

Comorbidity of Fibromyalgia in Primary Knee Osteoarthritis: Potential Impact on Functional Status and Quality of Life

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Background: Knee osteoarthritis (OA) is a painful condition with peripheral and central pain transmission. Fibromyalgia (FM) is the role model of central sensitization of pain perception.

Aim: To assess the frequency of FM in knee OA patients and evaluate the impact of FM on mental health and the quality of life in knee OA patients.

Patients and Methods: A total of 121 female patients were recruited and divided into 3 groups: group I of 59 patients with knee OA only, group II of 32 patients with knee OA and FM, and group III of 30 FM patients. Patients underwent history taking, examination, investigations, and radiological evaluation of both knees. The assessment of visual analog scale (VAS), Pittsburgh Sleep Quality Index (PSQI), Pain Anxiety Symptom Scale Short Form 20 (PASS20), Beck Depression Inventory (BDI-II), and PCASEE questionnaire were done for all patients. Lequesne index of knee OA and radiological Kellgren and Lawrence score severity were done for all OA patients. Fibromyalgia Impact Questionnaire (FIQ) was assessed for all FM patients.

Results: FM was diagnosed in 35.5% of knee OA patients. Group II patients had higher VAS, PASS-20, PSQI, and lower quality of life than either groups I and III, elevated Lequesne index score than group I, significant correlation between VAS and BMI ($p=0.002$), Lequesne index score ($p<0.001$), PASS20 ($p=0.006$), BDI-II score ($p=0.002$), and FIQ ($P<0.001$), and a negative correlation was found between VAS and physical ($p<0.001$), anxiety ($p=0.046$), and social ($p=0.026$) QoL parameters. Univariable regression analysis showed a higher age, VAS, PSQI, PASS20, and FIQ were associated with lower QoL in group II. A higher PASS20 was the only predictor of lower QoL in multivariable analysis.

Conclusion: Fibromyalgia coexists frequently in knee OA patients and has implications on their mental health, functional activity, and quality of life.

Keywords: knee osteoarthritis, fibromyalgia, central sensitization, osteoarthritis pain

Introduction

Osteoarthritis (OA) is a widespread musculoskeletal disease that can affect many joints like hips and knees especially in the overweight patients.¹ It is one of the main aching diseases that relatively affect older individuals. Pain of OA predominantly impacts the patients' performance and daily activities.² Although joint pathology is blamed for part of this painful condition, comorbidities may enhance the nociceptive processing and influence the clinical presentations.³ Additionally, the pain of OA is mediated by central and peripheral neurophysiological pathways.⁴

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Therefore, the optimization of pain relief therapy depends on the proper consideration of pain mechanisms in knee OA.⁵

Fibromyalgia (FM) is a prototypical disease of chronic widespread pain associated with sleep disorders, cognitive dysfunction, fatigue, and depression.⁶ It is considered as an obvious form of central sensitization.⁷ Primary FM is unassociated with underlying disorder while secondary FM occurs in patients with underlying rheumatic or other organic diseases.⁸ Secondary FM is common among inflammatory arthritis patients.⁹ In contrast, primary FM may be a comorbidity with noninflammatory disorders like OA, migraine, and peripheral neuropathy. Both forms impact either the associated or the co-morbid disease outcomes and treatment strategies.¹⁰

Chronic pain is the prominent feature of OA and FM. Additionally, they share the central sensitization mechanism of pain transmission which is a pain perception mechanism concerned with chronic pain development and maintenance.¹¹ A state of hyper-reactivity of the nervous system occurs persistently “wind-up”. This state lowers the pain threshold and maintains the pain sensation beyond the initial injury healing.^{12,13}

Similarly, OA and FM were proved to have psychofunctional implications as sleep disorders, anxiety, and depression.^{14–17} Pain and its peripheral and central sensitization mechanisms concern with these psychological and functional complaints in both diseases.^{18,19}

On the other hand, the comorbidity of FM and knee OA was not well studied and reported. This combination may affect the OA therapy as well as FM and their outcomes. So, we aimed to assess the frequency of comorbid FM in Primary knee OA patients and evaluate the impact of this comorbidity on these patients’ mental health and quality of life.

