High prevalence of fibromyalgia among Israeli school teachers

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ABSTRACT

Objective. *Fibromyalgia syndrome (FM), characterised by widespread pain and fatigue, has frequently been associated with stress in various models, including workplace related stress. In the current study we have evaluated the prevalence of FM symptoms among Israeli school teachers and have attempted to correlate such symptoms with work-related stress.*

Methods. *Individuals, all currently employed as school teachers in Israel, were recruited to the study. Participants were asked to answer a questionnaire evaluating symptoms of FM, based on the current diagnostic criteria, which include the widespread pain index (WPI) and the symptom severity scale (SSS). Participants were further questioned regarding stressful experiences during their work and about post-traumatic symptoms as well as regarding work performance and motivation.*

Results. *321 participants were recruited (79.4% female, 20.6 male). 30 individuals (9.3%) of the sample fulfilled current criteria for a diagnosis of FM, with a rate of 11.4% among females and 1.5% among males. While specific symptoms such as fatigue and irritable bowel symptoms were negatively correlated with work performance, no significant difference was found between teachers with or without fibromyalgia regarding work attendance and performance. FM symptoms were strongly correlated with work-related stress and were strongly correlated with post-traumatic stress disorder (PTSD) related symptoms. Motivation to work was significantly lower among teachers fulfilling FM criteria, but other performance-related parameters did not differ between teachers fulfilling or not fulfilling FM criteria.*

Conclusion. *Fibromyalgia symptoms are highly prevalent among Israeli school teachers, and may be related to stress encountered in the classroom. These results are relevant both for physicians treating individuals involved in educational careers as well as for educators and decision-makers involved in planning and managing educational strategies.*

Introduction

Fibromyalgia syndrome (FM) is a chronic pain condition, clinically characterised by the occurrence of widespread pain, tenderness and fatigue, accompanied by a broad spectrum of associated functional symptoms (1). While the precise aetiology and pathophysiology of FM remain incompletely understood, recent years have witnessed significant progress towards elucidating the mechanisms involved in pain chronicisation and in additional aspects of FM (2). Thus, the genetic background behind FM and other chronic pain conditions has been extensively studied (3-5) and great progress has been made towards understanding the central nervous system alterations in pain transmission and processing, which appear to underlie the clinical manifestations of FM (6-8). In addition, the role of several triggers, which appear to be related to either the occurrence or exacerbation of FM, has been studied and described, *e.g.* physical trauma (9, 10) and infection (11-13). Among these triggers, a considerable amount of research has been invested in analysing the role of stress in instigating the pathophysiological cascade leading to the development of FM. Various models of stress have focused attention in this context, ranging from early life events such as preterm birth (14), through childhood adversities including sexual abuse (15-17), to the acute stress related to catastrophic events such as war, terrorism, accidents and natural disasters (18-21). More specifically, workplace-related stress such as bullying has previously been tied to the development of FM (22).

School teachers represent a specific and somewhat unique occupational

population. While individuals involved in this vocation are typically considered to be highly motivated and even idealistic (23-25), the occupation itself is notorious for being highly demanding and stressful. The constant interaction with a large group of children, including those who may be disruptive, hyperactive or even aggressive, as well as the shear necessity to maintain a high level of alertness, concentration and physical effort, interact in making this lifetime occupation considerably challenging. Workplace bullying has also been specifically described among school teachers (26), and appears to have significant deleterious effects on health. Thus, considerable research has been focused on evaluating elements of burnout among school teachers (27-29) and strategies for stress-reduction have been implemented (30, 31). In addition, previous studies have focused on specific pain syndromes common among school teachers, including low back pain (32), neck pain (26, 33) etc.

In the current study we have attempted to evaluate the prevalence of FMS among a sample of Israeli school teachers. Our hypothesis was that in the view of the above outlined association between FM and stress, school teachers may suffer from an increased prevalence of FM symptoms, and that these symptoms may be correlated with the levels of stress to which they are exposed in the course of their occupation. Such findings could carry significant consequences both for healthcare workers treating individuals working in education as well as *vis-à-vis* policy makers involved in designing the occupational conditions under which such work is carried out.

