Psychiatric Disorders in Young Adults Diagnosed with Juvenile Fibromyalgia in Adolescence

Natoshia Raishevich Cunningham, Susan T. Tran, Anne M. Lynch-Jordan, Tracy V. Ting, Soumitri Sil, Daniel Strotman, Jennie G. Noll, Scott W. Powers, Lesley M. Arnold, and Susmita Kashikar-Zuck

ABSTRACT. ***Objective.*** Adolescents with juvenile-onset fibromyalgia (JFM) have increased rates of psychiatric disorders, but to our knowledge no studies have examined psychiatric disorders in adolescents with JFM when they enter young adulthood. This study examined the prevalence of psychiatric disorders in young adults diagnosed with JFM during adolescence and the relationship between mental health diagnoses and physical functioning.

Methods. Ninety-one young adults (mean age 21.60, SD 1.96) with a history of JFM being followed as part of a prospective longitudinal study and 30 matched healthy controls (mean age 21.57, SD 1.55) completed a structured interview of psychiatric diagnoses and a self-report measure of physical impairment.

Results. Young adults with a history of JFM were more likely to have current and lifetime histories of anxiety disorders (70.3% and 76.9%, respectively) compared with controls (33.3% for both, both $p < 0.001$). Individuals with JFM were also more likely to have current and lifetime histories of major mood disorders (29.7% and 76.9%, respectively) compared with controls (10% and 40%, $p < 0.05$). The presence of a current major mood disorder was significantly related to impairment in physical functioning [$F(1, 89) = 8.30$, $p < 0.01$] and role limitations attributable to a physical condition [$F(1, 89) = 7.09$, $p < 0.01$].

Conclusion. Psychiatric disorders are prevalent in young adulthood for individuals with a history of JFM, and a current major mood disorder is associated with greater physical impairment. Greater attention to early identification and treatment of mood disorders in patients with JFM is warranted. (J Rheumatol First Release September 15 2015; doi:10.3899/jrheum.141369)

Key Indexing Terms:
FIBROMYALGIA
AFFECTIVE DISORDERS
ANXIETY DISORDERS
JUVENILE FIBROMYALGIA

Juvenile-onset fibromyalgia (JFM) is a chronic pain disorder that affects about 2–6% of school-aged children and adolescents, and is associated with chronic pain, significant impairment in physical functioning, fatigue, and psychological distress[1]. Psychiatric conditions, particularly anxiety and depressive disorders, are known to be highly prevalent in children and adolescents with JFM[2] and in adults with fibromyalgia (FM)[3,4,5]. However, to our knowledge, there is no research examining current and lifetime prevalence of psychiatric disorders in young adults who were diagnosed with JFM in adolescence.

From the Division of Behavioral Medicine and Clinical Psychology, and Division of Rheumatology, Cincinnati Children's Hospital Medical Center; Department of Pediatrics, University of Cincinnati; Department of Psychiatry and Behavioral Neuroscience, University of Cincinnati College of Medicine, Cincinnati, Ohio; Department of Pediatrics, Emory University School of Medicine, Aflac Cancer and Blood Disorders Center, Children's Healthcare of Atlanta, Atlanta, Georgia, USA.

Funded by the National Institute of Arthritis and Musculoskeletal and Skin Diseases of the US National Institutes of Health, grants R01AR054842 and K24AR056687 to the last author (Kashikar-Zuck).

N.R. Cunningham, PhD, Assistant Professor of Pediatrics, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati; S.T. Tran, PhD, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center; A.M. Lynch-Jordan, PhD, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati; T.V. Ting, MD, Department of Pediatrics, University of Cincinnati, and Division of Rheumatology, Cincinnati Children's Hospital Medical Center; S. Sil, PhD, Department of Pediatrics, Emory University School of Medicine, Aflac Cancer and Blood Disorders Center, Children's Healthcare of Atlanta; D. Strotman, BA, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center; J.G. Noll, PhD, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati; S.W. Powers, PhD, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati; L.M. Arnold, MD, Department of Psychiatry and Behavioral Neuroscience, University of Cincinnati College of Medicine; S. Kashikar-Zuck, PhD, Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati.

Address correspondence to Dr. N.R. Cunningham, Assistant Professor of Pediatrics, Cincinnati Children's Hospital Medical Center, Division of Behavioral Medicine and Clinical Psychology, MLC 3015, 3333 Burnet Ave., Cincinnati, Ohio 45229-3026, USA. E-mail: Natoshia.cunningham@cchmc.org

Accepted for publication July 14, 2015.

