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COMPARISON OF FIBROMYALGIA SEVERITY ACCORDING TO AGE CATEGORIES IN PAKISTAN POPULATION: A CROSS-SECTIONAL STUDY

Original Research

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ABSTRACT

Background: Fibromyalgia (FM) is a chronic pain disorder marked by widespread musculoskeletal discomfort, persistent fatigue, and sleep disturbances. Physicians, who routinely encounter demanding clinical workloads, emotional strain, and irregular schedules, may face elevated vulnerability to FM due to prolonged exposure to occupational stressors. Understanding how demographic and work-related factors shape FM severity in this population is essential for designing targeted preventive and supportive strategies.

Objective: To evaluate demographic and occupational factors associated with FM severity among practicing physicians, including age, gender, marital status, years of clinical experience, specialty, weekly work hours, night-shift frequency, and perceived work-related stress.

Methods: A cross-sectional study was conducted among 250 physicians recruited through stratified random sampling from diverse healthcare settings. Data were collected using self-administered questionnaires capturing demographic information, occupational characteristics, and sleep quality measured through the Pittsburgh Sleep Quality Index (PSQI). FM severity was assessed using the Widespread Pain Index (WPI), Fibromyalgia Impact Questionnaire (FIQ), and Symptom Severity Score (SSS). Statistical analyses were performed using SPSS version 25.0, including descriptive statistics, independent t-tests, chi-square tests, Pearson and Spearman correlations, and multivariate logistic regression to identify independent predictors of FM severity.

Results: Participants had a mean age of 38.2 ± 7.5 years, with 110 males and 140 females. High work stress was reported by 70%, while 72% demonstrated poor sleep quality. FM prevalence showed 18% mild cases (SSS ≤ 4), 42% moderate (SSS 5–8), and 40% severe (SSS > 8). FM severity was significantly higher among females ($p = 0.04$). Physicians working more than two night shifts weekly exhibited elevated FIQ and WPI scores ($p = 0.02$). Poor sleep quality ($p < 0.01$), high work stress ($p < 0.01$), and longer years in practice ($r = 0.32$, $p = 0.001$) showed strong associations with FM severity. Physical activity demonstrated a protective effect ($r = -0.40$, $p < 0.001$).

Conclusion: A considerable proportion of physicians experience moderate to severe FM symptoms. Female gender, high occupational stress, frequent night shifts, and poor sleep quality significantly contribute to symptom severity. Workplace-based interventions focusing on stress reduction, sleep hygiene, and lifestyle modification are essential to reduce FM burden among medical professionals.

Keywords: Fibromyalgia, Occupational Stress, Physicians, Chronic Pain, Night Shifts, Sleep Quality, Workload.

INTRODUCTION

Fibromyalgia (FM) is a chronic pain disorder characterized by widespread musculoskeletal pain, debilitating fatigue, sleep disturbances, cognitive dysfunction, and considerable psychological distress. Despite extensive scientific interest, the condition remains poorly understood, and its etiology is generally attributed to an interplay of neurobiological, genetic, and environmental factors that disrupt central pain modulation mechanisms (1,2). Central sensitization, a process marked by abnormal amplification of pain signals within the central nervous system, is widely recognized as a key pathological feature contributing to heightened pain perception in individuals with FM. Although FM has been well documented in the general population, there is a notable lack of rigorous research exploring how this condition manifests among healthcare workers—especially medical doctors—who operate under uniquely demanding professional environments (3,4). Physicians often experience chronic occupational stress due to prolonged working hours, emotionally intense patient interactions, and the persistent pressure associated with medical responsibility. Literature consistently demonstrates that chronic workplace stress increases vulnerability to a range of health issues, including burnout, depression, sleep disorders, and chronic pain syndromes (5). Given that FM has been closely linked with stress, sleep disruption, and psychological strain, it is plausible that physicians may represent a high-risk professional group, yet empirical evidence investigating FM prevalence and severity within this population remains limited (6).