Methods

The study was conducted as a targeted survey distributed to Israeli school teachers in primary schools and high schools. Study questionnaires were distributed by reaching out to school head masters and were also sent to students of education. Questionnaires were distributed either by mail or online, using a *google docs* format the study questionnaire included basic demographic data, including age, marital status, education, religion and medical history. In addition, details were collected regarding work-related role, including number of weekly hours of teaching, years on the job, and type of educational role (home-room teacher, professional teacher etc.). Teachers were further questioned as to which of their workplace conditions are perceived of as causing most work-related stress, *e.g.* interactions with peers, with school directors, with professional supervisors, parents of students, as well as regarding the effect of physical conditions such as number of students in the classroom, presence of students with special needs (*e.g.* students suffering from attention deficit disorder), crowding, lack of air-conditioning and the need to teach subjects one is not specialised in.

Assessment of trauma and post-traumatic symptoms

The presence of post traumatic symptoms was screened for using the post-traumatic diagnostic scale (34) a version of which has previously been used by our group for assessing post traumatic symptoms (35).

Assessment of pain

Participants were screened for the presence of widespread pain, fatigue, sleep disorders, joint stiffness, paresthesia, irritable bowel symptoms, anxiety, depression, headache, back pain and difficulties with concentration. Duration of pain was recorded, as well as medical treatments utilised and specialist referrals performed. In addition, the FM diagnostic criteria questionnaires, *i.e.* the widespread pain index (WPI) and the symptoms severity scale (SSS) were included.

Lastly, teachers were questioned about the relation between their health conditions and their work performance, including questions about work motivation, work absence, work quality and relations with peers, parents and students.

Statistical analysis

Based on the responses of participants to the questions comprising the WPI and the SSS, it was possible to identify participants fulfilling diagnostic survey criteria of FM and to compare these individuals with participants not fulfilling these criteria.

Pearson correlations were calculated for the relationship between FM symptoms and traumatic events and for the relationship between work conditions and FM symptoms. T-tests were used in order to compare participants fulfilling FM criteria to participants not fulfilling criteria, regarding work performance.

SPSS 21 software was used in all calculations.

Results

321 individuals completed the study questionnaire, including 255 females (79.4%) and 66 males (20.6%). 30 individuals, including 29 females and one male, fulfilled ACR diagnostic criteria for FM, for a total prevalence of 9.3% of the entire sample. The prevalence among females and males was 11.4% and 1.5% respectively.

253 participants (78.8%) were Jewish, while 66 (20.6%) were Muslim and 2 were Christian. No significant difference was found regarding the prevalence of FM between these religious groups. We further analysed Jewish individuals based on their self-reported level of religiosity (classified as "secular", "conservative", "religious" and "ultra-orthodox"). No significant difference was found between these groups.

In order to evaluate the effect of teacher's professional role on the occurrence of FM symptoms, we analysed the prevalence of FM among different categories of teachers. These professional categories included teachers working only as either class educators or as professional teachers (*i.e.* teaching a specific subject), compared with teachers acting both as class educators and teaching specific subjects. We further made the comparison with teachers fulfilling an organisation-wide role (coordinators etc.) as well as teachers acting in multiple roles, *e.g.* acting as class educators, teaching specific subjects and also acting in organisation-wide roles.

These groups were compared using a χ^2 calculation. Among individuals acting in at least 3 such roles, 5/16 (31.2%) fulfilled FM criteria, compared with

Table I. Correlation between work conditions (stress) and symptoms.

	School management	General supervisor	Professional supervisor	Colleagues	Parents	Administr.	Students	Student composition	Physical conditions	Crowded schedule	Teach non specialty	Conflict home/work
FS	.171**	.148**	.136*	.075	.140*	.046	.125*	.220**	.158**	.226**	.099	.243**
WPI	.080	.116*	.088	.114*	.069	.094	.070	.142*	.127*	.119*	.051	.090
SSS	.208**	.140*	.146*	.023	.168**	-.005	.142*	.234**	.147**	.265**	.116*	.317**
Sleep disorders	.400**	.224**	.163**	.275**	.396**	.207**	.408**	.493**	.405**	.442**	.348**	.450**
Fatigue	.415**	.255**	.271**	.160**	.350**	.156**	.393**	.535**	.421**	.529**	.353**	.577**
Joint stiffness	.153**	.113*	.110	.118*	.047	.255**	.122*	.150**	.144*	.132*	-.027	.142*
Paresthesia	.183**	.189**	.221**	.158**	.070	.329**	.067	.151**	.130*	.120*	-.002	.142*
Feeling of swelling	.293**	.191**	.137*	.307**	.182**	.354**	.136*	.158**	.151**	.230**	.053	.195**
IBS	.283**	.225**	.236**	.173**	.193**	.156**	.154**	.257**	.218**	.275**	.181**	.275**
Anxiety	.294**	.342**	.258**	.245**	.320**	.194**	.239**	.303**	.217**	.267**	.195**	.309**
Depression	.304**	.316**	.218**	.232**	.264**	.206**	.198**	.223**	.109	.204**	.121*	.234**
Concentration	.288**	.278**	.204**	.149**	.267**	.195**	.187**	.271**	.231**	.267**	.174**	.295**
Memory	280**	.234**	.168**	.138*	.289**	.205**	.179**	.236**	.185**	.251**	.155**	.304**
Headache	.351**	.234**	.249**	.189**	.349**	.138*	.330**	.345**	.327**	.373**	.301**	.403**
Back pain	.195**	.169**	.186**	.160**	.186**	.133*	.145*	.246**	.219**	.235**	.159**	.238**
Widespread pain	.162**	.160**	.125*	.207**	.175**	.140*	.193**	.224**	.201**	.158**	.103	.168**

