Journal of Taibah University Medical Sciences (2024) 19(1), 90–98

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com

Original Article

Sleep profile and its correlation with clinical variables in fibromyalgia syndrome: A cross-sectional study

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Received 14 February 2023; revised 26 July 2023; accepted 31 August 2023; Available online 11 September 2023

الملخص

أهداف البحث: توجد ندرة في الأبحاث المتعلقة بجودة النوم في متلازمة الألم العضلي الليفي في السياق الهندي. تهدف الدراسة الحالية إلى وصف ملف نوم مرضى متلازمة الفيبروميالجيا الذين يعانون من قلة النوم المقيمين في مدينة بنغالور الحضرية وتحديد العلاقة بين متغيرات قلة النوم والفيبروميالجيا.

طريقة البحث: تم تضمين ستة وثمانون مريضا متلازمة الألم العضلي الليفي في الدراسة. تم استخدام مؤشر جودة النوم في بيتسبرغ واستبيان تأثير الألم العضلي الليفي المنقح ، على التوالي، لتقييم متغيرات نمط النوم والفيبروميالجيا. تم استخدام ارتباط رتبة سبيرمان واختبار "ت" و أنوفا أحادي الاتجاه للتحليل.

النتائج: تم تحديد واحد وتسعين بالمائة من مرضى متلازمة الألم العضلي الليفي على أنهم يعانون من قلة النوم. كان متوسط النتيجة العالمية لمؤشر جودة النوم في بيتسبرغ للمرضى المشمولين هو 12.04 ± 3.5. اختلفت درجة النوم العالمية حسب الجنس وشدة الألم العضلي الليفي. تم العثور على علاقة ذات دلالة إحصائية بين النتيجة العالمية لمؤشر جودة النوم في بيتسبرغ وإجمالي استبيان تأثير الألم العضلي الليفي المنقح والمجالات الفرعية لاستبيان تأثير الألم العضلي الليفي المنقح ومدة متلازمة الألم العضلي الليفي. ترتبط النتيجة العالمية لمؤشر جودة النوم في بيتسبرغ أيضا بالألم والاكتئاب والذاكرة والقلق والتوازن والحساسية.

الاستنتاجات: ينتشر اضطراب النوم بشكل كبير في مرضى متلازمة الألم العضلي الليفي المقيمين في مدينة بنغالور الحضرية. تميل جودة النوم إلى التدهور عند الإناث مع زيادة شدة متلازمة الألم العضلي الليفي ومدتها ولكنها لم تختلف عبر المتغيرات الديموغرافية الأخرى. ترتبط جودة النوم بشكل كبير بالمتغيرات الجسدية والنفسية. يمكن للدراسات المستقبلية التي تهدف إلى تقييم المتنبئين بسوء النوم أن تعزز النتائج بشكل أكبر.

الكلمات المفتاحية: ارتباط البيانات؛ فيبروميالغيا؛ ألم؛ جودة الحياة؛ ينام؛ الهند

Abstract

Objective: A scarcity of literature exists on sleep quality in fibromyalgia syndrome (FMS) in Indian patients. The current study described the sleep profile of patients with FMS with poor sleep quality residing in urban Bangalore and determined the relationship between poor sleep and fibromyalgia variables.

Methods: Eighty-six patients with FMS were included in the study. Pittsburgh Sleep Quality Index (PSQI) and Revised Fibromyalgia Impact Questionnaire (FIQR) were used to evaluate the sleep profile and fibromyalgia variables. Spearman's rank correlation, *t*-test, and one-way analysis of variance were used for the analyses.

Results: Ninety-one percent of patients with FMS were identified as poor sleepers (PSQI >5). The mean PSQI global score of the included patients was 12.04 ± 3.5. The global sleep score varied with sex ($p = 0.003$) and fibromyalgia severity ($p = 0.001$). A significant correlation was found between PSQI global score and FIQR total score (r = 0.4, $p < 0.001$), FIQR subdomains (r = 0.2–0.4,

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Peer review under responsibility of Taibah University.

Production and hosting by Elsevier

 https://doi.org/10.1016/j.jtumed.2023.08.010

$p < 0.05$), and FMS duration (r = 0.26, $p < 0.05$). The PSQI global score was also correlated with pain, depression, memory, anxiety, balance, and sensitivity (r = 0.2−0.3, $p < 0.05$).

