

Original article

Primary headaches in pediatric patients with chronic rheumatic disease

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Abstract

Objectives: To assess the presence, prevalence and clinical characteristics of primary headaches in pediatric patients with chronic rheumatic diseases such as juvenile idiopathic arthritis (JIA) and familial Mediterranean fever (FMF), and to analyze the common pathophysiological mechanisms. **Study design:** In this noncontrolled, cross-sectional study, a semi-structured 53 item headache questionnaire was administered to subjects with FMF and JIA, and interviewed a total sample size of 601 patients younger than 16 years of age. The questionnaires were then analyzed according to the International Headache Society's diagnostic criteria. **Results:** Children with FMF ($n = 378$) and JIA ($n = 223$) were studied. Each group was then divided into two subgroups according to whether the subjects reported headache or not. 29.5% of subjects with FMF reported having migraine, 37.6% probable migraine and 32.9% tension type headache (TTH). In JIA group 28.2% were diagnosed with migraine; 41.2% with probable migraine and 30.6% with TTH. No significant difference was found between all subjects with ($n = 258$) and without ($n = 343$) headache for variables such as living in a crowded family ($p = 0.95$), being the first child in the family ($p = 0.63$), academic achievement of the child ($p = 0.63$), high education level (higher than high school) of the mother ($p = 0.52$) and father ($p = 0.46$). The presence of systemic disease was reported not to be effecting the daily life at the time of evaluation by 90.2% of the children with headache and 91.0% of the children without headache ($p = 0.94$). 81.4% of the children reported their headaches were not aggravating with the exacerbation periods of their systemic disease. Family history of hypertension was reported higher by the subjects with headache (13.5% with headache and 4.0% without headache $p = 0.001$). Diabetes mellitus was also reported higher (5.8% with headache; 0.5% without headache; $p = 0.006$). Family history of headache was reported in 28.2% of the patients with headache whereas it was 17.4% of the patients without headache ($p < 0.001$). Family history of headache was reported in 28.2% of the FMF subjects with headache whereas it was 17.4% of the patients without headache ($p < 0.001$). For JIA patients a positive family history for headache was obtained in 25.9% of children with headache notably in migraineurs (81.8%). **Conclusion:** Patients with JIA and FMF should be asked specifically about accompanying primary headaches particularly migraine headaches as they may be additional disabilities for these patients.

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Keywords: Primary headache disorders; Systemic lupus erythematosus; Rheumatoid arthritis; Demography

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1. Introduction

Headache is commonly reported during childhood and becomes increasing more frequent during the

teenage years, particularly in adolescent females. Tension type headache (TTH) is the most common primary headache disorder in childhood (50.9%) followed by migraine [1]. The frequent or recurring patterns of migraine headaches occurred from 3% in the preschool years, to 4–11% by the elementary school years, and then up to 8–23% during the high school years [2–10].

Headaches might give a clue for silent neurological involvement in chronic rheumatological disorders such as systemic lupus erythematosus (SLE), Behçet's disease (BD), rheumatoid arthritis and familial Mediterranean fever (FMF), but there is no extensive and accurate data indicating the correlation between primary headaches in those patients [11–13]. Also a meta analysis did not reveal an association between SLE and migraine [14]. Juvenile idiopathic arthritis (JIA) is the most common chronic rheumatic illness in children and is a significant cause of both short- and long-term disabilities. Neurological involvement is a rare condition in patients with JIA, but primary headaches particularly tension type headache, might be encountered depending on depression and anxiety in terms of the severity of such a debilitating chronic diseases. Pediatric periodic syndromes usually indicate migraine-related condition including cyclic vomiting, benign vertigo and abdominal migraine. FMF is an inherited childhood periodic fever syndrome with recurrent painful attacks affecting the abdomen, chest or joints [15]. These two entities might have a common pathophysiological mechanism as they are mostly expressed with the same triggering factors and sharing a periodicity and painful attacks. Although the hallmark symptom of FMF is abdominal pain; primary headaches might accompany as well [15,16].