Mood and anxiety disorders are known to be more prevalent in adults with FM and adolescents with JFM than in the general population[2,3,4,5,6]. Specifically, in adults with FM, prevalence rates of anxiety and mood disorders are more than 3 times greater than those observed in the general population[5], with major mood disorders being the most common (~20–80%), followed by anxiety disorders (~13–63.8%)[3,4]. In adolescents with JFM, high rates of depressive, internalizing, and externalizing symptoms have also been noted, with rates that exceed population norms[6]. To date, we have conducted the only clinical investigation examining the presence of psychiatric diagnoses in adolescent patients with JFM[2]. Similar to adults with FM, adolescents with JFM were found to have elevated rates of current and lifetime anxiety and depressive disorders. However, unlike adult samples, there were higher rates of current anxiety disorders (57.5%) than depressive disorders (22%) in adolescents with JFM. Thus, while psychological distress appears to be elevated across the lifespan for patients with JFM/FM, it remains unclear when or whether patterns of primarily anxiety problems in adolescence shift to mood problems in adulthood. It is plausible that depressive disorders become more common in patients with JFM as they continue to age, as is seen in the general population during young adulthood[7].

Evidence suggests that psychological difficulties in patients with FM (JFM or FM) may correspond to increased impairment in daily functioning[2,5,8]. Epstein, *et al* found that current (but not lifetime) depression corresponded to increased physical impairment, but that neither depression nor anxiety was related to role limitations attributable to physical health in adults with FM[8]. On the other hand, Thieme, *et al* found that patients with FM with highest dysfunction (e.g., pain interference in daily tasks) were characterized by higher rates of anxiety disorders (> 60%) compared with those with better functioning[5]. In our previous investigation of adolescents with JFM, presence of an anxiety disorder corresponded to increased impairment through the physician's global assessment of functioning, but not to self-reported pain intensity[2]. Thus, the effect of psychological symptoms on various aspects of daily functioning in patients with JFM are still not entirely understood and even less is known about these relationships in those transitioning from adolescence to young adulthood.

In a recently published study examining the longterm outcomes of adolescents with JFM, we reported that FM symptoms persisted for a majority (> 80%) of participants at about a 6-year followup[9]. We also found that 60% of participants reported moderate to severe anxiety symptoms and 26.6% reported moderate to severe depressive symptoms. However, the current/lifetime rates of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) psychiatric disorders were not examined in that study. The purpose of our investigation was to (1) examine current and lifetime prevalence of psychiatric disorders in a sample of 91 young adults who were diagnosed with JFM during adolescence, and (2) examine how current psychiatric disorders [anxiety and major mood disorders (i.e., major depressive disorder, bipolar disorder)] may relate to physical functioning in young adulthood. Consistent with prior research in pediatric and adult populations, we predicted that the rates of anxiety and major mood disorders would exceed rates found in age-matched healthy controls, with significantly higher rates expected for anxiety disorders (> 60%) and major mood disorders (> 60%). Further, we predicted that the presence of current anxiety disorders and major mood disorders would be associated with higher levels of physical impairment. As an exploratory aim, we also examined whether prevalence rates of current and lifetime psychiatric disorders differed in individuals with active FM versus those with subclinical FM symptoms in adulthood.

MATERIALS AND METHODS

Participants. Participants (mean age 21.60, SD 1.86) eligible for our study were young adults with JFM and healthy controls enrolled in a longitudinal study of physical and psychosocial functioning in patients with JFM[9,10]. Initial recruitment of patients with JFM (who were between the ages of 13–18 yrs at the time of recruitment) took place in a pediatric rheumatology clinic at a midwestern (USA) pediatric medical center. Patients were eligible if they met the criteria for JFM using the Yunus and Masi criteria[1], i.e., generalized musculoskeletal aching at 3 or more sites for 3 or more months in the absence of another underlying condition, normal laboratory tests, pain in at least 5 tender points, and at least 3 of 10 associated features such as fatigue, irritable bowel syndrome, and poor sleep. At the time of the current followup, the age of the JFM group ranged from 19–27 years (mean 21.60, SD 1.96). Healthy controls (current ages 19–25 yrs, mean 21.57, SD 1.55) were originally recruited as part of a substudy of peer relationships in JFM[11] and were selected from classroom rosters of patients with JFM; they were matched based on closest birth date, age, sex, and having no chronic illness. Our current study was based on data collected as part of the third wave of followup assessments that were conducted at about 2-year intervals with ~84% retention of participants thus far. Of the original 144 participants (n = 100 with JFM and n = 44 healthy controls), 121 participants (84% retention rate) — 91 with JFM (91%) and 30 healthy controls (68.2%) — completed all required assessments for the current study.