Conclusion: Sleep disturbance is highly prevalent in patients with FMS residing in urban Bangalore. Sleep quality tends to worsen in females with increasing FMS severity and duration but does not differ across other demographic variables. Sleep quality is significantly correlated with somatic as well as psychological variables. Future studies evaluating the predictors of poor sleep are needed to further corroborate these findings.

Keywords: Correlation of data; Fibromyalgia; India; Pain; Quality of life; Sleep

Introduction

Fibromyalgia syndrome (FMS) is a chronic condition with a multitude of symptoms such as widespread pain, fatigue, sleep dysfunction, tenderness, cognitive deficits, depression, anxiety, and poor quality of life.[1] The global occurrence of this condition ranges from 0.2% to 6.6%,[2] with a mean prevalence of 2.7% worldwide.[3] FMS is particularly common among females[2,3] and in individuals aged 30−50 or ≥50.[3]

Sleep is a vital state necessary for regulating the body's functions, thus positively impacting overall health.[4] Disrupted sleep may be detrimental to a person's physical, mental, emotional, and cognitive health, leading to numerous morbidities.[5] Sleep disturbance is a common clinical symptom in patients with FMS.[6−8] Patients with FMS often have difficulties in sleep induction or maintenance, frequent night awakenings, and an unrefreshed feeling upon waking up in the morning.[8,9] Research indicates that sleep deprivation in healthy individuals is strongly associated with impaired nociceptive inhibition[10] and increases the susceptibility of adult females to developing FMS.[11] Sleep disturbance is also associated with FMS symptoms and decreased quality of life.[12−14] Furthermore, disrupted sleep in FMS individuals leads to daytime drowsiness, which can have a negative impact on their overall performance.[9] All the references contribute to the distress associated with FMS.

The etiopathogenesis of FMS is not fully clear. Several possible mechanisms include alteration in nociceptive processing by the central, peripheral, and autonomic nervous systems; altered levels of neurotransmitters and hormones; genetics; the immune system; psychological, behavioral, and social factors; and external stressors.[15−18] A relationship exists between disturbed sleep and the central sensitization phenomenon seen in FMS.[8] It is found that "slow wave sleep" (SWS) is impaired in patients with FMS.[10,19] During a typical SWS state in a healthy individual, synaptic transmission is inhibited. Nonetheless, in patients with FMS, impaired SWS may disrupt the inhibition of synaptic transmission. This, in turn, results in the disruption of nociceptive inhibitory processes, making the individuals more susceptible to painful and nonpainful sensations.[10] This mechanism could elucidate the role of impaired sleep in contributing to central sensitization and the presence of multiple symptoms in patients with patients.[8,10,19]

Studies have demonstrated the heterogeneous nature of the symptoms experienced by patients with FMS and described the relationship between sleep and other somatic and psychosocial symptoms.[12,13,20] However, studies in this context are lacking in the Indian population. Available literature has demonstrated differences in sleep patterns according to race and ethnicity.[21] Asian adults tend to have a shorter sleep duration than Caucasians, and Hispanic individuals[22] are more likely to report shorter sleep than Caucasians.[23]

Considering the sociocultural and environmental differences worldwide and the scarcity of literature illustrating the characteristics of sleep quality of patients with fibromyalgia in India, there is a need for studies in this population. Thus, the primary objective of the current study was to describe the sleep profile of fibromyalgia patients with poor sleep quality attending a hospital in urban Bangalore. The study's secondary objective was to determine the relationship between poor sleep quality and clinical variables of FMS. We hypothesized that poor sleep is prevalent in patients with FMS and related to FMS variables.

Materials and Methods

This was a cross-sectional study reported following the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines.[24]

Study setting and participants

The trial was conducted in the physiotherapy department of a hospital in Bangalore (from July 2020 to May 2022) and was approved by the hospital's scientific research and ethics committee. The study included participants who fulfilled the following criteria: (a) males or females aged 18−60 years; (b) FMS diagnosed using 2016 Revisions to the 2010/2011 American College of Rheumatology fibromyalgia diagnostic criteria[25]; (c) Pittsburgh Sleep Quality Index (PSQI) score of more than 5 indicating disturbed or poor sleep[26]; and (d) willingness to provide consent and adhere to the study protocol.

