



An evaluation of the correlation between the severity and frequency of migraine and the Buss-Perry Aggression Scale

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Abstract

It is important to identify concomitant psychological factors such as depression and aggression in patients with migraine. In this study, our objective was to demonstrate the difference of aggression scores in patients with migraine compared with normal scores, and whether the severity of the disease and the frequency of pain had an impact. Ninety-nine patients with migraine and 67 healthy controls who presented to the Okmeydanı Training and Research Hospital were included in the study. The pain frequency, duration, and severity of the migraine were recorded. The respective severities of pain, depression and aggression were evaluated using a visual analogue scale (VAS), the Beck Depression Scale, and the Turkish version of the Buss-Perry Aggression Questionnaire. It was found that the anger scores of patients with migraine were high ($p=0.001$; $p<0.01$), and their hostility levels were lower compared with those of the control group in a case ($p=0.017$; $p<0.05$) where there was no difference in depression level ($p>0.05$). No difference with the control group was found in terms of physical and verbal aggression. It was found that internalised anger was significantly higher. No correlation was found with the frequency and duration of pain. The anger scores of patients with migraine are higher, which may be directly related to the nature of migraine without any contribution of depression. The long-term impacts of the disease, and an evaluation of the psychological concomitants within the scope of the treatment plan are important for a more effective treatment method.

Keywords Migraine · Aggression · Anger · Depression · Frequency · Severity of pain

Introduction

Migraine is characterized by frequent comorbidity of psychiatric disorders such as anxiety, as well as coping difficulties and specific personality traits (e.g. neuroticism, perfectionism, emotional rigidity), traits that are closely related to a low tolerance to frustration, which manifests in migraineurs in the form of mutually generated characteristics, leading to severe anger [1]. Many factors can contribute to the development of such traits. Those can be genetic or related to environmental developmental issues. Among these, childhood trauma seems to play a significant role, as suggested by Serafini et al., who concluded that there was a positive association between childhood maltreatment and non-suicidal self-harm and that early detection was important [2].

In addition, patients with migraine have been reported to exhibit aggressive behaviour as a specific personality trait. Aggression is described as any behaviour that aims at directly harming a person's life or hurting them. Pain, aches, heat, offensive odours, being attacked, and crowds have been reported as factors that provoke aggression. In general, the concept of aggression refers to an emotional experience that ranges from moderate vexation or annoyance, to anger and severe rage [3]. Aggression can be related to behaviours such as physical and verbal aggression, or with emotions such as hostility and anger. While physical aggression, verbal aggression, and hostility are correlated with harming others, anger is rather correlated with self-harm [4].

Anger, as maintained by Kassirer and Tafrate [5], is mostly an acquired emotion. Culture, environment, and genetic factors play a role in the manner of expressing anger. On evaluating the correlation between migraine and anger, it has been indicated that repressed hostile emotions and unexpressed anger are the determining psychological factors in migraine [6]. There are two forms of expressing anger. Individuals experience their anger within themselves in the

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case of internalising or suppressing anger (anger-in). Externalising anger (anger-out), however, may manifest verbally or behaviourally [7]. Internal stimulation increases in the internalisation of anger, but there is an increase in physical activity when anger is externalised [8].

We wanted to illuminate the comprehension of aggression and therefore of anger in their relationship to migraine, and we aimed to answer the following questions:

1. Is there a correlation between aggression scores and frequency and intensity of pain in patients with migraine?
2. Is there a relationship between depression scores and aggression?
3. In which direction will anger and aggression scores deviate when the depression factor is taken away?
4. Independently from pain intensity and frequency, and independently from depression, can high aggression scores be directly explained by migraine pathophysiology itself?

Materials and methods

Approval was obtained from the Okmeydanı Training and Research Hospital (EAH) ethics board for the study (No. 1460, Date: 5.11.2019). All study participants completed an informed consent form. The study was conducted on 99 patients with episodic and chronic migraine who were diagnosed between November 2019 and May 2020 at the EAH neurology clinic in accordance with the International Headache Society (IHS) criteria (ICHD-3). Patients who presented with systemic comorbidities including hypertension, diabetes mellitus, hyperlipidaemia, an oncologic disease were excluded from our study.

