How does fibromyalgia affect sleep quality and quality of life in patients with metabolic syndrome?

Fibromiyalji metabolik sendromlu hastalarda uyku ve yaşam kalitesini nasıl etkiler?

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Abstract

Aim: In this study, we aimed to investigate the prevalence of fibromyalgia syndrome (FMS) in patients with metabolic syndrome (MetS) and its effects on sleep quality and quality of life (QoL).

Methods: The study included a total of 84 (56 females, 28 males) patients with MetS, with a mean age of 57.5 (34–74) years and mean body mass index of 32.5 (25–48.9) kg/m2. MetS was defined according to the National Cholesterol Education Program Adult Treatment Panel III criteria. The FMS diagnosis was made based on the 2013 American College of Rheumatology Alternative Criteria. QoL and sleep quality were evaluated by the Short Form 36 (SF-36) and the Pittsburgh Sleep Quality Index, respectively.

Results: All patients had diabetes mellitus and were obese or overweight. Of all patients, 73.8% had poor sleep quality and 51.2% had FMS. Patients with both MetS and FMS had a statistically significant female predominance (p<0.001). Impaired sleep was present in 62.9% of patients with both MetS and FMS and 37.1% of patients with MetS only (p<0.001). All SF-36 domain scores were statistically significantly lower in the MetS+FMS group than in the MetS group (p<0.001)

Conclusion: The frequency of FMS is high in patients with MetS. Sleep quality and QoL are impaired in the presence of FMS or MetS alone. The co-presence of these conditions causes poorer sleep quality and worse QoL. FMS should be considered in the treatment and follow-up of patients with MetS.

Keywords: fibromyalgia syndrome; metabolic syndrome; quality of life; sleep quality

Öz

Amaç: Bu çalışmada metabolik sendrom (MetS) hastalarında fibromiyalji sendromu (FMS) prevalansını ve fibromiyalji varlığının uyku kalitesi ve yaşam kalitesi üzerindeki etkilerini araştırmak amaçlanmıştır.

Yöntem: Çalışma ortalama yaşı 57,9±10,8 yıl ve ortalama vücut kitle indeksi 33,0±5,3 kg/m2 olan 84 (56 kadın, 28 erkek) MetS'li hasta ile gerçekleştirildi. MetS, Ulusal Kolesterol Eğitim Programı Yetişkin Tedavi Paneli III kriterlerine göre tanımlandı. FMS tanısı Amerikan Romatoloji Koleji'nin 2013 tarihli Alternatif Kriterler'ine göre kondu. Yaşam kalitesi Kısa Form 36 (KF-36), uyku kalitesi Pittsburgh Uyku Kalitesi İndeksi ile değerlendirildi.

Bulgular: Tüm hastalar diabetes mellitus hastasıydı ve de obez ya da aşırı kiloluydu. Hastaların %73,8'inde uyku bozukluğu, %51,2'sinde FMS mevcuttu. Hem MetS'li hem FMS'li hastalarda kadınlar istatistiksel olarak anlamlı biçimde çoğunluktaydı (p<0,001). Hem MetS'li hem FMS'li hastaların %62,9'unda, yalnızca MetS'li hastaların ise %37,1'inde uyku bozukluğu mevcuttu (p<0,001). Tüm KF-36 alan puanları MetS grubuna kıyasla MetS+FMS grubunda daha düşüktü (p<0,001).

Sonuç: MetS'li hastalarda FMS sıklığı yüksektir. MetS varlığı da FMS varlığı da tek başına uyku kalitesini ve yaşam kalitesini bozmaktadır. Bu iki durumun bir arada olması ise daha düşük uyku ve yaşam kalitesine neden olmaktadır. MetS'li hastaların tedavi ve takibinde FMS de göz önünde bulundurulmalıdır.