The patients were excluded if they had co-morbid conditions such as spinal injuries, inflammatory rheumatic diseases, obstructive sleep apnea, or uncontrolled endocrine disorders, or had diagnosed psychological or neurological disorders. The patients with FMS visiting the physiotherapy outpatient department were screened for eligibility and recruited for the study after providing written informed consent.

Assessment

The demographic details of the participants were noted and included age, sex, height, body mass, body mass index (BMI), duration of FMS symptoms, education, employment, marital status, physical activity status measured using the WHO Global Physical Activity Questionnaire (GPAQ),[27] diet, presence of comorbidities, vitamin deficiencies, and medications prescribed.

The following tools were used to evaluate sleep profile and fibromyalgia variables. The PSQI is a reliable and valid self-administered tool assessing sleep quality experienced by adults over the past month. It comprises seven components built on 19 questions: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. All seven components are rated from 0 to 3, so that the total score ranges from 0 to 21. A higher score denotes poorer sleep quality. It has good internal consistency (Cronbach's alpha, $\alpha = 0.83$) and test–retest reliability (Pearson's correlation coefficient, $r = 0.85$) and validity.[26]

The Revised Fibromyalgia Impact Questionnaire (FIQR) is a valuable tool to evaluate the symptoms and impact of FMS on patients. It has three domains (function, overall impact, and symptoms) with a total of 21 items. The function domain consists of nine functional activities: brushing, combing, walking, household activities, climbing, and shopping. The symptoms domain consists of 10 symptoms: pain, fatigue, stiffness, sleep, depression, memory, anxiety, tenderness, balance, and sensitivity. All items are rated from 0 to 10, and the final score ranges from 0 to 100, with higher scores denoting greater difficulty and impact. FIQR has sound psychometric properties ($\alpha = 0.95$).[28] The FMS severity calculated from the FIQR scores is classified as mild ($\leq$40), moderate (>40 & $\leq$63), and severe (>63) according to the FIQR cut-off scores determined by Salaffi et al.[29]

Sample size

The formula, $n = (Z_{1-\alpha/2})^2\ p(1-p)/d^2$, was used to determine the sample size, keeping p as 0.96[14] and d as 5% precision. Furthermore, the researchers anticipated a 30% dropout rate. Thus, the minimum sample required for the study was 85.

Statistical analyses

The data were entered in Microsoft Excel 2016, and analyses were conducted using Jamovi software (version 2.3). The mean and standard deviation/median and interquartile range were calculated using descriptive statistics based on findings from the Shapiro–Wilks test for normality. Frequency was used for the demographic and clinical variables that are categorical in nature. The two-sample independent *t*-test was employed to examine differences in sleep quality regarding sex and marital status. One-way analysis of variance (ANOVA) was utilized to determine whether the global sleep score varied with varying degrees of FMS severity, age, BMI, employment, and educational and physical activity levels. Tukey's post-hoc test was employed to compare the group means following a statistically significant finding. Spearman's rank correlation was utilized to determine the relationship between continuous variables.

Results

A total of 136 patients with FMS were screened for the study. Of these, 36 did not meet the eligibility criteria, and 14 refused to take part in the study. Hence, 86 patients were enrolled in the study.

The mean age of the patients was 36.7 years, and 88.4% were female. About 43% of the patients were overweight, and 18.6% were obese. The majority (90.69%) of patients had graduated, with 58.1% from the working population and 64% with low physical activity. More than 40% of the

Table 1: Demographic data of the included patients.

Variable	N = 86
Age, years, mean (SD)	36.66 (10.33)
BMI (mean, SD)	26.4 (4.95)
Sex, n (%)	
Female	76 (88.37%)
Male	10 (11.63%)
Education, n (%)	
Higher Secondary	8 (9.30%)
Bachelors	42 (48.84%)
Masters	36 (41.86%)
Employment status, n (%)	
Working	50 (58.14%)
Not working	31 (36.04%)
Student	5 (5.81%)
Marital status, n (%)	
Married	61 (70.93%)
Unmarried	25 (29.07%)
Physical activity level, n (%)	
Low	55 (63.95%)
Moderate	30 (34.88%)
High	1 (1.16%)
MET-min/week, median (IQR)	430 (615)
Diet, n (%)	
Vegetarian	39 (45.35%)
Non-vegetarian	18 (20.93%)
Both	29 (33.72%)
Vitamin deficiency, n (%)	
Yes	64 (74.4%)
No	22 (25.6%)
Comorbidities, n (%)	
Yes	35 (40.70%)
No	51 (59.30%)
FMS medication prescribed, n (%)	
Anticonvulsants	38 (44.19%)
Antidepressants/anti-anxiety	12 (13.95%)
Anticonvulsants + antidepressants/anti-anxiety	15 (17.44%)
Analgesics	3 (3.49%)
None	5 (5.81%)
Multiple	13 (15.12%)
Vitamin supplements, n (%)	
Yes	74 (86.05%)
No	12 (13.95%)

