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Impact of resilience on disease severity and psychiatric comorbidities in patients with fibromyalgia

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Abstract

Background: Resilience is the process of adjusting successfully in the face of adversity, trauma, threats, or severe stress, such as serious health problems. It is one of the factors that affect recovery from psychiatric disorders. It was suggested that fibromyalgia patients have low resilience. This study aimed to assess the impact of resilience on disease severity and psychiatric comorbidities in patients with fibromyalgia.

Results: We found that patients with fibromyalgia had a significantly lower resilience and higher prevalence of psychiatric comorbidities than the control group ($P < 0.05$). Also, fibromyalgia patients with high disease severity had a significantly lower resilience and a higher percentage of psychiatric problems than those with a better disease state ($P = 0.0001$). Also, there was a significant negative correlation of resilience with disease severity (as assessed by the FIQ score), visual analog scale (VAS) of anxiety, and VAS of depression ($P = 0.0001$).

Conclusion: Resilience significantly impacts the severity and psychiatric comorbidities in patients with fibromyalgia. So, enhancing and improving resilience must be considered in the management protocols of fibromyalgia patients.

Keywords: Resilience, Fibromyalgia, Psychiatric comorbidities, Connor-Davidson Resilience Scale 25

Background

Fibromyalgia, also known as fibromyalgia syndrome, is one of the most prevalent causes of widespread chronic pain. It is characterized by a complex polysymptomatology that includes tiredness, sleep difficulties, cognitive impairment, and functional disabilities in addition to pain [1, 2].

The prevalence of fibromyalgia in the general population ranges between 0.2% and 6.6%, mainly among females. In urban areas, this ratio is higher (between 0.7 and 11.4%), while in rural areas, it is lower (ranges between 0.1 and 5.2%) [3].

The central nervous system (CNS) sensitization is fibromyalgia's most crucial pathophysiological element. Fibromyalgia development may be exacerbated by extrinsic factors such as trauma, infection, and stress. As an additional point of interest, recent data suggest that fibromyalgia may have a genetic factor, and previous research has indicated that several potential genes may play a role in developing the disease [4].

Fibromyalgia is a multifaceted disease; not only associated with physical pain, but it is also closely associated with psychological discomfort and psychiatric disorders such as anxiety and depression, which are pathologies that might cause a worsening and irreversible chronicity when they are present in conjunction with this disease [5].

Resilience emerges as the crucial component in this study. It is the process of successful coping with adversity, trauma, threats, or serious stressors, such as serious health problems [6]. Additionally, it is a dynamic

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process that enables any individual at any period in life to improve, preserve, or restore their mental health [7]. Multiple factors can affect resilience, such as genetic, epigenetic, developmental, psychosocial, and neurochemical influences [8].

It has been shown that being resilient can positively impact recovery and the acceptance of healing processes and leads to favorable outcomes after experiencing adversity [9]. For treating rheumatic disorders, strategies to reduce stress and enhance resilience are gaining popularity. These strategies are especially beneficial when they are customized to the patient's risk factors to maximize patients' empowerment in rheumatic diseases [10].

There is a hypothesis that resilience is a protective variable, and its lack plays an essential role in developing chronic pain. It could be considered when deciding on possible treatment strategies for those patients [9, 11]. Also, it has been suggested in a recent review that patients with fibromyalgia may have a general lack of resilience [12].

As a result, the purpose of this study is to evaluate the impact of resilience on disease severity and psychiatric comorbidities in patients with fibromyalgia.

Methods

Patients

As a controlled cross-sectional study, we enrolled 101 fibromyalgia patients fulfilling the American College of Rheumatology (ACR) 2016 fibromyalgia diagnostic criteria, aged 18 or more (adult fibromyalgia) [13], and attending the Physical Medicine, Rheumatology, and Rehabilitation outpatient clinics.

The control group was 63 healthy, age, and gender-matched subjects recruited from our university's employees. We excluded those with neurocognitive disorders, diabetes, hypertension, renal patients, autoimmune diseases, and non-cooperative patients.

Ethics approval and consent to participate

The Ethical Committee Board of our Faculty approved the study protocol. The reference number is (4761/8-1-2022). Methods were performed following the principles of the Declaration of Helsinki (2000 revision). Written informed consent was obtained from all the participants after explaining the study and its purpose.

A detailed history of all participants was taken, and complete general and musculoskeletal examinations were done.

Assessments

1-The Mini-International Neuropsychiatric Interview (MINI)

A short structured brief diagnostic interview was designed in France and the United States to examine 17 disorders according to the Diagnostic and Statistical Manual (DSM-Ill-R) diagnostic criteria [14].

For shortness, it focuses on the existence of current disorders. One or two screening questions rule out the diagnosis when answered negatively for each disorder. The MINI focuses mainly on current diagnoses and only explores lifetime diagnoses that are clinically relevant to the present (e.g., previous manic episode for the diagnosis of bipolar disorder). The validated Arabic version of the tool was used in this study to assess psychiatric comorbidities [15].

2-Connor-Davidson Resilience Scale 25 (CD-RISC-25)

The Connor-Davidson Resilience Scale (CD-RISC-25) was used to assess resilience. The CD-RISC-25 is a valid measure of resilience. It consists of 25 statements describing different aspects of resilience. The scale incorporates items which measure hardiness (i.e. commitment/challenge/control) (items 5, 10, 11, 12, 22, 23, and 24), coping (2, 7, 13, 15, 18), adaptability/flexibility (items 1, 4, 8), meaningfulness /purpose (items 3, 9, 20, and 21), optimism (items 6, 16), regulation of emotion and cognition (items 14, 19), and self-efficacy (items 17 and 25) [16, 17]. We took permission to use it in our research from the CD-RISC-25 author.