Since now the presence and prevalence of primary headaches in children with chronic rheumatologic diseases have not been emphasized. The aim of this prospective, clinical based multidisciplinary designed study was to determine the prevalence and clinical characteristics of primary headaches in JIA and FMF.

2. Methods

2.1. Selection of the cases

Patients with JIA and FMF ages younger than 16 (mean age 11.95 ± 2.6 years, ranged 6–16 years) referred from a tertiary clinic of Pediatric Rheumatology Research Center were included in this study. The definite diagnoses of JIA and FMF were made under the supervision of the same pediatric rheumatology expert (OK) according to the clinical characteristics and laboratory findings of the patients and depending on the definition criteria [16]. Patients were recruited during a routine clinic visit. Informed consent was obtained from the parents according to the procedures of the institutional review board.

2.2. Evaluation of the cases and diagnosis of headache

The patients with a diagnosis of FMF or JIA more than 1 year and who were in remission period were randomly directed to neurology clinic by the pediatric rheumatologist during their control visits. Data were collected from one parent, who was accompanying to the child, during the evaluation session after obtaining a written informed consent. Information of socio-demographics, presence and characteristics of the headache, medical history of the family were included in a semi-structured 53 item questionnaire performed by a neurologist (MET). The first part of the questionnaire was asked to all patients and aimed to determine the socio-demographic variable influencing headache. The second part was answered by the patients who had headache at least for 6 months in which the frequency and duration, intensity, localization, quality of pain, associated symptoms, aggravating factors, medical and headache history of the family has been recruited. Although the questions about the characteristics of the headache led us to make a diagnosis according to The International Classification of Headache Disorders-II (ICHD-II), the final diagnosis was made by another neurologist during a face-to-face interview (DU) [17]. Neurological examinations were performed by neurologists under the supervision of specialized neurologist of the Headache Center (SS). Patients with abnormal neurological examination and a neurological disorder were excluded.

The children were asked to mark out the location of their pain on the head figures, shown in the questionnaire. We only selected patients with TTH and migraine diagnosis, suffering headaches at least for 6 months and have attack frequencies of at least once a month. The terms 'migraine' and 'probable migraine' were used. This decision was based on headache description fulfilling ICHD-II migraine criteria A–D in a context outside disease flares and not attributed to another disorder. Participants meeting all but one of the diagnostic criteria for migraine headache classified as 'probable migraine'.

2.3. Statistical analysis

SPSS software 11.5 (Chicago, IL, USA) and MedCalc[®] v11.0.1 were used for statistical analysis. Distribution of the variables was evaluated using Shapiro Wilks test. Results were reported as mean \pm SD when normally distributed. For that the variables not having normal distribution, median and quartiles (25% and 75%) or '%' values were given. Unpaired *t*-test was used for continuous data when normally distributed. Categorical and parametric data were compared with appropriate methods (Mann Whitney *U* test or *z* test). *p*-value < 0.05 was considered to be statistically significant.

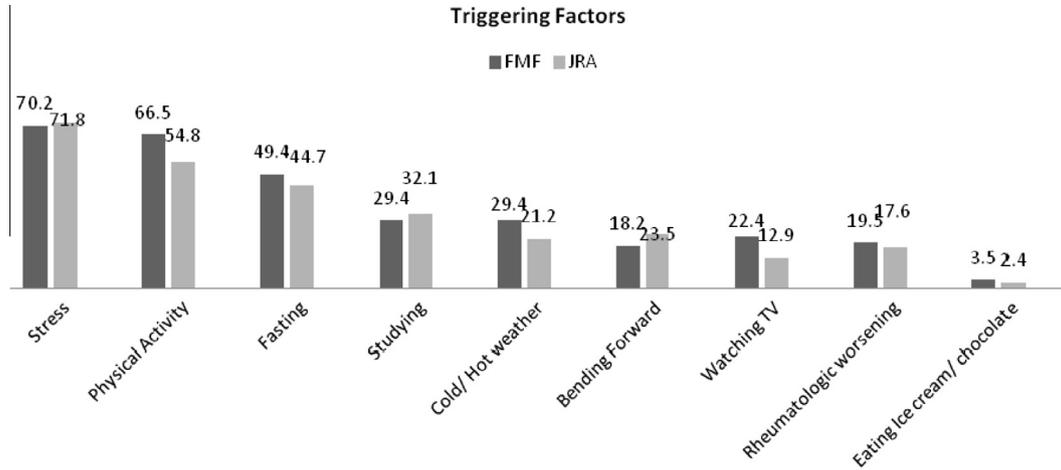


Fig. 1. The frequencies of the triggering factors in FMF and JIA patients with headache.