Abbreviations: BMI, body mass index; FMS, fibromyalgia syndrome; IQR, interquartile range; MET, metabolic equivalent.

patients had at least one comorbid conditions such as diabetes, hypertension, or hypothyroidism. Table 1 shows the demographic characteristics of the patients.

Regarding the clinical variables, 124 of 136 patients (91.17%) with FMS were identified as poor sleepers (PSQI >5). The mean PSQI global score of the included patients was 12.04 ± 3.5. The mean sleep latency, mean sleep duration, and mean habitual sleep efficiency were 65.38 min, 5.34 h, and 65.75%, respectively. Table 2 reports the clinical characteristics of the patients with FMS.

The independent *t*-test demonstrated a significant difference in global sleep score across sexes ($p = 0.003$). One-way ANOVA revealed a significant difference in PSQI score among varying degrees of FMS severity ($p = 0.001$). Further post-hoc analysis showed a significant difference between mild and severe FMS (mean difference = −3.141; $p = 0.009$) and moderate and severe FMS (mean difference = −2.472; $p = 0.006$). The sleep score did not vary across age groups, BMI levels, education, employment, or marital status. Due to too few (n = 1) participants with high physical activity, we combined the participants with moderate and high physical activity and used the independent *t*-test to compute the difference in sleep quality across physical activity levels. The results showed that sleep quality did not vary across physical activity levels ($p = 0.178$; Table 3). It was noted that a relatively large proportion of the patients were taking medication that can affect sleep. Thus, one-way ANOVA was used to determine whether the sleep quality varied with FMS medication. No significant difference in sleep quality was found across medications prescribed for FMS ($p = 0.066$).

Correlation analyses revealed a significant correlation between PSQI global score and FIQR total score (r = 0.4, $p < 0.001$) and its subdomains: function (r = 0.27, $p = 0.011$), overall impact (r = 0.3, $p = 0.006$) and symptoms (r = 0.43, $p < 0.001$). The PSQI global score was also significantly correlated with pain (r = 0.32, $p = 0.003$), depression (r = 0.22, $p = 0.041$), memory (r = 0.33, $p = 0.002$), anxiety (r = 0.28, $p = 0.008$), balance (r = 0.27, $p = 0.012$), and sensitivity (r = 0.31, $p = 0.004$). A significant correlation was noted between FMS duration and PSQI global score (r = 0.26, $p = 0.017$), sleep duration (r = −0.27, $p = 0.011$), and habitual sleep efficiency (r = −0.25, $p = 0.023$) scores (Table 4).

The following results were evident when analyzing the correlation of the PSQI component scores with FMS symptoms. Longer sleep latency correlated with greater pain scores (r = 0.24, $p = 0.025$). A negative correlation was observed between sleep duration and total scores for FIQR symptoms (r = −0.25, $p = 0.019$), memory (r = −0.22, $p = 0.04$), and anxiety (r = −0.22, $p = 0.04$). Poorer habitual sleep efficiency was correlated with poor outcomes related to total FIQR score (r = −0.28, $p = 0.008$), FIQR overall impact (r = −0.24, $p = 0.025$), total FIQR symptoms (r = −0.31, $p = 0.004$), pain (r = −0.3, $p = 0.005$), and sensitivity (r = −0.22, $p = 0.04$) (Table 4).

Table 2: Clinical characteristics of patients with FMS (n = 86).