Anahtar sözcükler: fibromiyalji sendromu; metabolik sendrom; uyku kalitesi; yaşam kalitesi

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INTRODUCTION

According to the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria, metabolic syndrome (MetS) is defined as metabolic dysfunction involving abdominal obesity, elevated blood pressure (BP), low high-density lipoprotein (HDL), elevated serum triglycerides (TG), and elevated fasting glucose (1). The overall prevalence of MetS in the United States was reported to be 34.2% (2). MetS is a serious health problem with multiple metabolic risk factors and has been shown to reduce sleep quality and quality of life (QoL) (3–7). The role of pain in QoL impairment was also mentioned in patients with MetS (5,8).

Fibromyalgia syndrome (FMS) is defined as widespread musculoskeletal pain and is characterized by unrefreshing sleep, fatigue, and a low threshold of pressure tolerance (9,10). Reduced QoL and sleep quality are also present (11,12). The general prevalence of FMS is around 2.7%, with a female predominance (9,10). However, the prevalence of FMS in patients with MetS is not known. Therefore, in this study we aimed to investigate the FMS prevalence and its effects on sleep quality and QoL in patients with MetS.

MATERIALS AND METHODS

Sample selection and study design

The cross-sectional study was conducted between 1 May 2018 and 30 November 2018. Patients who were diagnosed with MetS were referred from the internal medicine clinic. Patients who volunteered to participate in the study underwent an interview and completed the questionnaires at the same session. Data on patient age, sex, body mass index (BMI), waist circumference were recorded. The BMI classification was made based on the World Health Organization criteria. The exclusion criteria were a history of acute infectious diseases in the past 3 weeks, a history of past or current neurological, psychiatric, or chronic inflammatory disease, and pregnancy or presence of breastfeeding, malignancy, or substance abuse.

The FMS diagnosis was made based on the American College of Rheumatology's 2013 Alternative Criteria (ACR 2013AltCr). The MetS patients included were stratified into two groups according to the ACR 2013AltCr: patients with FMS and patients without FMS.

The MetS diagnosis was made based on the NCEP-ATP III criteria that were updated in 2005 by the American Heart Association / National Heart, Lung, and Blood Institute (1). Participants who met three or more of the following five criteria were defined as having MetS: (i) abdominal obesity (large waist circumference, >102 cm in men and >88 cm in women); (ii) hypertriglyceridemia (≥150 mg/dL / ≥1.695 mmol/L) or drug treatment for elevated triglycerides, (iii) low HDL cholesterol levels (<40 mg/dL / <1.036 mmol/L in men, <50 mg/dL / <1.295 mmol/L in women) or drug treatment for low HDL cholesterol, (iv) high BP (≥130/85 mmHg) or drug treatment for hypertension (HT), and (v) high fasting glucose levels (≥100 mg/dL / ≥6,1 mmol/L) or drug treatment for diabetes mellitus (DM).

Instruments

The FMS criteria included the use of a 28-area pain location inventory (PLI) and 10-item (pain, energy, sleep, depression, anxiety, memory problems, stiffness, tenderness to touch, balance problems, and sensitivity to loud noises, bright colors, odors and cold) symptom impact questionnaire (SIQR). A patient with FMS had the symptoms and pain for at least 3 months, with a PLI score ≥17 and SIQR score ≥21 (13).

Sleep quality was assessed by the Pittsburgh Sleep Quality Index (PSQI) differentiating "poor" sleep from "good" sleep, based on seven domains: subjective sleep quality, sleep duration, sleep latency, sleep disturbances, habitual sleep efficiency, daytime dysfunction, and use of sleep medication over the last month. A total score ≥5 indicates "poor" sleep (14).

The health-related quality of life (HR-QoL) was evaluated by the Short Form-36 (SF-36), which measures subjective health on four physical (physical functioning, role-physical [limitations due to physical problems], bodily pain, and general health) and four mental health-related (vitality, social functioning, role-emotional [limitations due to emotional problems], and mental health) domains (15). For each scale, scores range between 0 (worst) and 100 (best).

