Analysing Biological Rhythms in Fibromyalgia Syndrome

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ABSTRACT

Aim: *This study evaluated biological rhythm disorders in patients with fibromyalgia syndrome (FMS).*
Methods: *The study enrolled 82 patients with FMS and 82 controls. Pain intensity was evaluated using a visual analogue scale (VAS). The psychological conditions of the patients were evaluated using the Beck Depression Inventory (BDI). The Biological Rhythms Interview of Assessment in Neuropsychiatry (BRIAN) was used to assess disturbances in biological rhythms (*ie *sleep, activity, social and eating patterns).*
Results: *There was no difference between the two groups at baseline (all* $p > 0.05$*). The BDI, BRIAN total, sleep, activity, social, and eating scores were higher in patients with FMS than in the controls (all* $p < 0.001$*). Further, a significant correlation was found between biological rhythms and BDI scores (*$p < 0.001$*) and there were positive correlations between the VAS score and BRIAN total, sleep, and eating and BDI in patients with FMS (all* $p < 0.001$*).*
Conclusion: *There are marked biological rhythm disturbances in FMS. There is an important relationship between rhythm disorders and FMS. The disturbances in sleep, functional activities, social participation, and disordered rhythms like eating patterns show the need for a multidisciplinary approach to treating patients with FMS.*

Keywords: Biological rhythms, depression, fibromyalgia syndrome

Análisis de los Ritmos Biológicos en el Síndrome de Fibromialgia

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RESUMEN

Objetivo: *Este estudio evaluó trastornos del ritmo biológico en pacientes con el síndrome de fibromialgia (SFM).*
Métodos: *El estudio alistó a 82 pacientes con SMF y 82 controles. Se evaluó la intensidad del dolor mediante una Escala Analógica Visual (EAV). Las condiciones psicológicas de los pacientes fueron evaluadas mediante el Inventario de Depresión de Beck (IDB). La Entrevista de Ritmos Biológicos de Evaluación en Neuropsiquiatría (BRIAN) se utilizó para evaluar las alteraciones en los ritmos biológicos (es decir, sueño, actividad, patrones sociales y alimentarios).*
Resultados: *No hubo diferencias entre los dos grupos al inicio del estudio (todos* $p > 0.05$*). Las puntuaciones de IDB y BRIAN en su totalidad – sueño, actividad, resultados sociales y alimentarios – fueron mayores en los pacientes con SMF que en los controles (todos* $p < 0.001$*). Además, se encontró una correlación significativa entre los ritmos biológicos y la puntuación de IDB (*$p < 0.001$*) y hubo una correlación positiva entre la puntuación de EAV, BRIAN en total – dormir y comer – e IDB en pacientes con SMF (todos* $p < 0.001$*).*
Conclusión: *Hay marcadas alteraciones del ritmo biológico en SMF. Existe una importante relación entre los trastornos del ritmo y SMF. Las perturbaciones de sueño, las actividades funcionales, la participación social, y los ritmos desordenados tales como los patrones de alimentación, muestran la necesidad de un enfoque multidisciplinario para tratar a pacientes con SMF.*

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 DOI: 10.7727/wimj.2014.366

Palabras claves: Ritmos biológicos, depresión, síndrome de fibromialgia

West Indian Med J 2015; 64 (3): 242

INTRODUCTION

Fibromyalgia syndrome (FMS) is characterized by widespread pain, fatigue, disturbed sleep and appetite, morning stiffness and cognitive dysfunction. It is associated with other co-morbidities, such as depression, anxiety and irritable bowel syndrome (1). Fibromyalgia syndrome affects mostly females from 20 to 55 years old (2).

The aetiopathogenesis of FMS is not understood fully, but includes dysfunction of the central and autonomic nervous systems, neurotransmitters, hormones, external stress factors and psychiatric conditions. The levels and daily release rhythms of hormones and neurotransmitters such as serotonin, epinephrine, dopamine, and substance P are abnormal in FMS (3).

Daily biological rhythms are important in sleep cycles, body temperature, and the effects of hormone levels on cognition, attention and mood. Disruption of these daily rhythms is associated with mood disorders (4, 5). Sleep, appetite, and social rhythms are generally dysfunctional in depressive disorders (6). The aetiology of FMS includes alterations in the physiology of the circadian cycle, which can disrupt the daily rhythms of FMS patients.