N = 86	Mean (SD)	Median (IQR)
PSQI global (0–21)	12.04 (3.50)	12.00 (5.00)
Sleep latency (min)	65.38 (72.43)	45.00 (33.75)
Sleep duration (h)	5.34 (1.61)	5.5 (2.00)
Habitual sleep efficiency (%)	65.75 (19.25)	70.58 (26.53)
FIQR total (0–100)	59.86 (15.93)	62.58 (21.89)
FIQR (function, 0–90)	48.33 (19.46)	48.50 (26.75)
FIQR (OI, 0–20)	13.47 (4.18)	14.00 (6.75)
FIQR (symptoms total, 0–100)	60.55 (15.22)	61.00 (19.50)
FIQR symptoms subdomains, 0–10		
Pain	7.78 (1.60)	8.00 (2.00)
Energy	6.78 (1.93)	7.00 (2.00)
Stiffness	6.55 (2.70)	7.00 (3.00)
Sleep	7.19 (1.93)	7.00 (3.50)
Depression	5.28 (3.02)	6.00 (4.00)
Memory	4.23 (3.38)	5.00 (6.00)
Anxiety	6.69 (2.49)	7.00 (3.00)
Tenderness	6.93 (2.57)	7.00 (3.00)
Balance	2.74 (3.16)	2.00 (5.75)
Sensitivity	6.20 (3.08)	7.00 (3.00)
FMS duration (years)	4.25 (3.39)	3.00 (4.50)
FMS severity	N (%)	
Mild	13 (15.12%)	
Moderate	30 (34.88%)	
Severe	43 (50.00%)	

Abbreviations: FIQR, Revised Fibromyalgia Impact Questionnaire; FMS, fibromyalgia syndrome; IQR, interquartile range; OI, overall impact; PSQI, Pittsburgh Sleep Quality Index; SD, standard deviation.

Table 3: Differences in sleep quality concerning demographic variables.

Group	N = 86	Mean (standard deviation)	*p*-value
Gender			
Female	76	12.43 (3.39)	0.003[a]
Male	10	9 (2.94)	
Age (years)			
18–29	24	12.08 (2.65)	0.573
30–50	51	12.24 (3.84)	
51–60	11	11 (3.58)	
FMS severity			
Mild	13	10.23 (3.98)	0.001[a]
Moderate	30	10.9 (3.13)	
Severity	43	13.37 (3.13)	
Physical activity level[b]			
Low	55	12.42 (3.44)	0.178
Moderate/high	31	11.35 (3.57)	
Employment status			
Working	50	11.68 (3.66)	0.53
Not working	31	12.58 (3.44)	
Student	5	12.2 (1.92)	
Educational status			
Higher Secondary	8	12.8 (2.87)	0.601
Bachelors	42	12.3 (3.16)	
Masters	36	11.6 (4.01)	
Marital status			
Married	61	11.89 (3.72)	0.54
Unmarried	25	12.4 (2.96)	
BMI			
Underweight	5	12 (3.46)	0.93
Normal	28	12.21(2.74)	
Overweight	37	11.76 (4.03)	
Obese	16	12.38 (3.67)	

[a] Significant at $\alpha = 0.05$.
[b] Could not be computed as n = 1 in high physical activity.
Abbreviations: BMI, body mass index; FMS, fibromyalgia syndrome.

Table 4: Correlation between sleep quality and FMS variables.

	PSQI global	Sleep latency (min)	Sleep duration (hours)	Habitual sleep efficiency (%)
FIQR total	0.398***	−0.005	−0.178	−0.28**
FIQR function	0.273*	0.028	−0.04	−0.189
FIQR OI	0.295**	−0.003	−0.135	−0.24*
FIQR symptoms	0.434***	0.014	−0.253*	−0.306**
Pain	0.319**	0.24*	−0.205	−0.299**
Energy	0.142	−0.073	0.05	0.01
Stiffness	0.105	−0.047	0.04	0.02
Sleep (waking up)	0.545***	0.27*	−0.45***	−0.43***
Depression	0.221*	0.015	−0.17	−0.21
Memory	0.333**	0.064	−0.22*	−0.197
Anxiety	0.283**	−0.012	−0.218*	−0.16
Tenderness	0.182	0.12	−0.018	−0.086
Balance	0.268*	−0.108	−0.138	−0.163
Sensitivity	0.308**	−0.048	−0.138	−0.219*
Age	−0.071	−0.085	−0.053	−0.06
BMI	0.023	−0.068	−0.08	−0.016
FMS duration	0.256*	0.028	−0.274*	−0.245*
MET-mins	−0.189	−0.113	0.09	0.127

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Abbreviations: BMI, body mass index; FIQR, Revised Fibromyalgia Impact Questionnaire; FMS, fibromyalgia syndrome; MET, metabolic equivalent; OI, overall impact; PSQI, Pittsburgh Sleep Quality Index.

