Clinical Rheumatology (2019) 38:165–172
https://doi.org/10.1007/s10067-018-4313-x

ORIGINAL ARTICLE

Prevalence of fibromyalgia in physicians in training: a cross-sectional study

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Received: 19 April 2018 / Revised: 19 September 2018 / Accepted: 23 September 2018 / Published online: 3 October 2018

Abstract

The prevalence of fibromyalgia (FM) in physicians in training (PIT) in Saudi Arabia is unknown. The aim of this study is to evaluate the prevalence of FM in PIT using different screening tools and factors associated with its development. We also aimed at evaluating the level of agreement and correlation between screening tools. This was a cross-sectional study conducted in a single academic institution. PIT were invited to fill three questionnaires: Fibromyalgia Rapid Screening tool (FirST), Fibromyalgia Survey Questionnaire (FSQ), and London Fibromyalgia Epidemiology Study Screening Questionnaire (LFESSQ). A total of 182 PIT completed the questionnaire. They were predominantly males (57.1%), single (56.0%), and at resident level (86.7%). The median age was 28 (interquartile range = 4). The average number of house-calls/month was 3.2 (SD = 2.3). The prevalence of FM using the FirST, FSQ, and LFESSQ was 6.0%, 8.2%, and 11.6%, respectively. Six (3.3%) fulfilled the three criteria concurrently. After adjusting for different variables using the FSQ, PIT with family history of FM had 23.6 times the odds for testing positive (95% CI = 3.12, 178.37), and every extra house-call/month was associated with a 50% increase in the odds for testing positive for FM (95% CI = 1.00, 2.25). Percent agreement between tools was high (all > 86%). Results for kappa coefficient showed moderate agreement between FSQ scores and each of FirST and LFESSQ. There was poor agreement between FirST and LFESSQ. FM is prevalent among PIT. There is a high percent agreement and poor to moderate correlation between the screening tools used.

Keywords Fibromyalgia · Physician in training · Prevalence

Introduction

Residency training is the time where physicians in training (PIT) acquire knowledge and clinical skills in their chosen specialties. However, enrollment in such programs is associated with psychological stress and sleep deprivation, leading to a significant reduction in psychological well-being [1]. Feeling of burnout, depressive symptoms, and fatigue are commonly reported by PIT, and are all associated with an increased risk for future self-perceived major medical errors, which may further lead to psychological stress [2, 3]. Fibromyalgia (FM), a disorder characterized by chronic widespread pain [4] and decreased quality of well-being [5], can be caused by psychological stress and sleep deprivation. The publication of the modified 2010 [6] American College of Rheumatology (ACR) preliminary diagnostic criteria for FM syndrome eliminated "tender point examination", which used to be a requirement for the clinical diagnosis of FM by the previous 1990 ACR classification criteria [7], and by the physician-related component in the preliminary 2010 criteria [8, 9]. This has facilitated the development of screening questionnaires for FM that do not include clinical evaluation such

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as the Fibromyalgia screening tool (FSQ) a tool that has been shown to be reliable and valid [10–12]. The Fibromyalgia Rapid Screening tool (FirST) is a questionnaire developed by the French Society of Rheumatology and validated by Perrot et al. in 2010. It is easy to administer and has a sensitivity of 90.5% and a specificity of 85.7% [11]. The population used to develop the FirST consisted of rheumatoid arthritis and osteoarthritis patients. Another tool that has been developed and validated for screening of FM is the London Fibromyalgia Epidemiological Study Screening Questionnaire (LFESSQ) in 1999 by White et al. [12]. This tool has two components, the pain and fatigue components and unlike the FirST, it has been validated in the general population.

To our knowledge, no regional studies evaluated the prevalence of FM among Saudi PIT. The primary aim of this study was to estimate the prevalence of FM in PIT using three different validated screening tools. Secondary aims included assessing level of agreement and correlation between these screening tools among people identified with FM, as well as examining the association between FM and different sociodemographic characteristics and differences in prevalence across fields of training.