There are no instruments that comprehensively evaluate biological rhythms, including sleep, activity, social and eating. This report outlines the development and validation of a new instrument, the Biological Rhythms Interview of Assessment in Neuropsychiatry (BRIAN), devised to evaluate biological rhythms in a clinical setting (7). Therefore, this study evaluated biological rhythms in patients with FMS.

SUBJECTS AND METHODS

The study was approved by the Institutional Ethics Committee. Informed consent was obtained from all individuals. This study included 82 patients with FMS diagnosed according to the American College of Rheumatology (ACR) criteria (8) and admitted to the Physical Medicine and Rehabilitation Centre. The control group comprised 82 healthy individuals. Subjects with psychiatric, systemic, neuromuscular and neurological diseases, anaemia, endocrine or metabolic disorders were excluded. Demographic information, such as age, gender, occupation, educational level and pain duration, was recorded. A full blood count, erythrocyte sedimentation rate, and routine biochemical tests, autoimmune/inflammatory markers (*eg* autoantibodies, rheumatoid factor, complement, cryoglobulin), endocrine function tests, viruses (HIV, HBV, HCV) were also performed.

The level of pain was measured using a visual analogue scale (VAS) [0–100 mm] and the number of tender points was evaluated according to the 1990 ACR criteria. Eighteen anatomical tender points and four symmetric control points were assessed using ~4.0 kg of pressure.

The psychological condition of the patients and control group was evaluated using the Beck Depression Inventory (BDI), which assesses various symptoms of depression using 21 questions (9). The validity and reliability of these tests have been demonstrated (10). The daily biological rhythm was evaluated using BRIAN. The 18 items of the scale are divided into four specific areas: sleep, activity, social rhythms, and eating patterns. All items are scored from 1 (no difficulties) to 4 [serious difficulties] (7). The validity and reliability of the Turkish version of the questionnaire have been assessed (11).

Statistical analysis

All statistical analyses were conducted using SPSS version 17 (SPSS; Chicago, IL, USA). Descriptive statistics were analysed as medians and standard deviations. Scores on the BDI, BRIAN and BRIAN sub-scales were compared between groups using the Mann-Whitney *U*-test, and Spearman's correlation analysis was used to evaluate the relationships between these scores. A p-value < 0.05 was considered to indicate statistical significance.

RESULTS

The demographic and clinical characteristics of the subjects are presented in Table 1. There was no significant difference in the characteristics of the two groups (all $p > 0.05$).

Table 1: Demographic characteristics of the patients

	FMS n = 82	Controls n = 82	*p*
Age (years)	38.1 ± 11.7	42.9 ± 9.5	0.44
Gender (male/female)	7/75	5/77	
Weight (kg)	69.1 ± 13.0	71.7 ± 14.1	0.54
Height (cm)	161.3 ± 7.2	162.4 ± 8.5	0.66
BMI (kg/m^2)	26.6 ± 1.8	27.1 ± 1.9	0.38
Duration of diagnosis (months)	4.3 ± 3.5	–	
Marital status (single/married)	24/58	21/61	0.65
Education			0.67
Literate*	6.1%	7.5%	
Primary school	46.3%	47.9%	
High school	17.1%	18.1%	
University	30.5%	26.5%	
Occupation			0.46
Employee	30 (36.6%)	31 (37.8%)	
Housewife	44 (53.7%)	40 (48.7%)	
Retired	4 (4.9%)	6 (7.3%)	
Unemployed	4 (4.9%)	5 (6.1%)	

Values are presented as the median ± standard deviation
FMS: fibromyalgia; BMI: body mass index
*Know how to read and write but no diploma

The BDI, BRIAN total, sleep, activity, social and eating scores were higher in the patients with FMS than in the controls [all $p < 0.001$] (Table 2). There were positive correlations among BDI, BRIAN total and the four BRIAN sub-scales