3. Results

A total of 601 patients were recruited after excluding the patients with other primary or secondary type headache ($n = 67$) and they were grouped according to their definite rheumatologic diseases. Group I consisted of 378 FMF patients (62.8%) of whom 196 were girls (51.8%); with their mean age at the time of the study being 13.62 ± 3.09 years. Group II consisted of 223 JIA patients (37.2%) consisting of 132 girls (59.2%) with a mean age of (13.85 ± 3.51 years). There was no significant difference for gender ($p = 0.66$) and age ($p = 0.42$) between FMF and JIA groups. Each group was then divided into two subgroups according to whether the subjects reported headache or not.

Socio-demographic features of the children were presented on Table 1. The prevalence of recurrent primary headache in the study population was found to be 42.9% (258/601). The mean age of children with headache (14.17 ± 2.90 years) was significantly higher than subjects without headache (13.35 ± 3.45 years) ($p = 0.002$). There were no significant differences between the groups for variables such as living in a crowded family

($p = 0.95$), being the first child in the family ($p = 0.63$), academic achievement of the child ($p = 0.63$), high education level (longer than high school) of the mother ($p = 0.52$) and father ($p = 0.46$). The presence of systemic disease was reported not to be effecting the daily life at the time of evaluation by 90.2% of the children with headache and 91.0% of the children without headache ($p = 0.94$). 81.4% of the children reported their headaches were not aggravating with the exacerbation periods of their systemic disease. Prophylactic medication such as oral steroid, colchicium or methotrexate for the systemic disease were reported in 54.2% of the patients with headache and 49.2% without headache ($p = 0.05$). All subjects were in remission period of their systemic disease during the neurological evaluation. Family history of hypertension was reported higher by the subjects with headache (13.5% with headache and 4.0% without headache $p = 0.001$). Diabetes mellitus was also reported higher (5.8% with headache; 0.5% without headache; $p = 0.006$). Family history of headache was reported in 28.2% of the patients with headache whereas it was 17.4% of the patients without headache ($p < 0.001$).

Table 1
Socio-demographic features of pediatric patients with rheumatological disease.

	With headache ($n = 258$)	Without headache ($n = 343$)	p
Mean age \pm STD (years)	14.17 \pm 2.90	13.35 \pm 3.45	0.002
Gender (Female) ($n, \%$)	85(55.9%)	106(53.0%)	0.663
Living in a crowded Family (Yes) ($n, \%$)	132(88/0%)	176(88.4%)	0.957
High academic achievement of the child ($n, \%$)	120(92.3%)	144(90.0%)	0.634
High education level of the mother ($n, \%$)	32(16.1%)	32(16.1%)	0.528
High education level of the father ($n, \%$)	38(25.5%)	59(29.6%)	0.469
Systemic disease affect quality of life (No) ($n, \%$)	138(90.2%)	183(91%)	0.943
Prophylactic medication (Yes) ($n, \%$)	140(54.2%)	169(49.2%)	0.056
Family history of ($n, \%$)			
Hypertension	35(13.5%)	14(4.0%)	0.001
Diabetes	15(5.8%)	2(0.5%)	0.006
Headache	73(28.2%)	60(17.4%)	<0.001