FS: fibromyalgia score; WPI: widespread pain index; SSS: symptom severity scale.
*p<0.05; **p<0.01.

Table II. Pearson correlation between FM symptoms and PTSD-related symptoms in the study group (n=321).

Sad thoughts	FS	WPI	SSS	Sleep disorders	Fatigue	Joint stiffness	Paresthesia	Swelling	IBS	Anxiety	Depres.	Concentr.	Memory	Headache	Back pain	Widespread pain
Nightmares	.216**	.167**	.205**	.102	.229**	.142*	.290**	.236**	.257**	.269**	.239**	.202**	.210**	.063	.144*	.180**
Re-experiencing traumatic event	.150*	.117*	.141*	.124*	.211**	.101	.238**	.169**	.163**	.186**	.162**	.148*	.141*	.016	.075	.139*
Feeling down	.151*	.122*	.138*	.158**	.215**	.130*	.281**	.194**	.259**	.299**	.243**	.165**	.166**	.065	.158**	.201**
Physiological sensations	.239**	.202**	.212**	.160**	.235**	.131*	.269**	.184**	.264**	.356**	.359**	.255**	.231**	.135*	.172**	.257**
Avoiding thoughts	.156**	.140*	.131*	.104	.174**	.094	.284**	.179**	.217**	.266**	.237**	.162**	.181**	.056	.108	.205**
Avoiding activities	.219**	.192**	.188**	.124*	.189**	.112	.201**	.100	.198**	.226**	.180**	.155*	.159**	.026	.154*	.160**
Unable to recall important part of events	177** .	.190**	.120*	.080	.146*	.081	.199**	.150*	.167**	.199**	.198**	.148*	.163**	.018	.133*	.170**
Less interest in important activities	.161**	.178**	.104	.094	.148*	.089	.218**	.136*	.138*	.144*	.196**	.119*	.131*	.007	.056	.128*
Much less participation in important activities	.193**	.207**	.130*	.114	.157**	.091	.195**	.133*	.160**	.157**	.188**	.130*	.161**	-.029	.098	.168**
Feeling cut off or isolated	.187**	.201**	.126*	.070	.129*	.040	.136*	.114	.148*	.156**	.171**	.098	.139*	-.017	.110	.201**
Feeling emotional dullness	.189**	.165**	.162**	.112	.174**	.069	.236**	.163**	.186**	.211**	.250**	.149*	.177**	.046	.138*	.237**
Feeling ones hops and plans will not be fulfilled	.149*	.129*	.129*	.074	.144*	.064	.232**	.135*	.173**	.179**	.240**	.116	.134*	.036	.084	.173**
Restlessness	.115	.107	.092	.034	.122*	.068	.189**	.110	.190**	.190**	.239**	.157**	.110	.020	.093	.205**
Hypervigilance	.273**	.194**	.272**	.193**	.248**	.146*	.277**	.177**	.271**	.296**	.342**	.267**	.262**	.147*	.219**	.300**
Sad thoughts	.148*	.179**	.081	.043	.065	.064	.196**	.191**	.181**	.143*	.187**	.137*	.129*	.009	.090	.200**

FS: fibromyalgia score; WPI: widespread pain index; SSS: symptom severity scale.
*p<0.05; **p<0.01.