Globally, FM affects an estimated 2%–8% of adults, with a disproportionate impact on women, attributed to hormonal influences, heightened pain sensitivity, and sociocultural dynamics surrounding help-seeking behaviours (7). Existing research on FM in healthcare settings has predominantly focused on nurses and allied health professionals, leaving physicians comparatively understudied despite their heavier clinical, cognitive, and emotional burdens (8). Moreover, gender-based disparities in FM risk among medical professionals have not been adequately examined, despite well-established sex-related differences in FM occurrence in broader populations (9). The limited attention devoted to FM within physician groups represents a critical gap in occupational health literature. Current research addressing doctors' well-being primarily concentrates on mental health disorders such as anxiety, depression, and burnout, while overlooking chronic pain syndromes that may coexist or develop independently. Although scholars acknowledge the role of sleep disruption and occupational stress in FM pathogenesis, the specific effects of medical workload, specialty-related demands, and interpersonal stressors on FM development among physicians remain unclear. Addressing this deficiency is essential for guiding preventive strategies, informing institutional policies, and supporting healthier work environments in healthcare systems. The aim of this study was to evaluate the demographic and occupational factors associated with FM severity among medical doctors, including age, gender, marital status, years of medical practice, specialty, work hours, night-shift frequency, and work-related stress levels.

METHODS

This study employed a cross-sectional research design to assess the frequency of fibromyalgia (FM) and its associated risk factors among practicing physicians. Data were collected over a six-month period from both hospital-based and outpatient clinical settings. A stratified random sampling technique was used to recruit 250 medical specialists representing diverse clinical disciplines, ensuring adequate representation across specialty groups. Eligible participants were physicians aged 25 to 60 years who had maintained active clinical practice for at least one year and expressed willingness to participate. Physicians were excluded if they had a pre-existing diagnosis of FM or any other chronic pain disorder, or if they were using medications known to alter pain perception, such as opioids or systemic corticosteroids. Data collection was conducted through self-administered questionnaires supported by structured interviews to enhance completeness and accuracy. The questionnaire captured a comprehensive set of demographic variables including age, gender, and marital status, alongside occupational characteristics such as medical specialty, years of practice, weekly work hours, frequency of night shifts, and perceived workplace stress levels. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated instrument commonly applied in sleep research. FM severity was measured through a standardized combination of the Widespread Pain Index (WPI), Symptom Severity Score (SSS), and the Fibromyalgia Impact Questionnaire (FIQ), enabling categorization of FM into mild, moderate, or severe forms based on symptom distribution and functional impact.

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All statistical analyses were performed using SPSS version 25.0. Descriptive statistics summarized demographic and occupational variables, with continuous variables reported as mean ± standard deviation (SD) and categorical variables expressed as frequencies and percentages. Group comparisons were conducted using independent t-tests for normally distributed continuous data, while Mann–Whitney U tests were applied for non-normally distributed variables. The chi-square test was used to evaluate associations between categorical variables. Correlations between FM severity, work-related stress, and years of practice were examined using Pearson or Spearman correlation coefficients depending on data distribution. To identify independent predictors of FM, multivariate logistic regression analysis was performed with adjustment for potential confounders. Ethical approval for the study was obtained from the institutional review board, and all procedures adhered to established ethical standards for research involving human participants. Written informed consent was obtained from each participant, confidentiality was assured, and participation remained entirely voluntary throughout the study.