Procedures. Participants were contacted by phone to obtain consent for their followup assessment (Kashikar-Zuck, *et al*[9] for detailed procedures). After signed consent forms were received by mail, participants received a unique login name and password to access a secure Website to complete study questionnaires. For our current study, we used measures of demographic information, widespread pain, and physical functioning. Additionally, an in-person visit was scheduled at a convenient time for participants (at their homes or in the clinic) during which a trained examiner (psychology postdoctoral fellow or master's level social worker) conducted a semistructured clinical interview to assess the presence of current and lifetime psychiatric disorders. Information on treatments in the past 2 years for medical or psychiatric conditions, and history of physical or sexual abuse in childhood were collected through patient self-report. A standard 18-site tender point examination based on the 1990 American College of Rheumatology (ACR) criteria for FM[12] was also administered. Examiners were trained in the clinical assessment by a board-certified psychiatrist (LMA) and licensed clinical psychologist (SKZ), and in conducting standardized tender point assessments by a senior FM researcher (LMA), with confirmation of accuracy by reliability checks with the study rheumatologist (TT). This study was approved by the Children Hospital's Institutional Review Board.

Background and demographic characteristics. Demographic information, including age, race, sex, marital status, and educational background, was obtained. For participants with JFM, information on current and past treatments for medical or psychiatric problems, including physical therapy, medication use, psychotherapy, and integrative treatments, was also obtained through self-report questionnaires.

Psychiatric diagnoses. The Structured Clinical Interview for DSM-IV-TR (SCID) is a semistructured psychiatric interview widely used to evaluate major DSM-IV Axis I disorders[13]. It uses a categorical rating system and provides a scoring algorithm that allows for the standardized assessment of current and lifetime psychiatric diagnoses. Studies have shown that the SCID is a reliable and valid measure of DSM-IV disorders[14,15]. For our study, a trained examiner assessed for current and past diagnoses of mood disorders, anxiety disorders, substance use disorders, somatoform disorders, eating disorders, and psychotic disorders.

Widespread Pain Index (WPI) and Symptom Severity (SS). The WPI and SS scale[16] from the 2010 ACR criteria for FM diagnosis were adapted for self-report to gather comprehensive information about active FM symptoms at followup. On the WPI, participants indicated up to 19 body areas in which they experienced pain during the past week. Higher scores represent a greater number of pain locations (range 0–19). The SS scale assesses cardinal symptoms (e.g., fatigue, waking unrefreshed, cognitive symptoms) and other somatic symptoms (e.g., dizziness, numbness, irritable bowel, nausea) associated with FM. The severity of each cardinal FM symptom was rated by participants on a 4-point Likert scale. Participants then indicated (on a checklist) whether they experienced 40 somatic items within the previous week. Based on the number of somatic symptoms endorsed, the following ratings are assigned: 0 = no symptoms, 1 = few symptoms, 2 = moderate number of symptoms, or 3 = great deal of symptoms. The SS score consists of the sum of the 3 cardinal symptoms and the numeric rating of other somatic symptoms, with a final score between 0 and 12.

Physical functioning and perceived health status. The Medical Outcomes Study Short Form-36, version 2[17] is a self-report instrument designed for individuals ≥ 14 years of age that is frequently used to assess perceived health status in a variety of domains of physical and emotional health in adult patients with FM[18]. For our investigation, measures of impairment in physical functioning (physical function subscale) and role limitations attributable to a physical condition (role functioning subscale) were used as indicators of physical impairment in daily life. Impairment in physical functioning assesses the degree to which health limits participation in physical activities (i.e., vigorous activities such as running, lifting heavy objects, participating in strenuous sports, walking several hundred yards, bending/kneeling, climbing flight/s of stairs). Participants rate these items on a 3-point scale ranging from "Yes, limited a lot" to "No, not limited at all." Role limitations were defined as problems with work or other daily activities as a result of physical health (i.e., cut down on the amount of time spent on work/school or other activities, accomplished less than would have liked). Raters indicate the degree of problems with these activities as a result of physical health, with responses ranging from "All of the time" to "None of the time". Scores were transformed according to norm-based scoring (mean ± SD T score: 50 ± 10), with lower scores reflecting poorer functioning.