The control group consisted of 67 volunteers with a medical history free from any physical or psychiatric disease and the consumption of any neurologic or psychiatric treatment. Only participants who could read and write in the Turkish language were included in our study. The Depression and Puss Berry aggression scales were completed by the participants. Data such as sex; age; educational and marital status; disease duration; age at headaches onset; whether the patient presented previously for treatment; the frequency and duration of pain; the complementary characteristics of the headache; the presence of concomitant findings such as aura, phonophobia, photophobia and vomiting; relation to menses; pain trigger factors, medications used; non-pharmaceutical methods used to relieve pain; habits; and the presence of migraine in the family were recorded.

The severity of the disease was evaluated using a visual analogue scale (VAS). VAS is a scale with which the patient describes the severity of their pain on a horizontal or vertical plain on a 10-cm scale from 0 = no pain to 10 = most severe pain; the severity of the patient's pain is identified subjectively [9, 10].

Beck Depression Inventory (BDI): this instrument measures the physical, emotional, cognitive, and motivational symptoms seen in depression. The purpose of this scale is not to diagnose depression, but to assess the depression risk and to measure changes in the level and severity of depressive symptoms. Developed in 1961 by Beck et al. [11], the validity and reliability of the Turkish version were studied by Hisli [12]. The inventory contains 21 self-assessment statements scored on a 4-point Likert-type scale which was commonly used to assess the severity of depressive symptoms in the two weeks before completing the questionnaire. Each item is scored between 0 and 3 points, resulting in a total score between 0 and 63. A high total score indicates a high level or intensity of depression. The validity and reliability study for the Turkish version established a cut-off point of 17, interpreting a score of 0–10 points as no depression, 11–17 mild, 18–23 points as moderate, and 24 and above as severe level of depression.

The Buss-Perry Aggression Questionnaire (BPAQ) was administered for the psychiatric condition. The BPAQ consists of 29 items and four subgroups: physical aggression (9 items), verbal aggression (5 items), anger (7 items), and hostility (8 items) [13]. The answers to all items are provided through a five-point Likert-type scale and is evaluated by scores ranging from 'never' (1) to 'always' (5). The scores are added to obtain a general score. Higher scores indicate greater aggression. The validity and reliability of the Turkish version of this test were tested by Andaç et al. [14]. The highest score that can be obtained through the scale is 170, and the lowest score is 34. A high score indicates that the individual has an aggression behaviour relating to that dimension.

Statistical analysis

The NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) software was used for statistical analyses. Complementary statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum) were used when evaluating the study data. The suitability of quantitative data to normal distribution was tested using the Kolmogorov–Smirnov and Shapiro–Wilk tests, and graphic evaluations. Student's *t* test was used in the two-group comparisons of quantitative data presenting normal distribution, and the Mann–Whitney *U* test was used in two-group comparisons of data not presenting normal distribution. One-way analysis of variance (ANOVA) was used in the comparison of three and more groups presenting normal distribution, and the Kruskal–Wallis test was used to compare three and more groups not presenting normal distribution. The Fisher–Freeman–Halton exact test was used in comparing qualitative data. Spearman's correlation analysis

was used in evaluating correlations between variables. Significance was considered at a minimum of $p < 0.05$.

Findings

The patients' mean age was 39.60 ± 11.41 (range, 18–65) years. Ninety-nine (59.6%) participants had been diagnosed as having migraine, and 40.4% ($n = 67$) were in the control group. Fifty-three (31.9%) participants were graduates of primary schools and below, 8.4% ($n = 14$) were secondary school graduates, 28.9% ($n = 48$) were high school graduates, and 30.7% ($n = 51$) had graduated from university and above. Forty-nine (29.5%) were married and 117 (70.5%) were single (Table 1). No statistically significant differences were found between the groups in terms of age ($p = 0.062$; $p > 0.05$). No statistically significant differences were found between the groups regarding sex distribution, educational status, and marital status ($p > 0.05$).