Patients and Methods

This cross-sectional study was conducted in the Rheumatology, Rehabilitation & Physical Medicine Department, Faculty of Medicine, Benha University, Egypt. Knee OA patients were collected from the Department’s outpatient clinic while FM patients were collected also from the outpatients’ clinic of Neuropsychiatric Department. The study has been approved by Benha University Research Ethics Committee (the 1964 Declaration of Helsinki and its revisions). Written informed consents in Arabic were obtained from all participants included in the study.

Patients were diagnosed as primary knee OA according to the American College of Rheumatology (ACR) clinical/

radiographic symptomatic criteria of osteoarthritis.²⁰ Fibromyalgia was diagnosed by history and physical examination according to Modified 2010/2011 ACR Fibromyalgia Diagnostic Criteria.²¹ The exclusion criteria were: patients with a history of OA in joints other than knee joints, secondary OA, KL grade 4 (as they have a more sedentary life which has a direct impact on QoL), arthritis of diseases other than OA, trauma, chronic inflammatory diseases, chronic infection as tuberculosis, chronic diseases as thyroid dysfunction, diabetes, gout, renal and hepatic diseases, malignancies, pregnancy (menstruating patients), smoking, severe cognitive impairment, psychiatric disorders, and neuropathic pain in addition to male gender patients to rule out the variety in the emotional and physical status between male and female genders that may affect their functional status and quality of life.

All patients initially went to a rheumatologic appointment. They were asked about medical history, family history of OA, exercise type and duration/week, and medications. They were subjected to clinical examination especially musculoskeletal examination, Body mass index (BMI) calculation. The Lequesne index of severity for knee OA was used to assess the functional status of the OA patients. It has 3 parameters (Pain or Discomfort, Maximum distance walked, and Activity of daily living). The score is the sum of the points for all parameters with minimum points for each section: 0, maximum points for each section: 8, minimum index score: 0, maximum index score: 24. The handicap degree (0: none, 1–4: mild, 5–7: moderate, 8–10: severe, 11–13: very severe, and ≥ 14 : extremely severe).²² The severity of knee pain was measured by 10 cm visual analog scale (VAS).²³

Within the same week, the patients visited the neuropsychiatry team for assessment. The Arabic validated forms of Pain Anxiety Symptom Scale Short Form 20 (PASS20)²⁴ and the Pittsburgh Sleep Quality Index (PSQI)²⁵ questionnaires were used to assess psychological disturbances and sleep quality. The short form of the PASS is a 20-item self-report scale that measures 4 components (cognitive anxiety, escape and avoidance, fear of pain, and physiological anxiety). The frequency of occurrence of each of the 20 behaviors from 0 “never” to 5 “always”.²⁴ In the PSQI scoring, 7 component scores were derived (Subjective sleep quality, Sleep latency, Sleep duration, Sleep efficiency, Sleep disturbance, use of sleep medications, Daytime dysfunction), each scored 0 (no difficulty) to 3 (severe difficulty). The component

scores were summed to produce a global score (range 0 to 21). Higher scores indicated worse sleep quality.²⁵

The Arabic form of Beck Depression Inventory (BDI-II) was used for the assessment of depression in all patients.²⁶ Quality of life (QoL) was assessed using the Arabic form of PCASEE questionnaire which measures the physical, cognitive, affective, social, economic, and ego QoL features.²⁷ Each aspect has a final score ranging from 0 to 100. A detailed evaluation of the socioeconomic status was performed including collection of data about residence, educational level, marital status, and income. The functional status of FM patients was evaluated using the Arabic validated version of Fibromyalgia Impact Questionnaire (FIQ).^{28,29}

Then, radiographs of anteroposterior view in weight-bearing position for both knees were obtained from all participants. Kellgren and Lawrence (KL) grading score was used to evaluate the radiological severity of knee OA.³⁰

Statistical Methods

The data were analyzed by SPSS (25.00) Data were presented and suitable analysis was done according to the type of data obtained for each parameter. Kolmogorov–Smirnov test was done to calculate the normality of data distribution. The significant data were nonparametric.

Descriptive Statistics

Mean, standard deviation (\pm SD) were used for parametric numerical data, while median and range were used for non-parametric numerical data. Frequency and percentage were used for non-numerical data.

