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ORIGINAL ARTICLE

Determinants of sleep disturbance and sleep quality in children of mothers with fibromyalgia

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ABSTRACT

Objectives: This study aimed to determine whether maternal diagnosis of Fibromyalgia syndrome (FMS) affects the sleep quality of children.

Patients and methods: This prospective study was conducted with 80 female participants (mean age: 36.2±5.9 years; range 25 to 50 years) and their 80 children (27 males, 53 females; mean age: 6.6±2.6 years; range 2 to 12 years) between August 2019 and November 2020. The FMS group included 40 female FMS patients and their children, whereas the control group consisted of 40 healthy females and their children. In addition to sociodemographic variables, functional status was evaluated by the Fibromyalgia Impact Questionnaire (FIQ), which was completed by mothers with FMS, and the Children's Sleep Habits Questionnaire (CSHQ) was used to evaluate the sleep quality of all children.

Results: There was no statistically significant difference between the two groups in terms of demographic characteristics ($p>0.05$). The CSHQ score of the two groups was above 41 points and was at a clinically significant level. The median value for the CSHQ score was 60.5 and 52 in the FMS and control groups, respectively. Sleep time, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness scores were higher in the FMS group than in the control group, and the differences were statistically significant ($p<0.001$). The delayed falling asleep score, which was reversely coded, was lower in the FMS group than in the control group, and the difference was statistically significant ($p<0.001$).

Conclusion: This pilot study showed that the children of mothers with high Fibromyalgia Impact Questionnaire scores had sleep disorders. Maternal diagnosis of FMS negatively affects the sleep quality of children.

Keywords: Children of sleep disturbance, fibromiyalgia, maternal diagnosis of fibromiyalgia, sleep quality.

Fibromyalgia syndrome (FMS) is a complex disorder with widespread chronic pain, tenderness, fatigue, cognitive dysfunction, and nonrestorative sleep. It is the third most common musculoskeletal disorder after back pain and osteoarthritis.[1,2] Fibromyalgia syndrome prevalence increases with age (peak age 50 to 60 years) and has a mean estimated global prevalence of 2.7%.[2] It is more common among females, with a female to male ratio of 3/1.3. Although the pathogenesis of FMS is not fully understood, hypotheses such as genetic predisposition, stressful life events, and peripheral and central mechanisms are considered. FMS causes disability and functional limitations in daily life together with depression and anxiety.[2,3] Many studies have shown that the adverse psychosocial effects of FMS affect social relationships and impair working ability.[2-4] The problems of individuals with fibromyalgia are not limited to the ones mentioned above. Fibromyalgia syndrome also impacts patients' social environment, including spouses, children, or friends. Many studies have

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reported that parents' attitudes and behaviors towards their children's headache complaints have a strong relationship with the severity of headache attacks. Furthermore, mothers were reported to have more influence on children's pain and emotional regulation than fathers.[4] In the study by Champion et al.,[5] growing pain, low back pain, recurrent abdominal pain, persistent pain, and migraine were shown to have familial associations, and sleep disturbances are prevalent in FMS patients. When objective assessments are made, these patients have lower sleep efficiency and quality in addition to light sleep, short sleep duration, and longer wake-up times. Such patients also have more difficulties in beginning sleep when subjective assessments are performed. Sleep difficulties in FMS seem to be more prevalent when subjective assessments are performed rather than objective ones.[6] The data on sleep quality were obtained by polysomnography in patients with FMS.[7] There are also studies evaluating the sleep patterns and moods of parents of children with sleep disorders.[8] To our knowledge, there is no study evaluating the effects of maternal FMS on the sleep quality of children. In this study, we aimed to evaluate the sleep quality of the children with a maternal diagnosis of FMS and compare the results with a group of healthy subjects.

PATIENTS AND METHODS

The prospective study was conducted with 80 female participants (mean age: 36.2±5.9 years; range 25 to 50 years) and their 80 children (27 males, 53 females; mean age: 6.6±2.6 years; range 2 to 12 years) at the Physical Medicine and Rehabilitation Clinic of Acıbadem University School of Medicine between August 2019 and November 2020. The FMS group consisted of 40 female FMS patients and their children (n=40). Forty healthy females and their children (n=40) were selected from volunteering health workers and included in the control group. The age and sex of children were similar between the groups. The demographic data and educational status of all mothers and children were recorded in the sociodemographic information form.