RESULTS

A total of 250 practicing physicians were included in the analysis, with a mean age of 38.2 ± 7.5 years. Among them, 110 were male and 140 were female, and most participants were married (84%). Internal medicine represented the largest specialty group (28%), followed by surgery (24%), paediatrics (20%), anaesthesiology (12%), and other specialties (16%). Participants had an average of 12.4 ± 5.8 years of clinical practice, worked 65.3 ± 10.2 hours per week, and performed an average of 3.6 ± 1.8-night shifts weekly. High work-related stress was reported by 70% of physicians, and 72% rated their sleep quality as poor. Gender was significantly associated with FM severity measurements. Female physicians had higher mean FIQ scores (68.7 ± 7.8) and WPI scores (16.1 ± 2.6) than male physicians (62.1 ± 8.5 and 14.5 ± 2.9 respectively; $p = 0.04$). Physicians reporting high work stress demonstrated substantially higher FIQ (71.3 ± 6.7) and WPI scores (16.9 ± 2.2) compared with those experiencing low stress (55.2 ± 9.1 and 12.8 ± 3.1; $p < 0.01$). A similar pattern was observed with night-shift frequency, where participants undertaking more than two-night shifts per week exhibited higher FIQ (69.2 ± 7.5) and WPI scores (16.5 ± 2.5) than those working two or fewer night shifts (60.4 ± 8.9 and 13.5 ± 2.8; $p = 0.02$). Poor sleep quality corresponded with elevated FIQ (70.8 ± 7.2) and WPI scores (17.0 ± 2.1), compared with physicians reporting good sleep quality (58.1 ± 9.4 and 13.1 ± 3.0; $p < 0.01$). Correlation analysis revealed a significant positive association between years of medical practice and FM severity ($r = 0.32$, $p = 0.001$). In contrast, regular physical activity demonstrated a protective effect, showing a negative correlation with FM severity ($r = –0.40$, $p < 0.001$). When symptom severity categories were examined, 18% of participants fell within the mild range (SSS ≤ 4), 42% in the moderate range (SSS 5–8), and 40% in the severe range (SSS > 8), indicating that more than 80% experienced at least moderate symptom burden.

Age distribution analysis showed that physicians aged 30–40 years represented the largest proportion of severe FM cases (48%), followed by those older than 40 years (34%). Gender analysis demonstrated that women accounted for 61% of severe FM cases ($p = 0.02$). Marital status was also associated with FM severity, as 87% of severe FM cases occurred in married physicians, whereas single physicians contributed 35% ($p = 0.05$). Multivariate logistic regression was performed to identify independent predictors of fibromyalgia (FM) severity after adjusting for demographic and occupational confounders. The analysis demonstrated that female gender remained a significant independent predictor of higher FM severity (AOR 1.84, 95% CI 1.10–3.05, $p = 0.02$). High work-related stress also showed a strong independent association with severe FM symptoms (AOR 2.96, 95% CI 1.78–4.91, $p < 0.001$). Physicians performing more than two-night shifts per week were more likely to fall into the severe FM category (AOR 1.67, 95% CI 1.02–2.75, $p = 0.04$). Poor sleep quality emerged as one of the strongest predictors (AOR 3.21, 95% CI 1.88–5.47, $p < 0.001$). Increasing years of practice showed a modest but significant association with higher FM severity (AOR 1.04 per year, 95% CI 1.01–1.07, $p = 0.01$). In contrast, regular physical activity demonstrated a protective effect by reducing the likelihood of severe FM (AOR 0.68, 95% CI 0.52–0.89, $p = 0.006$). Age and marital status did not retain statistical significance in the final adjusted model. These findings indicate that occupational stressors and sleep quality were the strongest independent predictors of FM severity among physicians.

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Table 1: Demographic and Occupational Characteristics in Table Form

Variable	Mean ± SD / Percentage (%)
Age (years)	38.2 ± 7.5
Gender (M/F)	110/140
Marital Status (%)	
Single	40 (16%)
Married	210 (84%)
Specialty (%)	
Internal Medicine	70 (28%)
Surgery	60 (24%)
Pediatrics	50 (20%)
Anesthesiology	30 (12%)
Other	40 (16%)
Years of Practice	12.4 ± 5.8
Work Hours/Week	65.3 ± 10.2
Night Shifts/Week	3.6 ± 1.8
High Work Stress (%)	175 (70%)
Poor Sleep Quality (%)	180 (72%)