Method

A cross-sectional study was conducted in King Saud Medical City, Riyadh, Saudi Arabia.

The total number of registered residents and fellows in the postgraduate center was 452 (this yielded a power of 94% assuming a prevalence of FM = 8% and an expected difference of 4%). The sample included all trainees at the resident and fellow levels. Exclusion criteria included pre-scholar demonstrators and service physicians. We invited all resident and fellow trainees to fill an anonymous online self-administered questionnaire sent through the postgraduate department to the PIT emails. A reminder was sent to trainees after 2–4 weeks during their half academic activities in coordination with program directors and chief residents. The estimated time to complete the questionnaire was 5–7 min based on a pilot study conducted on 10 participants. At the end of the questionnaire, participants were invited to leave their contacts if they wanted to be further evaluated for their body pain.

Field of training was grouped into five groups: (1) anesthesia, (2) dermatology, (3) emergency medicine, (4) family medicine, (5) internal medicine, (6) pathology, (7) pediatrics, (8) psychiatry, (9) general surgery, and (10) other surgery. Other surgery included orthopedics, urology, ear, nose and throat, and plastic surgery. The study was conducted between the period October 2016 and May 2017.

Screening tools

Participants were asked "Do you have body pain?". If they answered (yes), they were invited to complete three different validated tools for FM screening. The first was the FirST, a six-item questionnaire that evaluates pain features including site, character, associated symptoms, and effect on quality of life. A cut-off score of 5 out of 6 (corresponding to the number of positive items) is considered positive [11]. The second was the LFESSQ [12] which consists of two parts, a pain component and a fatigue component. Participants would meet the criteria for the pain component when they have a positive response to all four pain items and have either both a right- and left-side positive response or one both sides positive response. The third tool was the FSQ, which consists of the Widespread Pain Index (WPI) and a Symptom Severity Score (SSS). A positive response is considered when (1) participants meet WPI $\geq$ 7/19 for pain sites and SSS $\geq$ 5/12, or WPI between 3 and 6/19 and SSS $\geq$ 9/12; (2) symptoms have been present at a similar level for at least 3 months [10]. Analysis was performed based on the responses for the FSQ as it was developed to represent 2/3 of the 2010 preliminary ACR criteria [6].

The questionnaire also asked about demographic characteristics including age, sex, marriage, nationality, and body mass index (BMI). Additionally, it enquired about training programs, asking about level of training (residency vs. fellowship), field of training, and average hours of house-calls per month. Other secondary measures included smoking status, sleep pattern (average hours of sleep and time of sleep), family history of FM, and presence of chronic co-morbidities.

Statistical analysis

Descriptive statistics were used to report demographic characteristics, rates of response, and prevalence of FM based on the three screening tools (FirST, LFESSQ, and FSQ). For FM prevalence, we reported percentages and 95% confidence intervals. We assessed concordance between screening tools by calculating Cohen's kappa coefficient, comparing every two screening tools with each other. We also estimated the prevalence of FM as measured by the FSQ across different fields of training, stratified by sex.

To assess the association between different characteristics and FM, we conducted logistic regression analysis using binary FM (defined by the FSQ tool) as the outcome variable. The model controlled for sex, marital status (married vs. single), smoking status (current smoker vs. non-smoker), level of training, hours of sleep, time of sleep (before vs. after 11 pm), family history of FM, and presence of co-morbidities, based on their potential confounding effects in predicting FM. We did not control for age as it was heavily correlated with level of training. We reported odds ratios, 95% confidence intervals,

and p values for logistic regression analysis. The level of significance in this study was set to 0.05. All statistical analyses were conducted using SAS 9.2 (SAS Institute Inc., Cary, NC).

Results

Characteristics of the participants

Out of 452 PIT, 182 (40.3%) completed the survey and were included in the final analysis. The majority were males (57.1%), single (56.0%), and at resident level (86.7%) (Table 1). Around 82.7% of participants had regular house-calls, with an average of 3.2 calls (SD = 2.3) per month. Few participants had family history of FM (7.7%) and 12.2% had history of chronic conditions. Of the male participants 43.3% were current smokers, where 60% smoked cigarettes and 55.6% smoked moassel or shisha. On the other hand, only five females (6.4%) were identified as current smokers, where half were cigarette smokers and half smoked hookah.