The mean duration of disease was 12.42 ± 10.21 (range, 1–43) years (median: 9 years). Forty-five (45.5%) patients had a family history. VAS measurements varied between 5 and 10 and the average was 9.00 ± 1.29 . Five per cent of the cases were migraines with an aura. The migraine characteristics are indicated in Table 2.

Distribution of the Beck Depression Scale and Buss-Perry Aggression Questionnaire Scores

Depression was not found in 55.4% of the participants ($n = 92$), mild depression was found in 19.3% ($n = 32$), moderate depression was seen in 16.3% ($n = 27$), and severe depression was found in 9.0% ($n = 15$).

When the aggression scale subordinate dimension scores were examined, it was found that the mean physical aggression score, the mean verbal aggression score, the mean anger score, and the mean hostility score were 16.69 ± 5.11 , 12.60 ± 3.46 , 17.87 ± 5.68 , and 21.64 ± 6.16 , respectively. The mean aggression scale total score was 68.55 ± 16.15 . No statistically significant differences were found between the BDS ratios between the groups ($p > 0.05$).

No statistically significant difference was found in terms of physical aggression and verbal aggression scores between the groups ($p > 0.05$).

When the migraine and control groups were compared, no statistically significant difference was found between their anger scores ($p = 0.001$ and $p < 0.01$, respectively); the anger scores of the migraine group were higher compared with those of the control group. A statistically significant difference was found between the hostility scores of the groups; the hostility scores of the migraine group were lower compared with those of the control group ($p = 0.017$ and $p < 0.05$, respectively). No statistically significant difference was found between the total aggression scores of the patients with migraine and those of the control group ($p > 0.05$) (Table 3).

No statistically significant correlation was found between the VAS scores, migraine duration, and frequency of attacks, and physical aggression, verbal aggression, anger, hostility, and total aggression scores ($p > 0.05$) (Table 4). The VAS pain scores of the migraineurs depending on the level of depression, migraine durations, and migraine frequencies showed no statistically significant difference ($p > 0.05$) (Table 5).

Table 1 Evaluation of demographic characteristics by group

	Total ($n = 166$)	Study group ($n = 99$)	Control group ($n = 67$)	p
Age (years)				
Min–Max (median)	18–65 (40)	18–62 (39)	19–65 (41)	^a 0.062
Mean \pm SD	39.60 ± 11.41	38.04 ± 9.84	41.90 ± 13.14	
Sex; n (%)				
Female	151 (91.0)	91 (91.9)	60 (89.6)	^b 0.602
Male	15 (9.0)	8 (8.1)	7 (10.4)	
Educational status; n (%)				
Primary school and under	53 (31.9)	35 (35.4)	18 (26.9)	^b 0.238
Secondary school	14 (8.4)	6 (6.1)	8 (11.9)	
High school	48 (28.9)	25 (25.3)	23 (34.3)	
University and above	51 (30.7)	33 (33.3)	18 (26.9)	
Marital status; n (%)				
Married	49 (29.5)	31 (31.3)	18 (26.9)	^b 0.538
Single	117 (70.5)	68 (68.7)	49 (73.1)	

^aStudent's t test

^bPearson Chi-square test

* $p < 0.05$

Table 2 Distribution of properties of the study group

	Study group (<i>n</i> = 99)	
	<i>n</i>	%
Duration of disease		
Min–Max (median)	1–43 (9)	
Mean ± SD	12.42 ± 10.21	
Family history		
No	54	54.5
Yes	45	45.5
VAS		
Min–Max (median)	5–10 (10)	
Mean ± SD	9.00 ± 1.29	
Migraine duration		
Short	15	15.2
Fair	42	42.4
Long	42	42.4
Migraine frequency		
Infrequent episodic	32	32.3
Frequent episodic	35	35.4
Chronic	32	32.3
Settlement		
One-side	55	56.1
Two-side	31	31.6
Other	12	12.2
Connection to menses		
Nausea	85	85.9
Vomiting	51	51.5
Photophobia	91	91.9
Phonophobia	89	89.9
Smell	78	78.8
Lack of appetite	64	64.6
Increase in physical activity	81	81.8
Stress	85	85.9
Hunger	60	60.6
Sleeplessness	69	69.7
Menses		
Food	22	22.2
Sunlight	53	53.5
Noise	56	56.6
Air	37	37.4
Painkiller use	48	48.5
Smoking	27	27.3