14/93 (13.1%) of teachers acting as class educators and only 1/33 (3.0%) of teachers acting only in an organisation-wide role. This difference was statistically significant (χ^2 (6) = 14.72, p=.02). Educational level: 55.1% of individuals had a university first degree, 41.1% had a second degree while 3.7% had a PhD. No significant differences were observed regarding the prevalence of FM among these three categories.

Extent of employment

65.4% of teachers were employed on a fulltime basis, *i.e.* 36 weekly hours while 19.3% were employed more than 36 weekly hours. 15.3% were employed on a half -time basis or less. The prevalence of FM was highest among teachers employed on a fulltime basis (11.9%) but the difference between the groups did not reach statistical significance.

Distribution according to age

No significant difference in the prevalence of FMS was found between the age groups analysed in the study.

Assessing the relationship between workplace-related stress and FM symptoms

In order to evaluate the possible relationship between workplace related stress conditions and the occurrence of physical symptoms characteristic of FM, participating teachers were asked to indicate in a series of questions, which of the following factors they considered to be a source of stress in their workplace, on a scale of 2-10: School management, general supervisors, professional supervisors, peers/colleagues, student parents, administrators, students. Additionally, participants were asked to indicate to what extent each of the following conditions was a cause of stress: The student composition of the class (high number of students, students with ADHD/ADD, students requiring special education), lack of proper physical condition (*e.g.* lack of air-conditioning), crowded schedule and lack of flexibility, re-

quirement to teach a subject other than one's specialty, and conflicting requirements between school assignments and home responsibilities.

The symptoms evaluated included the following: sleep disturbances, fatigue, joint stiffness, paresthesia, feeling of swelling, irritable bowel symptoms, anxiety, depression, difficulty with concentration and memory, headache, backache and widespread pain. We further compared the WPI and the SSS across these workplace-condition-related categories, as well as the total Fibromyalgia Score (FS).

Table I presents the correlation between symptoms and stressful factors in the entire sample.

As can be seen in the data presented in Table I, statistically significant correlations were observed between many signature FMS features and the major causes of work related stress surveyed. Thus, the total fibromyalgia score (FS) was strongly correlated with stress related to school management, to general supervisors, to the class student composition, to the physical conditions within the class, to crowded schedules and to conflicts between work and home responsibilities. As shown in the Table, widespread pain was also strongly correlated with many of these stressful factors.

Relationship between FMS symptoms and traumatic events

In order to evaluate the possible relationship between FM symptoms and traumatic events among school teachers, in the current study we collected data regarding the occurrence of PTSD-like symptoms among participants. We subsequently analysed the correlation between FM related symptoms and PTSD symptoms. Table II presents the results of this analysis.

As shown in the Table, strong correlations were found between central FMS features such as the FS, as well as the WPI and widespread pain, and between classical PTSD-related symptoms such as avoidant thoughts, difficulty in recalling parts of a traumatic event, loss of interest in participation, hypervigilance etc. These correlations demonstrate a close association between FM symptoms and PTSD symptoms in the population studied, although causality cannot be inferred.

Table III. Comparison between FM and non-FM teachers regarding work related performance (T test, df=298).

T test comparing FM vs. non-FM	FM status	N	Mean	Std. Deviation	t
Current health status	Non-FM	257	7.5097	1.94276	5.269**
	FM	29	5.4828	2.14843	
Work attendance	Non-FM	269	8.9015	7.60965	.343
	FM	30	8.3917	8.60124	
Work performance	Non--FM	266	8.7414	5.98094	.831
	FM	30	7.8267	2.04753	
Ties at work	Non-FM	270	9.0736	6.43309	.478
	FM	30	8.5000	3.88765	
Motivation to come to work	Non-FM	268	8.31	5.950	2.416**
	FM	30	5.63	3.337	
Punctuality of arrival	Non-FM	268	9.03	5.825	.890
	FM	30	8.07	2.815	
Absence from work	Non-FM	264	8.76	11.611	-.667
	FM	30	10.33	17.042	
Leaving work early	Non-FM	262	9.52	14.066	-.005
	FM	30	9.53	17.294	
Quality of classes prepared	Non-FM	266	8.50	5.923	1.096
	FM	30	7.30	2.628	
Quality of teaching in class	Non-FM	266	9.04	8.037	.909
	FM	30	7.70	2.261	
Conducting class to one's own satisfaction	Non-FM	266	8.55	5.843	.696
	FM	30	7.80	2.172	
Efforts to raise interest and curiosity among students	Non-FM	266	8.68	5.848	.569
	FM	30	8.07	2.318	
Satisfied with amount of material covered	Non-FM	265	8.93	8.072	.449
	FM	30	8.27	1.964	
Relationship with students	Non-FM	268	8.96	5.784	.738
	FM	30	8.17	2.520	
Caring for students	Non-FM	269	9.00	5.780	.721
	FM	30	8.23	2.569	
Relations with teachers	Non-FM	268	8.79	5.830	.799
	FM	30	7.93	2.132	
Relations with school management	Non-FM	269	8.81	8.107	1.234
	FM	30	6.97	3.168	
Relations with parents	Non-FM	270	9.76	12.486	-.584
	FM	29	11.24	16.999	