Discussion

The current study evaluated the sleep profile of patients with FMS visiting a hospital in urban Bangalore. We hypothesized that poor sleep is prevalent in patients with FMS and related to FMS variables. Most of the patients were educated, married, and female, with more than half of the population employed and engaging in low physical activity. The findings concerning education and employment status were in contrasted to those of another trial performed in India,[30] which reported that the majority of patients with FMS had lower education and were unemployed (homemakers). This could be because 95% of the population in the latter study were from a rural background in contrast to the urban population in the current research.

The prevalence of sleep disturbance was 91.2%, similar to that found in previous studies.[12,14] The mean sleep score was 12, in line with a survey conducted in Bhopal, India[14] and a meta-analysis conducted in 2017.[31] The patients exhibited prolonged average sleep latency (65.38 min), reduced mean sleep duration (5.34 h), and poor sleep efficiency (65.75%), indicating moderate difficulty in sleep.[26] The findings of the current study were consistent with those of a systematic review of 16 quantitative studies conducted in 2017.[32]

On analyzing the demographic profile of the patients, the study reported a lower mean age of the patients (36.7 years) than that found in other studies, which ranged from 45 to 56 years across studies.[12,31,32] This could be because of the lower median age of the population in India compared to other countries such as the USA, UK, Spain, and Brazil, where most of the above studies were conducted.[33] However, sleep quality did not significantly vary across age groups (Table 4). The results of this study were supported by a study, which concluded that age is not a determinant of sleep quality in FMS.[34] The age-related macro changes in sleep start after 50 years of age.[35] However, the mean age of patients with FMS in the current study was lower (36.7 years). Thus, the sleep disturbances in patients with FMS in the present study were less likely to be influenced by age.

A significant difference was found when comparing sleep quality between male and female patients with FMS. The findings supported the fact that women tend to report more sleep problems than men.[36,37] However, no sex differences in PSQI total score were found in patients with FMS in two studies.[38,39] By contrast, men reported having more problems in sleep latency and efficiency than women.[38] Similarly, another study reported that the objective sleep quality in FMS was affected more in men than women.[40] It is worth noting that all these studies were conducted in Spain. Hence, the sociocultural influences need to be considered.

The sleep quality in the current study also significantly varied with varying degrees of FMS severity, in accordance with other studies.[41,42] A study conducted in India also demonstrated a significant difference in sleep quality with varying FMS severity, with PSQI as a positive predictor of FIQR.[14] Thus, it appears that the greater the severity of FMS, the poorer the sleep quality. FMS duration also correlated with total sleep quality, duration, and efficiency. This finding, which is in agreement with that of other studies,[34,43] indicates that the duration of FMS symptoms could be considered a potential influencer of sleep quality.

The sleep quality in the present study did not vary with other demographic characteristics such as BMI, marital, educational, or employment status. These findings are in line with another study that demonstrated no correlation between demographic variables and sleep quality in FMS.[34,44] The current study's finding regarding physical activity contrasted with a previous study that reported better sleep with physical activity.[45] However, the study used an objective measure of physical activity and did not differentiate how sleep quality varied with low and moderate physical activity levels. The present study's findings aligned with studies by Kakinami et al.[46] and Lopenthin et al.,[47] which found no association between sleep and physical activity. Although the literature shows the beneficial effects of exercise on sleep,[48] the fact is that the physical activity level measured in the current study includes exercise as one of the activities. Not all of the participants did exercise as their physical activity. Thus, future studies are needed to differentiate the effects of physical activity and exercise on sleep in FMS. The present study's findings support that despite the contribution of race, ethnicity, and other demographic factors, sleep quality may differ according to the predictors and sleep outcome.[49]

Sleep quality did not vary with FMS medication. Various factors could have influenced this finding. First, there were very few patients who did not receive any medication. Second, the medication history was not noted in detail. A few patients were advised a new medication and had been taking that for a month. By contrast, few patients had taken the same medication for a long time without any change. Hence, further analyses using FMS medication as a covariate were not conducted.