No statistically significant correlation was found between the ages of the migraineurs, and the physical aggression, verbal aggression, anger, hostility, and total aggression scores ($p > 0.05$). Although not statistically significant, differences were found between the physical aggression scores of the migraineurs depending on sex; the males' physical aggression scores were much higher than those of the females ($p = 0.061$ and $p > 0.05$, respectively). This difference may

have been significant if the number of individuals in the groups was increased.

The verbal aggression, anger, hostility, and total aggression scores of the migraineurs showed no statistically significant difference depending on the group ($p > 0.05$).

Discussion

Our study found anger scores to be higher in patients with migraine. However, the physical and verbal aggression scores were similar to those of the control group. The hostility score was found to be low in the migraine group. These results suggested that patients with migraine experienced anger internally.

In parallel, a study conducted on a group with fibromyalgia found that the anger scores of these patients were higher compared with those with rheumatoid arthritis and healthy patients [15]. Anger, and how anger is regulated, appear to affect chronic pain fatigue. In particular, the repression of anger (introverted anger) has attracted much attention and it was emphasised that repressing or inhibiting verbal or physical expression of anger was related to increased pain severity.

Anger may increase sensitivity to pain [7]. In fact, according to Dunn's model, which offers an explicative diagram of the different patterns of sensory processing of different stimuli, individuals with a low neurologic threshold or hypersensitivity, especially the sensory sensitive category, exhibit a passive behavioural strategy, show discomfort with regular sensations, and negative reactions to sensory stimuli, which they experience as overwhelming and invasive. That is, migraineurs seem to fit with this pattern of Dunn's model. In relation with our study, as migraine was found to be associated with several psychiatric disorders, and that the pathophysiology of the latter may be explained by deficits in emotional processes and sensory processing, it can be proposed that aggressive behaviours can be explained by the same pathophysiology and that it may be related with a unique model of sensory processing, which, because of its morbid consequences, cannot be considered as a specific personality trait, but rather as a sensory processing disorder [16].

It was reported that sensory processing disorders affected individuals in a hypersensitive model [17], indicating that these individuals tended to perceive simple daily sensory events as noxious, or manifest exaggerated behavioural responses of 'fight and flight' to harmless sensory inputs. The sensory processing disorders are supposed to have a genetic origin, but also a developmental origin because they were reported mostly in children, but showed persistence in adulthood causing social and emotional difficulties for the adults involved. Childhood trauma seems to play a major

Table 3 Evaluation of the Beck Depression and Aggression Scale scores according to groups

		Total (n = 166)	Study group (n = 99)	Control group (n = 67)	p
Beck depression; n (%)					
No		92 (55.4)	52 (52.5)	40 (59.7)	b0.808
Mild		32 (19.3)	21 (21.2)	11 (16.4)	
Fair		27 (16.3)	17 (17.2)	10 (14.9)	
Severe		15 (9.0)	9 (9.1)	6 (9.0)	
Aggression scale					
Physical	Min–Max (median)	9–32 (16)	9–32 (16)	9–24 (15)	0.126
Aggression	Mean ± SD	16.69 ± 5.11	17.19 ± 5.53	15.96 ± 4.35	
Verbal aggression					
Min–Max (median)		6–23 (12)	6–23 (12)	7–20 (13)	0.807
Mean ± SD		12.60 ± 3.46	12.66 ± 3.70	12.52 ± 3.10	
Anger					
Min–Max (median)		7–34 (18)	7–34 (19)	7–28 (16)	0.001**
Mean ± SD		17.87 ± 5.68	19.03 ± 5.88	16.15 ± 4.93	
Hostility					
Min–Max (median)		9–37 (22)	9–37 (20)	13–37 (23)	0.017*
Mean ± SD		21.64 ± 6.16	20.71 ± 6.37	23.01 ± 5.59	
Total score					
Min–Max (median)		32–108 (68.5)	32–108 (69)	44–103 (66)	0.492
Mean ± SD		68.55 ± 16.15	69.23 ± 17.65	67.55 ± 13.70	