Analytical Statistics

Student's *T* test was used to assess the difference between the two study groups' means. Mann–Whitney test (*U*-test) was used for a non-parametric variable. Chi-square test was used for qualitative variables. Fisher's exact test was used to examine the relationship between two qualitative variables. Correlation analysis was done to assess the strength of association between two quantitative variables. Logistic regression analysis was used for the prediction of risk factors. Univariate regression examined the effect of a single independent variable on a dependent variable; one variable was analyzed at a time. In multivariate regression, several variables were analyzed together for any possible association or interactions. All tests were 2-sided and a *P*-value < 0.05 was considered statistically significant.

Results

According to the clinical examination, 59 (64.8%) of the patients had knee-OA only (group I) and 32 (35.2%) had coexistence of knee OA and FM (group II) and 30 patients with FM (group III). Thirty (32.9%) of our patients were illiterate, and 61 of them (67.1%) were from rural areas.

In our study, patients' age showed a significant difference between the three groups being oldest in group I and youngest in group III. BMI was higher in OA patients in either group when compared to that of the isolated FM patients. The severity of knee OA was more in group I than group II. Curiously, Group II had significantly higher VAS, PASS-20, and PSQI compared to group I and group II. Moreover, Lequesne index score was significantly elevated in group II compared to group I. There was no statistical significance of the residence, marital status, educational level, and diseases duration differences between the 3 groups. Regarding the depression issue, there was a difference between the 3 groups with a remarkable higher score of BDI-II questionnaire in group II patients. The quality of life variables is shown in [Table 1](#).

Patients of group II had significantly lower quality of life compared to group I and III patients (0.002 and 0.004, respectively) ([Figure 1](#)).

The correlations between Lequesne index score, anxiety, and depression scales with different demographic, clinical, and quality of life parameters in group I and II are shown in [Tables 2](#) and [3](#). In group II, a positive significant correlation was found between VAS and BMI ($p=0.002$), Lequesne index score ($p<0.001$), PASS20 ($p=0.006$), BDI-II score ($p=0.002$), and FIQ ($P<0.001$), while a significant negative correlation was found between VAS and physical ($p<0.001$), anxiety ($p=0.046$), and social ($p=0.026$) QoL parameters ([Table 2](#)).

Regarding patients with group I, VAS had a significant positive correlation with BMI ($p=0.03$) and Lequesne index score ($p<0.001$), while a significant negative correlation was found between VAS and physical ($p<0.001$) and social ($p<0.001$) QoL parameters ([Table 3](#)).

Regression analysis was conducted for prediction of QoL in all studied cases, using age, BMI, duration, Lequesne index score, VAS, PSQI, PASS20, BDI-II, and FM comorbidity as confounders. Regarding patients of group I, VAS had a significant positive correlation with BMI ($p=0.03$) and Lequesne index score ($p<0.001$), while a significant negative correlation was found between VAS and physical ($p<0.001$) and social ($p<0.001$) QoL parameters ([Table 4](#)).