Each item has a score from 0 to 4 (0 = not at all true to 4 = true nearly all the time). The total final score is the sum of scores from all 25 items, which gives a score that can range from 0 to 100. Lower scores indicate less resilience, and higher scores indicate greater resilience [16, 17]. We used the Arabic version of CD-RISC-25 in this study. We explained the scale to the participants, and they filled it out by themselves.

3-Fibromyalgia Impact Questionnaire (FIQ)

FIQ is a validated 20-item self-reported assessment that assesses the severity of fibromyalgia symptoms, functional status, and overall impact of the disease [18]. Eleven items about physical impairment are included in the first item, with each query being scored on a 4-point Likert-type scale. Items 12 and 13 assess the number of days patients felt good and the number of days they could not work during the last week (including housekeeping) due to fibromyalgia symptoms. Additionally, it has questions about job difficulties, pain, exhaustion, morning fatigue, stiffness, anxiety, and depression to be rated using horizontal linear scales indicated in ten-point increments or a visual analog scale (VAS) on items 14 through 20. Every item has a rating to be added together, and the total score ranges from 0 to 100 points. The average score is 50, with the severely afflicted patients receiving ratings of 70 or above. More severe symptoms are indicated by higher ratings and higher total scores [18].

We used the Arabic validated version of FIQ [19]. Fibromyalgia patients completed it after explaining each item.

Statistical analysis

All the data were coded and imported into the Statistical Package for the Social Sciences (SPSS version 25) software. The data normality of the distribution was evaluated first. It was not normally distributed, so nonparametric tests were used. All studied variables were expressed as means, standard deviations, and percentages. Mann–Whitney *U* test, Kruskal-Wallis test, Post-hoc tests, Chi-square test, and Spearman correlation coefficients explained the study results. The results were considered significant if P was ≤ 0.05.

Results

Table 1 shows the demographic and clinical characteristics of both groups. The mean age of the fibromyalgia patients and the control group was 43.12 ± 10.57 and 39.86 ± 5.8, respectively. All participants in this study were females. Both groups were matched in age. Most of the participants had a constant job.

The FIQ assessed physical impairment, missed days of work, job ability, and VAS of fatigue, pain, stiffness,

Table 1 Clinical and demographic data of the studied groups

	Case group $N = 101$	Control group $N = 63$	*P* value
Age	43.12 ± 10.57	39.86 ± 5.8	0.154[1]
Females (%)	101 (100%)	63 (100%)	
Workers (%)	95 (94.1)	63 (100%)	**0.049[2]**
Does not work (%)	6 (5.1%)	0	
Low education (%)	7 (6.9%)	0	**0.02[2]**
Medium education (%)	54 (53.5%)	27 (42.9%)	
High education (%)	40 (39.5%)	36 (57.1%)	
Rural	32 (31.7%)	21 (33.3%)	0.829[2]
Urban	69 (68.3%)	42 (66.7%)	
Married	81 (80.2%)	54 (85.7%)	0.368[2]
Non-married	20 (19.8%)	9 (14.3%)	
Symptoms duration	3.6040 ± 2.349		
Physical impairment	5.93198 ± 1.49		
Days feel good	6.3189 ± 2.067		
Work missed days	6.2253 ± 2.812		
Job ability	7.47 ± 1.884		
VAS pain	7.45 ± 1.48		
VAS fatigue	7.49 ± 1.712		
VAS morning tiredness	6.74 ± 2.274		
VAS stiffness	6.36 ± 2.516		
VAS anxiety	6.30 ± 3.084		
VAS depression	5.80 ± 3.184		
FIQ total score	65.910 ± 16.38		
FIQ less than 50(%)	24 (38.72%)		
FIQ 50 to less than 70 (%)	26 (23.8%)		
FIQ 70 or more (%)	51 (25.7%)		
Resilience score (%)	60.38 ± 15.677	68.3 ± 7.32	**0.011[1]**
Major depressive disorder (%)	50 (49.5%)	5 (9.1%)	**0.0001[2]**
Persistent Depressive disorder (%)	58 (57.4%)	3 (5.5%)	**0.0001[2]**
Generalized anxiety disorder (%)	56 (55.4%)	11 (20%)	**0.0001[2]**
Low suicide risk (%)	93 (92.1%)	63 (100%)	**0.0001[2]**
Medium suicide risk (%)	3 (3%)		
High suicidal risk (%)	5 (5%)		

All variables are expressed as mean ± standard deviation except otherwise indicated. *P* value is significant if ≤ 0.005, *1* = Mann–Whitney *U* test, *2* = Pearson chi-square, *N* = number of patients, *Std. Deviation* = standard deviation, *FIQ* = Fibromyalgia Impact Questionnaire, *VAS* = visual analogue scale

anxiety, and depression in fibromyalgia patients. It was found that the mean physical impairment was 5.93 ± 1.49, the mean VAS of pain was 7.47 ± 1.48, the mean VAS of depression was 5.8 ± 3.184, the mean VAS of anxiety was 6.3 ± 3.08, and the mean total FIQ scores was 65.91 ± 16.38, as reported in Table 1.

The mean CD-RISC-25 score in the fibromyalgia patients was 60.38 ± 15.67. It was significantly lower in the case group than in the control group ($P < 0.05$). Regarding the assessment of psychiatric comorbidities using MINI, we found that 49.5% of fibromyalgia patients had major depressive disorder, 57.4% had persistent or chronic depression, 55.4% of patients had a generalized anxiety disorder, and 5% had high suicidal risk, as shown in Table 1. There was a significant difference between both groups regarding psychiatric comorbidities.

