Sleep quality in fibromyalgia and rheumatoid arthritis: associations with pain, fatigue, depression, and disease activity

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ABSTRACT

Objectives. *The aim of this study was to compare the sleep quality in patients with rheumatoid arthritis (RA) and fibromyalgia syndrome (FMS); and to evaluate the relationship between sleep quality and pain, fatigue, depression, and disease activity in patients with RA and FMS.*

Methods. *Forty RA, 40 FMS and 40 healthy controls were enrolled in the study. Disease activity and disease duration were reported in patients. Pain by visual analogue scale (VAS), fatigue by Multidimensional Assesment of Fatigue (MAF), depression by Beck Depression Index (BDI), and sleep quality by Pittsburgh Sleep Quality Index (PSQI) were gathered in all participants.*

Results. *All participants were aged between 20 and 65 years, with a mean age of 42.97±10.75 years. There was no significant difference with respect to demographic characteristics among the three study groups. Patients reported more depression than controls, but BDI scores were similar in FMS and RA patients. VAS pain scores and MAF scores were significantly different in the three groups ($p<0.001$). FMS and RA patients had poor sleep quality ($p<0.001$). FMS patients had daytime dysfunction due to sleep disorder and had worse habitual sleep efficiency than RA patients ($p<0.05$). In patients, positive correlations were found between PSQI and clinic assessment variables except disease duration.*

Conclusions. *FMS and RA may have poor sleep quality when compared to subjects without rheumatologic disorders. The quality of sleep can be impaired by pain, fatigue, depression, and disease activity in such patients.*

Introduction

Fibromyalgia syndrome (FMS) is a chronic disorder that is characterised by diffuse musculoskeletal pain, sleep disturbance, fatigue, stiffness, and presence of multiple tender points (1). More than 75% of patients with fibromyalgia complain of sleep disturbances (2). Schaefer reported that the widespread pain and fatigue of FMS may be linked to the sleep disturbances found in the disorder (3). It was suggested that the relationships between sleep and fatigue and pain were highly individual with directional and intensity differences in women with FMS (3).

Rheumatoid arthritis (RA) is a chronic, generally progressive auto-immune disease that causes functional disability, pain, and joint destruction. Sleep complaints and related daytime symptoms occur in 54–70% of adult RA patients. Most of the studies in RA patients have shown that sleep disturbance is linked to pain, mood, and disease activity (2). Sleep complaints are one of the most important symptoms in rheumatologic disorders. The impacts of sleep disorders and sleep disruption in worsening the rheumatologic processes are still poorly understood and pain, depression, and inflammation are intertwined with sleep complaints (2). There have been few studies comparing the sleep problems of FM patients to those of another chronic pain group and healthy subjects. In some studies, FM patients reported more sleeping disturbances than RA and OA patients or healthy subjects (4, 5). Belt *et al*. found that the patients in both chronic pain groups of FM and RA showed somewhat reduced sleep duration when compared to the general population (6). The objective of this study is to determine and compare sleep quality of patients with FMS and RA and to evaluate the relationship between sleep quality and pain, fatigue, depression, and disease activity in these patients.

Materials and methods

The present study was conducted at the Department of Physical Medicine and Rehabilitation of the Medical Faculty of Ondokuz Mayis University and the

local ethics committee approved the study protocol. Forty patients who met the 1990 American College of Rheumatology (ACR) criteria for FMS (1), 40 patients who met the ACR classification criteria for RA (7), as well as 40 sex- and age-matched healthy controls were enrolled in the study. In order to have statistical power of 0.80, and $p<0.05$, it was calculated that 36 subjects in each group were required to detect the differences in global sleep quality scores between the groups.

The criteria for exclusion were other rheumatic diseases, severe somatic or psychiatric disorders and painful or disabling medical conditions, and presence of biologic therapy in RA patients. Subjects were also excluded if they had taken medications for sleepiness within one month of the study. All subjects were women and gave written informed consent.

All participants were questioned about their age, sex, body mass index (BMI), working status, educational level, medical co-morbidities, and current medications. Disease duration of the patients was also reported.