After the FMS diagnosis of patients by a physiatrist, they were queried for inclusion and exclusion criteria of the study. We used the revised 2016 criteria for the diagnosis of FMS. Mothers diagnosed with FMS were included in the study according to the criteria. The patients had to meet the following three criteria: a widespread pain index (WPI) score ≥7 and symptom severity scale (SSS) score ≥5, or a WPI score of 4-6 and SSS score >9; the presence of symptoms for at least three months; the presence of generalized pain, defined as pain in at least four of five regions (left and right upper, left and right lower, and axial). A diagnosis of FMS does not exclude the presence of other clinically important illnesses.[9]

Exclusion criteria for mothers were as follows: age <18 years, any accompanying medical, neurological, or psychiatric illness, and the presence of pain syndromes other than FMS. Having more than one child was not an exclusion criterion. However, only one child at preschool-school age was included in the study (age groups <7, 7-8, 8-9, and >9). One child was taken to be age-matched with the control group patients. The exclusion criteria for children were recurrent abdominal pain, headache, and presence of any chronic disease.

Functional status was evaluated by using the Fibromyalgia Impact Questionnaire (FIQ), which was completed by mothers with FMS. Turkish validity and reliability adaptation of the survey was performed by Sarmer et al.[10,11] FIQ measures 10 different characteristics; physical function, feeling unwell, absenteeism, problems at work, pain, fatigue, morning fatigue, stiffness, anxiety, and depression. Except for the sense of well-being, lower scores indicate improvement or being less affected by the disorder. FIQ is filled by the patient. The maximum possible score for each subtitle is 10. Thus, the total maximum score is 100.

Children's sleep quality was evaluated with the short-form Children's Sleep Habits Questionnaire (CSHQ), which was created by Owens et al.[12] in 2000 to examine children's sleep-related problems and habits, and it consists of 33 items in total. They included children aged 4 to 10 years. The Turkish validity and reliability study of CSHQ was done by Fiş et al.[13] They included school-age children and classified them as <7, 7-8, 8-9, and >9.

The scale was retrospectively filled by the parents. Parents were asked to evaluate the child's

sleep habits over the previous week. A total of 41 points is considered the cut-off point, and values above this are considered clinically significant.

The scale consists of eight subunits as follows: bedtime resistance (items 1, 3, 4, 5, 6, and 8), delayed falling asleep (item 2), sleep duration (items 9, 10, and 11), sleep anxiety (items 5, 7, 8, and 21), night awakenings (items 16, 24, and 25), parasomnias (items 12, 13, 14, 15, 17, 22, and 23), sleep breathing (items 18, 19, and 20), and sleepiness (items 26, 27, 28, 29, 30, 31, 32, and 33). Items in the scale are coded as follows: usually=3 (the specified behavior occurs five to seven times a week), sometimes=2 (two to four times a week), and rarely=1 (zero to one time a week). Items 1, 2, 3, 10, 11, and 26 are reverse-coded (usually=1, sometimes=2, and rarely=3). Thirty-second and 33rd items are coded as does not sleep=0, sleeps a lot=1, and falls asleep=2. The 41 points acquired in total are accepted as the cut-off point, and values above these are considered clinically significant.[12,13]

Statistical analysis

The data were analyzed with the IBM SPSS version 23.0 software (IBM Corp., Armonk, NY, USA). Compliance with normal distribution was examined by the Kolmogorov-Smirnov test. One-way analysis of variance and independent