Table 2: Factors Affecting FM in Doctors

Factor	Mean FIQ Score ± SD	Mean WPI ± SD	p-value
Gender			
Male	62.1 ± 8.5	14.5 ± 2.9	0.04*
Female	68.7 ± 7.8	16.1 ± 2.6	
Work Stress			
Low Stress	55.2 ± 9.1	12.8 ± 3.1	<0.01*
High Stress	71.3 ± 6.7	16.9 ± 2.2	
Night Shifts/Week			
≤2 Shifts	60.4 ± 8.9	13.5 ± 2.8	0.02*

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Factor	Mean FIQ Score ± SD	Mean WPI ± SD	p-value
>2 Shifts	69.2 ± 7.5	16.5 ± 2.5	
Sleep Quality			
Good Sleep	58.1 ± 9.4	13.1 ± 3.0	<0.01*
Poor Sleep	70.8 ± 7.2	17.0 ± 2.1	
Years of Practice	r = 0.32 (p = 0.001)		
Physical Activity	r = -0.40 (p < 0.001)		

Table 3: Prevalence of Fibromyalgia (FM) based on Symptom Severity Score (SSS)

SSS Category	Frequency (n)	Percentage (%)
Mild (SSS ≤ 4)	45	18%
Moderate (SSS 5-8)	105	42%
Severe (SSS > 8)	100	40%
Total	250	100%

Table 4: Association of Demographics with Screening Factors

Demographic Factor	High FM Severity (%)	Low FM Severity (%)	p-value
Age Group (years)			
<30	30 (18%)	20 (20%)	0.03*
30-40	80 (48%)	35 (35%)	
>40	56 (34%)	45 (45%)	
Gender			
Male	65 (39%)	45 (45%)	0.02*
Female	101 (61%)	55 (55%)	
Marital Status			
Single	22 (13%)	18 (18%)	0.05*
Married	144 (87%)	82 (82%)	

*p<0.05 indicates statistical significance

Table 5: Multivariate Logistic Regression Analysis of Predictors of Severe Fibromyalgia

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Female Gender	1.84	1.10–3.05	0.02*
High Work Stress	2.96	1.78–4.91	<0.001*
>2 Night Shifts/Week	1.67	1.02–2.75	0.04*
Poor Sleep Quality	3.21	1.88–5.47	<0.001*

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Years of Practice (per year)	1.04	1.01–1.07	0.01*
Physical Activity (regular)	0.68	0.52–0.89	0.006*
Age Group	1.12	0.82–1.55	0.46
Marital Status (Married)	1.29	0.77–2.15	0.32