Table 2 shows the relation of all used variables in the study with the disease severity according to FIQ. We categorized fibromyalgia patients according to the FIQ total scores into three groups: patients with FIQ less than 50, patients with FIQ 50 to less than 70, and patients with FIQ 70 or more. We found a significant difference between groups regarding the VAS of pain, fatigue, anxiety, and depression. Also, the patients with disease severity of 70 or more had low resilience compared to patients in the other two groups using the Kruskal-Wallis test.

Also, we made a pairwise comparison between all groups using Post Hoc tests, and we found that the patients in the group of FIQ 70 or more had low resilience and high VAS of depression and anxiety significantly compared to patients in the group FIQ 50 to 70 ($P < 0.05$). Additionally, the patients within the group of FIQ 50 to 70 had low resilience and high VAS of depression and anxiety significantly compared to patients within the group of FIQ less than 50 ($P < 0.05$).

Regarding the psychiatric comorbidities, we found that the prevalence of major depressive disorder, persistent depressive disorders, generalized anxiety disorder, and high suicidal risk were significantly higher in patients with high disease severity versus patients with lower disease severity using the Kruskal-Wallis tests and post hoc tests ($P < 0.05$), as shown in Table 2.

Figures 1 and 2 show the relationship between resilience, psychiatric comorbidities, and disease severity. The patients with major depressive disorder and generalized

Table 2 Relation of all variables with fibromyalgia severity

	FIQ less than 50	FIQ 50 to less than 70	FIQ 70 or more	*P* value
Age	50.79 ± 8.172	43.46 ± 12.548	39 ± 8.379	**0.0001**[1]
Education				
Low (%)	4 (16.7%)	3 (11.5%)	0	0.074[2]
Medium (%)	12 (50%)	12 (46.2%)	30 (58.8%)	
High (%)	8 (33.3%)	11 (42.3%)	21 (41.2%)	
Married (%)	17 (70.8%)	19 (73.1%)	45 (88.2%)	0.121[2]
Urban address (%)	16 (66.7%)	17 (65.4%)	36 (70.6%)	0.88[2]
Rural address (%)	8 (33.3%)	9(34.6%)	15 (29.4%)	
Symptoms duration	1.5104 ± 0.959	7.69 ± 0.788	5.5 ± 1.58	**0.0001**[1]
VAS pain	6.13 ± 0.741	6.69 ± 0.788	8.45 ± 1.457	**0.0001**[1]
VAS fatigue	5.42 ± 0.881	7.08 ± 1.197	8.67 ± 1.108	**0.0001**[1]
VAS morning tiredness	4 ± 1.642	6.54 ± 1.749	8.14 ± 1.4	**0.0001**[1]
VAS stiffness	3.29 ± 1.654	5.92 ± 1.787	8.02 ± 1.543	**0.0001**[1]
VAS anxiety	2.58 ± 0.654	4.31 ± 1.49	9.06 ± 1.121	**0.0001**[1]
VAS depression	2.46 ± 0.884	3.19 ± 0.634	8.71 ± 1.487	**0.0001**[1]
Resilience score	78.54 ± 4.925	71.4 ± 6.688	46.20 ± 5.571	**0.0001**[1]
Major depressive episode (%)	0	0	50 (98%)	**0.0001**[2]
Persistent depression disorder (%)	1 (4.2%)	8 (30.8%)	49 (96.1%)	**0.0001**[2]
Generalized anxiety disorder (%)	0	5 (19.2%)	51 (100%)	**0.0001**[2]
Suicidal risk				
High (%)	0	1 (3.8%)	4 (7.8%)	**0.026**[2]
Medium (%)	0	3 (11.5%)	0	
Low (%)	24 (100%)	22 (84.6%)	47 (92.2%)	

All variables are expressed as mean ± standard deviation except otherwise indicated *P* value is significant if ≤ 0.005, *1* = Kruskal-Wallis test, *2* = Pearson chi-square, *FIQ* = Fibromyalgia Impact Questionnaire, *VAS* = visual analogue scale

