, disability, and depression will enhance the validity and generalizability of the findings. Additionally, it's crucial to consider the temporality between headache episodes and the timing of MTrP examination to accurately assess their association and potential causal relationship.

Conclusions

MTrPs are found in migraine patients, and a higher number of MTrPs was associated with anxiety and migraine severity. There was no association between the number of MTrPs and any other migraine characteristics, MIDAS scores, or depression.

Abbreviations

HADS-A	Hospital Anxiety and Depression Scale-Anxiety
HADS-D	Hospital Anxiety and Depression Scale-Depression
MIDAS	Migraine Disability Assessment
MTrPs	Myofascial trigger points
TrPs	Trigger points

Acknowledgements

We thank the patients and their families for their cooperation.

Authors' contributions

Conceptualization: SR and A.T Methodology: SR, AT, and GF. Software: HR. Analysis: HR, AB, and A.Z. Resources: S.R. and A.T. Data curation: HR. Original draft preparation: AB and AZ. Review and editing: all authors. Supervision: SR, AT, and GF. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Oral informed consent was obtained from all participants. The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Tehran University of Medical Sciences (Ethics Code: IR.TUMS.IKHC.REC.1397.276).

Consent for publication

Not applicable.

Competing interest

The authors declare no competing interests.

Received: 5 December 2023 Accepted: 28 August 2024
Published online: 05 September 2024

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