

Fibromyalgia Syndrome in Children and Adolescents: Clinical Features at Presentation and Status at Follow-up

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ABSTRACT. *Objectives.* To 1) describe the characteristic features of fibromyalgia syndrome (FS) in a pediatric population, 2) note similarities and differences with FS in adults, and 3) determine outcome after treatment.

Setting and Design. The Pediatric Rheumatology Clinic at the University of Rochester Medical Center is staffed by two pediatric rheumatologists and serves as a regional subspecialty referral service with ~450 annual patient visits, of which ~120 are initial evaluations. A retrospective medical record review from 1989 to 1995 was used to identify and describe the study population, and a structured telephone interview served to determine current status and response to treatment.

Results. A total of 45 subjects were identified (41 female; 42 white; mean age, 13.3 years), of whom 33 were available for telephone interview at a mean of 2.6 years from initial diagnosis (0.1 to 7.6 years). Of a possible 15 symptoms associated with FS, subjects reported a mean of 8, with >90% experiencing diffuse pain and sleep disturbance. Less frequent were headaches (71%), general fatigue (62%), and morning stiffness (53%). The mean cumulative number of tender points summed over all visits was 9.7 (of 18). Telephone interviews showed improvement in most patients, with a mean positive change of 4.8 on a self-rating scale of 1 to 10 comparing current status to worst-ever condition.

Conclusions. FS in patients referred to a pediatric rheumatology clinic is characterized by diffuse pain and sleep disturbance, the latter being more common than that in adults. The mean number of tender points summed over all visits is fewer than the criterion of 11 established for adults at a single visit. The majority of patients improved over 2 to 3 years of follow-up. *Pediatrics* 1998;101:377-382; *fibromyalgia syndrome, pediatric rheumatology, pain.*

ABBREVIATIONS. FS, fibromyalgia syndrome; ACR, American College of Rheumatology.

Fibromyalgia syndrome (FS) is a noninflammatory disorder characterized by prominent symptoms of diffuse pain and specific tender points found on physical examination. The American College of Rheumatology (ACR) criteria state that there must be no other diagnoses to explain the illness.¹ In a population-based Swedish study,² 1% of

900 randomly selected adults had FS, whereas medical referral-based prevalences have been significantly higher. In all series, women are much more commonly affected than are men. Beginning in the early 1900s, this syndrome originally was referred to as fibrositis, but a clear and consistent definition was lacking.³ Despite early discussions including inflammation as a part of fibrositis, later research has noted the absence of histologic evidence for inflammation of the muscles and/or connective tissue.⁴ As a result of this work and by consensus, the term fibromyalgia has replaced fibrositis, although a precise etiology remains unidentified. A disturbance in stage 4 or delta wave sleep has been observed in patients with FS.^{5,6} With the knowledge that growth hormone secretion peaks during stage 4 sleep, more recent work has focused on abnormalities in somatomedin C levels in these patients.⁷

In the absence of laboratory or histologic confirmation of FS, a set of clinical features observed have come to be used to establish the diagnosis. Results from a large multicenter study designed to establish classification criteria for FS in adults involving 293 patients with FS and 265 controls were published in 1990.¹ Although questioned subsequently,⁸ these ACR diagnostic criteria of 1) diffuse pain and 2) a minimum of 11 (of 18) tender points have served as a clinical definition for diagnosing adults with FS. Associated symptoms (and prevalence in the study population) noted in this paper were fatigue (81%), stiffness (77%), sleep disturbance (75%), changes with weather (67%), paresthesias (63%), headaches (53%), anxiety (48%), and others.