The distribution of children with primary headaches according to ICHD-II criteria was as follows; 205 patients with FMF (54.2%) and 138 patients with JIA (61.9%) had no headache. Among FMF patients 29.5% (51/173 patients) were diagnosed with migraine; 37.6% (65/173 patients) with probable migraine and 32.9% (57/173 patients) with TTH. Among JIA patients 28.2% (24/85 patients) were diagnosed with migraine; 41.2% (35/85 patients) with probable migraine and 30.6% (26 patients) with TTH. Of the 173 children with headache in FMF group 96 were girls (55.5%) and of the JIA patients 55 were girls (64.7%). The onset age of headache in migraine patients was 11.32 ± 2.72 years, in TTH patients was 10.77 ± 3.04 years. The onset age of migraine headaches in FMF patients was 11.06 ± 2.64 years, and in JIA patients was 11.86 ± 2.85 . The onset age of TTH headaches in FMF patients was 10.73 ± 2.91 years and in JIA patients was 10.84 ± 3.37 years. The mean duration of headache attacks in both FMF patients was significantly longer in children with migraine and probable migraine than children with TTH ($p = 0.02$). On the other hand the frequency of headache was similar in children with TTH and migraine ($p = 0.55$). Some of the diagnostic features, triggering factors and burden of headache in both FMF and JIA patients were compatible to those in general population (Table 2) (Fig. 1).

Consumption of analgesics for headache (73.2% versus 47.2%; $p = 0.014$) was the most sensitive headache characteristics for migraine diagnosis whereas vomiting, photophobia and phonophobia were the most specific ones ($p < 0.001$). For FMF patients the localization of the headache was predominantly in the forehead and occipital region in both migraine and TTH patients (Table 3). A positive family history for headache was obtained in 29.4% of children with headache notably 70.6% of children with migraine headaches.

Among JIA group no statistical difference was found in having headache during schooldays between migraine/probable migraine and TTH groups ($p = 0.72$). Children reported similar ratio of analgesic use in both groups (68.2% in migraine/probable migraine versus 53.8% TTH; $p = 0.62$). For JIA patients the localization of the headache was predominantly in forehead and occipital region in both migraine and TTH patients (Table 4). A positive family history for headache was obtained in 25.9% of children with headache notably in migraineurs (81.8%).

The differences between JIA and FMF groups in terms of the characteristics of migraine and TTH individually were also analyzed. The mean duration of migraine and TTH headache attacks, diagnostic features, trigger factors and localization of the headaches were similar in each groups (Table 5), but only it was noted that migraine patients with FMF were mentioned their headaches could be frequently relieved with analgesics than JIA group ($p = 0.0007$).

4. Discussion

This study demonstrated the presence, prevalence and clinical characteristics of primary headaches in FMF and JIA. Nonstructural headache of JIA and FMF was suggested to be not associated with primary neurological involvement and it is not specific for this disorder, but may be explained by a vascular headache triggered by the immune mediated disease activity in individuals and a possible link between migraine and rheumatic diseases (FMF and JIA) has been suggested.

TTH is a common complaint in patients with chronic systemic diseases associated with depression and anxiety but not with disease activity. It is possible that primary headaches are common in JIA and FMF, such a debilitating chronic diseases, but has been unrecognized. Therefore the presence and prevalence of primary headaches were assessed by a questionnaire and face to face examination in a wide patient group. In our study the frequency of primary headache in children with rheumatic diseases was 42.9%, and there was a female preponderance in headache group.

This study shows the highest prevalence of migraine (29.1%) followed by TTH (13.8%) in patients with pediatric JIA and FMF. Among primary headaches migraine and probable migraine were observed in 67.0% of FMF and 69.4% of JIA patients and TTH was observed in 32.9% of FMF and 30.6% of JIA patients. Primary headaches had not been sought specifically in these patient categories in the past, it may be that in the presence of other disabling symptoms, complaints of primary headaches have been ignored or overlooked. It might also be suggested that small vessel disease may reflect the clinical manifestations of JIA and may contribute to vasculitic dysfunction causing migraine that needs to be studied [18]. The association of migraine with chronic pediatric rheumatic diseases such as JIA and FMF may indicate a link between those disorders, for which there might be common pathogenic mechanism and further work on that may shed some light on the aetiopathogenesis of these diseases.