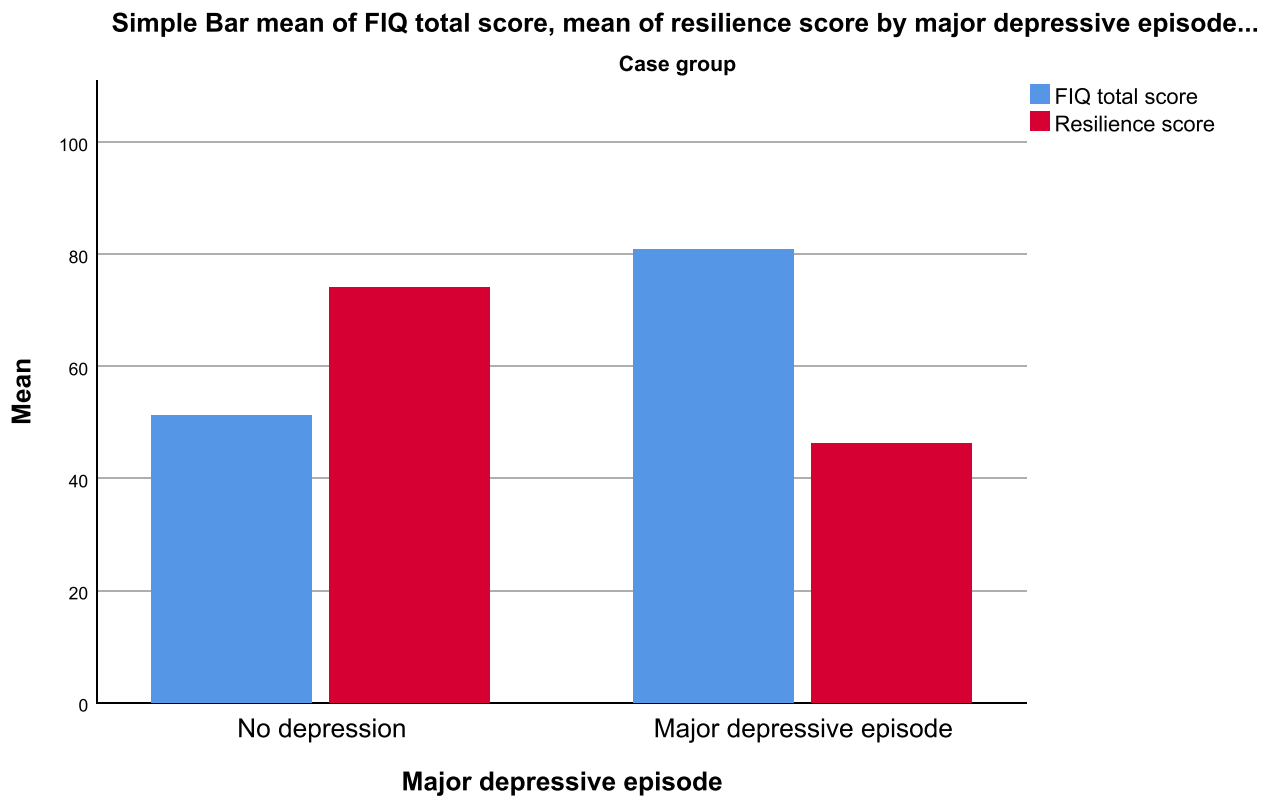

Fig. 1 Bar graph showing that fibromyalgia patients with major depressive disorder had low resilience and higher disease severity in comparison to those without major depressive disorder using the Kruskal-Wallis test ($P = 0.0001$)

anxiety disorder had significantly lower resilience and higher disease severity than those without major depressive disorder and generalized anxiety disorder. Also, the patients with a persistent depressive disorder had higher disease severity than those without persistent depression, using the Kruskal-Wallis test, as shown in Fig. 3.

Also, we noticed a strong negative correlation between resilience and each of FIQ total scores, VAS of anxiety, and VAS of depression, using the Spearman correlation coefficient ($P = 0.0001$), as shown in Figs. 4, 5, and 6.

Discussion

Recently, attention was paid to vulnerability to stress, levels of resilience, and psychiatric comorbidities in rheumatic diseases. The capacity to adapt and recover from adverse experiences is known as resilience. It can be defined as "a steady trajectory of healthy functioning after a highly aversive occurrence, as well as the deliberate attempt to go ahead in an informed, integrated positive way as a consequence of lessons acquired from an aversive experience." The resilience of individuals is a primary factor that affects the mental and psychological state; it means that individuals can adapt and pass without psychological problems. It is an essential dynamic tool that can be enhanced in patients suffering from psychological issues [20]. It was found that resilience has a significant positive correlation with the recovery from psychiatric comorbidities [21].

Fibromyalgia is the second most common "rheumatic" disorder [22]. Chronic widespread pain continues to be the defining feature of fibromyalgia. It can be associated with extra-articular symptoms such as fatigue, anxiety, sleep disorders, depression, and functional impairment of daily living activities [2]. Depression is highly prevalent in patients with fibromyalgia, and it can have a crucial role in disease pathogenesis and severity. It is difficult to determine whether it precedes the condition or is secondary to it. The relationship between pain and depression seems bidirectional: chronic depression can induce central sensitization, and chronic pain can be associated with mood changes that can lead to a depressive state [23].

The etiology of fibromyalgia and the underlying cause of fibromyalgia-related nociplastic alterations are not fully understood. The interplay between various mechanisms, including genetic predisposition, stressful life events, and peripheral (inflammatory) and central (cognitive-emotional) mechanisms, are thought to lead to