Less work has been published concerning children, but FS ranked as the 12th most common new-patient diagnosis identified by pediatric rheumatologists, representing 2.1% of new diagnoses made among children and adolescents in a US pediatric rheumatology clinic disease registry.⁹ The most recent update of this registry (October 1996) reveals that FS has risen to 7.65% of new diagnoses (S Bowyer, personal communication, March 28, 1997). In our clinic practice, FS has ranked third, accounting for a similar 7% frequency of new diagnoses over the past 3 years. In a population-based study of 338 school children, Buskila and colleagues¹⁰ found a 6.2% (21 children) prevalence of FS using the 1990 ACR diagnostic criteria. Yunus and Masi¹¹ reported a series of 33 patients with FS (mean age, 14.7 years) seen in a rheumatology clinic in which criteria of diffuse pain and five or more tender points were used for diag-

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nosis. In this group, a mean of 13 tender points were found, and prominent symptoms (and prevalences) in addition to diffuse pain were waking up feeling tired (100%), fatigue (91%), stiffness (79%), poor sleep (67%), subjective swelling (61%), headaches (54%), paresthesias (36%), and irritable bowel syndrome (27%). At a mean of 18.8 months after diagnosis, these children revealed overall improvement, with no patients rating their symptoms as severe. In another study, 15 pediatric patients (mean age, 13 years) presenting to a rheumatology practice showed similar symptom frequencies, although fewer experienced subjective swelling (33%) and waking up tired (73%), and a mean of 14 tender points was found. Response to therapy also was good, but the duration of follow-up in this group was not specified in the paper.¹² More recently, Buskila and coworkers¹³ reported on 15 of their original 21 school children with FS, and their outcome after a mean of 30 months also was good.

Over the past 7 years, we have looked for FS in children and noted that its presentation seemed to differ from what has been described in adults in two important aspects: 1) a high prevalence of sleep disturbance in these children, and 2) the frequent finding of fewer than 11 tender points on physical examination. Studies in children appearing before the publication of the ACR criteria for FS (as described above) have certainly reported high rates of sleep disturbance, but tender point counts have tended to be similar to the standard for adults.¹⁰⁻¹⁵ The current retrospective, descriptive study was performed to characterize further FS as it presents in our pediatric population, to expand on what has been published previously regarding follow-up of children, and to propose an adaptation of the adult diagnostic criteria that would better suit the diagnosis of the disorder in younger patients.

The Pediatric Rheumatology Clinic at the Children's Hospital at Strong, University of Rochester Medical Center, Rochester, NY, is staffed by two pediatric rheumatologists (D.M.S. and J.B.) and a social worker and provides consultation and ongoing care to patients from western New York state and northwestern Pennsylvania. Over the period of study, ~120 new patients were seen annually, with a total of ~450 visits per year.

SUBJECTS AND METHODS

Subjects

The subjects eligible for the study were patients seen in the clinic from January 1989 to June 1995 with a confirmed diagnosis of FS by a pediatric rheumatologist. Prevailing standards used in evaluating these patients were the assessment of diffuse pain (pain above and below the waist and including both the right and left sides of the body), fatigue, tender points (although any number was considered significant), poor sleep (nocturnal awakening, physical restlessness while asleep, awakening feeling unrefreshed), and other associated symptoms described in the literature (see "Methods"). All patients were investigated as to alternative diagnoses (rheumatologic and others) to explain their symptoms, and these evaluations revealed the absence of other organic pathology. A total of 45 patients met this entry criterion. All of these patients were seen at the same or different visits by both pediatric rheumatologists who concurred as to the diagnosis.