Table 1. Patient characteristics

		Total (N=85)	MetS with FMS[b] (n=43)	MetS without FMS[b] (n=41)	*p*
Age[a]		57.5 (34–74)	58.0 (34–74)	56.0 (35–74)	0.21[1]
Sex	Male[b]	28 (33.3)	6 (21.4)	22 (78.6)	*<0.001*[2]
	Female[b]	56 (66.7)	37 (66.1)	19 (33.9)	*<0.001*[2]
BMI[a]		32.5 (25–48.9)	33.2±4.7	32.8±5.9	0.43[1]
	Overweight[b] (BMI: 25–30 kg/m^2)	29 (34.5)	11 (37.9)	18 (62.1)	0.1[2]
	Obese[b] (BMI: >30 kg/m^2)	55 (65.5)	32 (58.2)	23 (41.8)	0.1[2]
WC[c]		105.6±12.4	105.5±13.6	105.8±11.1	0.91[3]
	Large[b]	71 (84.5)	37	34	0.7[2]
	Normal[b]	13 (15.5)	6	7	0.7[2]
FMS	PLI[a]	13 (0–28)	18.0 (7–28)	5.0 (0–13)	*<0.001*[1]
	SIQR[c]	24.3±12.7	32.1±10.2	16.2±9.5	*<0.001*[3]

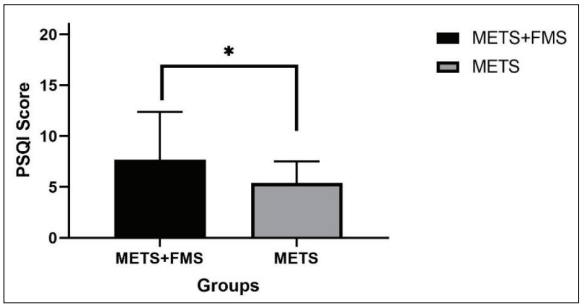
[a] median (minimum–maximum),
[b] number (percentage)
[c] mean±standard deviation
[1] Mann–Whitney U test
[2] chi-square test
[3] independent t-test
BMI: body mass index; FMS: fibromyalgia syndrome; MetS: metabolic syndrome; PLI: the pain location inventory; SIQR: the symptom impact questionnaire; WC: waist circumference (large WC: >102 cm in men, >88cm in women)

Table 2. Comparison of SF-36 and PSQI scores in patients with and without FMS

		Total (N=85)	MetS with FMS[b] (n=43)	MetS without FMS[b] (n=41)	*p*
Sleep disorder	PSQI score[a]	8 (1–21)	10.9 (4–21)	6.0 (1–21)	*<0.001*[1]
	Present[b] (PSQI score: ≥5)	62 (73.8)	39 (62.9)	23 (37.1)	*<0.001*[2]
	Not present[b] (PSQI score: <5)	22 (26.2)	4 (18.2)	18 (81.8)	*<0.001*[2]
SF-36	PF[a]	55 (0–100)	35.0 (0–85)	80.0 (20–100)	*<0.001*[1]
	RP[a]	0 (0–100)	0 (0–100)	100.0 (0–100)	*<0.001*[1]
	RE[a]	16.6 (0–100)	0 (0–100)	100.0 (0–100)	*<0.001*[1]
	MH[c]	46.3±22	40.8±17.4	52.2±24.8	*0.017*[3]
	GH[c]	41.9±19.6	32.2±16.7	52.0±17.3	*<0.001*[3]
	VT[c]	42.6±20.3	34.0±15.6	51.5±21.0	*<0.001*[3]
	SF[a]	50 (0–100)	37.5 (0–100)	62.5 (2.5–100)	*<0.001*[1]
	BP[a]	45 (0–100)	32.5 (0–90)	67.5 (22.5–100)	*<0.001*[1]

[a] median (minimum–maximum),
[b] number (percentage)
[c] mean±standard deviation
[1] Mann–Whitney U test
[2] chi-square test
[3] independent t-test
BP: bodily pain; FMS: fibromyalgia syndrome; GH: general health; MetS: metabolic syndrome; MH: mental health; PF: physical functioning; PSQI: the Pittsburgh Sleep Quality Index; RE: role-emotional; RP: role-physical; SF: social functioning; SF-36: Short Form 36; VT: vitality