Prevalence of fibromyalgia

The prevalence of FM using the FirST, FSQ, and LFESSQ was 6%, 8.2%, and 11.6%, respectively (Table 2). Six participants (3.3%) fulfilled the three criteria concurrently. Among the 23 fellows in the study, 17.4% (95% CI = 6.98, 37.14) were positive for FM by FSQ criteria, while only 7.3% (95% CI = 4.14, 12.65) of residents were positive for FM. When comparing prevalence of FM between different fields of training, FM as identified by the FSQ was only positive among male trainees in the fields of anesthesia and internal medicine (9% in both). On the other hand, FM-positive female residents were identified among trainees in the fields of anesthesia, dermatology, emergency medicine, internal medicine, pediatrics, and general surgery (Fig. 1). The highest prevalence of FM in the female resident group was among those specializing in anesthesia and general surgery (both 33%) (Fig. 1).

A significantly greater proportion of female participants were positive for body pain criteria, FirST criteria, and LFESSQ fatigue score criteria, in addition to being concurrently positive for FirST, FSQ, and LFESSQ (Table 2).

Agreement and correlation between the screening tools

Overall percent of agreement between screening tools were high (all above 86%). Results for kappa coefficient showed moderate agreement between FSQ and each of FirST, LFESSQ pain criteria, and LFESSQ fatigue score (Table 3). However, there was fair agreement between LFESSQ pain criteria and each of FSQ and LFESSQ fatigue score, and poor agreement between FirST and LFESSQ pain criteria (Table 3).

Association between FM and participant characteristics

Results from logistic regression analysis showed that only number of calls per month and having family history of FM were associated with greater odds of being positive for FM through FSQ criteria, when controlling for other covariates (Table 4). There was no notable difference in the odds for being positive for FM when males were compared to females, or when smokers were compared to non-smokers (the odds ratio approximated the null). However, although not statistically significant, being married, being a resident, and having a co-morbidity were associated with reduced odds for being positive for FM, compared to their counterpart participants (Table 4). Furthermore, every extra hour of sleep per night was associated with a 10% reduction in the odds for being positive for FM (AOR = 0.9, 95% CI = 0.55, 1.53), albeit not statistically significant.

Discussion

FM is linked to the significant reduction in health-related quality of life (HRQOL) [13] and disability [5]. Physicians are at increased risk for reduced professional quality of life (ProQOL) [14]. This study was the first to examine FM among PIT, a unique population that is considered vulnerable to work-related stress [2, 3], sleep disturbance [2], fatigue [2], reduced quality of life [15, 16], and burnout [16–18], all of which can lead to reduced levels of well-being [18] and difficulties in coping [18, 19]. Data from our study show that the prevalence among PIT (8.2%) is greater than the pooled prevalence for general populations in the region (4.4%) [20]. Although FM is well known to be less common in males than in females, the population of this current study is predominantly male and at an age relatively younger than the age of onset of FM. In a recent systematic review by Heidari et al. conducted on different studies from around the world, the pooled prevalence of FM among the general population, women, and men was 1.78% (95% CI = 1.65, 1.92), 3.98% (95% CI = 2.80, 5.20), and 0.01% (95% CI = − 0.04, 0.06), respectively [20]. In our study, we used three different screening questionnaires in order to have a closer range to the real prevalence and to evaluate the correlation and agreement between these tools. Additionally, in this resident population, we identified two important predictors for testing positive for FM as measured by the FSQ: number of calls per month and family history of FM.