FM status. The ACR 2010 diagnostic criteria based on the WPI and SS scale described above, along with the ACR 1990 criteria[12,16], were used to determine whether participants met the criteria for adult FM at followup. They were classified as having subclinical FM symptoms if they continued to experience pain and ≥ 1 of the cardinal symptoms (fatigue, sleep difficulty, and cognitive symptoms), but did not meet the full criteria for FM. Patients were considered "pain free" if they reported no pain and were not receiving any medications to manage FM pain.

Statistical analyses. Data were analyzed using SPSS 22.0[19]. Descriptive data were computed for all demographic variables. Rates of current and lifetime psychiatric disorders were calculated for young adults previously diagnosed with JFM and controls. Differences in prevalence rates of current and lifetime psychiatric diagnoses between the JFM and control groups were assessed by Fisher's exact tests. Exploratory analyses were also conducted to examine differences in current and lifetime psychiatric diagnoses prevalence rates within the JFM group based on clinical characteristics (clinical vs subclinical FM symptoms). Differences in the number of psychiatric diagnoses between groups were assessed by independent Student t tests. After ensuring that there were no violations of the assumptions of normality, linearity, and multicollinearity, 2 multivariate ANOVA were conducted to assess the effect of (1) a current anxiety disorder diagnosis, or (2) a current major mood disorder diagnosis on physical functioning and role limitations.

RESULTS

The final sample consisted of 91 young adults with JFM and 30 matched healthy controls. The retention rate for the JFM group was higher (91%) than healthy controls (68.2%). There were no significant differences between participants and dropouts based on age or baseline socioeconomic status, pain, or depressive symptoms. This sample has largely been described in a prior paper on the persistence of JFM (50% met full criteria for adult FM) and associated symptoms (85% continued to experience FM symptoms to some degree) into young adulthood[9]. In both the JFM and control groups, the majority of the sample was female, white, and single (Table 1). There were no significant differences between groups in age, sex, race, marital status, or education status.

Psychiatric diagnoses in patients with JFM and healthy controls. The current and lifetime prevalence of psychiatric disorders in patients previously diagnosed with JFM and the control group is shown in Table 2.

Current diagnoses. The most common current diagnoses for those previously diagnosed with JFM were generalized anxiety disorder (46.2%), major depressive disorder (18.7%), social and specific phobia (each 17.6%), panic disorder (14.3%), and posttraumatic stress disorder (14.3%). On average, the JFM group had 2.10 (SD 1.96) current psychiatric diagnoses compared with 1.03 (SD 1.65) diagnoses in controls [T (119) = 2.68, $p < 0.01$]. In the JFM group, 78% had at least 1 current psychiatric diagnosis compared with

Table 1. Sample demographics. Values are n (%) unless otherwise specified.

Characteristics	JFM, n = 91	Controls, n = 30
Age, yrs, mean (SD)	21.6 (2.0)	21.6 (1.6)
Female	87 (95.6)	27 (90.0)
Race		
White	80 (87.9)	27 (90.0)
African American	5 (5.5)	2 (6.7)
Marital status		
Single	71 (78.0)	28 (93.3)
Married	16 (17.6)	2 (6.7)
Divorced/separated	4 (4.4)	0 (0.0)
Educational status		
High school	35 (38.5)	6 (19.9)
Bachelor's in progress	39 (42.9)	20 (66.7)
Bachelor's degree	16 (17.6)	4 (13.3)

JFM: juvenile-onset fibromyalgia.

Table 2. Current and lifetime prevalence of psychiatric disorders in young adults with and without JFM. Values are n (%) unless otherwise specified.