Table I Baseline Characteristics of Different Groups

	Variable		KOA (n=59) Group I	KOA Patients with FM (n=32) Group II	FM (n=30) Group III	P value
Demographic	Age (years)	Mean \pm SD	53.4 \pm 7.2	37.5 \pm 6.9	47.3 \pm 4.6	< 0.001* p1 < 0.001*, p2 < 0.001*, p3 < 0.001*
	BMI	Mean \pm SD	33.4 \pm 3.1	29.5 \pm 3.9	33.3 \pm 3.4	< 0.001* p1 < 0.001*, p2 < 0.001*, p3 = 0.8
	Residence	(Rural: Urban)	(34:25)	(18:12)	(22:10)	0.58
	Marital status	(Married: not married)	(49:10)	(19:11)	(23:9)	0.11
	Educational level	(Literate: Illiterate)	(39:20)	(26:4)	(26:6)	0.07
Clinical	Disease duration (years)	Median (IQR)	3 (2–5)	2(2–3)	2 (1–3.5)	0.07
	KL grades	I n(%)	16(27.1%)	—	18 (56.3%)	0.02*
		II n(%)	17(28.8%)	—	7(21.9%)	
		III n(%)	26 (44.1%)	—	7(21.9%)	
	VAS	Median (IQR)	3 (2.0–4.75)	5 (3–7)	6 (5–8)	< 0.001* p1=0.002*, p2=0.04*, p3 < 0.001*
	PSQI	Mean \pm SD	7.5 \pm 1.7	9.1 \pm 2.7	12.5 \pm 2.5	< 0.001* P1 < 0.001*, p2 < 0.001*, p3 < 0.001*
	PASS20	Mean \pm SD	35.9 \pm 8.4	40.5 \pm 8.6	47.8 \pm 10.9	< 0.001* p1=0.02*, p2=0.005* p3 < 0.001*
	BDI-II	Median (IQR)	5 (2–7)	22.5(18–27)	14(9–17.5)	< 0.001* p1 < 0.001*, p2 < 0.001*, p3 < 0.001*
	Lequesne score	Median (IQR)	5(4–7)	—	7(5.5–12)	< 0.001*
Quality of life	FIQ	Mean \pm SD	—	42.8 \pm 13.2	49.5 \pm 20.7	0.14
	Physical	Mean \pm SD	49.8 \pm 14.7	62.1 \pm 14.4	47.6 \pm 14.1	< 0.001* p1 < 0.001*, p2 < 0.001*, p3 = 0.5
	Cognitive	Mean \pm SD	55.6 \pm 15	51.3 \pm 14.8	49.9 \pm 16.6	0.2
	Affective	Mean \pm SD	53.5 \pm 14.3	47.6 \pm 15.1	34.4 \pm 17.3	< 0.001* p1 = 0.07, p2 = 0.002*, p3 < 0.001*
	Social	Mean \pm SD	50.5 \pm 15.2	55.2 \pm 12.4	45.8 \pm 13.8	0.04* P1 = 15, p2 = 0.006*, p3 = 0.14
	Economic	Mean \pm SD	55.2 \pm 19.1	60.9 \pm 16.5	54.8 \pm 22.5	0.36
Quality of life	Ego	Mean \pm SD	47.8 \pm 16	35.9 \pm 14.9	34.9 \pm 15.9	< 0.001* p1 = 0.001*, p2 = 0.8, p3 < 0.001*

(Continued)

Table 1 (Continued).

	Variable		KOA (n=59) Group I	KOA Patients with FM (n=32) Group II	FM (n=30) Group III	P value
Medications	Acetaminophen	n (%)	49(83%)	15 (50%)	20 (62.5%)	0.004*
	NSAIDS	n (%)	46 (78%)	22 (73.3%)	27(84.4%)	0.6
	Antidepressant	n (%)	4(6.8%)	27(90%)	12(37.5%)	<0.001*
	Gabapentinoids	n (%)	9(15.3%)	24(80%)	16(50%)	<0.001*
	Chondroprotectives	n (%)	46(78%)	0(0%)	21(65.6%)	0.3

Notes: P1: between KOA group and FM group; p2: between FM group and KOA patients with FM co-morbidity group; p3: between KOA group and KOA patients with FM co-morbidity group. *p<0.05.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia; BMI, body mass index; KL, Kellgren and Lawrence; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; BDI-II, Beck Depression Inventory; FIQ, Fibromyalgia Impact Questionnaire; NSAIDS, non-steroidal anti-inflammatory drugs.

Linear regression analysis for prediction of factors affecting the functional status denoting by Lequesne index score in all studied knee OA patients using the same parameters. Univariable analysis revealed that higher

BMI, PSQI, BDI-II, and FM presence associated with higher Lequesne index score, while multivariable analysis showed that higher BMI and BDI-II are predictors of lower QoL in all knee OA cases (Table 5).