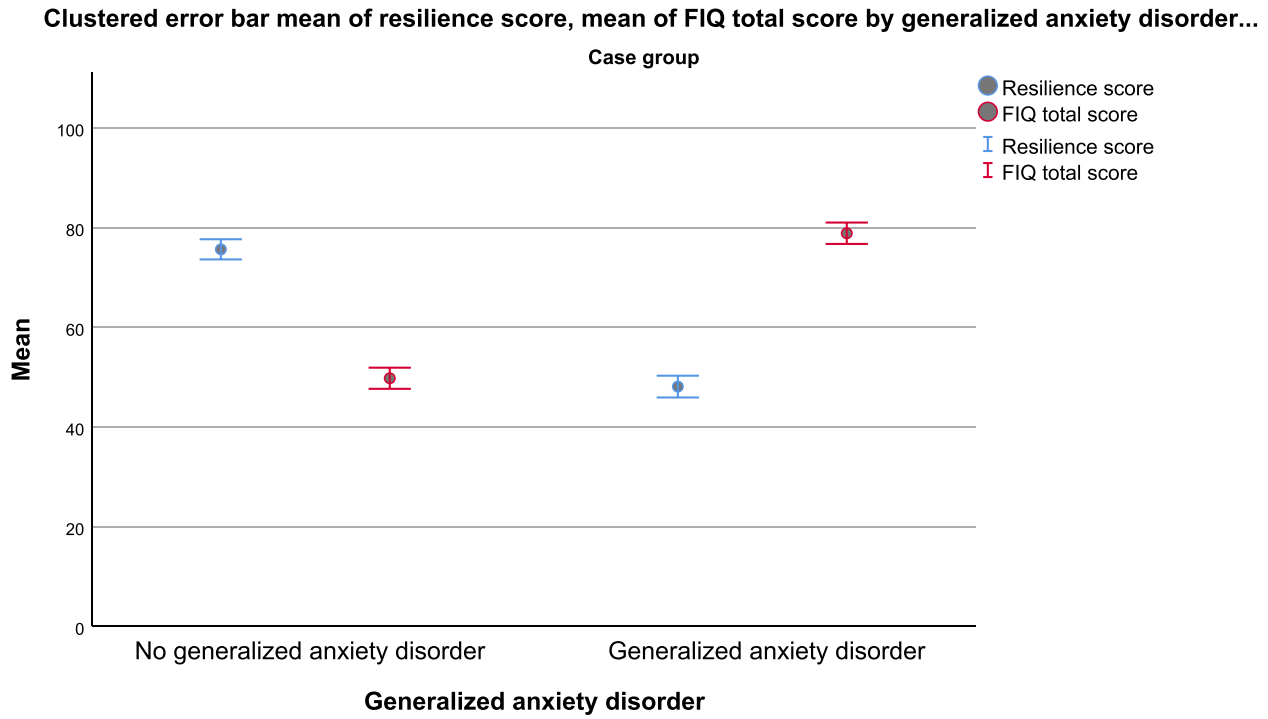

Fig. 2 Bar graph showing that fibromyalgia patients with a generalized anxiety disorder had low resilience and higher disease severity in comparison to those without generalized anxiety disorder using the Kruskal-Wallis test ($P = 0.0001$)

neuromorphological modifications ('nociplastic pain') and pain misperception [2].

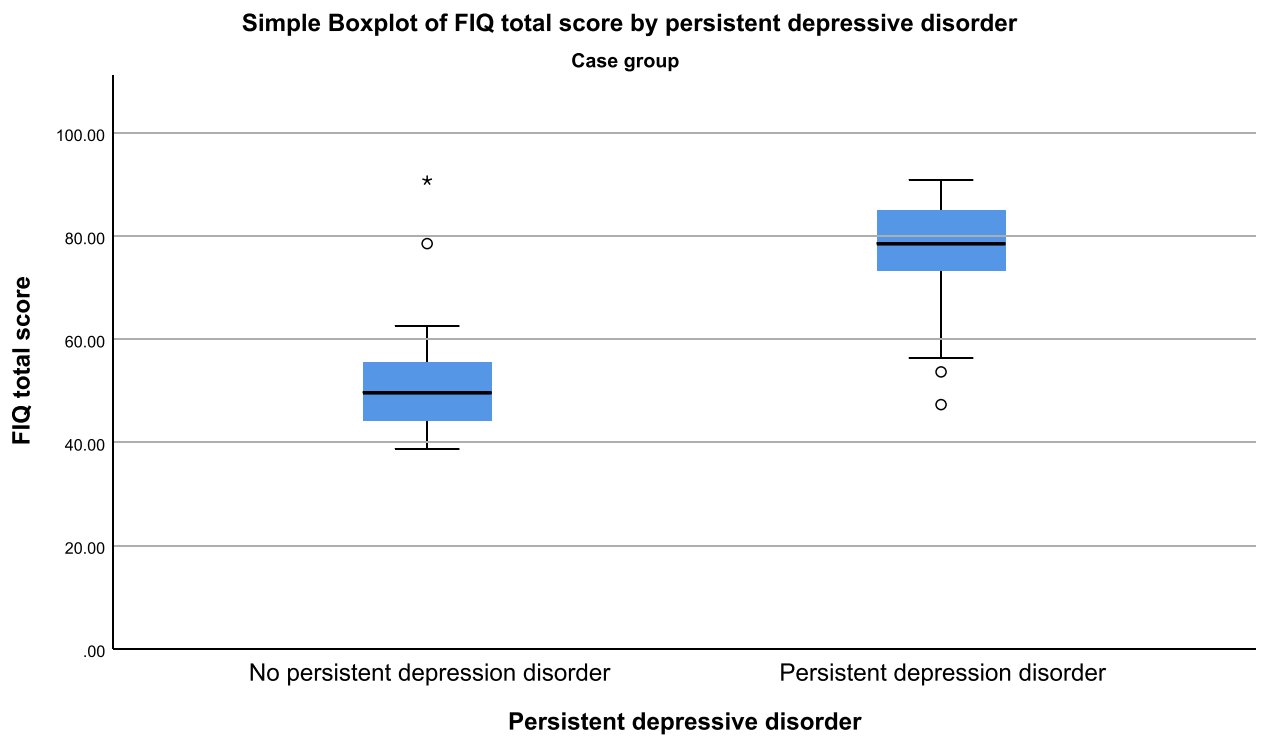

Fig. 3 Bar graph showing that fibromyalgia patients with persistent depressive disorder had significantly higher disease activity in comparison to those without persistent depressive disorder using the Kruskal-Wallis test ($P = 0.0001$)