Sleep disturbance, a major element in the development of FM [21, 22] that was not evaluated in the current study in an

Table 1 Characteristics of participants by sex

Characteristic	Male *n* = 104 Count (%)	Female *n* = 78 Count (%)	Total *n* = 182 Count (%)
Age (median, IQR)	28 (3.0)	27 (3.0)	28 (4.0)
Marital status			
Married	54 (51.9%)	26 (33.3%)	80 (44.0%)
Single	50 (48.1%)	52 (66.7%)	102 (56.0%)
Nationality			
Saudi	85 (81.7%)	71 (91.0%)	156 (85.7%)
Other	19 (18.3%)	7 (9.0%)	26 (14.3%)
Level of training			
Resident	83 (86.5%)	67 (87.0%)	150 (86.7%)
Fellow	13 (13.5%)	10 (13.0%)	23 (13.3%)
Field of training			
Anesthesia	11 (11.7%)	3 (3.9%)	14 (8.2%)
Dermatology	2 (2.1%)	6 (7.8%)	8 (4.7%)
Emergency medicine	12 (12.8%)	7 (9.1%)	19 (11.1%)
Family medicine	2 (2.1%)	3 (3.9%)	5 (2.9%)
Internal medicine	44 (46.8%)	33 (42.9%)	77 (45.0%)
Pathology	0	3 (3.9%)	3 (1.8%)
Pediatrics	3 (3.2%)	11 (14.3%)	14 (8.2%)
Psychiatry	3 (3.2%)	0	3 (1.8%)
Surgery (general)	11 (11.7%)	6 (7.8%)	17 (9.9%)
Surgery (other)*	6 (6.4%)	5 (6.5%)	11 (6.4%)
Training includes house-calls			
Yes	80 (83.3%)	63 (81.8%)	143 (82.7%)
No	16 (16.7%)	14 (18.2%)	30 (17.3%)
Average number of calls per month (mean, SD)	3.2 (2.3)	3.2 (2.3)	3.2 (2.5)
BMI (mean, SD)	28.9 (5.4)	23.9 (4.9)	26.8 (5.8)
Obesity (BMI > 30)	39 (37.5%)	9 (11.5%)	48 (26.4%)
Current smoker			
Yes	45 (43.3%)	5 (6.4%)	50 (27.5%)
No	59 (56.7%)	73 (93.6%)	132 (72.5%)
Family history of fibromyalgia			
Yes	4 (5.1%)	6 (11.8%)	10 (7.7%)
No	75 (94.9%)	45 (88.2%)	120 (92.3%)
Chronic co-morbidities**			
Yes	8 (8.6%)	12 (16.9%)	20 (12.2%)
No	85 (91.4%)	59 (83.1%)	144 (87.8%)
Sleeps before 11 pm			
Yes	12 (12.9%)	17 (23.9%)	29 (17.7%)
No	81 (87.1%)	54 (76.1%)	135 (82.3%)
Average hours of sleep (mean, SD)	5.7 (1.3)	6.0 (1.8)	5.9 (1.5)

*Other surgical programs included urology (0.6%), orthopedics (1.8%), ear, nose, and throat (3.3%), and plastic surgery (0.6%)

**Reported chronic conditions included ankylosing spondylitis (0.6%), bronchial asthma (4.9%), Crohn's disease (0.6%), gastro-esophageal reflux disease (0.6%), hypothyroidism (3.0%), irritable bowel syndrome (0.6%), and psoriatic arthritis (0.6%)

IQR interquartile range, *SD* standard deviation, *BMI* body mass index

Table 2 Prevalence of fibromyalgia as measured by screening criteria, stratified by sex ($N = 182$)

