



The Relationship Between the Presence of Allodynia and Pain Acceptance and Somatosensory Amplification in Patients with Migraine

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Abstract

Aim: Allodynia is a pain disorder that adversely affects the prognosis of migraine and reduces the quality of life of patients with migraine. Thus, the study evaluated the relationship between the presence of allodynia and psychiatric aspects such as somatosensory amplification and pain acceptance in patients with migraine.

Methods: The participants diagnosed with migraine who applied to the neurology outpatient clinic between October and December 2020 were included in this observational study. Structured Clinical Interview for DSM-V, Migraine Disability Assessment Questionnaire, Visual Analogue Scale, Allodynia Symptom Checklist-12, Beck Anxiety Inventory, Beck Depression Inventory, Somatosensory Amplification Scale, Chronic Pain Acceptance Questionnaire, and Acceptance and Action Questionnaire-II were applied to the patients.

Results: Eighty-one patients aged 18-65 years were included. Allodynia was found in 50 patients (62%). There was mild allodynia in 18 patients, moderate allodynia in 14 patients, and severe allodynia in 18 patients. The number of analgesics used in a month was higher in patients with allodynia than without allodynia ($p=0.038$). Somatosensory Amplification Scale scores were found to be higher in migraine patients with severe allodynia than in mild allodynia ($p=0.029$).

Conclusion: The presence of allodynia causes a more analgesic use in patients. Patients with severe allodynia are more aware of bodily sensations than mild severity. Allodynia does not make a difference in the levels of pain acceptance and willingness. This study will contribute to other studies in the context of acceptance and commitment in patients with migraine patients.

Keywords: Hyperalgesia, pain, migraine disorders, analgesics

Introduction

Migraine is a chronic neurological disease that affects 12-17% of people every year as the most common cause of disability in the worldwide (1). The rate of allodynia during headache attacks in patients with migraine is close to 80% (2). Lipton et al. (3) reported that the prevalence of allodynia in migraineurs is 63.2%, and it is severe in approximately one-third of the patients. Somatosensory amplification is an exaggeration of bodily sensations related to the somatization mechanism. Barsky (4) defined it as "experiencing various

somatic and visceral sensations as intense, damaging, and disturbing". Somatosensory amplification makes it difficult for patients who have chronic pain to cope with pain and comorbid psychiatric disorders (5).

Pain acceptance includes taking a realistic approach to pain and pain-related events and participating in positive activities without struggling with pain (6). Pain acceptance plays a substantial role in the mental and physical well-being of patients who have chronic pain disorders (7). Low pain acceptance is associated with susceptibility to depression, functionality, and low quality of life (8).

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Acceptance and value-based approaches and interventions come to the fore to improve functionality recently. The migraine treatment guide published by the American Headache Society in 2021 stated that relaxation therapies, mindfulness-based therapies, and acceptance and commitment therapy as biobehavioral treatments may also be suitable for acute and preventive treatments besides somatic treatments (9). Based on all these, we explored allodynia and its effects on headache severity, disability, depression and anxiety symptom severity, pain acceptance, and psychological flexibility in patients with migraine in this study.

Materials and Methods

Compliance with Ethical Standards

The Clinical Research Ethics Committee of University of Health Sciences Turkey, Haydarpaşa Numune Training and Research Hospital, approved the study (approval no: 2020/237, date: 09.11.2020). Informed consent was obtained from the patients.

Study Design

Between October and December 2020, 100 patients between the ages of 18 and 65 who were diagnosed with migraine at the neurology outpatient clinic were included in the study. A psychiatrist examined the participants using the Structured Clinical Interview for DSM-V (SCID-V). We excluded nineteen participants with a history of organic brain disorders, psychotic disorders, mood disorders, alcohol and substance use disorders, mental retardation, and dementia from the study because their reasoning was insufficient. Socio-demographic and clinical data forms created by the researchers, Migraine Disability Assessment Questionnaire (MIDAS), Visual Analogue Scale (VAS), Allodynia Symptom Checklist (ASC), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), Somatosensory Amplification Scale (SSAS), Chronic Pain Acceptance Questionnaire (CPAQ-8), Acceptance and Action Form (AAQ-II) applied to 81 participants.

Structured Clinical Interview for DSM-V

It is a scale that includes exploratory questions consisting of 10 modules and 32 diagnostic categories, in which the clinician evaluates the participants' psychopathologies in detail. It contains questions about psychotic symptoms, psychotic disorders, mood disorders, substance use disorders, anxiety disorders, obsessive-compulsive disorders, traumas and stress-related disorders, neurodevelopmental disorders, and others. The reliability study has been performed in Turkish (10).