Methods

Based on the ACR criteria for the classification of FS,¹ a checklist of 16 symptoms was compiled and then completed for each subject using two sources of information: 1) documentation in the medical record (both the hospital-based clinic chart and the pediatric rheumatologist-composed letters sent back to the referring physician after each visit), and 2) a structured telephone interview designed to fill in data not available from the written record. The telephone interview also included questions asking patients to describe their current and past status and perceived efficacy of treatment. The medical record checklist included demographics, height and weight at first clinic visit, cumulative number of visits, and activity level measured as number of sick days per month. The characteristic features of FS inventoried were general fatigue, morning stiffness (mild, <15 minutes; moderate, 15 minutes to 1 hour; severe, >1 hour), morning fatigue, tiring easily, and generalized pain. In addition, we asked about other features described in the literature as commonly associated with FS including global anxiety; paresthesias; headache; swollen feeling in soft tissues; dysmenorrhea; irritable bowel syndrome (recurring episodes of abdominal cramping and diarrhea alternating with constipation); depression (persistent sadness, anhedonia, spontaneous crying, feelings of hopelessness and helplessness); Raynaud's phenomenon; change in symptoms with weather changes; feeling worse with exercise; and family history of FS, depression, or rheumatoid arthritis. The cumulative number of tender points (standardized examination by D.M.S. and J.B. using 4-kg pressure as measured by a pinch strength meter¹⁶ and including control sites) in each patient across all visits to the clinic was determined as well as the types of treatment implemented. In the setting of a clinically consistent presentation, the authors accepted as few as one tender point as meeting that diagnostic criterion. The presence or absence of concurrent hypermobility (three or more of the five physical signs of hypermobility)¹⁷ and/or patellofemoral pain syndrome (knee pain, locking, instability with crepitus, and tenderness on patellar tracking¹⁸) also was recorded. Measurement of orthostatic blood pressure change was not included in the examination.

During the telephone interview, patients were asked to score their level of disability attributable to FS, using a rating scale of 1 to 10, in which 1 represented complete disability and 10 indicated no disability. Subjects assigned a score to the following five different clinical states: how they were functioning 1) currently; 2) 1 year ago; 3) on average; 4) the best they have been since symptoms started; and 5) the worst they have ever been. The numbers assigned these latter two states determined a functional range for each patient, thereby providing a context in which to interpret their status ratings for past and present. The rating scale was not validated otherwise before use in this study. The data were entered into Epi-info (an IBM PC-DOS-based statistical program), and means, SD units, and percentages were used for descriptive analyses. Comparisons of symptom prevalences reported in the adult literature with those reported in our study population were not subjected to statistical testing. The study protocol was approved by the human subjects institutional review board, and consent was obtained from patients and parents before the telephone interview.

RESULTS

Of 45 patients eligible for the study, all had medical record data available, whereas 33 (73%) of the 45 also were reached by telephone. Of the 12 subjects for whom telephone interview data were not obtained, 1 refused, 1 had run away from home (whereabouts unknown), and 10 had either moved without providing a forwarding telephone number or could not be contacted despite multiple attempted calls on different days and at different times (Table 1). In the original cohort of 45, 41 were female. They were predominantly white (93%) and had a mean (\pm SD) age of 13.3 ± 2.4 years (range, 9 to 20 years). The mean number of clinic visits documented in the medical record was 4.8 ± 3.6 , with a range of 1 to 15. The 33 subjects contacted by telephone did not differ

TABLE 1. Description of Pediatric Population With FS

	Group I Medical Record Review	Group II Telephone Interview Follow-up
<i>n</i>	45	33
Female (%)	41 (91)	31 (94)
Male (%)	4 (9)	2 (6)
White (%)	42 (93)	33 (100)
Age in years*	13.3 ± 2.4 (9–20)	13.4 ± 2.4 (10–20)
Number of clinic visits*	4.8 ± 3.6 (1–15)	4.8 ± 3.5 (1–13)
Years since diagnosis*	3.5 ± 2.4 (0.2–15.4)	3.1 ± 1.6 (0.1–7.6)

* Mean ± SD (range).

significantly by demographic characteristics (31 female, all white, mean age of 13.4 ± 2.4) or number of clinic visits (4.8 ± 3.5; range, 1 to 13). Using the date of telephone interview as the most recent encounter, time from initial diagnosis ranged from 0.1 to 7.6 years, with a mean of 3.1 ± 1.6 years. For the group of 12 patients not reached by telephone, the date of attempted telephone contact was used to determine the time since diagnosis. Two patients in this group had been diagnosed substantially earlier than the remainder of the group, accounting for the slightly higher mean (3.5 ± 2.4) and wider range (0.2 to 15.4) recorded for the overall study population (Table 1, Group I).