Migraine has been associated with an increased prevalence of various cardiovascular (CVS) risk factors [19]. The CVS risk factors had been previously studied in adult migraineurs, but the family CVS risk was overlooked in pediatric migraine patients. In our patient group family history of DM and HT were high in pediatric headache patients particularly in migraine. Migraine and vascular disorders have common pathogenic mechanisms and that genetic susceptibility plays a role in increasing the risk of migraine in the off-springs of families with one or more cerebrovascular and CVS conditions. Additionally, it is still unknown whether pediatric migraineurs with a family history of CVS risk factors will develop CVS risk in the future.

Table 2
Headache characteristics in subjects with FMF and JIA.

	FMF cases with headache (n = 173)	JIA cases with headache (n = 85)	p
Headache duration (month) Median (25–75%)	12 [8–36]	12 [8–30]	0.852
<i>Headache characteristics</i>			
Pressing	44(27.8%)	24(28.9%)	0.976
Throbbing	110(69.6%)	50(60.2%)	0.185
Stabbing	4(2.5%)	9(10.9%)	0.014
<i>Localization</i>			
Forehead	88(50.9%)	43(49.4%)	0.925
Occipital	70(40.5%)	34(40.0%)	0.953
Temporal	20(11.6%)	9(10.6%)	0.976
Unilateral	13(7.5%)	4(4.7%)	0.558
Calvarial	5(2.9%)	6(7.1%)	0.215
<i>Type of headache</i>			
Migraine	51(29.4%)	24(28.2%)	0.944
Probable migraine	65(37.5%)	35(41.2%)	0.673
Tension type	57(32.9%)	26(30.6%)	0.818
<i>Triggering factors</i>			
Emotional stress	118(70.2%)	61(71.8%)	0.906
Physical activity	113(66.5%)	46(54.8%)	0.093
Fasting	84(49.4%)	38(44.7%)	0.565
Studying	50(29.4%)	27(32.1%)	0.767
Cold/hot water	50(29.4%)	18(21.2%)	0.212
Bending forward	31(18.2%)	20(23.5%)	0.405
Watching TV or playing station	38(22.4%)	11(12.9%)	0.099
Rheumatologic worsening	33(19.5%)	15(17.6%)	0.845
Eating ice-cream/chocolate	6(3.5%)	2(2.4%)	0.925
<i>Associated features of the headache</i>			
Nausea/vomiting	56(32.4%)	21(24.7%)	0.2604
Visual disturbances	18(10.4%)	10(11.8%)	0.8991
Photophobia	63(36.4%)	29(34.1%)	0.8225
Phonophobia	100(57.8%)	51(60.0%)	0.8394
Other (face flashing, lacrimation, etc.)	27(15.8%)	11(12.9%)	0.6686
<i>Headache duration in an attack</i>			
Migraine	4.0[1.13–5]	4.0[3.0–4.0]	0.955
Probable migraine	1.0[0.5–3.0]	1.0[1–4]	0.312
Tension type	1.0[0.5–1.88]	1.0[0.56–2.63]	0.463
<i>Use of drugs to relieve headache (%yes)</i>			
Migraine	38(36.2%)	12(40.0%)	0.8683
Probable migraine	38(36.2%)	10(33.3%)	0.9391
Tension type	29(27.6%)	8(26.7%)	0.8929
<i>Family history of headache</i>			
Migraine	15(29.4%)	9(40.9%)	0.4913
Probable migraine	21(41.2%)	9(40.9%)	0.8140
Tension type	15(29.4%)	4(18.2%)	0.4777

Diagnosis of migraine can be particularly challenging, the clinical manifestations of migraine vary widely through childhood because the disorder can be expressed differently or incompletely. Children with migraine often describe their headache as throbbing or just sore and in the middle of the forehead rather than one side of the head as in commonly the case in adults. The migraine headaches were predominantly in the forehead or occipital region in the present study. The headache characteristics in patients with FMF and JIA were similar comparing with the general population.