Migraine Disability Assessment Questionnaire

The MIDAS is a self-report scale designed to measure the migraine-related loss of function. The items assessed

the number of days in the past three months that are reduced or no housework and non-work activities due to migraine attacks. Two additional questions measure the number of headache days in a month and the average pain severity. Turkish translation, validity, and reliability studies were performed on this scale (11).

Visual Analogue Scale

The VAS is a 10 cm line drawn on the horizontal plane on paper. On this scale, the patients score the pain between 0-10 points in their experience (12). In this study, patients were asked to determine the average pain intensity felt during a migraine attack on this chart.

Allodynia Symptom Checklist

It is a self-report scale that consists of 12 questions; a total of 0-24 points is obtained with 0 (I have never done this, never, rarely), 1 (less than half), and 2 (more than half) points given to the questions. Scores between 0-2 are considered without allodynia, 3-5 are considered mild, 6-8 are moderate, and 9 and above are severe allodynia. This scale has an validity and reliability study in Turkish (13).

Beck Anxiety Inventory

It is a self-report scale that evaluated 21 body symptoms due to anxiety and the severity of the symptoms. A Turkish validity and reliability study were performed on this scale (14).

Beck Depression Inventory

The BDI is a 21-items self-report questionnaire designed to measure the somatic, emotional, cognitive, and impulsive symptoms of depression. A Turkish validity and reliability study was conducted (15).

Somatosensory Amplification Scale

The SSAS has 10 items that explore a range of disturbing bodily sensations people experience. The exaggeration/enlargement score was obtained with the sum of all items. A Turkish validity and reliability study has been established (5).

Chronic Pain Acceptance Questionnaire

It is a 20-item self-report scale developed in chronic pain populations to assess the acceptance of pain. The scale includes two subscales: activity engagement and pain willingness. The high total score indicates the individual's high level of pain acceptance. The Turkish validity and reliability of the scale were performed (16).

Acceptance and Action Form

It is a 7-item Likert-type scale that measures the level of psychological inflexibility. The higher total score obtained from the scale showed higher psychological rigidity. A Turkish validity and reliability study were performed (17).

Statistical Analysis

Statistical analysis was conducted using SPSS 25.0 for Windows (IBM Corporation, Armonk, NY, USA). The Shapiro-Wilk and Kolmogorov-Smirnov tests were used to determine the assumption of normality. Pearson’s chi-square test was used to compare categorical variables between migraineous patients with and without allodynia. Student’s t-test was used for continuous variables between groups. Patients with allodynia were evaluated using One-Way ANOVA and psychiatric tests. Questionnaire correlations were conducted with Pearson’s correlation analysis in the study group. A p-value set at below 0.05 for significance.

Results

There were a total of (n=81) patients, 73 (90.1%) were females and 8 (9.9%) were males in the study group. The findings obtained from the socio-demographic and clinical data form are shown in Figure 1.

The study group was sub-grouped according to the presence of allodynia. Thirty-one patients are non-allodynic, and 50 patients are found allodynic. There was mild allodynia in 18 patients, moderate in 14 patients, and severe in 18 patients. Allodynic patients are more likely to use painkillers monthly than those non-allodynic patients (p=0.038) (Table 1).

The psychiatric tests were evaluated with One-Way ANOVA in patients with allodynia. Severe allodynic patients have higher SSAS scores than mild allodynic patients (p=0.029). The comparison using independent t-test and chi-square test of the questionnaire scores between the allodynic and non-allodynic groups is shown in Figure 2.

Correlative relationships were evaluated in psychiatric scales and socio-demographic data in all patients. As the number of days with headache increases in a month, the pain willingness scores of migraine patients are lower (r=-0.26, p=0.01). Monthly n use increased somatosensory amplification in patients with migraine patients (r=0.22, p=0.04).