Assessing the effect of FM symptoms on work performance

In order to evaluate what impact FM symptoms had on teacher professional performance, participants were questioned about a range of work performance – related parameters. This questionnaire included questions regarding attendance, motivation to reach work, punctuality of arrival, efforts invested in creating student interest, caring for students, self-assessed quality of instruction, relations with parents etc. (see Appendix 1 for full questionnaire). The results of these parameters were correlated with FMS symptoms in the entire sample and a dichotomous comparison was

also performed between participants fulfilling and not fulfilling FM criteria.

Among all work-performance parameters asked about, only "motivation to come to work" showed a significant correlation with FM parameters, including the WPI, SSS, sleep disturbances, concentration and memory difficulties, headaches, back pain and depression. When dichotomously comparing teachers fulfilling and not fulfilling FMS criteria, "motivation to come to work" as well as "general health status" were significantly lower among participants fulfilling FMS criteria (Table III).

Discussion

In the current study we have demonstrated a high prevalence of fibromyalgia symptoms among Israeli schoolteachers, roughly twice the prevalence in the general population. This central finding, which to our knowledge has not been previously reported, is a major indication of the role of workplace-related conditions in the pathogenesis of centralised pain. While the mechanisms underlying this association cannot be determined with certainty, our findings point towards the possibility that workplace-related stress and traumatic events may play a major role in the development of FM symptoms among individuals working as school teachers. Thus, our findings linking FM symptoms with trauma on the one hand and with stressful work conditions on the other hand among teachers make stress a plausible link in the association. As noted above, multiple models have previously been utilised in order to elucidate the link between stress and chronic pain in general and with FM in particular. While both acute and chronic models of stress have been described, the exact contribution of stress, in comparison to other factors such as genetics (3, 4) is hard to precisely determine. It remains likely that in FM, similar to other complex and polygenic conditions, an intricate matrix of interactions plays out between genetic susceptibility and a lifelong of more-or-less subtle exposures, which may include elements as diverse as viral infection, physical trauma, hormonal changes and stress (36). As our understanding of these nature-nurture interactions continues to broaden, it becomes apparent that even in conditioned classically described as the straightforward result of stressful exposure, *e.g.* PTSD, genetic underpinnings can be identified (37, 38). In the field of mental health, this has led to the challenging undertaking of attempting to build a multi-factorial matrix for the classification of mental health, the Research Domain Criteria (RDoC) project (39). This ambitious project, which attempts to create a framework for research on pathophysiology, with a focus on genomics and neuroscience, may serve as a model for the future understanding of other presumably central nervous system based conditions, such as FMS. Such a framework may incorporate environmental factors such as those demonstrated in the current study together with psychosocial, genetic and neuroimaging-based findings.

As noted above, workplace-related stress has previously been related to the development of FM and extensive literature attests to the relationship between workplace mistreatment and occupational outcomes such as absenteeism from work (40). In this perspective it is interesting to point out that our results did not show an increase in absenteeism or a decrease in other work-performance parameters (at least so far as can be evaluated through the self-report of participants) but did show a decrease in motivation to come to work among teachers with FM symptoms. As we did not collect data regarding the actual performance of teachers, it is hard to determine the real impact FM symptoms may have on the performance and productivity of school teachers. Nonetheless, the results of our study call attention to the necessity of carefully scrutinizing the workplace in which school teachers (as well as other critical professionals) carry out their vocation. A society-wide perspective should be combined with an epidemiological and occupational-medicine point of view in reassessing this milieu and doing what is possible in order to assure that school teachers continue to perform their vital functions for the benefit of their students and society as a whole, without jeopardising their own health.

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