Screening criteria used	Male		Female		Total	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Have body pain**	33.7	(24.86, 43.83)	57.8	(46.15, 68.55)	44.2	(36.77, 51.84)
FirST**	1.9	(0.53, 6.74)	11.5	(6.19, 20.50)	6.0	(3.41, 10.50)
FSQ	4.8	(2.07, 10.76)	12.8	(7.12, 22.02)	8.2	(5.06, 13.15)
LFESSQ	8.7	(4.67, 15.78)	15.4	(9.03, 24.99)	11.6	(7.71, 17.09)
Fatigue criteria for LFESSQ*	10.6	(6.01, 17.95)	21.8	(14.08, 32.16)	15.4	(10.86, 21.34)
FirST and FSQ*	1.9	(0.53, 6.74)	9.0	(4.42, 17.38)	5.0	(2.62, 9.13)
FirST and LFESSQ*	1.0	(0.17, 5.25)	6.4	(2.77, 14.14)	3.3	(1.52, 7.00)
FSQ and LFESSQ*	2.9	(0.99, 8.14)	10.3	(5.29, 18.95)	6.0	(3.41, 10.50)
All 3 criteria*	1.0	(0.17, 5.25)	6.4	(2.77, 14.14)	3.3	(1.52, 7.00)

*P value for chi-square test comparing prevalence between males and females was < 0.05

**P value for chi-square test comparing prevalence between males and females was < 0.01

CI confidence interval, *FirST* Fibromyalgia Rapid Screening tool, *FSQ* Fibromyalgia Survey Questionnaire, *LFESSQ* London Fibromyalgia Epidemiology Study Screening Questionnaire

objective method, was common among responders in our study. The median hours of continuous sleep in the studied population are lower than the American Academy of Sleep Medicine and Sleep Research Society recommendation [23]. Another habit identified is sleeping after 11 pm that has been admitted by the majority of participants. Although not significant, participants sleeping before 11 pm had a higher OR to score positive for FM. This could be explained due tiredness and fatigue in these individuals. Future studies should include formal sleep studies or validated questionnaires to confirm these findings.

These sleeping habits have been frequently observed in the Saudi population and can partially explain our findings [24, 25]. Papp et al. evaluated 149 residents, in which participants were divided into focus groups with moderators that used a standardized, semi-structured discussion guide, along with a quantitative questionnaire assessing sleepiness and workplace sleep attitudes using the Epworth Sleepiness Scale (ESS). Papp and colleagues reported that only 16% scored within normal range of the ESS score and that poor sleep and fatigue were associated with a negative impact on personal lives of residents [26].

Another important aspect to consider is what PIT decide to do with their off-duty time. Taylor et al. identified two models of recovery in post-call times, recovery of sleep and recovery of self, from qualitative interviews that included 24 residents from Canadian programs [27]. In their study, PIT had to tradeoff personal and social activities to recover from deprived sleep and fatigue. In our study, although not statistically significant, there was a trend toward reduced odds of FM in married residents. This could be due to the moral support provided by the spouse.