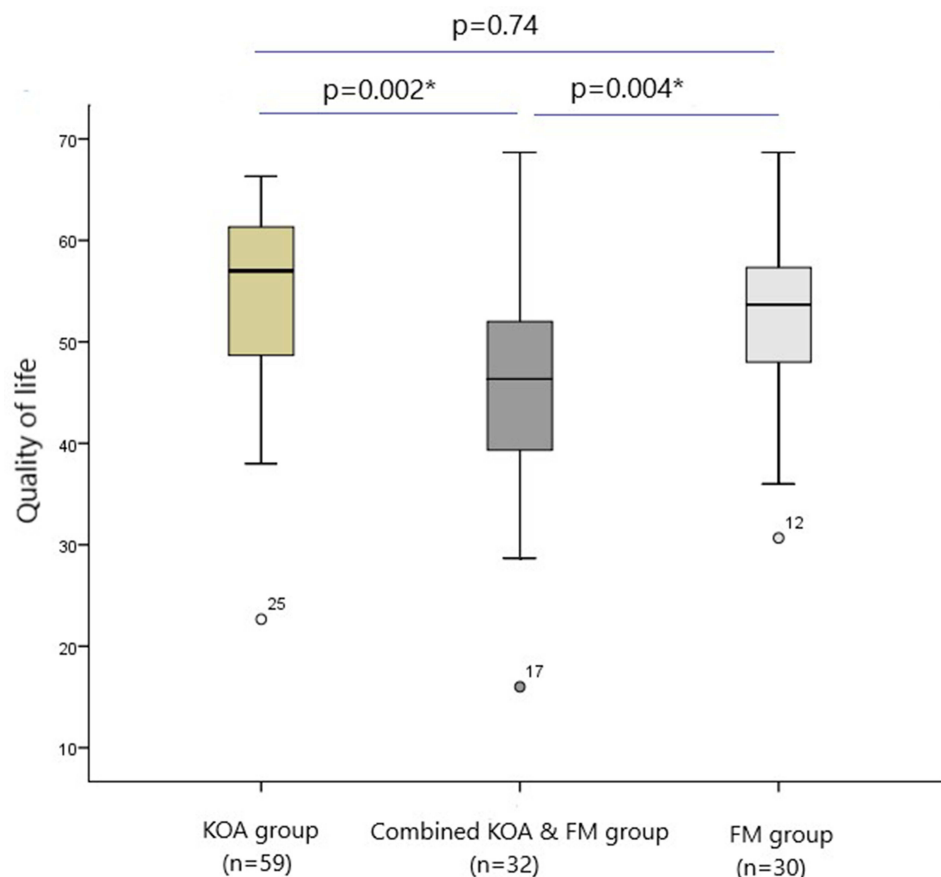


Figure 1 Quality of life in different groups.

Note: *P<0.05.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia.

Table 2 Correlation of Different Parameters in KOA Patients with FM Comorbidity

Parameters		VAS		PASS20		BDI-II		Lequesne	
		r	p	r	p	r	p	r	p
	Age	0.17	0.35	0.46	0.009*	0.13	0.49	0.2	0.27
	BMI	0.53	0.002*	0.04	0.84	0.29	0.11	0.38	0.03*
	Disease duration	0.04	0.84	0.16	0.37	0.09	0.64	0.2	0.26
	VAS	—	—	0.48	0.006*	0.53	0.002*	0.64	<0.001*
	PSQI	0.23	0.21	0.4	0.02*	0.18	0.32	0.28	0.11
	PASS20	0.48	0.006*	—	—	0.25	0.16	0.37	0.04*
	BDI-II	0.53	0.002*	0.25	0.16	—	—	0.17	0.37
	Lequesne's score	0.64	<0.001*	0.37	0.04*	0.17	0.37	—	—
	FIQ	0.56	<0.001*	0.77	<0.001*	0.32	0.07	0.47	0.006*
Quality of life	Physical	−0.62	<0.001*	−0.71	<0.001*	−0.4	0.02*	−0.42	0.02*
	Cognitive	−0.1	0.57	−0.47	0.007*	0.1	0.6	−0.09	0.6
	Affective	−0.36	0.046*	−0.67	<0.001*	−0.1	0.6	−0.32	0.08
	Social	−0.39	0.026*	−0.7	<0.001*	−0.35	0.049*	−0.29	0.1
	Economic	0.12	0.52	−0.11	0.56	−0.03	0.87	−0.04	0.85
	Ego	−0.03	0.88	−0.5	0.004*	0.13	0.49	−0.04	0.85

Note: *p<0.05.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia; BMI, body mass index; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; BDI-II, Beck Depression Inventory; FIQ, Fibromyalgia Impact Questionnaire.