Clinical assessments

The following outcome measures were included in each evaluation:

– Sleep quality

The Pittsburgh Sleep Quality Index (PSQI) was used for the subjective assessment of sleep quality. The PSQI is a questionnaire consisting of 19 items which are coded on a 4-point scale (0–3) to obtain 7 subcategories, including sleep duration, sleep disturbances, sleep latency, daytime dysfunction, sleep efficiency, sleep quality, and medication use. The sum of all sub-scores represents the total sleep quality score, ranging between 0–21, with higher scores representing lower sleep quality. Respondents are asked to rate their sleep reflecting on the past month. The validity and reliability of the Turkish form of PSQI was performed by Agargun *et al*. (8).

– Measurement of pain severity

The global pain of the patients was assessed by a 10-cm visual analogue scale (VAS); the score 0 indicates 'no pain' and 10 indicates 'very severe pain'.

– Fatigue

Fatigue was assessed with multidimensional assessment of fatigue (MAF). MAF scale contains five dimensions of fatigue: degree, severity, distress, impact on activities of daily living, and timing. Each 100-mm VAS was changed to a 10-point numerical rating scale. Scores ranged from 0 (no fatigue) to 50 (severe fatigue) (9).

– Psychological status

Psychological status was assessed by Beck Depression Inventory (BDI). The BDI is a 21-item scale that gathers information on different symptoms of depression. Each item on the scale is scored from 0 to 3. It provides information both about the presence and the severity of depression, on somatic, emotional, cognitive, and motivational dimensions. Higher scores imply the presence of more depression. BDI was developed by Beck *et al*. and adapted to Turkish by Hisli (10).

– Disease activity

Fibromyalgia Impact Questionnaire (FIQ) is widely used in patients with FMS to evaluate both the clinical severity of the disease and the efficacy of different treatments. FIQ is a self-administered questionnaire and consists of VAS and questions regarding limitations of daily living activities over the previous week. The total score ranges from 0 to 80; a higher score indicates a more negative impact. It was found a reliable and valid instrument in Turkish female FMS patients (11).

Disease activity of RA patients was evaluated using Disease Activity Score including 28 joints (DAS-28). For this purpose tender joint count, swollen joint count, erythrocyte sedimentation rate, and global assessment score were used. DAS-28 scores that are greater than 5.1 imply high disease activity, while scores below 3.2 low disease activity (12).

Statistical analyses

Statistical analyses were performed with SPSS 16.0 for Windows. Descriptive data were presented as mean ± standard deviation (SD) or minimum–maximum (median). The Shapiro-Wilk test was used to analyse normal distribution assumption of the quantitative outcomes. Kruskal-Wallis test was used to compare the three groups, because the data were not normally disturbed. To compare two groups Mann-Whitney U-test was used. The correlations were investigated by using Spearman correlation analysis. The sociodemographical characteristics (education, occupation) of the groups were evaluated by Chi-square test. p-values less than 0.05 were considered statistically significant.

Results

All participants were aged between 20 and 65 years, with a mean age of 42.97±10.75 years. Demographic and clinical characteristics of the study sample are shown in Table I. There was no significant difference with respect to demographic characteristics among the three study groups.

The mean DAS-28 and FIQ score were 3.98±1.11 (1.82–6.33) and 61.04±1.38 (31.95–87.74) in patients with RA and FMS, respectively.

The mean duration of disease was 4.3±3.55 years for the FMS group and 6.8±5.57 years for the RA group, and there was no significant difference between the groups ($p>0.05$).

In the study groups, the mean BDI score was significantly different from the control group, but there was no significant difference between the patients with FMS and RA for BDI score (Table I).

The mean VAS pain score and the mean MAF score were significantly different in the three groups (Table I).

The comparison of results of the global and components of PSQI scores by diagnosis are presented in Table I. There was a significant difference between the FMS patients and the RA patients according to sleep efficiency ($p=0.027$) and daytime dysfunction ($p=0.032$). There were statistically significant differences between the control and FMS patients for all components and global scores of PSQI (Table I). All components and global scores of the PSQI were higher in patients with FMS than in the control group (Table I). The group comparisons revealed that all components and global scores of PSQI

Table I. Comparison of groups' demographic and clinical data.