Table 2: Comparison of the clinical findings

	FMS n = 82	Controls n = 82	Z value	*p*-value
VAS 100 (mm)	63.2 ± 14.4	–		
BRIAN total	42.8 ± 8.2	26.83 ± 5.86	–10.002	< 0.001
Sleep	15.2 ± 3.0	9.32 ± 2.45	–9.896	< 0.001
Activity	12.67 ± 3.38	7.21 ± 1.92	–9.421	< 0.001
Social	7.68 ± 2.33	5.64 ± 1.48	–6.148	< 0.001
Eating	7.65 ± 2.75	4.83 ± 1.11	–7.948	< 0.001
BDI	17.29 ± 9.37	7.34 ± 3.53	–6.106	< 0.001

Values are presented as the median ± standard deviation
FMS: fibromyalgia; VAS: visual analogue scale;
BRIAN: Biological Rhythms Interview of Assessment in Neuropsychiatry;
BDI: Beck Depression Inventory

in the patients with FMS (all $p < 0.001$). There were also positive correlations between the VAS score and the BRIAN total, sleep and eating, and BDI (Table 3).

Table 3: Correlations of the clinical findings

Variables	VAS	BRIAN total	BRIAN sleep	BRIAN activity	BRIAN social	BRIAN eating	BDI
VAS	1						
BRIAN total	0.247*						
	0.025						
BRIAN sleep	0.218*	0.913**	1				
	0.048	0.000					
BRIAN activity	0.113	0.904**	0.823**	1			
	0.310	0.000	0.000				
BRIAN social	0.142	0.728**	0.593**	0.609**	1		
	0.199	0.000	0.000	0.000			
BRIAN eating	0.285**	0.791**	0.664**	0.633**	0.617**	1	
	0.009	0.000	0.000	0.000	0.000		
BDI	0.279*	0.502**	0.458**	0.443**	0.308**	0.450**	1
	0.011	0.000	0.000	0.000	0.000	0.000	

The squares contain the correlation coefficient above the *p*-value
**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)
VAS: visual analogue scale; BDI: Beck Depression Inventory; BRIAN: Biological Rhythms Interview of Assessment in Neuropsychiatry

DISCUSSION

Chronic pain, sleep and functional activity disorders, social incompatibility and depression symptoms are all problems in patients with FMS. Although there are many clinical scales with which one can assess these clinical problems independently, no one scale enables assessment of all of the components of the patient's daily life comprehensively and rapidly. The Biological Rhythms Interview of Assessment in Neuropsychiatry is a biological assessment scale that assesses the patient's daily activities, quality of life, and factors such as sleep, social and functional activity, and eating habits (7).

Studies of depressed and bipolar patients have reported a relationship between disease intensity and disturbed biological rhythms; treatment resulted in normalization of the biological rhythms (6–12). We also found depression in the FMS patients and a positive correlation between depression and biological rhythms. Therefore, we believe that abnormal biological rhythms will be normalized by the treatment of depression in these patients.

After chronic pain, the main problem in FMS is sleep disorder *ie* sleep is not restful. The circadian rhythms of sleep are disrupted in patients with FMS (3). We believe that disorders of neurotransmitters and hormones that affect the sleep rhythm, such as serotonin and growth hormone, disrupt the sleep rhythm in patients with FMS.

In FMS, functional capacity is impaired due to muscle fatigue and weakness, which can affect the daily physical activity of these patients. Studies have reported low functional capacity in patients with FMS (13, 14), as in this work. The symptoms of FMS considerably impair the activities and social participation of these patients and ultimately result in a poorer health-related quality of life. Therefore, exercise therapy might regulate the activity rhythms of these patients (15).

A biological rhythm has a regular periodicity of physiological or behavioural expression, such as hormonal secretion and eating patterns. The biological rhythm is the result of the interaction between endogenous (*eg* hormones) and exogenous (*eg* temperature) factors. The exogenous factors set the biological clock and include exercise, eating patterns, and social factors (16).

Irregular eating habits and nutritional disorders, which are more prominent in adolescent FMS patients, affect the severity of the disease. There was a correlation between the pain score and eating rhythms in our study, as reported elsewhere (17).