Symptoms documented in the medical record of study subjects are shown by rank order of prevalence in Table 2, middle column. There was a mean of 8.0 ± 2.8 (of a possible 16) associated characteristics per patient, with >90% of subjects experiencing diffuse pain (93%) and sleep disturbance (96%). Headaches (71%), general fatigue (62%), and morning stiffness (53%) were the next most commonly reported symptoms. Fewer than half of subjects experienced any of the following: morning fatigue, depression, feeling worse with exercise, subjective swelling, irritable bowel symptoms, dysmenorrhea, illness changes with weather, paresthesias, global anxiety, and lack of energy. Raynaud's phenomenon was found in 13% of patients. Table 2, column three,

TABLE 2. Rank Order of Symptoms in Children and Adolescents With FS as Compared With Adults:* Medical Record Review (N = 45)

Symptom	Percent of Pediatric Patients	Percent of Adult Patients* (Rank)
Sleep disturbance	96	75 (4)
Diffuse pain	93	98 (1)
Headaches	71	53 (7)
General fatigue	62	81 (2)
Morning stiffness	53	77 (3)
Morning fatigue	49	—
Depression	43	32 (10)
Feels worse with exercise	42	—
Subjective swelling	40	—
Irritable bowel	38	30 (11)
Dysmenorrhea	36	41 (9)
Changes with weather	36	67 (5)
Paresthesias	24	63 (6)
Global anxiety	22	48 (8)
Lack of energy	18	—
Raynaud's phenomenon	13	17 (12)

* From Wolfe et al.¹

lists for comparison the prevalences and rank order of these same symptoms as published in the description of an adult FS population.¹

The cumulative number of different tender points (summed over all recorded visits) was a mean of 9.7 ± 4.3 (of 18) per patient with a possible range of 1 to 18. Interestingly, 18 patients (40%) of the 45 also carried a diagnosis of hypermobility syndrome, and 15 (33%) had been diagnosed with patellofemoral pain syndrome.

Additional data obtained via the structured telephone interview in which each of 15 symptoms was queried specifically revealed a somewhat different perspective (Table 3). Although diffuse pain and sleep disturbance continued to be quite prevalent (94% of subjects for each), other symptoms ascended in the ranking such that >80% of patients reported having experienced general fatigue (97%), morning stiffness (88%), morning fatigue (82%), headaches (82%), and changes with weather (82%). In these interviews, a mean of 11.4 ± 2.3 (range, 7 to 15) symptoms per patient were found to have been experienced at some point over the duration of the illness. The Figure compares the prevalences of both initial (from the medical record) and cumulative (from the telephone interview) symptoms.

The telephone interview was also used to determine the self-reported course of the disease (Table 4). Using the 10-point scale described previously, the mean of subjects' ratings of their current status was 6.9 ± 1.6, whereas they described their condition 1 year ago as a mean score of 5.1 ± 3.0. When asked to assign a rating to their usual or average condition over the duration of their illness, the mean was 5.7 ± 1.3. The responses for "the worst you've ever been" and "the best you've ever been" were means of 2.2 ± 1.3 and 8.6 ± 1.2, respectively. Thus, the difference between current status (6.9) and "worst ever" (2.3) was 4.8, whereas the difference between current status and "best ever" (8.6) was 1.7, suggesting that overall, these patients were doing better.

All patients in the study had received standard therapy for FS including low-dose tricyclic antidepressant medication, moderate exercise (beginning with brisk walking for 20 minutes 3 times per week

TABLE 3. Rank Order of Symptoms in Children and Adolescents With FS: Telephone Interview Follow-up (N = 33)

Symptom	% of Patients
General fatigue	97
Sleep disturbance	94
Diffuse pain	94
Morning stiffness	88
Morning fatigue	82
Headaches	82
Changes with weather	82
Lack of energy	67
Depression	61
Subjective swelling	59
Global anxiety	58
Irritable bowel	46
Dysmenorrhea	42
Feels worse with exercise	39
Paresthesias	36
Raynaud's phenomenon	30