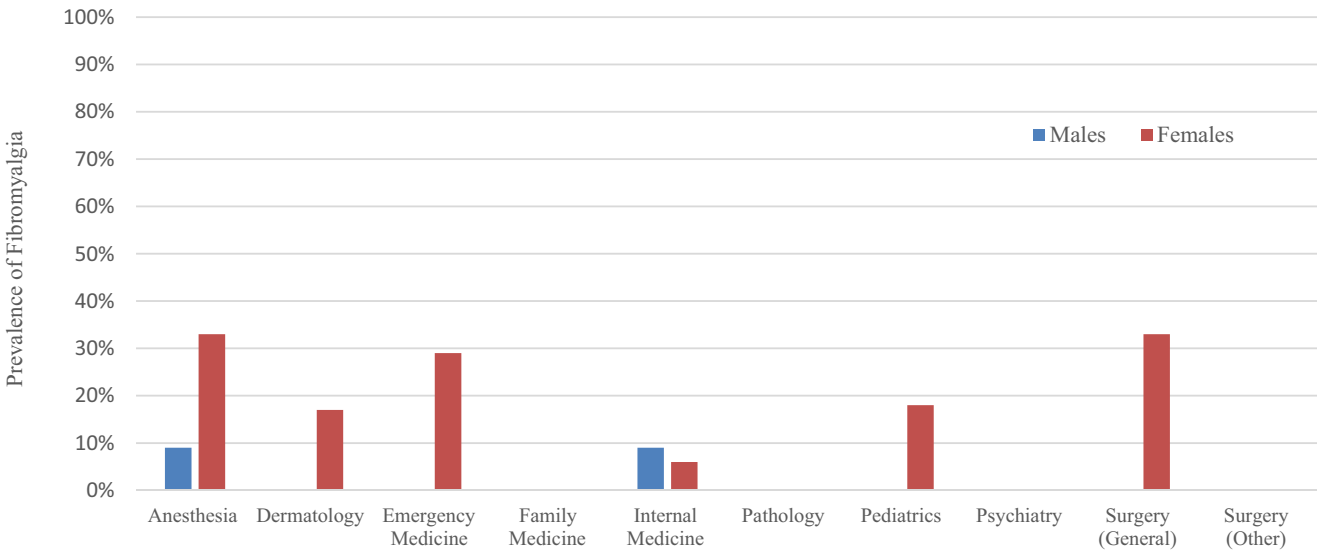

Fig. 1 Prevalence of fibromyalgia as measured by FSQ, across fields of training, stratified by sex. FSQ, Fibromyalgia Survey Questionnaire

Table 3 Concordance between different screening criteria for fibromyalgia

Criteria used	Percent agreement	Kappa coefficient	*P* value*
FirST and FSQ	96.1%	0.67	< 0.0001
FirST and LFESSQ (pain criteria)	89.0%	0.32	< 0.0001
FirST and LFESSQ (fatigue criteria)	88.9%	0.41	< 0.0001
LFESSQ pain and fatigue criteria	86.2%	0.41	< 0.0001
FSQ and LFESSQ (pain criteria)	93.9%	0.60	< 0.0001
FSQ and LFESSQ (fatigue criteria)	90.1%	0.51	< 0.0001

**P* value for testing the null hypothesis of no agreement

FirST Fibromyalgia Rapid Screening tool, *FSQ* Fibromyalgia Survey Questionnaire, *LFESSQ* London Fibromyalgia Epidemiology Study Screening Questionnaire

With respect to determinants of FM in this population, we identified that the number of house-calls per month was associated with increased odds for developing FM. The number of house-calls is an important measure that differentiates specialties with on-call duty from those with no call duty. This is an important implication for improving the working environment of PIT in Saudi Arabia. Incidentally, in late 2017, the Saudi Commission for Health Specialties developed a new policy for duty hours. This policy clearly states that the frequency for house-calls should be between every 4th and 6th night. Additionally, house-calls should not exceed 24 h and PIT can have a maximum of two weekend calls every 4 weeks.

Table 4 Regression analysis assessing the association of fibromyalgia with different socio-demographic, clinical, and working characteristics ($N = 182$)

Characteristic	AOR	95% CI	*P* value
Sex			
Male	1.1	0.19, 6.51	0.898
Female	Reference		
Marital status			
Married	0.7	0.14, 3.41	0.645
Single	Reference		
Level of training			
Resident	0.5	0.07, 3.93	0.526
Fellow	Reference		
Every extra call per month	1.5	1.00, 2.25	0.050
Current smoker			
Yes	1.1	0.16, 8.13	0.894
No	Reference		
Family history of fibromyalgia			
Yes	23.6	3.12, 178.37	0.002
No	Reference		
Chronic co-morbidities			
Yes	0.7	0.05, 10.42	0.794
No	Reference		
Sleeps before 11 pm			
Yes	3.7	0.47, 28.61	0.213
No	Reference		
Every extra hour of sleep time	0.9	0.55, 1.53	0.733

AOR adjusted odds ratio, *CI* confidence interval

Our study also suggests that a positive family history of FM is associated with increased odds for screening positively for FM. This finding is important to incorporate in stratifying PIT from the time of joining programs and counseling them about improving sleep habits, exercising, and managing work-related stress.