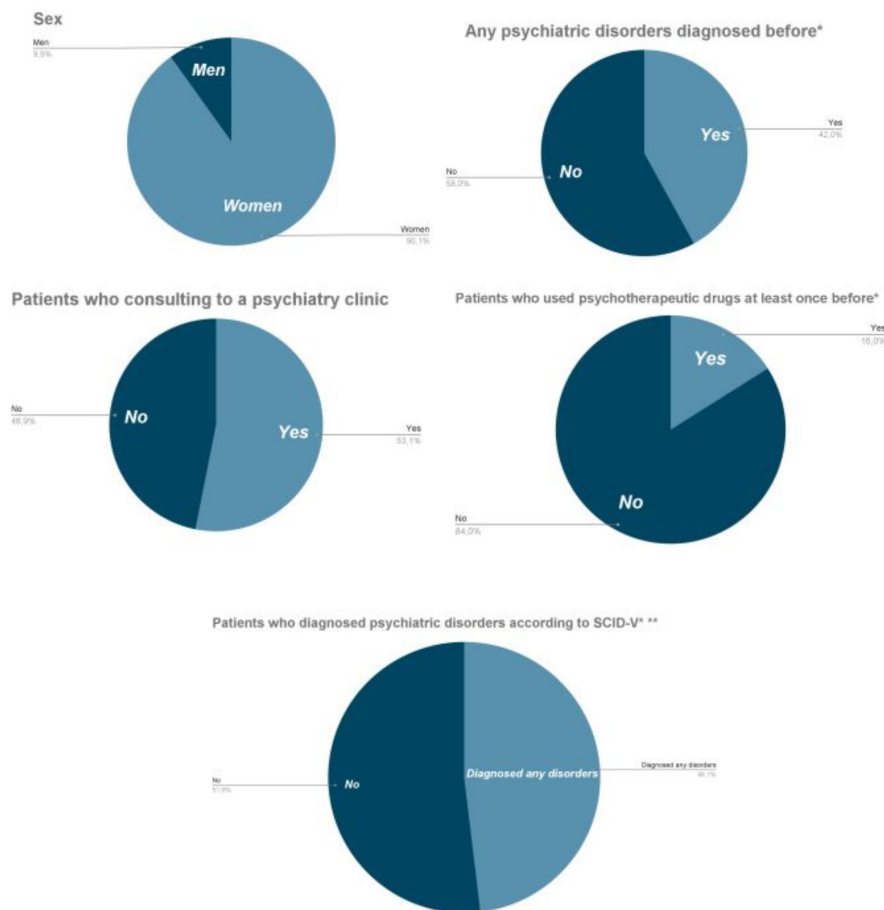


Figure 1. Socio-demographic and clinic data
 *chi-square test was used, **SCID-V: Structured clinical interview for DSM-V

Table 1. Comparing allodynic and non-allodynic migraine patients' features of headaches			
	Allodynia + (n=50)	Allodynia - (n=31)	p-value
Prophylaxy*			
Yes	9-(18)	5-(16.1)	0.540
No	41-(82)	26-(83.9)	
Type of headache*			
Pulsative	45-(90)	25-(80.6)	0.194
Others	5-(10)	6-(19.4)	
Location*			
Unilateral	36-(72)	22-(71)	0.557
Bilateral	14-(28)	9-(29)	
Aura*			
Yes	18-(36)	6-(19.4)	0.088
No	32-(64)	25-(80.6)	
Analgesic using*			
None	4-(8)	4-(12.9)	0.804
NSAID	28-(56)	19-(61.3)	
Others	18-(36)	6-(25.8)	
Migraine onset-age**	22.62±7.01	24.64±8.53	0.249
Migraine duration/years**	10.02±8.75	10.17±7.31	0.934
Attacks in a month**	4.96±3.34	4.09±3.78	0.287
Headache + days in a month**	8.60±6.73	6.29±5.46	0.112
Analgesics using in a month**	12.20±14.85	6.06±8.02	0.038
VAS**	7.64±1.57	7.64±1.45	0.988
MIDAS*			
Grade-1	1-(2)	5-(16.1)	0.082
Grade-2	4-(8)	4-(12.9)	
Grade-3	15-(30)	6-(19.4)	
Grade-4	30-(60)	16-(51.6)	

*chi-square, **independent samples t-test was used. NSAID: Non-steroid anti-inflammatory drugs, VAS: Visual analog scale, MIDAS: Migraine disability assessment questionnaire