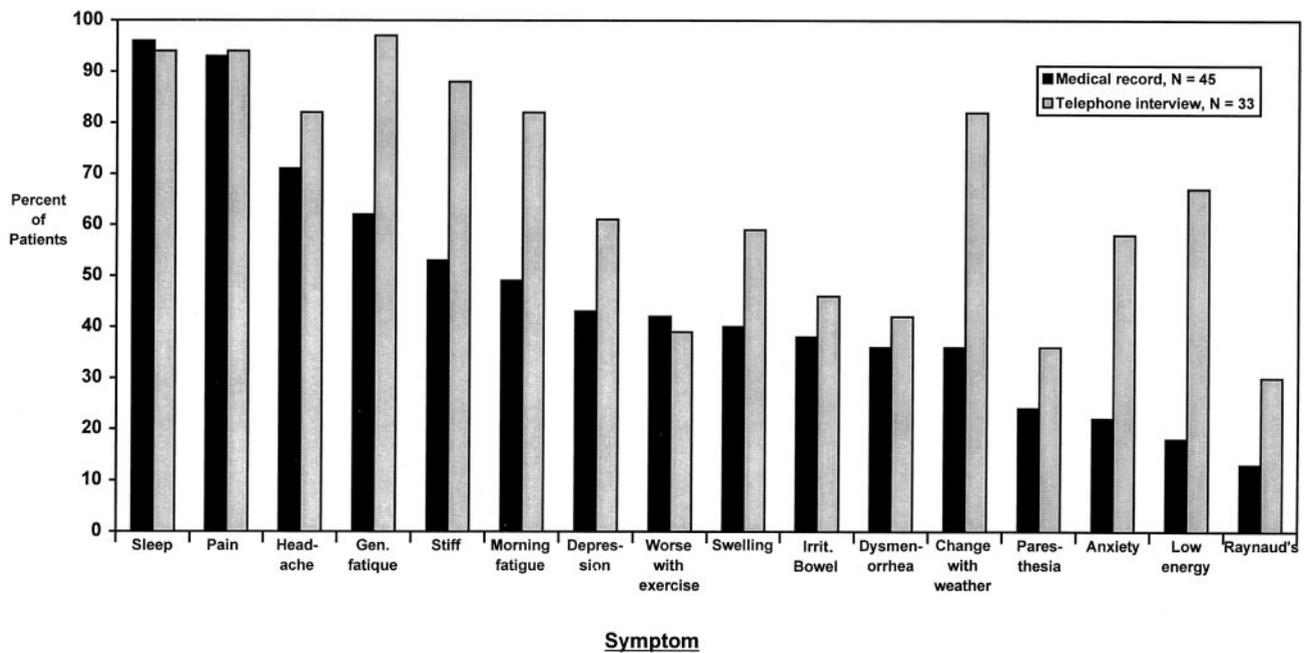


Figure. Initial (medical record) and cumulative (telephone interview) symptoms in children and adolescents with FS.

TABLE 4. Self-ratings of Illness Severity Among Children and Adolescents With FS (N = 33)

Question	Rating Mean ± SD (Range)
How are you now?	6.9 ± 1.6 (3–10)
How were you 1 year ago?	5.1 ± 3.0 (1–10)
How are you on average?	5.7 ± 1.3 (3–9)
The worst you've ever been?	2.2 ± 1.3 (1–5)
The best you've ever been?	8.6 ± 1.2 (6–10)

1 indicates Complete disability; 10, no Disability.

and progressing as tolerated), and nonsteroidal antiinflammatory drugs or over-the-counter analgesics (as needed). Medical record data indicated eventual positive response to treatment in all subjects, although exacerbations and remissions were typical over the course of the disease. Those subjects who participated in the telephone interview were asked to identify the different modes of treatment they had tried. The most commonly prescribed preparation was cyclobenzaprine (30/33 subjects, between 5 and 30 mg, nightly) followed by nortriptyline (12/33, 10 to 40 mg, nightly) and amitriptyline (8/33, 5 to 40 mg, nightly). Patients also were asked to indicate what they would recommend for other patients with FS. Seven participants had no suggestions, but statements of encouragement and positive attitude were offered by 13 patients (eg, "Have a positive outlook," "Hang in there," "Believe in yourself," etc), followed in frequency by the advice to exercise (10 patients). Use of medication was less commonly recommended by subjects (cyclobenzaprine, 3; nortriptyline, 1; naproxen, 1).