Table 3 Correlation of Different Parameters in Confined KOA Group

Parameters		VAS		PASS20		BDI-II		Lequesne	
		r	p	r	p	r	p	r	p
	Age	0.07	0.61	−0.2	0.13	−0.06	0.63	0.07	0.59
	BMI	0.3	0.03*	0.03	0.84	0.36	0.005*	0.3	0.03*
	Disease duration	0.05	0.7	0.21	0.1	0.15	0.26	0.14	0.3
	VAS	—	—	0.05	0.71	0.11	0.39	0.74	<0.001*
	PSQI	0.05	0.73	0.38	0.003*	0.33	0.01*	0.04	0.74
	PASS20	0.05	0.71	—	—	0.27	0.04*	0.22	0.09
	BDI-II	0.11	0.39	0.27	0.04*	—	—	0.02	0.85
	Lequesne's score	0.74	<0.001*	0.22	0.09	0.02	0.85	—	—
Quality of life	Physical	−0.54	<0.001*	−0.31	0.02*	0.06	0.67	−0.65	<0.001*
	Cognitive	−0.09	0.52	−0.03	0.82	0.13	0.34	−0.19	0.15
	Affective	−0.12	0.37	−0.39	0.002*	−0.23	0.08	−0.14	0.3
	Social	−0.55	<0.001*	−0.34	0.009*	0.1	0.42	−0.6	<0.001*
	Economic	0.05	0.73	−0.16	0.23	−0.07	0.58	0.15	0.24
	Ego	−0.18	0.17	−0.25	0.06	−0.16	0.24	−0.3	0.02*

Note: *p<0.05.

Abbreviations: KOA, knee osteoarthritis; BMI, body mass index; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; BDI-II, Beck Depression Inventory.

Regression analysis was conducted for prediction of QoL in group II cases, using age, BMI, duration, Lequesne index score, VAS, PSQI, PASS20, FIQ, and BDI-II as confounders. Higher age, VAS, PSQI, PASS20, and FIQ were associated with lower QoL in univariable analysis. By using significant confounders in Univariable analysis into multivariable analysis revealed that only higher PASS20 was the only predictor of lower QoL (Table 6).

Discussion

Quality of life (QoL) is defined as a well-being status of persons in several aspects like physical health, psychological health, education, and socio-economic environment.³¹ Physical disorders represent a main impact on QoL especially when concerning with pain.³² In chronic musculoskeletal pain disorders as knee osteoarthritis and fibromyalgia,

Table 4 Linear Regression Analysis for Prediction of Factors Affecting Quality of Life in All Studied KOA Patients

Variables	Univariate		Multivariate	
	P value	β	P value	β
Age	0.484744	1.2234		
BMI	0.239142	0.11234		
Disease duration	0.232511	0.3456		
Lequesne's score	0.049234*	0.11381	3.3787	-1.2828
VAS	0.96678	-2.157		
PSQI	0.000272*	-1.289	0.0334*	-1.08364
PASS20	0.103467	-0.6000		
BDI-II	0.012142*	-0.4292	0.8613	-0.034
FM	0.00319*	-6.886	0.05793	1.86320

Notes: * $p < 0.05$. β : regression coefficient.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia; BMI, body mass index; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; BDI-II, Beck Depression Inventory.

Table 5 Linear Regression Analysis for Prediction of Factors Affecting Lequesne's Score in All Studied KOA Patients

Variables	Univariate		Multivariate	
	P value	β	P value	β
Age	0.60895	-0.027146		
BMI	0.003511*	0.33460	0.046788105*	0.1720
Disease duration	0.57293	0.1060		
VAS	0.36687	1.0920		
PQAI	0.008671*	0.3093	0.664619446	-0.0558
PASS 20	0.60	0.13076		
BDI-II	0.014601*	0.1368	0.012639246*	-0.13515
FM	0.000828*	2.5132	0.298019997	0.957599

Notes: * $p < 0.05$. β : regression coefficient.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia; BMI, body mass index; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; BDI-II, Beck Depression Inventory.

the nociceptive pain is sustained by continuing impulse from peripheral tissues, including muscle, ligaments, and joints.^{33,34} As well, in such diseases, central sensitization affects the pain intensity, threshold, and maintenance.³⁵ Quality of life, performance, psycho-functional status, and sleep efficiency are parameters intensely affected by knee OA painful sequelae.³⁶ These parameters are seemed also to be influenced by FM.³⁷ The functional and psychological statuses of patients with FM and some inflammatory arthritis were studied previously.^{38–40} But, the evaluation of these statuses in patients with combined knee OA and FM was not studied yet. This study aimed to reveal the superimposed impacts of the co-incident FM on knee OA patients' symptomatology.