Disorders	Current Prevalence of Psychiatric Disorders			Lifetime Prevalence of Psychiatric Disorders		
	JFM, n = 91	Controls, n = 30	Fisher's Exact Test	JFM, n = 91	Controls, n = 30	Fisher's Exact Test
Mood disorders						
Dysthymic disorder	8 (8.8)	0 (0.0)	2.82	8 (8.8)	0 (0.0)	2.82
Bipolar disorder	11 (12.1)	2 (6.7)	0.69	12 (13.2)	2 (6.7)	0.94
Major depressive disorder	17 (18.7)	1 (3.3)	4.20*	58 (63.7)	10 (33.3)	8.47**
Any major mood disorder	27 (29.7)	3 (10.0)	4.68*	70 (76.9)	12 (40.0)	14.08***
Anxiety disorders						
Generalized anxiety disorder	42 (46.2)	6 (20.0)	6.45*	43 (47.3)	6 (20.0)	6.95**
Obsessive-compulsive disorder	12 (13.2)	2 (6.7)	0.94	15 (16.5)	2 (6.7)	1.80
Panic disorder	13 (14.3)	2 (6.7)	1.21	18 (19.8)	3 (10.0)	1.51
Posttraumatic stress disorder	13 (14.3)	1 (3.3)	2.65	24 (26.4)	2 (6.7)	5.19*
Social phobia	16 (17.6)	2 (6.7)	2.12	20 (22.0)	2 (6.7)	3.56
Specific phobia	16 (17.6)	2 (6.7)	2.12	17 (18.7)	3 (10.0)	1.23
Any anxiety disorder†	64 (70.3)	10 (33.3)	13.00***	70 (76.9)	10 (33.3)	19.14***
Eating disorders						
Anorexia nervosa	2 (2.2)	0 (0.0)	0.67	2 (2.2)	0 (0.0)	0.67
Bulimia nervosa	1 (1.1)	1 (3.3)	0.69	3 (3.3)	2 (6.7)	0.65
Any eating disorder‡	5 (5.5)	1 (3.3)	0.22	10 (11.0)	2 (6.7)	0.47
Substance use disorders						
Alcohol abuse/dependence	2 (2.2)	3 (10.0)	3.47	16 (17.6)	10 (33.3)	3.32
Drug abuse/dependence	5 (5.5)	2 (6.7)	0.06	6 (6.6)	5 (16.7)	2.77
Any substance use disorder	7 (7.7)	4 (13.3)	0.87	20 (22.0)	11 (36.7)	2.56
Somatoform disorders						
Hypochondriasis	1 (1.1)	0 (0.0)	0.33	1 (1.1)	0 (0.0)	0.33
Somatization disorder	8 (8.8)	0 (0.0)	2.82	8 (8.8)	0 (0.0)	2.82
Psychotic disorders						
Schizophrenia	0 (0.0)	0 (0.0)	N/A	0 (0.0)	0 (0.0)	N/A

*p < 0.05. **p < 0.01. ***p < 0.001. †Does not include specific phobia. ‡Includes eating disorder not otherwise specified. JFM: juvenile-onset fibromyalgia; N/A: not applicable.

40% of controls (Fisher's exact test $p < 0.001$), and 51.6% had at least 2 psychiatric diagnoses compared with 26.7% of controls (Fisher's exact test $p < 0.05$).

Lifetime diagnoses. The most common lifetime diagnoses in young adults previously diagnosed with JFM were major depressive disorder (63.7%), generalized anxiety disorder (47.3%), posttraumatic stress disorder (26.4%), and social phobia (22.0%). At least 1 lifetime psychiatric diagnosis was found in 89% of the JFM group (Fisher's exact test $p < 0.01$), whereas the rate of at least 1 lifetime diagnosis in controls was 60%. On average, patients previously diagnosed with JFM had 2.87 (SD 1.90) lifetime diagnoses compared with 1.60 [SD 1.81, $T(119) = 3.2$, $p < 0.01$] in the control group. Two or more lifetime psychiatric diagnoses were found in 77% of patients who had JFM compared with 43% of the control group (Fisher's exact test $p < 0.001$).

Prevalence rate comparison by group. Anxiety disorders were more common than mood disorders in both the JFM and healthy control groups. However, rates of anxiety and depressive disorders were significantly higher in patients who had been diagnosed with JFM compared with controls. For example, young adults with a past diagnosis of JFM were more than 3 times as likely to have a current major mood disorder, defined as major depressive disorder or bipolar disorder. There were significantly higher rates of both current ($p < 0.05$) and lifetime ($p < 0.01$) major depressive disorders in patients who had been diagnosed with JFM compared with controls. Similarly, young adults with a past JFM diagnosis were also more than twice as likely to have a current ($p < 0.001$) or lifetime ($p < 0.001$) anxiety disorder compared with controls. There were significantly higher rates of current ($p < 0.05$) and lifetime ($p < 0.01$) generalized anxiety disorders and higher rates of lifetime ($p < 0.05$) posttraumatic stress disorder in the JFM group compared with controls. Eating disorders, substance use disorders, psychotic disorders, and somatoform disorders (both current and lifetime) were relatively rare or absent in the JFM and control groups.