About 70% of migraineurs have a positive family history in a first degree relative [20]. First degree relatives of those with migraine with aura have a fourfold greater risk of migraine with aura, those with migraine without aura have a 1.9-fold increased risk of migraine without aura [21]. One third of our migraine patients had a family history of migraine in first degree relatives either father or mother. Triggers or precipitating factors are present in about 85% of the patients with headache. Most common headache triggers identified were environmental factors such as emotional stress (75.5%)

Table 3
Headache characteristics in FMF patients.

	Migraine/probable migraine (n = 116)	TTH (n = 57)	p
Mean duration (month) of the headaches	24 [9.75–36]	12 [6–24]	0.029
Frequency of headache/month	3 [2–5]	3 [2–4]	0.554
<i>Accompanying features</i>			
Nausea/vomiting	54(46.6%)	2(3.5%)	<0.001
Phonophobia	57(49.1%)	6(10.5%)	<0.001
Photophobia	87(75.0%)	13(22.8%)	0.009
Other (lacrimation, face flashing, etc.)	25(21.6)	2(3.5%)	0.004
<i>Triggering factors</i>			
Changes in weather	28(39.4%)	6(17.6%)	0.044
Emotional stress	47(66.2%)	23(67.6%)	0.937
Worsening of rheumatological disease	12(17.1%)	2(5.9%)	0.206
Starving	41(57.7%)	10(29.4%)	0.012
Eating ice-cream/chocolate	4(5.6%)	1(2.9%)	0.905
<i>Relieving factors</i>			
Sleeping	52(73.2%)	22(62.9%)	0.389
Use of medicine	44(62.0%)	17(48.6%)	0.269
Eating	2(2.8%)	0	0.811
Other	12(16.9%)	28(5.7%)	0.194
Severe headache on school days (Yes)	18(25.7%)	1(2.8%)	0.008
Consumption of analgesics (Yes)	52(73.2%)	17(47.2%)	0.014
<i>Localization of headache</i>			
Forehead	58(50.0%)	30(52.6%)	0.873
Occipital	53(45.7%)	17(29.8%)	0.066
Temporal	16(13.8%)	4(7.0%)	0.288
Calvarial	3(2.6%)	2(3.5%)	0.880
Unilateral	7(6.0%)	6(10.5%)	0.453

Table 4
Headache Characteristics in JIA patients.

Variables	Migraine/probable migraine (n = 59)	TTH (n = 26)	p
Mean duration (month) of the headaches	12 [10–27]	12 [7.75–31.5]	0.625
Frequency of headache/month	3 [2–4]	3.5 [2.25–4.75]	0.121
<i>Accompanying features</i>			
Nausea/vomiting	21(35.6%)	0(0.0%)	0.0012
Phonophobia	26(44.1%)	3(11.5%)	0.0075
Photophobia	40(67.8%)	11(42.3%)	0.0487
Other (lacrimation, face flashing, etc.)	10(16.9%)	1(3.8%)	0.1904
<i>Triggering factors</i>			
Changes in weather	3(13.6%)	3(23.1%)	0.797
Emotional stress	16(72.7%)	9(69.2%)	0.868
Worsening of rheumatological disease	3(13.6%)	4(30.8%)	0.428
Starving	11(50%)	10(29.4%)	0.402
Eating ice-cream/chocolate	1(4.5%)	0(0.0%)	0.780
<i>Relieving factors</i>			
Sleeping	12(54.5%)	8(61.5%)	0.959
Use of medicine	6(27.3%)	2(15.4%)	0.694
Eating	1(4.5%)	1(7.7%)	0.718
Other	5(22.7%)	0(0.0%)	0.175
Severe headache on school days (Yes)	3(13.6%)	2(15.4%)	0.724
Frequent use of analgesics (Yes)	15(68.2%)	7(58.8%)	0.624
<i>Localization of headache</i>			
Forehead	25(42.4%)	18(69.2%)	0.041
Occipital	24(40.7%)	10(38.5%)	0.960
Temporal	8(13.6%)	1(3.8%)	0.332
Calvarial	5(8.5%)	1(3.8%)	0.745
Unilateral	3(5.1%)	1(3.8%)	0.767

Table 5

The differences between JIA and FMF groups in terms of the characteristics of migraine and TTH.