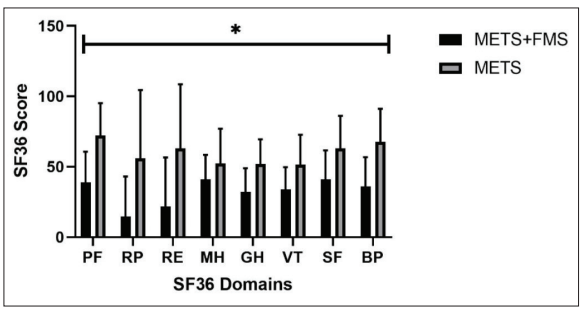
Figure 1. The comparison of PSQI scores of patients with and without FMS



* p<0.05

FMS: fibromyalgia syndrome; MetS: metabolic syndrome; PSQI: the Pittsburgh Sleep Quality Index

Figure 2. Comparison of SF-36 domain scores in patients with and without FMS



* p<0.05

BP: bodily pain; FMS: fibromyalgia syndrome; GH: general health; MetS: metabolic syndrome; MH: mental health; PF: physical functioning; RE: role-emotional; RP: role-physical; SF: social functioning; VT: vitality

Statistical analysis

Statistical analysis was performed using the SPSS (v. 22.0) software (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as means and standard deviations, categorical variables as numbers and percentages, and non-normally distributed variables as median (minimum–maximum) values. Normality of the data was checked using the Kolmogorov–Smirnov or Shapiro–Wilk test. Intergroup analyses were performed using the independent t-test and the Mann–Whitney U test for normally and non-normally distributed variables, respectively. Qualitative data were compared by the chi-square test. p<0.05 was considered statistically significant.

Study ethics

The study protocol was approved by the Local Ethics Committee (2018/896). Written informed consent was obtained from all participants. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

The study included a total of 84 (56 females, 28 males) patients with a mean age of 57.5±10.0 (range: 34–74) years and mean BMI of 33.0±5.2 kg/m^2. Patient demographic and clinical characteristics are presented in Table 1. FMS was present in 51.2 % of the patients. Patients with MetS+FMS had a statistically significant female predominance (p<0.001). Of the patients, 66.5% were obese and 84.5% had a large waist circumference (WC). Of all patients, 73.8% had poor sleep quality.

The comparison of SF-36 scores in MetS patients with and without FMS is shown in Table 2. No significant difference was found between the two groups of patients in terms of BMI and WC (p>0.05 for each comparison). While 62.9% of the patients with MetS+FMS had impaired sleep, the condition was present in only 37.1% of the patients without FMS; and the difference was statistically significant (p<0.001).

The PSQI-score-based comparison of sleep quality is shown in Figure 1. Scores were higher in patients with FMS than in those without (10.9 [4–21] vs. 6.0 [1–21]) (p<0.001).

The SF-36-based comparison of HR-QoL is shown in Figure 2. In all SF-36 domains, scores were lower in patients with FMS than in those without (p<0.001).

DISCUSSION AND CONCLUSION

We found that FMS had a higher prevalence and a significant negative effect on QoL and sleep quality in patients with MetS. Since this was a first study to investigate FMS in MetS, we reviewed the literature on the components of the MetS and FMS association. In the present study, we found that 51.2% of our patients with MetS also had FMS, showing a higher FMS prevalence compared with that in the normal population, perhaps because all of our patients had the DM component of MetS, with %84.5 of them having large WC. In addition to these, all of them were overweight or obese, and there was a female predominance (66.6%). The FMS prevalence in patients with DM (17–21%) was

reported to be higher than that in the normal population (16–18). It was also found that the FMS incidence in DM patients was nearly four times greater than that in non-diabetic controls (19). Other conditions thought to lead to increased FMS frequency are obesity, abdominal obesity, and overweight. It was found that abdominal obesity might be a factor associated with FMS, that overweight and obese women had a higher risk of developing FMS compared to those with normal weight, and that the rate of co-occurrence of FMS and obesity was between 30 and 45% (19–22). Furthermore, the FMS prevalence was reported to be six times greater in women than in men (9). All these data explain the high rate of FMS in our study.