Table 1. Comparison of the study group according to the demographic data

	FMS patients (n=40)			Healthy controls (n=40)			Total (n=80)				
	n	%	Mean±SD	n	%	Mean±SD	n	%	Mean±SD	t*	p
Age (year)			36.7±5.7			35.7±6			36.2±5.9	0.742	0.460
Mother											
Educational status											
Primary school	6	15		3	7.5		9	11.3			
Secondary school	5	12.5		2	5		7	8.8		3.850	0.278
High school	7	17.5		5	12.5		12	15			
University	22	55		30	75		52	65			
Working status											
Working	26	65		31	77.5		57	71.3		1.526	0.217
Unemployed	14	35		9	22.5		23	28.8			
Child											
Age group (year)											
<7	22	55		21	52.5		43	53.8			
7-8	3	7.5		3	7.5		6	7.5		0.149	0.985
8-9	8	20		8	20		16	20			
>9	7	17.5		8	20		15	18.8			
Sex											
Male	16	40		11	27.5		27	33.8		0.753	0.385
Female	24	60		29	72.5		53	66.2			
Education											
Preschool	5	12.5		3	9.7		8	11.3			
Kindergarten	16	40		8	25.8		24	33.8		2.919	0.404
Primary school	14	35		12	38.7		26	36.6			
Secondary school	5	12.5		8	25.8		13	18.3			

SD: Standard deviation; *Chi-square test statistics.

Table 2. Comparisons of demographic data with the CSHQ score in the FMS group

	Mean±SD	Test statistics	*p*
Education status			
Primary school	54.3±10.4[a]	F=4.050	**0.014**
Secondary school	61.6±8.5[ab]		
High school	72±7.7[b]		
University	61.1±9.7[ab]		
Working status			
Working	62.2±8.8	t=0.127	0.899
Unemployed	61.8±13.3		
Sex			
Male	63.4±9.4	t=0.639	0.527
Female	61.2±11.2		
Education			
Preschool	59.6±8.4	F=0.623	0.604
Kindergarten	62±9.8		
Primary	64.6±12.4		
Secondary	57.8±8.9		

CSHQ: Children's Sleep Habits Questionnaire; FMS: Fibromyalgia syndrome; a, b: There is no difference between education groups with the same letter; F: One-way analysis of variance test statistic; t: Independent samples t-test statistic.

samples t-test were used to compare normally distributed data. Kruskal-Wallis and Mann-Whitney U tests were used as nonparametric tests. The relationship between variables was analyzed using Pearson and Spearman correlation analyses. The data that were not normally distributed were expressed as median (min-max). The chi-square test was used for the comparison of categorical data, which was presented as frequency (percentage). The level of significance was set at $p<0.05$.

RESULTS

Maternal age, education status, mother's employment status, children's age, sex, and the education of the study group and the control group are shown in Table 1. There was no statistically significant difference between the two groups in demographic characteristics ($p>0.05$; Table 1).

The CSHQ score of the two groups was also above 41 points and was at a clinically significant level. While the median value of CSHQ score in mothers with fibromyalgia was 60.5, it was 52 in the control group ($p<0.001$; Table 2).

In the FMS group, the CSHQ score varied according to the mother's educational status ($p=0.014$). While the mean CSHQ score was

Table 3. The relation between the demographic data of the mothers in the control group and the CSHQ scores of their children

	Median	Min-Max	Test statistics (U)	*p*
Education status				
Primary school	40	0-49	5.940	0.115
Secondary school	39	0-78		
High school	54	49-64		
University	52	0-63		
Working status				
Working	52	0-78	116.0	0.463
Unemployed	48	0-64		
Sex				
Male	51	0-62	158.0	0.914
Female	52	0-78		
Education				
Preschool	50	46-61	1.169	0.760
Kindergarten	54	0-62		
Primary	50	0-78		
Secondary	51.5	0-60		

CSHQ: Children's Sleep Habits Questionnaire.

Table 4. The relationship between the children of mothers with FMS and the control group's CSHQ total score and subgroups' CSHQ score