Table 6 Linear Regression Analysis for Prediction of Factors Affecting Quality of Life in Combined KOA and FM Patients

	Univariable		Multivariable	
	β	p	β	p
Age	-1.020	0.023*	-0.100	0.773
BMI	-0.182	0.774		
Disease duration	-2.052	0.112		
Lequesne's score	-1.078	0.074		
VAS	-2.251	0.046*	-0.222	0.810
PSQI	-1.762	0.034*	-0.581	0.379
PASS20	-0.382	<0.001*	-0.944	<0.001*
FIQ	-0.298	0.002*	-0.138	0.260
BDI-II	-0.317	0.363		

Notes: * $p < 0.05$. β : regression coefficient.

Abbreviations: KOA, knee osteoarthritis; FM, fibromyalgia; BMI, body mass index; VAS, visual analog scale; PSQI, Pittsburgh Sleep Quality Index; PASS20, Pain Anxiety Symptom Scale Short Form 20; FIQ, Fibromyalgia Impact Questionnaire; BDI-II, Beck Depression Inventory.

We found about 35% of our knee OA patients to have comorbidity of OA and FM. There is conflicting data in the literature about the prevalence of FM comorbidity in OA patients. Some reports demonstrated relatively lower frequency as 6%⁴¹ and 10%,⁴² while Dzekan et al⁴³ reported a higher prevalence (22.83%) of FM among their OA patients. This discrepancy can be attributed to the difference in the sample size, socio-economic status including educational level as the diagnosis of FM is highly subjective. Also, all our subjects were females, known to have an increased prevalence of FM.

We found that patients with comorbid OA-FM had more implications on their QoL that was related to either functional or psychological status. They showed higher scores of the questionnaires evaluating pain, anxiety, sleep disorders, depression, and the functional condition than either patients of confined knee OA or FM. The presence of FM was a predictor factor of both lower functional status and lower QoL. Moreover, the higher FIQ was one of the factors that affect the QoL of these patients negatively.

The management of painful conditions is a serious issue that can lower the burden by increasing the functional status of the patients.⁴⁴ In our study, we stressed on the coexistent fibromyalgia with OA, a degenerative arthritis. Previous studies emphasized on the concomitant fibromyalgia with inflammatory arthritis and its implications on their disease activity and management; as Rheumatoid Arthritis^{45–47} and Systemic Lupus Erythematosus.^{48,49} Staud discussed the shared pain mechanisms in OA, FM, and low back pain.⁵⁰ Neville et al demonstrated the role of central pain processing

in patients of knee OA who met the FM criteria.⁵¹ We studied the quality of life with comorbidity of knee OA and FM. Quality of life of OA patients and FM patients was assessed separately in previous studies.^{42,52,53}

Mental health is a crucial aspect of all individuals that affect their attitude in dealing with daily stresses. FM patients mostly have a general state of distress in addition to depression that obstacle their lifestyle.⁵⁴ Furthermore, it was proved that OA patients have a reduction in the mental health level with a depression association of poor outcome.⁵⁵ The present results showed the serious psychological and functional drawbacks of associated FM with knee OA and the further burden on this comorbidity patients' mental health. An ending point that may open a new window in the management plan of those patients.

The point of strength in our study is the first orientation about the comorbidity of knee OA and FM impacts on the quality of life and mental health of these patients. Our study limitations were the relatively small sample size and being a single center study done on one ethnic group. We utilized the Arabic form of PCASEE questionnaire which is not the latest. Illiterate people were not excluded from the study and it was reported that educational level may have an impact on pain perception.⁵⁶

We can settle from this research that FM could be a frequent knee OA comorbidity. This comorbidity may facilitate the pain perception and affect the sleep quality, psychological status, functional outcomes, and consequently the quality of life of knee OA patients. Early identification of such association can improve the management plan accordingly with a better outcome. Future longitudinal researches should spot on the FM treatment lines and their effects on knee OA patients' functional and mental status.

Disclosure

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