DISCUSSION

Relative to the volume of literature on FS in adults published in the past 15 years, we found a limited number of studies concerning children and adoles-

cents.^{6,10–15,19} Our own clinical experience had suggested that FS is not a rare or unusual diagnosis made in newly referred patients (7% of new patients, or the third most frequent diagnosis in our clinic), and the presentation seemed to be somewhat different from that reported among adults. The data we describe in this report support our initial suspicion. Although diffuse pain is almost universal (as is the case in adults), sleep disturbance is equally important in establishing the diagnosis. Although our reported sleep disturbance prevalence (96%) is higher than that of Roizenblatt et al,⁶ the definitions differ. We accepted any manifestation of disrupted sleep, as described in "Subjects," whereas Roizenblatt et al⁶ listed frequencies separately for morning fatigue (56%), motor agitation (62%), and nonrestorative sleep (44%). We suspect that if these three symptoms had been pooled, the collective prevalence would have been higher. Furthermore, the information gathered in the telephone interviews suggests a possible cumulative effect of FS over time. As documented in the medical record, patients experienced a mean of 9.7 associated symptoms, whereas at follow-up, this had increased to 11.4. The more structured and closed-ended nature of the telephone questionnaire may account for some of this increased symptom detection (ie, ascertainment bias), but more likely, it is an evolution of the illness even despite generally improved functional status.

Furthermore, the number of tender points in younger patients appears to be less than that observed in adults. Even summing the number of different tender points over all visits resulted in a total <11, whereas this minimum number (11) established for adults was based on observations made at only a single (the initial) visit. Tender point locations are relatively stable over time, but our patients did manifest additional sites over the first few rheumatology clinic visits. Yunus and Masi¹¹

used ≥ 5 as the tender point count in their study of 33 patients (with control subjects never having >4), but the mean number of tender points per patient was 13. Our findings support the use of a number <11 in children. The explanation for this apparent difference with the adult criterion is not clear. Perhaps patients diagnosed during adolescence are at a very early stage in illness progression and therefore have fewer areas of tenderness than do patients identified in adulthood who are more likely to have had untreated disease for a longer period before diagnosis and treatment. Perhaps early intervention alters disease course. Interestingly, consistent with other reports,^{14,20} we also found an association of FS with hypermobility syndrome. This disorder could be expected to overlap with the symptom of diffuse pain, and recurrent or chronic pain experienced by patients with hypermobility syndrome might provoke a sleep disturbance over time, but tender points are not a shared disease manifestation.

Information from patients regarding the status of their illness was also both revealing and heartening. These young people have significant ups and downs over the course of their disease (as evidenced by the "worst ever" and "best ever" rating scale means ranging from 2.2 to 8.6), but overall, they seem to do well and improve over time. Their current status was consistently better than that for 1 year ago, although not as high in function as they had ever been. Although the 33 patients who participated in the telephone interviews may represent a group biased toward those who were more willing to be questioned because they were feeling better than those who were not reached, we have no evidence to that effect. The 12 subjects not interviewed did not actively refuse; rather, we were unable to locate them. It is important to note that the 2 patients with the longest disease duration were among those not contacted by telephone. Poorer outcome in these 2 subjects would have influenced our severity of illness data somewhat. One might argue that were we to follow patients much longer (eg, 15 years), their status would be found to have deteriorated. This cannot be addressed from our data, but we did assess patients at 7.6 years from diagnosis and they were doing well. Previously cited outcome studies of smaller samples of children with FS over shorter follow-up durations have demonstrated improvement.^{12,13} Thus, it would appear that most children and adolescents with FS can expect to improve over time (we believe to a great extent in response to treatment) and maintain a reasonable level of function even in the context of periodic disease exacerbations.