Characteristics	FMS (n=40) Mean±SD Median (min–max)	RA (n=40) Mean±SD Median (min–max)	Control (n=25) Mean±SD Median (min–max)	
Age (years)	43.02 ± 10.30 44 (23–62)	43.8 ± 11.17 45 (20–65)	42.08 ± 10.97 44 (20–65)	NS
BMI (kg/m^2)	27.40 ± 4.51 28 (16–38)	27.74 ± 3.82 28 (16–33)	26.39 ± 2.82 26 (19–33)	NS
Occupation				
housewife	33	34	32	NS
retired	6	5	7	
other	1	1	1	
Education				
literate	2	2	2	NS
primary education	21	24	20	
secondary education	11	10	12	
college	6	4	6	
Disease duration (months)	4.30 ± 3.55 3 (1–15)	6.80 ± 5.57 5 (1–18)		NS
VAS pain score [a]	8.00 ± 1.60 8 (3–10)	6.55 ± 2.36 7 (2–10)		
BDI score [b,c]	15.15 ± 7.39 15 (3-29)	12.22 ± 6.30 11.5 (3–29)	2.88 ± 2.13 2.5 (0–8)	
MAF score [a,b,c]	39.38 ± 9.97 43 (18–50)	29.35 ± 14.35 30 (1–50)	11.56 ± 8.24 11 (1–32)	
PSQI Total [b,c]	9.70 ± 4.29 9.5 (2–20)	9.45 ± 4.44 9.5 (1–18)	2.78 ± 2.14 2.5 (0–9)	
Sleep quality [b,c]	1.78 ± 0.76 2 (1–3)	1.45 ± 0.71 1 (0–3)	0.70 ± 0.56 1 (0–2)	
Sleep latency [b,c]	1.62 ± 1.21 2 (0–3)	1.48 ± 1.26 2 (0–3)	0.45 ± 0.78 0 (0–3)	
Duration of sleep [b,c]	1.65 ± 1.27 2 (0–3)	2.10 ± 1.17 3 (0–3)	0.60 ± 0.92 0 (0–3)	
Sleep efficiency [a,b,c]	1.38 ± 1.39 1 (0–3)	2.05 ± 1.32 3 (0–3)	0.25 ± 0.58 0 (0–2)	
Sleep disturbance [b,c]	1.62 ± 0.29 2 (1–3)	1.42 ± 0.55 1 (1–3)	0.58 ± 0.55 1 (0–2)	
Day dysfunction [a,b,c]	1.00 ± 0.87 1 (0–3)	0.62 ± 0.86 0 (0-3)	0.20 ± 0.46 0 (0–2)	
Need medications to sleep [b,c]	0.65 ± 1.23 0 (0–3)	0.35 ± 0.95 0 (0–3)	0 0	

FMS: fibromyalgia syndrome; RA: rheumatoid arthritis; BMI: body mass index; VAS: visual analogue scale; BDI: Beck depression index; MAF: multidimensional assessment of fatigue; PSQI: Pittsburg sleep quality index; NS: not significant.
[a] Significant difference between FMS and RA group.
[b] Significant difference between FMS and control group.
[c] Significant difference between RA and control group

were significantly higher in RA patients than in controls (Table I).

Correlation analysis

The results of the correlation analysis between the PSQI and clinical assessment variables are shown in Table II in FMS patients. The global PSQI and subjective sleep quality scores were positively correlated with MAF score (Table II). The pain by VAS score was positively correlated only with the daytime dysfunction (Table II). In the same patients group, subjective sleep quality and sleep disturbance were correlated with BDI score positively (Table II). FIQ score was found to positively correlate with the global PSQI score and subjective sleep quality, and sleep disturbance (Table II). In the FMS group, there was no significant correlation between the global and components of PSQI scores and the duration of illness (Table II).