^aStudent's *t* test^bPearson's Chi-square test**p* < 0.05, ***p* < 0.01**Table 4** Correlation between the vas pain score, migraine duration and frequency, and the aggression scale scores in the study group (n = 99)

		Aggression scale				
		Physical aggression	Verbal aggression	Anger	Hostility	Total
VAS						
<i>r</i>		– 0.003	– 0.065	– 0.057	– 0.114	– 0.055
<i>p</i>		0.973	0.519	0.575	0.261	0.586
	<i>n</i>	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Migraine duration						
Short	15	18.27 ± 6.49	13.07 ± 3.69	21.20 ± 6.22	21.20 ± 4.89	72.4 ± 17.67
Medium	42	17.45 ± 5.50	12.95 ± 3.34	19.55 ± 6.19	21.86 ± 6.87	71.45 ± 17.74
Long	42	16.55 ± 5.24	12.21 ± 4.07	17.74 ± 5.22	19.38 ± 6.20	65.88 ± 17.40
^a <i>p</i>		0.545	0.596	0.110	0.196	0.267
Migraine frequency						
Infrequent episodic	32	16.34 ± 5.39	12.44 ± 2.69	17.16 ± 5.02	20.59 ± 6.21	66.06 ± 15.30
Frequent episodic	35	18.66 ± 5.70	13.03 ± 4.52	19.80 ± 5.71	20.46 ± 5.83	71.91 ± 17.75
Chronic	32	16.44 ± 5.31	12.47 ± 3.66	20.06 ± 6.54	21.09 ± 7.24	69.47 ± 19.66
^a <i>p</i>		0.149	0.764	0.088	0.915	0.401

r spearman's correlation coefficient^aOne-way ANOVA

Table 5 Correlation between VAS Pain Score, and migraine duration and frequency by the presence of depression ($n=99$)

	Beck depression				<i>p</i>
	None ($n=52$)	Mild ($n=21$)	Moderate ($n=17$)	Severe ($n=9$)	
VAS					
Min–Max (Median)	5–10 (10)	5–10 (10)	7–10 (9)	5–10 (9)	^a 0.995
Mean \pm SD	9.04 \pm 1.20	8.86 \pm 1.62	9.18 \pm 0.88	8.78 \pm 1.72	
Migraine duration; n (%)					
Short	5 (9.6)	5 (23.8)	3 (17.6)	2 (22.2)	^b 0.463
Medium	23 (44.2)	6 (28.6)	9 (52.9)	4 (44.4)	
Long	24 (46.2)	10 (47.6)	5 (29.4)	3 (33.3)	
Migraine frequency; n (%)					
Infrequent episodic	22 (42.3)	7 (33.3)	2 (11.8)	1 (11.1)	^b 0.094
Frequent episodic	18 (34.6)	7 (33.3)	8 (47.1)	2 (22.2)	
Chronic	12 (23.1)	7 (33.3)	7 (41.2)	6 (66.7)	

^aKruskal–Wallis test^bFisher–Freeman–Halton exact test

role in the genesis of pathologic personality traits causing non-suicidal self-harm or even suicidal self-harm [2]. Headache, may be the expression an internalized non suicidal self harm behaviour.

Depression and anxiety are frequently observed in patients with migraine [18]. The ratio of depression and anxiety was found to be high in patients with chronic migraine, and aggression scales relating to these were also found to be high [19]. In our study, the control group was chosen from among individuals who reported no headache or other chronic disease or treatment. However, there were also unexpressed depressive symptoms in the control group. When comparing these two groups that presented no statistical difference in terms of depression ratios, we found that anger scores increased due to the presence of migraine. We also considered that the presence of migraine alone affected anger.