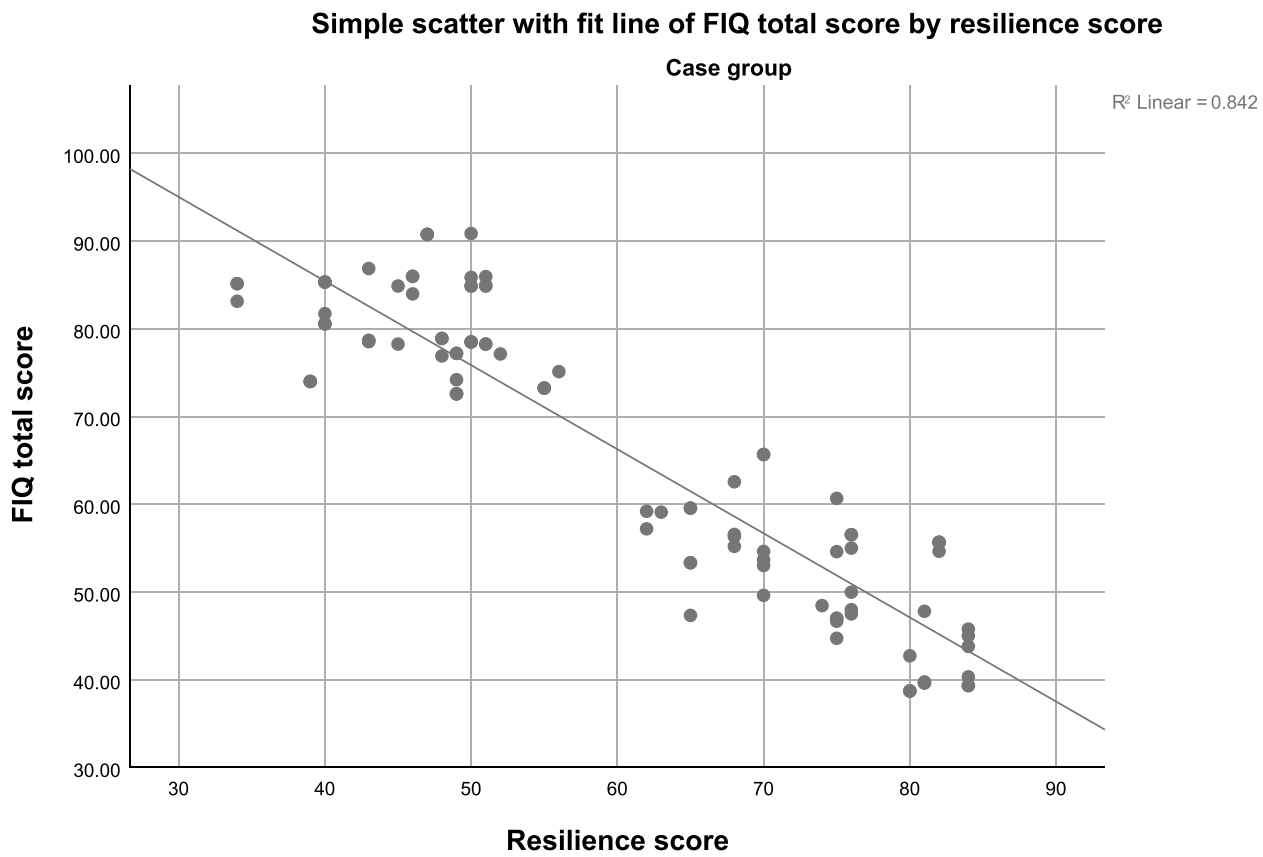

Fig. 4 Significant negative correlation of resilience with FIQ total score ($r = -0.917$, $P = 0.0001$)

Many patients with fibromyalgia associate stressors with the onset and exacerbations of their condition [24], and multiple studies have reported an association between fibromyalgia and traumas or abuse [25]. Psychiatric disorders (such as depression, anxiety, obsessive-compulsive disorder, and posttraumatic stress disorder (PTSD) might be caused by triggers that are usual to fibromyalgia patients, such as early life stress or trauma [22]. Patients with fibromyalgia might indeed have reduced levels of resilience and effective coping strategies [12].

Fibromyalgia patients were postulated in a review article to have significantly reduced resilience, leading to a variety of psychiatric disorders [12]. So, this study's objective was to assess the impact of resilience on disease severity and psychiatric comorbidities in patients with fibromyalgia.

In our study, we found that fibromyalgia patients had lower resilience than the control group. A previous study compared resilience in fibromyalgia with rheumatoid arthritis (RA) patients. They found that fibromyalgia patients had lower resilience than RA patients [26].

The stress response is implemented by the hypothalamic-pituitary-adrenal (HPA) axis, a neuro-endocrine system that plays a critical role in adjusting an organism to stressful circumstances. It may interpret the relationship between resilience and fibromyalgia. During the acute stress response, HPA was shown to be activated. A variety of events activates the HPA system. The hypothalamus secretes corticotrophin-releasing hormone (CRH), which stimulates the production of pituitary adrenocorticotropic hormone (ACTH). The hypothalamic production of arginine vasopressin (AVP) synergistically promotes CRH function. Increased ACTH stimulates adrenal gland cortisol production, which improves resilience [27].

Glucocorticoids give negative feedback regulation of the HPA axis and disrupt the HPA axis via multiple mechanisms acting on the hypothalamus and pituitary. However, excessive and prolonged cortisol and glucocorticoid concentrations are harmful under chronic stress conditions because they cause severe structural and functional changes in the central nervous system, such as increased glutamate tone, hippocampus atrophy, and inflammation [27]. These events cause direct