This study showed that disturbances of biological rhythm (*eg* in sleep and social and activity patterns) are marked in FMS, and there is an important link between rhythm insta-

bility and FMS. We think that the disruptions in these rhythms are caused by abnormalities in biological factors (*eg* hormones and metabolism). Biological rhythm regulation might be an important target for interventions to treat symptoms, prevent relapses and improve functioning in FMS. Further, the strong correlations between depression and FMS, the disturbances in sleep, functional activity and social participation, and disorders of rhythm, such as eating patterns show the necessity of a multidisciplinary approach to treatment.

In summary, specific psychosocial interventions focussed on lifestyle regularity should be considered as an add-on maintenance treatment for FMS. We believe that the BRIAN score facilitates assessment of daily activities, patient and treatment parameters in patients with FMS.

REFERENCES

1. Heymann RE, Paiva Edos S, Helfenstein M Jr, Pollak DF, Martinez JE, Provenza JR et al. Brazilian consensus on the treatment of fibromyalgia. Revta Brasil Reumatol 2010; **50:** 56–66.
2. Geenen R, Jacobs JW. Fibromyalgia: diagnosis, pathogenesis, and treatment. Curr Opin Anaesthesiol 2001; **14:** 533–9.
3. Bellato E, Marini E, Castoldi F, Barbasetti N, Mattei L, Bonasia DE. Fibromyalgia syndrome: etiology, pathogenesis, diagnosis, and treatment. Pain Res Treat 2012; **2012:** 426130.
4. Bunney WE, Bunney BG. Molecular clock genes in man and lower animals: possible implications for circadian abnormalities in depression. Neuropsychopharmacol 2000; **22:** 335–45.
5. Millar A, Espie CA, Scott J. The sleep of remitted bipolar outpatients: a controlled naturalistic study using actigraphy. J Affect Disord 2004; **80:** 145–53.
6. Mondin TC, de Azevedo Cardoso T, Jansen K, Coiro Spessato B, de Mattos Souza LD, da Silva RA. Effects of cognitive psychotherapy on the biological rhythm of patients with depression. J Affect Disord 2014; **155:** 142–8.
7. Giglio LM, Magalhães PV, Andreazza AC, Walz JC, Jakobson L, Rucci P et al. Development and use of a biological rhythm interview. J Affect Disord 2009; **118:** 161–5.
8. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the Multicenter Criteria Committee. Arthritis Rheum 1990; **33:** 160–72.
9. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961; **4:** 561–71.
10. Hisli N. Beck Depresyon envanterinin üniversite öğrencileri için geçerliliği ve güvenilirliği. Psikoloji Dergisi 1989; **7:** 3–13.
11. Aydemir O, Akkaya C, Altınbaş K, Kora K, Dikici D, Akdeniz F et al. Reliability and validity of Turkish version of Biological Rhythms Interview of Assessment in Neuropsychiatry. Anatolian J Psychiat 2012; **3:** 256–61.
12. Rosa AR, Comes M, Torrent C, Solè B, Reinares M, Isabella Pachiarotti I. Biological rhythm disturbance in remitted bipolar patients. Int J Bipolar Disord 2013; **1:** 1–6.
13. Akyol Y, Ulus Y, Tander B, Durmus D, Bilgici A, Kuru O. Sleep quality in fibromyalgia and rheumatoid arthritis: associations with pain, fatigue, depression, and disease activity. Clin Exp Rheumatol 2011; **29:** 92–6.
14. Tutoglu A, Boyaci A, Koca I, Celen E, Korkmaz N. Quality of life, depression, and sexual dysfunction in spouses of female patients with fibromyalgia. Rheumatol Int 2014; **34:** 1079–84.
15. Farin E, Ullrich A, Hauer J. Participation and social functioning in patients with fibromyalgia: development and testing of a new questionnaire. Health Qual Life Outcomes 2013; **11:** 135.
16. Schimitt RL, Hidalgo MPL, Caumo W. Ritmo social esas formasi demensuração: uma perspectiva histórica. Rev Estud Pesq Psicol 2010; **10:** 457–70.
17. da Silva SG, Sarni RO, de Souza FI, Molina J, Terreri MT, Hilário MO et al. Assessment of nutritional status and eating disorders in female adolescents with fibromyalgia. J Adolesc Health 2012; **51:** 524–27.