Psychiatric diagnoses in active FM versus subclinical FM. Of the 91 individuals with JFM, 47 (51.65%) continued to meet criteria for active FM and 44 (48.35%) had subclinical or minimal FM symptoms (with 14 of those 44 patients reporting no pain in the past 3 mos and no current use of pain medications). There were no statistical differences in the rates of anxiety and mood disorders in the clinical FM group compared with the subclinical FM group.

History of trauma (physical or sexual abuse). There was no significant difference between individuals with and without

JFM with regard to physical abuse during childhood [6.6% vs 0.0%, chi-square (1) = 2.08, Fisher's exact test p > 0.05]; there was a significant difference regarding sexual abuse history in that those with JFM were more likely to have reported childhood sexual abuse than healthy control subjects [15.4% vs 0.0%, chi-square (1) = 5.22, Fisher's exact test p < 0.05]. Patients with active FM had somewhat higher rates of physical abuse (10.6% vs 2.3%) and sexual abuse (19.1% vs 11.4%) during childhood compared with their subclinical FM counterparts. There were no significant differences between FM groups with regard to physical or sexual abuse reported during adulthood.

Other treatments in active FM versus subclinical FM. Overall, individuals with active FM reported similar treatments compared with those with subclinical FM, including use of antidepressant medication, integrative therapies, physical therapy, and psychotherapy (Table 3). The only difference in treatments between those who continued to meet criteria for FM and those who had subclinical symptoms was current serotonin norepinephrine reuptake inhibitor (SNRI) use, with those meeting FM criteria more likely to be treated with SNRI than those with subclinical symptoms [chi-square (1) = 8.21, Fisher's exact test p < 0.01].

Anxiety and depressive disorders in relation to impairment in physical function. Mean differences in physical functioning based on the presence of major mood disorder and anxiety disorder are presented in Table 4. Multivariate ANOVA results indicated significantly higher levels of physical impairment for both physical functioning [F (1, 89) = 8.30, p < 0.01] and role limitations because of a physical condition [F (1, 89) = 7.09, p < 0.01] in the presence of current major mood disorder [F (2, 88) = 5.08, p < 0.01]. However, the model examining the relationship between the 2 measures of physical disability and presence of a current anxiety disorder was not significant.

Table 3. Treatments in young adults with JFM by clinical and subclinical FM. Values are n (%).

Variables	Clinical FM, n = 47	Subclinical, n = 44
Physical therapy		
Physical therapy	0 (0.0)	2 (4.5)
Past physical therapy	7 (14.9)	11 (25.0)
Psychotherapy		
Psychotherapy	9 (19.1)	7 (15.9)
Past psychotherapy	6 (12.8)	13 (29.5)
Medications		
Tricyclic	7 (14.9)	6 (13.6)
SSRI	4 (8.5)	9 (20.5)
SNRI	8 (17.0)	0 (0.0)
Atypical antidepressant	3 (6.4)	1 (2.3)
Other antidepressant	6 (12.8)	7 (15.9)
Any antidepressant	18 (38.3)	19 (43.2)
NSAID	18 (38.3)	13 (29.5)
Anticonvulsant	6 (12.8)	9 (20.5)
Muscle relaxer	3 (6.4)	3 (6.8)
Non-opioid analgesic	7 (14.9)	5 (11.4)
Opioid analgesic	4 (8.5)	1 (2.3)
Integrative therapies		
Acupuncture	1 (2.1)	2 (4.5)
Chiropractor	5 (10.6)	1 (2.3)
Massage	7 (14.9)	1 (2.3)
Past acupuncture/massage/ chiropractor	9 (19.1)	11 (25.0)

FM: fibromyalgia; JFM: juvenile-onset FM; SSRI: selective serotonin reuptake inhibitors; SNRI: serotonin norepinephrine reuptake inhibitor; NSAID: nonsteroidal antiinflammatory drugs.

DISCUSSION

Our investigation examined the prevalence of psychiatric disorders in young adults who were previously diagnosed with JFM. JFM is a persistent and enduring condition in most patients, and is commonly associated with anxiety and depressive symptoms[9]. The findings from our followup study suggest that rates of DSM-IV anxiety and depressive disorders are also highly prevalent in young adult patients who had JFM compared with healthy controls. The rates of anxiety and depression in individuals with JFM exceeds the prevalence rates seen in individuals with other chronic disease conditions, including diabetes[20], inflammatory bowel disease[21], and rheumatoid arthritis[3]. The rates of psychiatric disorders in this sample also exceed the rates seen in certain functional pain conditions, such as irritable bowel syndrome, although individuals with other conditions such as chronic fatigue syndrome may have comparable or higher rates of psychiatric comorbidities[22]. The prevalence rates of major depressive disorder and anxiety in our healthy controls were generally consistent with population norms[23,24,25]. Our current study also found that the presence of a current major mood disorder is associated with increased impairment in physical functioning.