In their study, Perozzo et al. indicated that the anger scale was high in the monitored individuals presenting chronic tension-type headaches (TTH), and those presenting TTH along with migraine. A correlation between anger and headaches was emphasised [20]. A controlled study conducted with 144 migraineurs found a higher total score and anger, hostility, and aggression scores, which were higher compared with those of healthy individuals [21]. It was emphasised in this study that the aggression scale was correlated with anxiety, the frequency of headaches, and the chronic migraine nature of the pain. The episodic migraine group was found to be similar to healthy individuals [19]. However, dissimilarly, no correlation was found between the frequency and severity of pain and increased anger scores in our study. This may be related to the smaller number of our patients.

In a study conducted on patients with cluster headaches, it was found that internal aggression increased in correlation with depression and self-blame. However, no increase was

found with respect to physical aggression scores. The self-aggression score was highest in chronic cluster headaches and was correlated with the severity of depression [21]. A study in which patients with chronic TTH and migraine were compared found that patients with TTH presented higher depression and anger scores, and higher repressed anger scores were found in patients with migraine, and the constant anger score was higher in those with TTH [22].

The scores obtained by men physical aggression scores were significantly higher compared with those obtained by women [23]. It was indicated that the difference in physical aggression scores was much greater, whereas the difference in verbal aggression was very low. Our study group included a small number of men, and no statistically significant difference was found despite the higher physical aggression scores in men. We need a larger number of male patients to draw any firm conclusions.

A study using the constant anger and anger expression scale observed no difference between the migraine group and the control group regarding anger-in and anger-out. The study conducted by Boyle et al. [24] revealed similar ratios for migraine and healthy groups. The differences in studies in terms of anger levels may vary depending on culture. It is indicated that the expression of anger is based on learning and may render an individual more susceptible to attack and criticism depending on how it is expressed [25]. Culture, the environment, and genetic factors play a role in the manner of expression. A study conducted in our country found high internal anger scores, and difficulty in projecting anger outwards [26]. Studies conducted on normal populations also revealed high anger scores. Another study conducted in Turkey found that healthy students experienced moderate levels of anger, they were unable to express their anger easily, and had a low level of repressing and controlling their anger [27]. However, we found

these scores to be higher in the migraine group. In a study in which the contribution of age to anger was evaluated, the repression of anger was found to be less in adolescents and children [28]. We found no correlation with age.

Stress is an important factor that triggers migraine attacks. Stress and anxiety scores were found high in patients with migraine, and depression scores were low in normal and migraine groups [29]. Boz et al. [30] maintained that patients with headache might develop headaches as a response to stress. Some studies showed that patients with migraine had higher levels of internalised anger [31]. After their depression and anxiety were controlled, patients with migraine were found similar to the group without headaches in terms of anger scores [31]. In our study, we found no correlation between the severity of depression and the severity and frequency of pain in our migraine group.

The limitation of our study was that it was a single-centre study that was conducted at a tertiary research hospital in a cross-sectional manner. Therefore, we had many patients that were resistant to treatment. The fact that anxiety was not evaluated in our patients is another limitation. Also, the majority of the sample were women. This causes a limitation in generalisation. The assessment of patients at the time of the evaluation only took into consideration the psychological state at that time but did not investigate childhood traumas or their psychological history. The spectrum of psychometric tests we used in our study could have been widened by using more specific psychometric parameters such as suicidality-assessing scales and alexithymia-assessing tests.

Our data suggest that anger that increased in connection with psychological or physical factors could not be externalised, which in turn caused an increase in internalised anger, increasing the level of headache through somatisation. The fact that the inner-anger score was high independently from the frequency and the intensity of pain in patients with migraine suggests that it might be directly related to the pathophysiology of migraine, without the intervention of depression. It is important to investigate inner-anger parameter when assessing migraineurs. Inner anger can be considered a kind of non-suicidal self-harm behaviour, as such, it can be used as an early detector for professions to take charge before it converts to genuine suicidal self-harm behaviour. Along with medical treatment, early psychological assessment and support are very important in the therapeutic planning and management of patients with migraine. These should benefit from interdisciplinary care including cognitive behavioural therapy.

Declarations

Conflict of interest The authors report no conflict of interest.

Ethical approval The authors certify that they comply with the Principles of Ethical Publishing.

Informed consent All participants provided informed consent prior to their participation.

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