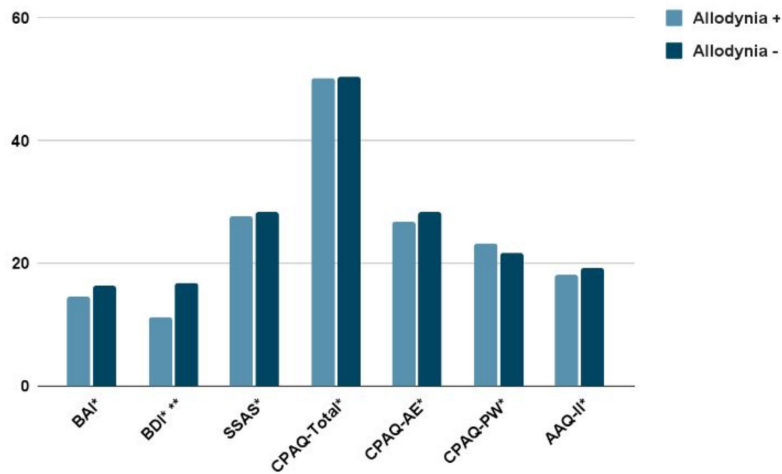


Figure 2. Comparing allodynic and non-allodynic migraine patients' psychiatric questionnaires scores
 *Independent samples t-test was used, **p=0.009. BAI: Beck anxiety inventory, BDI: Beck depression inventory, SSAS: Somatosensory amplification scale, CPAQ-total: Chronic pain acceptance questionnaire-total score, CPAQ-AE: Chronic pain acceptance questionnaire- activity engagement score, CPAQ- PW: Chronic pain acceptance questionnaire-pain willingness score, AAQ-II: Acceptance and action questionnaire

Visual analogue scale scores and clinical test correlations were evaluated. Anxiety and somatosensory amplification levels increase as the VAS score increases ($r=0.23$, $p=0.03$; $r=0.23$, $p=0.03$). It was shown that the level of pain reported by the patients decreased as the pain acceptance and willingness increased ($r=-0.36$, $p=0.001$; $r=-0.29$, $p=0.008$).

Migraine Disability Assessment Questionnaire scores and clinical test correlations were evaluated. Anxiety and somatosensory amplification increase functionality impairment in migraine ($r=0.23$, $p=0.03$; $r=0.25$, $p=0.02$). As the pain willingness, the functionality of the patients increases ($r=-0.25$, $p=0.02$). The correlation of other psychiatric scale results are in Table 2.

Discussion

Allodynia indicates a poor prognosis in patients with migraine; it was predicted that it would be helpful to reveal allodynia and related psychiatric findings (18). Cutaneous allodynia is associated with major depressive disorder and generalized anxiety, and therewithal major depressive disorder is the strongest risk factor for cutaneous allodynia (19). The presence of anxiety and depression in patients with migraine and allodynia is higher than that in patients without allodynia (20). According to this study, allodynia does not make a difference in the levels of anxiety. Allodynic migraine patients are less depressive than those without allodynia. These findings may be related to this study's limited sample.

Two studies are related to somatosensory amplification in patients diagnosed with migraine (21,22). However, no study indicated a relationship between somatosensory amplification and the presence of allodynia. In this study, patients with severe allodynia are more aware of bodily sensations compared with mild allodynia. Although the somatosensory amplification effect of the presence of allodynia has not been demonstrated, its relationship with the severity of allodynia has been demonstrated.

According to the migraine in america symptoms and treatment study, migraine patients with allodynia have more headaches in a month and overuse acute medications compared with those without allodynia (23).

Even if that large sample study gives information about acute drug overusing, there is no research that chronic painkiller/analgesic drug use is related to allodynia in migraine patients. In our study, the presence of allodynia is related to increased painkiller use. This relationship may be related to the high number of monthly headaches, as well as the high incidence of acute overuse.

Higher levels of somatosensory amplification in migraine patients are related to moderate and severe functional loss compared to the minimal and mild loss. The number of migraine attacks in the last three months and somatosensory amplification levels is correlated. It was pointed out that timely evaluation of somatosensory amplification may help improve the quality of life of patients with migraine patients (21). In a study, a positive correlative relationship has been shown between MIDAS, VAS scores, and the level of somatosensory amplification in migraine patients (24). In our study, patients who have migraine-related disability and high levels of headache are more aware of bodily sensations, as shown in other studies. The agreement of our findings with the results of other studies emphasizes the importance of investigating the relationship between somatosensory amplification and the levels of headache and migraine-related disability.

Pain acceptance and value-based actions have not been adequately qualified for migraine. Low pain acceptance is strongly associated with depression and loss of function in patients with migraine patients (25). In a study conducted by participants keeping a diary, patients with high pain acceptance are more likely to participate in activities and use less pain coping strategies (26). Depression and anxiety levels were found to be higher in patients with low pain acceptance and low activity engagement. These results suggest that psychiatric symptoms affects the migraine-related loss of function, in part through willingness and activity participation in pain (27).