Previous investigations have documented high levels of anxiety disorders in children and adolescents diagnosed with JFM[2]. Our current findings indicate that patients with JFM who grow into young adults with persistent FM may be at risk for progressing toward developing a clinically complicated profile categorized by increased physical impairment and comorbid anxiety and depressive disorders[26]. These findings are interesting in light of work theorizing that FM in the presence of comorbid depression may be categorically distinct from FM in the absence of depression, with the former constituting an affective spectrum disorder and the latter possibly considered a functional pain condition[27]. Although there were no statistically significant differences in psychiatric comorbidity between the clinical FM group and the subclinical FM group, both groups showed more psychiatric comorbidities than in the healthy control group. Overall, the exploratory findings support the notion of categorically distinct FM profiles based on symptom severity and presence of psychiatric comorbidities.

Patients previously diagnosed with JFM who have a

Table 4. Physical functioning and role limitations in participants with JFM based on current anxiety and mood disorder status. Values are mean (SD).

Variables	Major Mood Disorder		Anxiety Disorder	
	Present, n = 27	Absent, n = 64	Present, n = 64	Absent, n = 27
Physical functioning	62.04 (21.76)*	76.09 (21.05)	70.70 (23.02)	74.81 (19.88)
Role limitations	53.47 (30.64)*	69.04 (23.02)	61.82 (27.23)	70.60 (23.37)

*p < 0.01. JFM: juvenile-onset fibromyalgia.

current depressive disorder may be at increased risk for greater physical function impairment and increased limitations in day-to-day activities, though this does not appear to be the case for a current anxiety disorder diagnosis. These findings are consistent with a prior investigation of adults with FM in which a current diagnosis of depression but not anxiety was associated with increased physical impairment[8]. These findings have important clinical implications for medical providers who treat young adults who were diagnosed with JFM. The identification and treatment of mood disorders, in particular, among young adults previously diagnosed with JFM and those with persistent FM symptoms were critical because of the link between depression and increased physical impairment found in our current investigation.

Several limitations of our study should be noted, including generalizability. Our study is based on a clinical population of patients with JFM (i.e., initially recruited from a pediatric rheumatology subspecialty clinic) and so these patients may have had more severe disease or greater impairment compared with individuals with JFM from community-based studies. Moreover, our sample was predominantly female and white. Although this demographic is generally characteristic of patients with JFM and FM, it limits generalizability to other groups of people with JFM, such as males or those from other ethnic backgrounds. Many participants in our longitudinal study were recruited from a clinical trial in which severe psychopathology (e.g., schizophrenia) was an exclusionary criterion[9]. Although very few patients were excluded on these grounds, the original selection criteria for our study may further discriminate this clinical sample from the general population. Finally, we did not systematically assess for family history of psychiatric disorders, current/past life stressors (other than abuse history), or daily hassles, which may have also affected psychosocial functioning and physical impairment.

The findings of our study allow for enhanced understanding of the psychiatric comorbidity and physical function of patients diagnosed with JFM during a critical transitional period to young adulthood. It is possible that if children and adolescents are screened regularly and treated for psychiatric symptoms at the time of initial JFM diagnosis, this may prevent the maintenance and onset of additional psychopathology, such as major mood disorders and deterioration in physical functioning. Future research aimed at following patients with JFM over a longer period of time would be beneficial to understanding how longterm functioning is affected after the transition from adolescence to young adulthood. Future work may identify the longterm trajectories of anxiety and depression in patients with JFM and more clearly identify risk profiles for the progression of anxiety to more complex presentations that include depressive disorders and impairment in function over time. The developmental psychopathology of patients with JFM remains a relatively poorly understood area, and more research is needed to improve clinical care and to prevent the emotional impairment associated with this chronic pain condition.