	Patients with TTH headache		<i>p</i>	Patients with migraine headaches		<i>p</i>
	FMF patients (<i>n</i> = 57)	JIA patients (<i>n</i> = 26)		FMF patients (<i>n</i> = 116)	JIA patients (<i>n</i> = 59)	
Headache duration (month) median (25–75%)	0.4 [0.2–0.8]	0.4[0.25–1.0]	0.573	0.8 [0.32–1.2]	0.40[0.33–0.9]	0.457
Associated features of the headache						
Nausea/vomiting	2(3.5%)	0	0.8469	54(46.6%)	21(36.6%)	0.2709
Phonophobia	13(22.8%)	11(42.3%)	0.1196	87(75.0%)	40(67.8%)	0.4065
Photophobia	6(10.5%)	3(11.5%)	0.8065	57(49.1%)	26(44.1%)	0.6412
Other	2(3.5%)	1(3.8%)	0.5763	25(21.9%)	10(16.9%)	0.5640
Triggering factors						
Changes in weather	6(11.1%)	4(15.4%)	0.8542	44(37.9%)	14(23.7%)	0.0860
Emotional stress	38(70.4%)	18(69.2%)	0.8802	80(70.2%)	43(72.9%)	0.8458
Rheumatologic worsening	7(13.0%)	5(19.2%)	0.6943	26(22.6%)	10(16.9%)	0.4957
Starving	19(35.2%)	10(38.5%)	0.9687	65(56.0%)	28(47.5%)	0.3655
Eating ice-cream/chocolate	2(3.7%)	1(3.8%)	0.5435	4(3.4%)	1(1.7%)	0.8736
Relieving factors						
Sleep	35(62.5%)	12(48.0%)	0.3282	91(78.4%)	38(64.4%)	0.0720
Use of medicine	29(51.8%)	8(32.0%)	0.1582	76(65.5%)	22(37.3%)	0.0007
Eating	0(0.0%)	1(4.0%)	0.6768	2(1.7%)	1(1.7%)	0.5363
Other	5(8.9%)	3(12.0%)	0.9770			
Localization of headache						
Forehead	32(58.2%)	18(69.2%)	0.4801	62(54.4%)	28(47.5%)	0.4832
Occipital	18(32.7%)	10(38.5%)	0.7932	56(49.1%)	26(44.1%)	0.6428
Temporal	7(12.7%)	2(7.7%)	0.7718	18(15.8%)	9(15.3%)	0.8926
Calvarial	2(3.6%)	1(3.8%)	0.5561	4(3.5%)	5(8.5%)	0.2972

or weather changes (68.6%), starving (69.6%) [22]. Trigger factors were frequently reported by children with migraine and stress and physical activity were the most frequent as in our study.

This study has some limitation as a noncontrolled study, not having any data about the effect of obesity and allergy in childhood, not taken into consideration to psychiatric comorbidity and epilepsy, and finally not including the effect of medications for rheumatological diseases on primary headaches. We found a higher prevalence of migraine (29.1%) followed by TTH (13.8%) in patients with pediatric JIA and FMF. The migraine rate is higher than the headache prevalence reported for the Turkish population in our previous studies, and TTH rate was also lower than our reports [23,24]. To the best of our knowledge, this is the first study determining the prevalence and clinical characteristics of primary headaches in a large pediatric cohort with FMF and JIA.

5. Conclusion

It might be argued that the increased prevalence of migraine found in the pediatric patients with JIA and FMF in this survey; 1, is a nonspecific result of the possible stress and emotional upheavals associated with the disease chronicity; 2, may be explained by a vascular headache triggered by the immune mediated disease

activity suggesting a possible link between migraine and FMF or JIA. Migraine in JIA and FMF may in part be due to the underlying disease process. In view of the findings of this study, patients with JIA and FMF should be asked specifically about headaches and in particular migraineous headaches as they may be additional disabilities for these patients.

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