Psychological flexibility expresses the willingness to experience internal events as they occur (acceptance) and to engage in behaviors (value-based actions) to achieve greater goals and values (28). Therapeutic interventions designed to promote psychological resilience, particularly

Table 2. Comparing psychiatric questionnaire scores in all migraine patients

	BDI	BAI	AAQ-II
SSAS	$r=0.57$; $p<0.001$	$r=0.60$; $p<0.001$	$r=0.53$; $p<0.001$
AAQ-II	$r=0.65$; $p<0,001$	$r=0.71$; $p<0.01$	
CPAQ-total	$r=-0.36$; $p=0.001$	$r=-0.42$; $p<0.001$	
CPAQ-AE	$r=-0.22$; $p=0.04$	$r=-0.35$; $p=0.001$	
CPAQ-PW	$r=-0.27$; $p=0.01$		

*Pearson's correlation analysis used in all questionnaires. BAI: Beck Anxiety inventory, BDI: Beck depression inventory, SSAS: Somatosensory amplification scale, CPAQ-total: Chronic pain acceptance questionnaire-total score, CPAQ-AE: Chronic pain acceptance questionnaire-activity engagement score, CPAQ-PW: Chronic pain acceptance questionnaire-pain willingness score, AAQ-II: Acceptance and action questionnaire

acceptance and commitment therapy (ACT), seek to improve functioning rather than reduce symptoms. Studies are shown that these interventions lead to improvements in functionality in medical diseases (29). In a multicenter study, according to the results of drug therapy and ACT interventions applied to patients with migraine, it was reported that an integrated and flexible treatment combining different approaches may be more effective than drugs alone in relieving pain and enhancing clinical recovery (30). In our study, the loss of psychological flexibility is related to increased somatosensory amplification, depression, and anxiety levels. These results are valuable in terms of demonstrating the effects of the flexible attitude toward their pain on the exaggerated perception of somatic symptoms, depression, and anxiety levels in patients with migraine patients.

In this study, it was determined that patients with a high willingness to pain and perform their activities despite pain had lower levels of depression. Patients with high pain willingness have lower monthly headache days, loss of functionality, and pain levels. Based on these findings, it is understood that patients with migraine who prefer to accept and continue their responsibilities instead of taking actions such as managing their pain and relieving pain will have positive effects on patients' life.

Study Limitations

There are some limitations to our study. First, although we planned our study before the pandemic, the study was performed during the pandemic period. For this reason, we tried keeping our meetings with our participants as quick and short as possible. Second, due to the limitation created by the pandemic, we have limited the number of patients. The questionnaires in which we investigated psychiatric symptoms were based on self-report and there may have been a limitation due to this. Finally, as the pain itself is a self-reported condition, we think that our study may have limited its data, as in other studies.

In addition to all of these, there are strengths in our study. First, psychiatric symptoms in the presence of allodynia have been the subject of few studies. However, somatosensory amplification has not been investigated, and its importance has not been adequately demonstrated in both allodynia and migraine patients. Finally, studying migraine in the context of acceptance and commitment-based therapies, which are recommended to be applied in addition to somatic treatments, which AHS has also mentioned recently, has been a feature that makes our study unique.

Conclusion

Migraine patients with allodynia take more analgesics. Patients with severe allodynia have a higher somatosensory

amplification. Migraine patients who exaggerate their bodily symptoms, migraine-related disability, and headaches are worse off and they use painkillers more frequently. Migraine patients with more depression and anxiety have less pain willingness, and their level of activity engagement is low. These psychiatric comorbidities accompanying migraine may lead to decreased success rates during migraine treatment and undesirable conditions, such as drug overuse. The widespread use of pain acceptance, psychoeducation, and acceptance and commitment-based approaches may be an important tool for individuals with migraine to lead a more active and functional life despite their pain.

Ethics

Ethics Committee Approval: The Clinical Research Ethics Committee of University of Health Sciences Turkey, Haydarpaşa Numune Training and Research Hospital, approved the study (approval no: 2020/237, date: 09.11.2020).

Informed Consent: Informed consent was obtained from the patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: A.Y.O., B.R.H.B., S.S., Design: A.Y.O., B.R.H.B., Data Collection or Processing: A.Y.O., R.E.Y., Analysis or Interpretation: B.R.H.B., Literature Search: A.Y.O., Writing: A.Y.O., B.R.H.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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