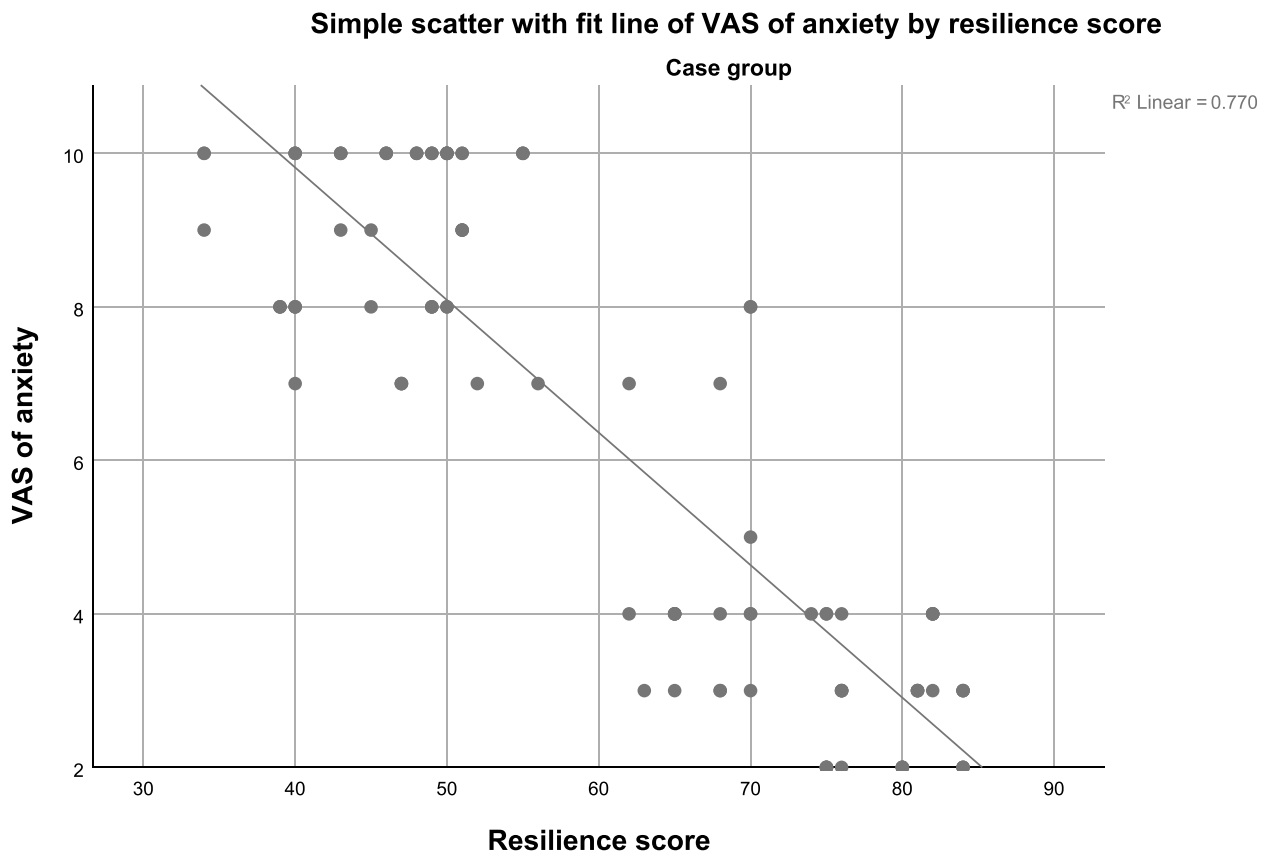

Fig. 5 Significant negative correlation of resilience with VAS of anxiety in fibromyalgia patients ($r = -0.878$, $P = 0.0001$)

consequences on physical health, behavior, cognitive capacities, and emotions, increase vulnerability, and lead to multiple diseases [28].

Also, arousal of the locus ceruleus-norepinephrine system (LCNE), which stimulates brain areas such as the amygdala, hippocampus, medial prefrontal cortex (PFC), nucleus accumbens (NAc), ventromedial hypothalamus, and brain stem nuclei, is another important neural mechanism. These pathways play roles in emotion and anticipation, stress precipitation, propagation and termination, and pain activation [29].

Few studies explain the relationship between resilience, disease severity, and psychiatric comorbidities in fibromyalgia patients. This study detected a significant negative correlation between resilience and disease severity. We also found that fibromyalgia patients with high disease severity have a significantly higher prevalence of psychiatric comorbidities and lower resilience levels when compared to those with a better disease state.

Maladaptive coping styles during various stressors (for example, a low level of self-efficacy, hypervigilance to pain stimuli, avoidance, and catastrophizing) can dysfunctionally modulate pain and affect the intensity of subjective pain and a patient's general health, as well as cause increasing activation in pain-related areas of the brain [30, 31]. Cognitive–emotional sensitivity to pain is the name given to this process. This can interpret the relation of resilience with disease severity and pain in fibromyalgia patients. Resilience helps the recovery of psychiatric disorders [21]. Also, low resilience can be associated with psychiatric problems [32], which affect the disease severity also [23].

Regarding psychiatric comorbidities, we found a significantly higher percentage of psychiatric comorbidities in fibromyalgia patients compared to the control group, 49.5% of fibromyalgia patients had current major depressive episodes, 57.4% had persistent depressive disorder, 55.4% had a generalized anxiety disorder, and 92.1% had low suicidal risk. This data is consistent with a systemic review and meta-analysis that reported the prevalence of depressive disorders in fibromyalgia range from 7 to 68% [33].

Another systematic review reported that the prevalence of current major depressive episodes ranges from 6 to 67%, and its lifetime prevalence is from 20 to 51%, while the lifetime prevalence of generalized