	Children of mothers with FMS		Controls		Total			
	Median	Min-Max	Median	Min-Max	Median	Min-Max	Test statistics*	*p*
Bedtime resistance	1.9	1-2.5	2	1.5-2.5	2	1-2.5	603.5	0.220
Delayed falling asleep	2	0-3	3	1-3	3	0-3	406.5	**<0.001**
Sleep time	2.3	1.3-2.7	2.3	1.7-2.7	2.3	1.3-2.7	538.5	**0.040**
Sleep anxiety	2	1-3	2	1-3	2	1-3	681.5	0.686
Waking up at night	1.7	0.7-3	1.3	1-2.3	1.7	0.7-3	470	**0.008**
Parasomnias	1.7	0.4-2.4	1.1	1-2.7	1.2	0.4-2.7	363	**<0.001**
Disrupted breathing during sleep	1.5	0.7-3	1	1-3	1	0.7-3	405	**<0.001**
Sleepiness during the day	2.1	1.4-2.8	1.5	1.1-2.4	1.8	1.1-2.8	224.5	**<0.001**
CSHQ score	60.5	39-82	52	0-78	56	0-82	358.0	<0.001

FMS: Fibromyalgia syndrome; CSHQ: Children's Sleep Habits Questionnaire; * Mann-Whitney U test.

Table 5. The relation between symptom severity scale, diffuse pain index, and FIQ scores of the mothers with FMS and the CSHQ total and subscale scores of their children

	WPI score	SSS score	FIQ
Bedtime resistance			
r*	0.033	-0.109	0.085
p	0.839	0.501	0.603
Delayed falling asleep			
r*	-0.389	0.140	-0.536
p	**0.013**	0.391	**<0.001**
Sleep time			
r*	-0.039	-0.145	-0.335
p	0.812	0.373	**0.035**
Sleep anxiety			
r*	0.109	-0.083	0.410
p	0.505	0.610	**0.009**
Waking up at night			
r*	0.265	0.145	0.413
p	0.098	0.373	**0.008**
Parasomnias			
r*	0.201	-0.169	0.547
p	0.214	0.296	**<0.001**
Disrupted breathing during sleep			
r*	0.378	-0.034	0.561
p	**0.016**	0.837	**<0.001**
Sleepiness during the day			
r*	0.215	-0.072	0.585
p	0.182	0.658	**<0.001**
CSHQ			
r**			0.553
p			<0.001

FIQ: Fibromyalgia Impact Questionnaire; FMS: Fibromyalgia syndrome; CSHQ: Children's Sleep Habits Questionnaire; WPI: Widespread pain index; SSS: Symptom severity scale; r*: Spearman correlation coefficient; r**: Pearson correlation coefficient

54.3±10.4 in the primary school group, it was 61.6±8.5 in the secondary school group, 72±7.7 in the high school group, and 61.1±9.7 in the university group. Only the primary school group's score was lower than the high school group, and this result was statistically significant (Table 2). In the control group, the CSHQ score did not differ according to maternal education status, mother's employment status, child's sex, and education (Table 3). There was no statistically significant difference ($p>0.05$). Delayed falling asleep, sleep time, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness during the day differed between the groups (Table 4). The delayed falling asleep score, which was reverse coded, was lower in the FMS group than in the control group, and the difference was statistically significant ($p<0.001$). Sleep time, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness scores were higher in the FMS group than in the control group, and the differences were statistically significant ($p<0.001$). A moderate and positive relationship was found between the FIQ score and the CSHQ score. We know that as the FIQ score increases, the FMS more significantly affects daily living activities. Thus, it was found that children whose mothers had high FIQ scores had high CSHQ scores, and this was statistically significant ($p<0.001$).

In Table 5, the relationship between the subscales of CSHQ scores and FIQ score, widespread pain index score, and symptom severity scale scores was presented. A moderate positive correlation was found between the FIQ score and sleep anxiety, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness during the day ($p<0.001$). A weak-positive significant relationship was found between the widespread pain index score and disrupted breathing during sleep. Children of mothers with high widespread pain index scores had disrupted breathing during sleep score, and this result was statistically significant ($p=0.016$). We found a negative correlation between the FIQ and WPI scores and the delayed falling asleep score, and it was statistically significant ($p=0.0013$ and $p<0.001$, respectively). In addition, there was a significant and negative correlation between the FIQ score and sleep duration ($p<0.001$; Table 5).

DISCUSSION

In this study, sleep disturbance factors affecting sleep quality in children whose mothers had FMS were evaluated. The sleep quality of the children whose mothers had fibromyalgia was found to be worse. Similar to the hypothesis established for our study, sleep disturbance in the same children group was higher than in the control group.