The correlation coefficients between the PSQI and clinic assessment variables with RA patients are shown in Table III. MAF score was correlated with only sleep disturbance (Table III). There was a positive correlation between the VAS pain score and the PSQI global score, subjective sleep quality, sleep latency, and sleep disturbance (Table III). Total PSQI score, subjective sleep quality, and sleep latency were correlated positively with BDI score (Table III). A positive association was also found between DAS-28 score and the global PSQI score and subjective sleep quality (Table III). None of the PSQI scores showed any correlation with the duration of illness in patients with RA (Table III).

Discussion

Sleep disturbance is a common condition that has major influences on the quality of life and is prevalent among patients with rheumatologic disorders. Comparative researches on sleep quality in patients with FMS and RA, and the inter-relationships between sleep quality, pain, fatigue, depression, and disease activity in these disorders are limited in the literature (2, 6). In this study, we aimed to determine sleep quality of patients with FMS and RA by using PSQI and to compare with a sex- and age-matched control group. The impact of pain, fatigue, depression, and disease activity on sleep quality were also evaluated.

PSQI is used widely as a general measure of sleep quality. It is one of the instruments which should be considered for use in planned clinical trials of RA patients (13). PSQI is also a useful instrument for characterising and quantifying sleep disturbances in patients with FMS (5).

Previous studies revealed that FMS patients suffer from poorer quality of sleep than the general population, and the other rheumatic diseases such as RA or osteoarthritis (4-6, 14). In the current study, FMS and RA patients

Table II. The correlation coefficients between clinical variables and the global PSQI score and its components in FMS patients.

PSQI	Disease duration	VAS pain	BDI	MAF	FIQ
Total	r = 0.18	r = 0.05	r = 0.16	r = 0.33*	r = 0.36*
Sleep quality	r = 0.06	r = 0.12	r = 0.47*	r = 0.37*	r = 0.61**
Sleep latency	r = 0.10	r = 0.05	r = 0.08	r = 0.06	r = 0.14
Duration of sleep	r = 0.21	r = 0.03	r = -0.01	r = 0.23	r = 0.25
Sleep efficiency	r = 0.27	r = 0.01	r = 0.05	r = 0.25	r = 0.28
Sleep disturbance	r = 0.04	r = 0.12	r = 0.33*	r = 0.16	r = 0.39*
Daytime dysfunction	r = 0.09	r = 0.34*	r = 0.19	r = 0.14	r = 0.19
Need medications to sleep	r = -0.12	r = -0.22	r = -0.10	r = 0.14	r = -0.07

VAS: visual analogue scale; BDI: Beck depression index; MAF: multidimensional assessment of fatigue; FIQ: fibromyalgia impact questionnaire; PSQI: Pittsburg sleep quality index.
*$p<0.05$; **$p<0.001$.

Table III. The correlation coefficients between clinical variables and the global PSQI score and its components in RA patients.

PSQI	Disease duration	VAS pain	BDI	MAF	DAS-28
Total	r = 0.01	r = 0.35*	r = 0.38*	r = 0.05	r = 0.39*
Sleep quality	r = -0.01	r = 0.50*	r = 0.43*	r = 0.24	r = 0.50**
Sleep latency	r = 0.08	r = 0.34*	r = 0.43*	r = 0.16	r = 0.28
Duration of sleep	r = 0.06	r = 0.01	r = 0.05	r = -0.12	r = 0.24
Sleep efficiency	r = -0.06	r = 0.06	r = 0.28	r = -0.14	r = 0.19
Sleep disturbance	r = 0.13	r = 0.69**	r = 0.58**	r = 0.49**	r = 0.44*
Daytime dysfunction	r =-0.08	r = 0.26	r = 0.23	r = 0.01	r = 0.14
Need medications to sleep	r = 0.01	r = 0.03	r = 0.02	r = -0.23	r = 0.12

VAS: visual analogue scale; BDI: Beck depression index; MAF: multidimensional assessment of fatigue; DAS-28: disease activity score-28; PSQI: Pittsburg sleep quality index.
*$p<0.05$; **$p=0.001$.