REFERENCES

1. Yunus MB, Masi AT. Juvenile primary fibromyalgia syndrome. A clinical study of thirty-three patients and matched normal controls. Arthritis Rheum 1985;28:138-45.
2. Kashikar-Zuck S, Parkins IS, Graham TB, Lynch AM, Passo M, Johnston M, et al. Anxiety, mood, and behavioral disorders among pediatric patients with juvenile fibromyalgia syndrome. Clin J Pain 2008;24:620-6.
3. Arnold LM, Hudson JI, Keck PE, Auchenbach MB, Javaras KN, Hess EV. Comorbidity of fibromyalgia and psychiatric disorders. J Clin Psychiatry 2006;67:1219-25.
4. Fietta P, Fietta P, Manganelli P. Fibromyalgia and psychiatric disorders. Acta Biomed 2007;78:88-95.
5. Thieme K, Turk DC, Flor H. Comorbid depression and anxiety in fibromyalgia syndrome: relationship to somatic and psychosocial variables. Psychosom Med 2004;66:837-44.
6. Mikkelsson M, Sourander A, Piha J, Salminen JJ. Psychiatric symptoms in preadolescents with musculoskeletal pain and fibromyalgia. Pediatrics 1997;100:220-7.
7. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 5th ed. Arlington: American Psychiatric Publishing; 2013.
8. Epstein SA, Kay G, Clauw D, Heaton R, Klein D, Krupp L, et al. Psychiatric disorders in patients with fibromyalgia. A multicenter investigation. Psychosomatics 1999;40:57-63.
9. Kashikar-Zuck S, Cunningham N, Sil S, Bromberg MH, Lynch-Jordan AM, Strotman D, et al. Long-term outcomes of adolescents with juvenile-onset fibromyalgia in early adulthood. Pediatrics 2014;133:e592-600.
10. Kashikar-Zuck S, Lynch AM, Slater S, Graham TB, Swain NF, Noll RB. Family factors, emotional functioning, and functional impairment in juvenile fibromyalgia syndrome. Arthritis Rheum 2008;59:1392-8.
11. Kashikar-Zuck S, Lynch AM, Graham TB, Swain NF, Mullen SM, Noll RB. Social functioning and peer relationships of adolescents with juvenile fibromyalgia syndrome. Arthritis Care Res 2007;57:474-80.
12. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology

1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. Arthritis Rheum 1990;33:160-72.
13. First MB, Spitzer RL, Gibbon M, Williams JB. Structured clinical interview for DSM-IV-TR axis I disorders, research version, patient edition (SCID-I/P). New York: Biometrics Research Department, New York State Psychiatric Institute; 2002.
14. Zanarini MC, Skodol AE, Bender D, Dolan R, Sanislow C, Schaefer E, et al. The collaborative longitudinal personality disorders study: reliability of axis I and II diagnoses. J Pers Disord 2000;14:291-9.
15. Kranzler HR, Kadden RM, Babor TF, Tennen H, Rounsaville BJ. Validity of the SCID in substance abuse patients. Addiction 1996;91:859-68.
16. Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Katz RS, Mease P, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care Res 2010;62:600-10.
17. Ware Jr JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30:473-83.
18. Wittink H, Turk DC, Carr DB, Sukiennik A, Rogers W. Comparison of the redundancy, reliability, and responsiveness to change among SF-36, Oswestry Disability Index, and Multidimensional Pain Inventory. Clin J Pain 2004;20:133-42.
19. IBM SPSS Statistics for Windows, Version 22.0. Armonk: IBM Corp; 2013.
20. Kruse J, Schmitz N, Thefeld W; German National Health Interview and Examination Survey. On the association between diabetes and mental disorders in a community sample: results from the German National Health Interview and Examination Survey. Diabetes Care 2003;26:1841-6.
21. Walker JR, Ediger JP, Graff LA, Greenfeld JM, Clara I, Lix L, et al. The Manitoba IBD cohort study: a population-based study of the prevalence of lifetime and 12-month anxiety and mood disorders. Am J Gastroenterol 2008;103:1989-97.
22. Janssens KA, Zijlema WL, Joustra ML, Rosmalen JG. Mood and anxiety disorders in Chronic Fatigue Syndrome, fibromyalgia, and Irritable Bowel Syndrome: results from the LifeLines Cohort Study. Psychosom Med 2015;77:449-57.
23. Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 2005;62:617-27.
24. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 2005;62:593-602.
25. Hasin DS, Goodwin RD, Stinson FS, Grant BF. Epidemiology of major depressive disorder: results from the National Epidemiologic Survey on Alcoholism and Related Conditions. Arch Gen Psychiatry 2005;62:1097-106.
26. Lange M, Petermann F. [Influence of depression on fibromyalgia : A systematic review]. [Article in German] Schmerz 2010;24:326-33.
27. Gracely RH, Ceko M, Bushnell MC. Fibromyalgia and depression. Pain Res Treat 2012;2012:486590.