*Statistically significant at $p < 0.05$

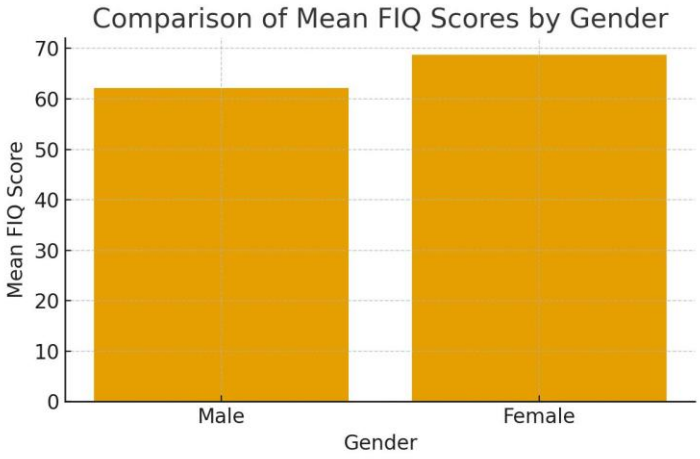

Figure 2 Comparison of Mean FIQ Scores by Gender

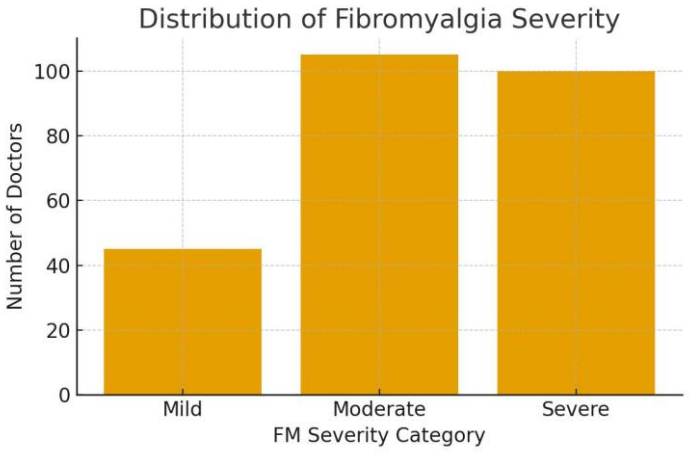

Figure 2 Distribution of Fibromyalgia Severity

DISCUSSION

The present study provided essential insight into the burden of fibromyalgia (FM) among medical practitioners and highlighted the multifactorial nature of its severity within this high-risk occupational group. The findings demonstrated that moderate to severe FM symptoms were prevalent in more than four-fifths of participating physicians, with 40% falling within the severe category and 42% exhibiting moderate symptom severity. These results align with earlier research describing FM as a significant health concern in populations exposed to high occupational stress, repetitive physical strain, or prolonged emotional burden (10,11). The elevated rates observed in this study underscore the vulnerability of physicians compared with the general population, where FM prevalence typically ranges between 2% and 8% (12). This discrepancy reinforces the influence of chronic work stressors, irregular work routines, and reduced recovery opportunities on FM pathophysiology. Age-related patterns revealed that physicians between 30 and 40 years experienced the highest severity of FM symptoms, a trend differing from some population-based studies that often report increased FM symptoms at older ages (13). The current finding may reflect the cumulative pressures faced by mid-career physicians, who frequently balance demanding clinical responsibilities, administrative duties, and family obligations. The study further confirmed a significant association between gender and FM severity, with women demonstrating disproportionately higher symptom intensity than men ($p = 0.02$). Previous literature supports this gender effect, noting that hormonal variations, enhanced pain sensitivity, and psychosocial stress responses contribute to the heightened vulnerability of women to FM (14).

Marital status also demonstrated a notable association, with married physicians reporting markedly higher FM severity compared to their single colleagues. Although marriage is often associated with social support, the added responsibilities of managing family life alongside strenuous professional duties likely contribute to this trend (15). Work stress emerged as a central factor influencing FM severity, as physicians with high stress levels showed substantially elevated FIQ and WPI scores. This observation is consistent with studies linking dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis to FM symptom amplification, reinforcing the role of sustained psychosocial burden in exacerbating chronic pain syndromes (16). Night-shift frequency played a significant role, with physicians performing more than two-night shifts weekly presenting higher FM scores. Disturbances in circadian rhythm and sleep

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deprivation are known to impair pain regulation, and the findings corroborate evidence that irregular work schedules exacerbate FM symptoms by compounding both physiological and psychological stress (17). Sleep quality emerged as one of the strongest determinants of FM severity, with 72% of doctors reporting poor sleep. This supports well-established evidence demonstrating that sleep disturbances influence central pain modulation and contribute to fatigue, cognitive dysfunction, and heightened pain sensitivity in FM (18). Conversely, regular physical activity showed a protective association, reducing FM severity and supporting prior studies that identify exercise as a cornerstone of FM symptom management due to its positive effects on neuromuscular function, inflammation, and mood regulation (19,20). Multivariate regression analysis strengthened the interpretation of these findings by identifying independent predictors of FM severity, including female gender, high work stress, frequent night shifts, poor sleep quality, and longer years of practice, while physical activity served as a protective factor. These results emphasize that FM among physicians is shaped not by a single factor but by a complex interplay of occupational demands, physiological influences, and lifestyle patterns.