The current study's findings are in agreement with those of previous studies regarding the relation between total sleep score and fibromyalgia impact, demonstrating a significant correlation between PSQI total and FIQ total score,[14,34,42,50] and FMS duration.[34] In the current study, a significant correlation was also seen between PSQI total and the subdomains of FIQR, indicating that sleep quality may also be related to the function and symptoms of patients with FMS. Similar results were found in a study that demonstrated a positive correlation between sleep quality and the number of FMS symptoms.[12] Henceforth, it can be inferred that sleep quality may influence the FMS symptoms and function. This can give us prospects of conducting studies focusing on improving sleep quality and thus influencing FMS symptoms.

A greater PSQI global score positively correlated with greater scores for pain, depression, memory, anxiety, balance, and sensitivity (Table 4). These results were evident among many studies demonstrating a positive correlation with various symptoms such as pain,[32,34,51] anxiety,[34,51] depression,[34,52] and balance.[53] The components of PSQI also demonstrated a significant correlation with FMS symptoms. Prolonged sleep latency correlated with higher pain scores. This finding was in line with that of other studies.[12,52] However, the sleep latency in the current study did not correlate with the FIQR total. By contrast, one study showed that subjective and objective sleep latency positively correlated with FIQ. However, the study was conducted on a very small sample (17 patients) in Turkey, which may have sociodemographic differences.[54]

Shorter sleep duration correlated with higher scores for FIQR symptoms total, memory, and anxiety scores. The study by Andrade et al.[12] noted similar results, which demonstrated a significant correlation between sleep duration and pain, memory, mood, and anxiety. The sleep efficiency in the present study correlated negatively with FIQR total, FIQR overall impact, FIQR symptoms, pain, and sensitivity scores. A similar relationship was found in previous studies between sleep efficiency and FIQ,[42] and pain.[12] The correlation with pain was also present when sleep efficiency was evaluated objectively.[51]

The present study is the first to describe the sleep profile of patients with FMS with poor sleep quality. It is also the first to evaluate the relationship between poor sleep and FMS variables in the Indian population.

However, there were certain limitations. First, the sample was recruited from a single urban location. So a larger sample from various urban areas is needed to generalize the current study's findings. Second, sleep was evaluated subjectively. Hence, future studies can be conducted using objective sleep measures. The study also gives prospects for designing treatment programs to improve the sleep quality of patients with FMS, which in turn may influence the FMS symptoms and function.

Conclusion

There is a high prevalence of sleep disturbance in patients with FMS residing in urban Bangalore. Women reported more significant subjective sleep disturbances than men. The sleep quality did not differ across other demographic variables. However, it tends to be worse with increasing FMS severity and duration. The total sleep quality correlated with fibromyalgia impact, function, and somatic as well as psychological symptoms. The sleep latency, duration, and efficiency were also related to fibromyalgia symptoms. Future studies need to be conducted on a large scale using objective measures to explore this phenomenon further. Additionally, studies aimed at evaluating the predictors of poor sleep can further corroborate the current study's findings.

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no conflicts of interest to declare.

Ethical approval

The study was approved by the ethics committee of Manipal Hospital, Bangalore, on 20 July 2020 ("ECR/34/Inst/KA/2013/RR-19"). All procedures performed in the current study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent

Informed consent was obtained from all the eligible participants before the commencement of the intervention.

Author contributions

RAU: Conceptualization, methodology, data curation, investigation, formal analysis, writing-original draft preparation, visualization, project administration. PV: Conceptualization, methodology, validation, supervision, writing – reviewing, and editing. DBG: Conceptualization, methodology, investigation, writing-reviewing, and editing. YPS: Conceptualization, methodology, validation, supervision, writing-reviewing, and editing. VLR: Conceptualization, methodology, formal analysis, writing-reviewing and editing. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Acknowledgments

The authors would like to thank Manipal Hospital, Bangalore, and the participants for their support during the study.

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How to cite this article: Ughreja RA, Venkatesan P, Gopalakrishna DB, Singh YP, R VL. Sleep profile and its correlation with clinical variables in fibromyalgia syndrome: A cross-sectional study. J Taibah Univ Med Sc 2024;19(1):90–98.