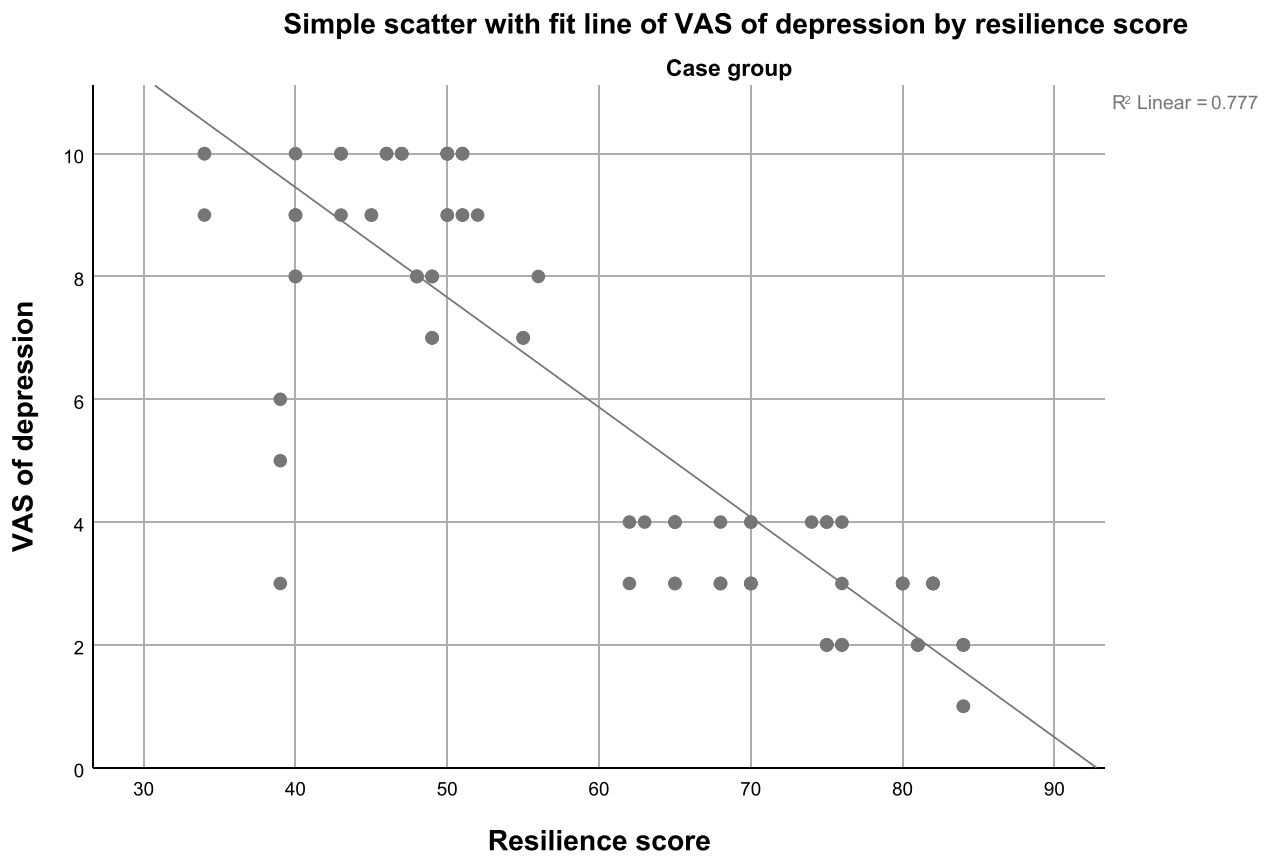

Fig. 6 Significant negative correlation of resilience with VAS of depression in fibromyalgia patients ($r = -0.882$, $P = 0.0001$)

anxiety disorder is from 9 to 12% [34]. Another study reported that the prevalence of anxiety in fibromyalgia was 87.5%, and the prevalence of depression was 72.5% using the Hospital Anxiety And Depression Scale (HADS) [35].

Most patients in our study were found to have low suicidal risk; this may be explained by the fact that persistent depression though continuous yet it is mild and associated with a low risk of suicide. Persistent depression can lower the nociceptive threshold and cause chronic pain in fibromyalgia patients [23].

So, resilience enhancing techniques are crucial in the treatment strategies of fibromyalgia. Several treatment approaches, such as cognitive-behavioral stress-management and resilience therapies, are primarily intended to change cognitive, affective, and behavioral risk factors and improve the patient's specific self-management and resilience capacities in coping with the disease [10]. These treatments are usually offered individually or in a group and last several weeks (10–15 sessions, including booster sessions for relapse prevention), with intensive homework assignments and exercises provided by specially trained cognitive-behavioral therapists [36].

The strengths of this study are that it was a controlled cross-sectional study, and it is the first study that explains the impact of resilience on disease severity and psychiatric comorbidities in patients with fibromyalgia. Although it has strengths, it also has issues of limitation: the relatively small sample size and the assessments were done by questionnaires that mainly depend on the patient's evaluation.

Conclusion

Fibromyalgia patients have lower resilience levels compared to the general population. Resilience significantly affects disease activity and psychiatric comorbidities in patients with fibromyalgia. These results show that resilience has a crucial role in fibromyalgia pathogenesis. So, improving resilience can be a new effective modality of treating patients with fibromyalgia.

Abbreviations

CD-RISC-25: Connor-Davidson Resilience Scale 25; FIQ: Fibromyalgia Impact Questionnaire; VAS: Visual analog scale; CNS: Central nervous system;

DSM-III-R: Diagnostic and Statistical Manual; HPA: Hypothalamic-pituitary-adrenal; CRH: Corticotrophin-releasing hormone; ACTH: Adrenocorticotropic hormone; AVP: Arginine vasopressin; LCNE: Locus ceruleus-norepinephrine system; PCF: Medial prefrontal cortex; NAc: Nucleus accumbens; HADS: Hospital Anxiety And Depression Scale.

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Authors' contributions
All authors significantly get involved in the preparation of the manuscript. AE and ZN drafted the manuscript, ZN performed the study statistics, and MA revised it. All authors took part in interpreting the results and approved the final version.

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Availability of data and materials
The datasets analyzed during the current study are included in supplementary information files.

Declarations

Ethics approval and consent to participate
The study protocol was approved by the Ethical Committee Board of the Faculty of Medicine, Suez Canal University. The reference number is (4761/8-1-2022). Methods were performed following the principles of the Declaration of Helsinki (2000 revision). Written informed consent was obtained from all subjects after explaining the study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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