The study offered several strengths, including the use of validated FM assessment instruments, structured sampling across specialties, and a comprehensive evaluation of both occupational and personal variables. Moreover, employing multivariate statistical methods allowed greater clarity in identifying independent predictors. However, limitations must be acknowledged. The cross-sectional design restricted the ability to infer causality, and reliance on self-reported measures introduced potential recall or reporting bias. Undiagnosed psychological comorbidities such as anxiety or depression, which frequently coexist with FM, were not assessed and may have influenced symptom reporting. The study also included physicians from a limited number of institutions, which may restrict generalizability to broader healthcare settings. Additionally, physical activity levels and sleep quality were based on subjective reporting rather than objective monitoring, limiting the precision of these measurements. Future research would benefit from longitudinal designs to track symptom changes over time and clarify causal pathways linking occupational exposures to FM development. Incorporating objective sleep measurements, biomarkers of stress physiology, and mental health assessments would deepen understanding of FM progression in medical professionals. Investigating the effectiveness of workplace-based interventions, including structured stress-reduction programs, modified shift schedules, and institutional wellness initiatives, would provide actionable strategies to mitigate FM burden. Overall, the findings demonstrate a substantial and under-recognized occupational health issue within the medical community. Addressing FM among physicians requires institutional reforms that prioritize workload management, mental health support, improved sleep hygiene, and promotion of physical activity. These measures hold potential to improve both physician well-being and overall healthcare system performance.

CONCLUSION

This study demonstrated that fibromyalgia is a significant occupational health concern among medical practitioners, with symptom severity influenced by gender, work-related stress, night-shift burden, sleep quality, and years of clinical practice, while physical activity appeared to offer protective benefits. These findings highlight the need for targeted interventions within healthcare environments, including structured stress-management support, promotion of regular exercise, improved sleep hygiene practices, and more balanced work schedules to help mitigate the impact of fibromyalgia on physicians. By addressing these modifiable factors, healthcare institutions can enhance physician well-being, reduce chronic pain–related impairment, and ultimately support a healthier and more sustainable medical workforce. Future longitudinal research is essential to determine the long-term effectiveness of such interventions and to deepen understanding of how fibromyalgia develops and progresses within high-stress clinical settings.

AUTHOR CONTRIBUTION

Author	Contribution
Abdul Aziz*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Taimoor Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing

Author	Contribution
	Has given Final Approval of the version to be published
Ehtisham ul Haq	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Rida Asghar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Tanveer Ahmed Mirza	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Waleed Ghous	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

REFERENCES

1. Siracusa R, Paola RD, Cuzzocrea S, Impellizzeri D. Fibromyalgia: pathogenesis, mechanisms, diagnosis and treatment options update. International journal of molecular sciences. 2021 Apr 9;22(8):3891.

2. Cohen-Biton L, Buskila D, Nissanholtz-Gannot R. Review of fibromyalgia (FM) syndrome treatments. International Journal of Environmental Research and Public Health. 2022 Sep 24;19(19):12106.

3. Galvez-Sánchez CM, Reyes del Paso GA. Diagnostic criteria for fibromyalgia: critical review and future perspectives. Journal of clinical medicine. 2020 Apr 23;9(4):1219.

4. Ghavidel-Parsa B, Bidari A, Atrkarroushan Z, Khosousi MJ. Implication of the nociplastic features for clinical diagnosis of fibromyalgia: development of the preliminary Nociplastic-Based Fibromyalgia Features (NFF) tool. ACR open rheumatology. 2022 Mar;4(3):260-8.

5. Sun T, Shi Y, Yin D, Zhang SE, Wang X. Assessment of need for recovery and its relationship with work characteristics and health in a sample of Chinese doctors: a cross-sectional survey. Frontiers in public health. 2021 May 7;9:600179.

6. Lee RS, Son Hing LS, Gnanakumaran V, Weiss SK, Lero DS, Hausdorf PA, Daneman D. Inspired but tired: how medical faculty's job demands and resources lead to engagement, work-Life conflict, and burnout. Frontiers in Psychology. 2021 Feb 10;12:609639.