We have found that our longer-term patients have been able to anticipate events and experiences that will precipitate activity of FS and so institute presumptive therapy. As an example, several young women who have gone on to college have become quite adept at resuming or focusing management of their illness more diligently when confronted with such potential disease stressors as impending final examinations and/or disrupted sleep-wake schedules. A combination of the therapy itself, as well as the confidence and reassurance that flare-ups can be

moderated and shortened in duration, certainly results in consistently higher levels of functioning for patients. Furthermore, it is important for the rheumatologist to discuss the natural history and favorable prognosis of pediatric or juvenile FS with patients and their families. Many of them have presented to us after a rather extensive and nondiagnostic work-up, which often has resulted in discouragement, uncertainty, and fear. With positive identification of the illness by the physician, many patients are able to proceed enthusiastically with treatment rather than remaining burdened and preoccupied with anxieties over a grave but as yet undetected diagnosis lurking in the background. Beside the reassurance associated with assigning a disease label, being able to tell patients that their response to treatment and course over time is likely to result in significant recovery frequently leads to a positive attitude shift. This cognitive therapy aspect of an integrated disease management strategy has been suggested by others as well.²¹ What we have experienced in these patients also bears on the advisability of FS support groups. Whereas sharing ideas and feelings with others similarly afflicted can yield much that is positive, groups of adults with FS may be more likely to relate a persistent and unrelenting disease course that paints a misleading and grim picture for younger people. Although this is not true for all FS support groups, younger patients may do better with patients of similar age.

Limitations

This study carries limitations, as one would expect from a retrospective, chart-review design. Over the years included in the protocol, a standardized data collection form for FS was not a part of the medical encounter and record. Thus, one cannot be certain that all patient interactions followed identical formats. However, only two rheumatologists provided care and documentation of all patients throughout the period of study, and the data-gathering techniques were reasonably consistent. As for accuracy of diagnosis, our FS prevalence of 7% is comparable with the 7.65% found in the US pediatric rheumatology centers' disease registry. This would suggest a consistency of patient identification locally and nationally. Comparison of our chart- and telephone-derived information with findings reported in a prospective designed adult FS study¹ is potentially flawed by different methods of data ascertainment, but bias would be in the direction of less difference. Thus, the contrasts that persisted (sleep disturbance prevalence and tender point count) are likely to be valid.

We chose to sum the reported tender points over all visits (rather than just at the initial encounter) in an attempt to capture the maximum number. In this way, we provided the most robust challenge of our hypothesis that fewer tender points exist in pediatric patients. Despite this strategy, we still observed a lower tender point count than that reported in adults. The telephone interviews were conducted in a structured format with both open- and closed-ended questions. Information provided by patients

in the latter group certainly resulted in a complete accounting of symptoms as well as of relative clinical status. The increase in symptom reporting over time may be attributable in part to a detection bias introduced by the more routinized telephone interview compared with medical record data. We do not believe this to be substantial, however, because again the latter included all clinic encounters, during which the 16 symptoms were extremely likely to have been investigated even if they were not queried systematically at a single visit. Nevertheless, generalizability of our findings to larger populations must be considered in the context of our modest clinic referral volume (~120 new patients annually).

In summary, FS in children and adolescents is not rare and is similar to the disease in adults, with the following important exceptions. 1) Sleep disturbance and nonrestorative sleep is highly prevalent. 2) Fewer than 11 tender points are required (especially at an initial visit) to establish the diagnosis. 3) The prognosis is quite good. A prospective study comparable in design with the diagnosis criteria study in adults,¹ including a comparison group of sequentially presenting patients with pain but without FS, should be performed to test our preliminary findings.

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