had more sleep problems than controls, but sleep quality scores of both patient groups were similar. Unlike RA group, FMS patients had daytime dysfunction due to sleep disorder and had worse habitual sleep efficiency than RA patients. Pain and sleep disturbances may be mutually correlated; pain may cause a sleep problem, but on the other hand, disturbances in sleep may also alter the pain threshold (15). Significant relationships between pain and sleep patterns were demonstrated in FMS and RA patients (2, 16). Similar to our study, previous authors reported higher pain scores in FMS patients compared to the RA patients (17-19). In our study, pain was correlated only with daytime dysfunction in FMS patients, therefore pain may not be the only cause of sleep disturbance in these patients. In RA patients, pain was positively related to PSQI global score, subjective sleep quality, sleep latency, and sleep disturbance, suggesting that increased pain is associated with an increase in sleep disturbance.

Fatigue is a non-specific, subjective feeling of low vitality that affects daily functioning and is common in rheumatologic disorders (20-22). Sleep disturbance may be a determinant of fatigue (23). In a study by Crawford *et al*., patients with FMS reported that fatigue was an important symptom of their illness (24). Zautra *et al*. have shown that fatigue in FMS has been associated with pain, stiffness, depression, and disordered sleep (25). As in FMS, a correlation between fatigue and sleep disturbance in RA patients has already been demonstrated (22). In the present study, patients with both FMS and RA demonstrated greater fatigue scores than controls. Similar to the study by Belt *et al*., fatigue scores were higher among participants with FMS than those with RA (6). In FMS group, there was a significant relation between fatigue and the global PSQI, and subjective sleep quality. In RA group, fatigue was correlated only with sleep disturbance. Therefore fatigue may probably play an important role in sleep disturbance, although it may influence sleep via various mechanisms.

The mutual correlation between sleep disorders and depressive complaints was shown in a study by Spoormaker *et al*. (26). Co-morbid depression was reported in 17% of FMS patients with sleep disorders (2). Korszun *et al*. found that the patients with FMS alone had more sleep disturbance than the healthy controls, and the patients with both FMS and depression showed the most severe sleep problems (27). Depressive symptoms are present in 13–20% of RA patients. Nicassio *et al*. showed self-reported sleep problems were associated with depression, independently of pain and functional impairment in RA (28). In the current study BDI scores were significantly high in RA and FMS patients. Although it was reported that FMS patients are more depressed than RA patients, similar to study by Ofluoglu *et al*., in this study no difference was found between RA and FMS group for BDI scores (29). BDI scores were positively correlated with subjective sleep quality and sleep disturbance in FMS patients, and positively correlated with global PSQI, subjective sleep quality, and sleep latency in RA group. Therefore patients with FMS and RA, whose BDI scores are high, may have more sleep problems.

Severity of symptoms may contribute to a decreased sleep quality in patients with FMS (30-32). In RA patients, an association between sleep disturbance and disease activity is controversial. In many studies, significant positive correlations were shown between disease activity and sleep complaints in RA patients, while Hirsh *et al*. reported no correlation (2). The current study showed that total FIQ score was positively correlated with global PSOI, subjective sleep quality, and sleep disturbance. In the RA group, there were significant correlations between the DAS-28 scores with global PSQI and subjective sleep quality.

According to the results of this study, patients with FMS suffer from poor sleep quality as a function of fatigue,

depression, or disease activity rather than pain. On the other hand, the effect of pain, fatigue, depression, and disease activity on sleep quality was detected in RA patients. Although the clinical findings and pathophysiology of FMS is different from RA, and sleep disturbance is a typical symptom to FMS, RA patients have sleep problems as patients with FMS.

A strong point of our study is that it is the first study in which the impact of pain, fatigue, depression, and disease activity on sleep quality was assessed together in patients with FMS and RA. Since cytokines play a significant role in inflammation, insomnia, and depression (2), RA patients on biologic drugs were excluded from the study. The major limitation of the current study is the limited number of patients, who were all women. Future studies should include a larger population and both sexes.

In conclusion, the patients in both chronic pain groups of FMS and RA may have poor sleep quality when compared to subjects without rheumatologic disorders. The quality of sleep can be impaired by pain, fatigue, depression, and disease activity in patients with FMS and RA. Therefore, these interactions should be considered in the treatment of sleep disorders in such patients.

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