7. Yeganeh S, Torabizadeh C, Bahmani T, Molazem Z, Doust HY, Dehnavi SD. Examining the views of operating room nurses and physicians on the relationship between professional values and professional communication. BMC nursing. 2022 Jan 14;21(1):17.

8. Demori I, Losacco S, Giordano G, Mucci V, Blanchini F, Burlando B. Fibromyalgia pathogenesis explained by a neuroendocrine multistable model. Plos one. 2024 Jul 11;19(7):e0303573.

9. Ahmed S. Pathogenesis of fibromyalgia in patients with autoimmune diseases: scoping review for hypothesis generation. Central Asian Journal of Medical Hypotheses and Ethics. 2020;1(1):43-54.

10. Creed F. A review of the incidence and risk factors for fibromyalgia and chronic widespread pain in population-based studies. Pain. 2020 Jun 1;161(6):1169-76.

11. Patel A, Al-Saffar A, Sharma M, Masiak A, Zdrojewski Z. Prevalence of fibromyalgia in medical students and its association with lifestyle factors–a cross-sectional study. Reumatologia/Rheumatology. 2021 Jun 14;59(3):138-45.

12. Fors EA, Wensaas KA, Eide H, Jaatun EA, Clauw DJ, Wolfe F, Helvik AS. Fibromyalgia 2016 criteria and assessments: comprehensive validation in a Norwegian population. Scandinavian Journal of Pain. 2020 Oct 25;20(4):663-72.

13. Levit D, Yaish I, Shtrozberg S, Aloush V, Greenman Y, Ablin JN. Pain and transition: evaluating fibromyalgia in transgender individuals. Clin Exp Rheumatol. 2021 Jan 1;39(3):27-32.

14. Izquierdo-Alventosa R, Inglés M, Cortés-Amador S, Gimeno-Mallench L, Chirivella-Garrido J, Kropotov J, Serra-Añó P. Low-intensity physical exercise improves pain catastrophizing and other psychological and physical aspects in women with fibromyalgia: a randomized controlled trial. International journal of environmental research and public health. 2020 May;17(10):3634.

15. Montesó-Curto P, Toussaint L, Kueny A, Ruschak I, Lunn S, Rosselló L, Campoy C, Clark S, Luedtke C, Gonçalves AQ, Aguilar Martín C. Emotional experiences and gender roles of men with fibromyalgia syndrome: a cross-cultural qualitative study. Frontiers in Medicine. 2024 May 20;11:1286729.

16. Yu SR, Zhang CY, Xiong WJ, Chen JT, Song JX, Chen H. An hypothesis: disproportion between cardiac troponin and B-type natriuretic peptide levels—a high risk and poor prognostic biomarker in patients with fulminant myocarditis?. Heart, Lung and Circulation. 2021 Jun 1;30(6):837-42.

17. Izquierdo-Alventosa R, Ingles M, Cortes-Amador S, Gimeno-Mallench L, Sempere-Rubio N, Serra-Ano P. Effectiveness of high-frequency transcranial magnetic stimulation and physical exercise in women with fibromyalgia: a randomized controlled trial. Physical Therapy. 2021 Oct 1;101(10):pzab159.

18. Shamim-Uzzaman QA, Bae CJ, Ehsan Z, Setty AR, Devine M, Dhankikar S, Donskoy I, Fields B, Hearn H, Hwang D, Jain V. The use of telemedicine for the diagnosis and treatment of sleep disorders: an American Academy of Sleep Medicine update. Journal of Clinical Sleep Medicine. 2021 May 1;17(5):1103-7.

19. Masquelier E, D'haeyere J. Physical activity in the treatment of fibromyalgia. Joint Bone Spine. 2021 Oct 1;88(5):105202.

20. Norouzi E, Hosseini F, Vaezmosavi M, Gerber M, Pühse U, Brand S. Zumba dancing and aerobic exercise can improve working memory, motor function, and depressive symptoms in female patients with Fibromyalgia. European journal of sport science. 2020 Aug 8;20(7):981-91.