The results showed significant differences between the groups in terms of CSHQ total scores and subscale scores of delayed falling asleep, sleep time, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness during the day. In addition, a higher FIQ score in mothers with FMS indicated lower sleep quality in their children. The frequency of sleep anxiety and night awakening was high in the children of patients with high FIQ scores. Moreover, parasomnias, disruptive breathing during sleep, and sleepiness during the day scores of these children were high. The breathing impairment rate during sleep was higher in the children whose mothers had a high pain index score. It has been determined in studies that respiratory problems, such as obstructive sleep apnea, can accompany FMS.[14,15]

Children of mothers with FMS with high WPI and FIQ scores may expect similar symptoms as their mothers. Future studies may yield important results in this respect. Early diagnosis and treatment may have been provided for these children.[14]

Good sleep quality is essential for the growth and development of children. A total of 30% of children experience sleep disturbances beginning in early childhood.[15] Lyu et al.[16] reported that reduced sleep in mothers in the second and third trimesters was correlated with childhood sleep disorders. This situation causes negative consequences, such as mental health problems, obesity, injury, and poor school performance. The parent-child relationship affects bedtime, sleep routines, and sleep efficiency. Daytime sleepiness of mothers, psychological distress, insomnia, and marital conflicts play a role in children's sleep.[15] Thus, we wanted to see if the functional status of mothers with FMS causes sleep disturbances in children using FIQ. We know that mothers with FMS experience difficulties

in their daily lives and are affected negatively by the increase in the FIQ score. According to the results obtained in our study, children of mothers with high FIQ scores had sleep disorders, such as sleep anxiety, waking up at night, parasomnias, disrupted breathing during sleep, and sleepiness during the day. Although it is known that there is a close relationship between parents and children in terms of pain and psychological functioning, there are limited data to understand the development of this situation over time. For example, Wilson et al.[17] studied to establish the risk factors for chronic pain in children whose mothers had chronic pain. As a result of this study, maternal disability was associated with child psychosocial function. In our study, we compared the WPI score with the CSHQ subscales of the children, and we found that as the mother's WPI score increased, the child's sleep quality deteriorated. The parents' sleep quality, depressive mood, and maternal adverse childhood experiences (e.g., parental divorce and physical or sexual abuse) were related to the children's sleep disorder.[8,18] When studies on pain in childhood were examined, it was seen that pain was affected by early maternal psychosocial factors, and it has been found that children with a history of pain in their family had a higher musculoskeletal pain experience.[19,20] In the light of these studies, it is very likely that children of parents with FMS are affected.[21]

In the study of Walitt et al.,[22] not having a college education was a predictor of FMS. The association between education level and FMS is clear, with a higher prevalence among persons with the lowest educational level.[23] In our study, it was found that children whose mothers had high FIQ scores also had high CSHQ scores, which was statistically significant. However, in the FMS group, the CSHQ score varied according to the mother's educational status (p=0.014). Only the CSHQ score of the primary school group was significantly lower than the high school group. We would expect the education level of children with high CSHQ to be low. However, we think that the number of mothers with FMS is not sufficient to make this generalization.

Cultural ideologies and traditions have an impact on sleep habits with potentially beneficial and harmful consequences and can provide a basement to build on sleep interventions.[15] Therefore, the limitation of our study is that the collected data were solely sourced from Türkiye, which cannot be generalized to the world population. More studies are needed in this area to achieve more widespread results comprising different countries. Future research should focus on the risks to parents' health and psychological characteristics with FMS regarding children's pain, sleep, and psychological disorders.

In conclusion, it was determined that the sleep quality of children whose mothers had FMS was negatively affected when compared to the sleep quality of children with healthy mothers in our study. Since fibromyalgia is a reproductive age disease, we included the children of mothers of this age group in the study. We wanted to raise awareness in children of mothers with fibromyalgia, as sleep disorders begin in early childhood.

Ethics Committee Approval: The study protocol was approved by the Acıbadem University and Acıbadem Healthcare Institutions Medical Research Ethics Committee (ATADEK) (date: 11.07.2019, no: 2019-12/22). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: Informed consent was obtained from all individual participants included in the study.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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