MetS is a chronic and serious health problem with an increased risk of morbidity and mortality, and can also cause physical, emotional, and psychosocial problems (1,2,5). While previous studies reported impaired sleep quality in 63.4% of patients with MetS (6), poor sleep quality was observed in 73.8% of our patients. Many factors can cause sleep disturbance, with DM, high BMIs, and abdominal obesity being the most commonly reported ones (23,24). Sleep disturbances seen in DM or obesity may be due to the disease itself or its complications. Okubo et al. found higher PSQI scores in MetS and stated that hyperglycemia and low HDL cholesterol were independently associated factors of the global PSQI score (24). Another study showed the impact of WC, BMI, and fasting glucose levels on the PSQI scores in MetS patients (23). We observed lower scores in all SF-36 domains in our patients compared to Turkish population norms (25). Comparative studies with healthy controls reported an association between poorer HR-QoL and MetS presence (5,7,8). Components of MetS, such as elevated BP, large WC, and DM, were reported to have a direct effect toward decreased scores of HRQL (7,26). All of our patients had DM; their BMI was not within the normal range; and, furthermore, 84.5% of them had abdominal obesity. Therefore, our results are consistent with the literature.

The negative effect of FMS on sleep quality and QoL in MetS has not been studied until now. Sleep quality and QoL are impaired in the presence of FMS or MetS. Although pain is the primary symptom of FMS, poor sleep is also a major symptom. Wagner et al. found that sleep difficulties caused worse HR-QoL among patients with FMS (27), which impairs QoL along with sleep quality. Mungula et al. found a higher rate of sleep disorders in FMS patients (96%) while only 46% of healthy women had decreased sleep quality (11). Hoffman et al. showed that people with FMS scored significantly lower in all eight domains of SF-36 compared with the general population (12). The negative impact of FMS on sleep quality and QoL has been linked to overweight and obesity (22,28). We found that 62.9% of our patients with MetS+FMS had poor sleep quality, with statistically significantly higher PSQI scores compared to the patients without FMS. Similarly, they also had significantly lower scores in all SF-36 domains. The two conditions cause worse QoL and sleep quality together.

Finally, our study has several limitations. First, because of the cross-sectional design, other possible relationships between MetS and sleep quality or QoL could not be established. Second, our evaluation did not include other factors affecting QoL and sleep quality, such as depression and drug use. Larger, multidimensional studies are required to confirm our findings.

In conclusion, the frequency of FMS is high in patients with MetS. Although MetS alone has a negative effect on QoL and sleep quality, these are affected more negatively in the co-occurrence of Mets and FMS. Therefore, FMS also should be considered in the treatment and follow-up of patients with MetS.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

REFERENCES

1. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation. 2005;112(17):2735–52.
2. Moore JX, Chaudhary N, Akinyemiju T. Metabolic syndrome prevalence by race/ethnicity and sex in the United States, National Health and Nutrition Examination Survey, 1988–2012. Prev Chronic Dis. 2017;14:e24.

3. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, et al. Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. Circulation. 2009;120(16):1640–5.
4. Miettola J, Niskanen LK, Viinamäki H, Sintonen H, Kumpusalo E. Metabolic syndrome is associated with impaired health-related quality of life: Lapinlahti 2005 study. Qual Life Res. 2008;17(8):1055–62.
5. Han JH, Park HS, Shin CI, Chang HM, Yun KE, Cho SH, et al. Metabolic syndrome and quality of life (QoL) using generalised and obesity-specific QoL scales. Int J Clin Pract. 2009;63(5):735–41.
6. Hung HC, Yang YC, Ou HY, Wu JS, Lu FH, Chang CJ. The association between self-reported sleep quality and metabolic syndrome. PloS One. 2013;8(1):e54304.
7. Jahangiry L, Shojaeezadeh D, Montazeri A, Najafi M, Mohammad K. Health-related quality of life among people participating in a metabolic syndrome e-screening program: a web-based study. Int J Prev Med. 2016;7:27.
8. Roohafza H, Sadeghi M, Talaei M, Pourmoghaddas Z, Sarrafzadegan N. Psychological status and quality of life in relation to the metabolic syndrome: Isfahan Cohort Study. Int J Endocrinol. 2012;2012:380902.
9. Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum. 1995;38(1):19–28.
10. Queiroz LP. Worldwide epidemiology of fibromyalgia. Curr Pain Headache Rep. 2013;17(8):356.
11. Munguía-Izquierdo D, Legaz-Arrese A. Determinants of sleep quality in middle-aged women with fibromyalgia syndrome. J Sleep Res. 2012;21(1):73–9.
12. Hoffman DL, Dukes EM. The health status burden of people with fibromyalgia: a review of studies that assessed health status with the SF-36 or the SF-12. Int J Clin Pract. 2008;62(1):115–26.
13. Bennett RM, Friend R, Marcus D, Bernstein C, Han BK, Yachoui R, et al. Criteria for the diagnosis of fibromyalgia: validation of the modified 2010 preliminary American College of Rheumatology criteria and the development of alternative criteria. Arthritis Care Res. 2014;66(9):1364–73.
14. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiat Res. 1989;28(2):193–213.
15. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473–83.
16. Tishler M, Smorodin T, Vazina-Amit M, Ramot Y, Koffler M, Fishel B. Fibromyalgia in diabetes mellitus. Rheumatol Int. 2003;23(4):171–3.
17. Yanmaz MN, Mert M, Korkmaz M. The prevalence of fibromyalgia syndrome in a group of patients with diabetes mellitus. Rheumatol Int. 2012;32(4):871–4.
18. Mirghani HO, Elbadawi AS. Are diabetes mellitus, restless syndrome, and fibromyalgia related? IJBAMR. 2016;5(3):208–15.
19. Fatima J, Jain V, Priya S, Karoli R, Shukla V, Siddiqi Z, et al. Fibromyalgia linked to uncontrolled diabetes mellitus and hypomagnesemia. J Intern Med India. 2018;12:19–25.
20. Loevinger BL, Muller D, Alonso C, Coe CL. Metabolic syndrome in women with chronic pain. Metabolism. 2007;56(1):87–93.
21. Mork PJ, Vasseljen O, Nilsen TI. Association between physical exercise, body mass index, and risk of fibromyalgia: longitudinal data from the Norwegian Nord-Trøndelag Health Study. Arthritis Care Res. 2010;62(5):611–7.
22. Okifuji A, Donaldson GW, Barck L, Fine PG. Relationship between fibromyalgia and obesity in pain, function, mood, and sleep. J Pain. 2010;11(12):1329–37.
23. Jennings JR, Muldoon MF, Hall M, Buysse DJ, Manuck SB. Self-reported sleep quality is associated with the metabolic syndrome. Sleep. 2007;30(2):219–23.
24. Okubo N, Matsuzaka M, Takahashi I, Sawada K, Sato S, Akimoto N, et al. Relationship between self-reported sleep quality and metabolic syndrome in general population. BMC Public Health. 2014;14:562.
25. Demiral Y, Ergor G, Unal B, Semin S, Akvardar Y, Kıvırcık B, et al. Normative data and discriminative properties of Short Form 36 (SF-36) in Turkish urban population. BMC Public Health. 2006;6(1):247.
26. Corica F, Corsonello A, Apolone G, Mannucci E, Lucchetti M, Bonfiglio C, et al. Metabolic syndrome, psychological status and quality of life in obesity: the QUOVADIS Study. Int J Obes. 2008;32(1):185–91.
27. Wagner JS, DiBonaventura MD, Chandran AB, Cappelleri JC. The association of sleep difficulties with health-related quality of life among patients with fibromyalgia. BMC Musculoskelet Disord. 2012;13(1):199.
28. Arranz LI, Rafecas M, Alegre C. Effects of obesity on function and quality of life in chronic pain conditions. Curr Rheumatol Rep. 2014;16(1):390.