In the current study, we evaluated the concordance and level of agreement between three different screening tools for FM. When comparing the three screening tools, we found a good percentage of agreement, but fair to moderate concordance between these tools. This could be explained by the small sample size and number of positive responders, the structure of each questionnaire used, the components evaluated, or the weight of each component. The LFESSQ evaluates pain distribution and how widespread it is. Its fatigue component does not actually affect the positivity of the questionnaire. On the other hand, the FSQ evaluates pain distribution but appoints an important weight on symptom severity. Finally, the FirST has a simpler structure of six mixed questions on pain quality, severity, and associated symptoms that have the same weight. We have used the FSQ as the standard, because it is derived from the modified 2010 ACR FM diagnostic criteria [10].

Management of patients with FM is complex and requires an individualized approach [28]. The underlying co-morbidity and the primary specialty both play important roles in achieving the best outcome [29]. Various guidelines on the management of patients with FM have been published by different specialties over the last 13 years. Despite some inconsistencies among these guidelines that might be related to the methodology and background of the panelists, exercise, cognitive-behavioral therapy, and pharmacological therapy were ranked highest among the most useful methods for management of FM [30]. Schiltenwolf et al. conducted a systematic review and updated the Association of the Scientific Medical Societies in Germany (AWMF) guidelines in 2017. They

found that the use of multimodal therapy (combination of aerobic exercise with at least one psychological therapy) is strongly recommended and is associated with a better outcome [31]. The data evaluated by different studies did not highlight the inclusion of PIT or practicing physicians, which limits the applicability of these modalities to the special group we studied.

Certain aspects should be considered among physicians when they become patients. First, physicians are perfectionists and have a sense of responsibility and being in control. Second, they tend to delay seeking help from other colleagues. Reasons for this may include not wanting to appear weak or the fear of being wrong about a self-diagnosis. Third, realization of a reduction in their level of health could introduce them to a state of mixed emotions such as fear of not being able to function as a physician or guilty feelings about the added burden their illness may place on their families at home and their colleagues at work [32]. Finally, physicians' knowledge about the mechanisms of action and adverse events of their medication might negatively impact their adherence to treatment. In a condition like FM, it would be difficult for physicians to incorporate exercise and cognitive-behavioral therapy due to their busy working schedule.

Limitations to our study should be noted. First, the cross-sectional design makes it unfeasible to assess the risk for FM. Second, the small response rate that yielded a sample size made it difficult to estimate associations with greater precision. Third, due to the unequal specialty representation, we were unable to properly assess differences in FM across different fields of specialty. Forth, we did not confirm the diagnosis of FM cases using the gold standard (physician assessment). Thus, our FM measurement may be subject to measurement error. Finally, a selection bias and overestimation in the questionnaire responders is possible. Nevertheless, despite these aforementioned limitations, our study adds great value to the limited literature on FM among PIT, by being the first to measure prevalence of FM among PIT and identify its important correlates.

In conclusion, results from our study suggest that PIT have a higher prevalence of developing FM compared to the general population using three validated screening tools. A positive family history of FM and increased number of house-calls per month are associated with increased odds for developing FM. Additionally, poor sleeping habits appear to be common among PIT. Despite the differences in the elements and scoring systems of the three tools used, there is a high percent of agreement. The level of correlation ranges between poor and moderate. Further longitudinal studies with a larger sample size are needed to confirm these findings. We recommend including the relationship of FM with PIT coping, burnout, and self-perceived major medical errors in the design of future studies, all of which are important elements for evaluation of physician performance and well-being.

Acknowledgments The authors would like to the thank Dr. Riyadh Alsehli and the postgraduate secretaries for their support and assistance in conducting the project.

Role of authors Study conception: Moh O, SA, NA, and AA. Data collection: YA, MA, SA, NA, and AA. Data analysis: Moh O, RD, and Mah O. Manuscript preparation and approval: all authors.

Funding This study was supported by the College of Medicine Research Center, Deanship of Scientific Research, King Saudi University, Riyadh, Saudi Arabia. The funding source had no role in study design, data collection, data analysis, nor manuscript preparation.

Compliance with ethical standards

Approval from the Institutional Research Board at King Saud University was obtained prior to study inclusion. All participants signed an electronic informed consent form. The study was performed according to the STROBE initiative guidelines.

Disclosures None.

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