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Posttraumatic stress disorder in fibromyalgia syndrome: Prevalence, temporal relationship between posttraumatic stress and fibromyalgia symptoms, and impact on clinical outcome

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ABSTRACT

A link between fibromyalgia syndrome (FMS) and posttraumatic stress disorder (PTSD) has been suggested because both conditions share some similar symptoms. The temporal relationships between traumatic experiences and the onset of PTSD and FMS symptoms have not been studied until now. All consecutive FMS patients in 8 study centres of different specialties were assessed from February 1 to July 31, 2012. Data on duration of chronic widespread pain (CWP) were based on patients' self-reports. Potential traumatic experiences and year of most burdensome traumatic experience were assessed by the trauma list of the Munich Composite International Diagnostic Interview. PTSD was diagnosed according to the *Diagnostic and Statistical Manual of Mental Disorders IV* symptom criteria by the Posttraumatic Diagnostic Scale. Age- and sex-matched persons of a general population sample were selected for controls. Three hundred ninety-five of 529 patients screened for eligibility were analysed (93.9% women, mean age 52.3 years, mean duration since chronic widespread pain 12.8 years); 45.3% of FMS patients and 3.0% of population controls met the criteria for PTSD. Most burdensome traumatic experience and PTSD symptoms antedated the onset of CWP in 66.5% of patients. In 29.5% of patients, most burdensome traumatic experience and PTSD symptoms followed the onset of CWP. In 4.0% of patients' most burdensome traumatic experience, PTSD and FMS symptoms occurred in the same year. FMS and PTSD are linked in several ways: PTSD is a potential risk factor of FMS and vice versa. FMS and PTSD are comorbid conditions because they are associated with common antecedent traumatic experiences.

1. Introduction

Chronic widespread pain (CWP), fatigue, and sleep problems are major, and additional somatic and psychological symptoms are minor diagnostic criteria of fibromyalgia syndrome (FMS), according to the preliminary 2010 diagnostic criteria of the American College of Rheumatology (ACR) [40]. FMS symptoms are associated with varying grades of disability [13]. The prevalence of FMS, according to the modified diagnostic ACR 2010 criteria, in the general German population was 2.1% [38].

A biopsychosocial model of interacting variables in the predisposition, triggering, and perpetuating of FMS has been suggested [33]. Among psychosocial variables, major negative life events

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and traumatic experiences may play a role in the predisposition to FMS. Major life events and traumatic experiences have been more frequently reported by FMS patients than by controls in clinical as well as in population samples. Sexual and physical abuse in childhood and adulthood were associated with FMS in adulthood [18,25]. The association of FMS with traumatic experiences is mediated by posttraumatic stress disorder (PTSD) [4]. The prevalence rates of PTSD in FMS patients range from 15% to 56% [10]. In FMS patients with PTSD, sudden unexpected death of a close relative or friend and diagnosis of life-threatening illness, but not physical and sexual violence, were reported to be the most frequent traumatic experiences [5]. Furthermore, a negative effect of PTSD symptoms on the severity of FMS symptoms has been reported by 2 studies [7,32].

Although the association between FMS and PTSD is well established, the temporal relationships between traumatic events and FMS and PTSD symptoms remain unclear. The following hypotheses have been suggested: (1) PTSD is a risk factor of FMS [3,27]; (2) FMS is a risk factor of PTSD [27,31]; (3) FMS and PTSD are comorbid conditions because of an association with a common antecedent factor (trauma) [27]; (4) The relationship between PTSD and FMS is mediated by a third factor, for example, depression [13,27].

Data on the temporal relationships of traumatic events and the onset of FMS and PTSD symptoms could help to test the hypotheses above. The first hypothesis would be supported if traumatic events and PTSD symptoms would predate CWP. The second hypothesis would be supported if CWP would predate traumatic events and PTSD symptoms. The third hypothesis would be supported if both FMS and PTSD symptoms would occur within the same time interval after a traumatic experience. However, data on temporal relationships of traumatic events, PTSD, and FMS symptoms have not been reported by previous studies. The aims of the study therefore were to assess in FMS patients:

(1) The prevalence and types of (potential) traumatic events and of PTSD compared to controls,
(2) the temporal relationships of traumatic events, PTSD, and FMS symptoms, and
(3) the impact of PTSD on FMS outcome.

2. Methods

2.1. Subjects

2.1.1. FMS patients

All consecutive FMS patients of 8 study centres (3 psychosomatic and pain medicine, 2 rheumatology, 1 orthopaedic surgery, 1 physical therapy, 1 complementary medicine) were screened for eligibility for study participation from February 1 to July 31, 2012. The levels of care of the study centres were as follows: 3 hospital outpatient departments (1 hospital of secondary and 2 hospitals of tertiary care); 3 inpatient departments (2 rehabilitation clinic, 1 acute care hospital); and 2 medical practices.

All consecutive patients with an established or first diagnosis of FMS of the participating study centres were asked by the physicians of these centres to take part in the study. Patients were included if the diagnosis of FMS had been established in the past or recently by one of the study physicians who were all experienced in the management of FMS patients. Because there is no gold standard of FMS case identification [13], FMS could be diagnosed by the ACR 1990 classification criteria [42], by the modified ACR 2010 diagnostic criteria [37], or by the criteria of the Association of the Medical and Scientific Societies in Germany [16]. Patients were excluded in case of somatic diseases, sufficiently explaining the majority of pain sites, who were not able to speak and read German language or were mentally handicapped. There were no other exclusion criteria.

The questionnaires were handed out by the physicians of the centres with a standardized letter explaining the focus of the study. The questionnaires were returned by the patients in a closed and anonymous envelope and kept away from the charts in a closed box. The anonymous questionnaires were sent to the study centre at the end of the study.

2.1.2. General population controls

A representative sample of the German general population was selected with the assistance of a demographic consulting company (USUMA, Berlin, Germany). The random selection was based on multistage sampling with 3 stages (according to the typical random selection procedure in national surveys in Germany). First, 258 sample point regions were randomly drawn from the last political election register, covering rural and urban areas from all regions in Germany. The second stage was a random selection of households using the random route procedure (based on a starting address). The third stage was a random selection of household respondents with the Kish selection grid. The sample was aimed to be representative in terms of age, gender, and education for the general German population. The inclusion criteria for the study were age at or above 14 years and the ability to read and understand the German language. All participants were informed about the study procedures and signed an informed consent form. In minors, the informed consent was obtained by the parents.

All subjects were visited by a study assistant and informed about the investigation. Self-rating questionnaires were presented. The subjects were instructed that several rating scales would follow without informing about the special topics of the study. The set of questionnaires included a wide range of topics other than pain and potential traumatic events, such as crying, envy, political beliefs, or adult attention deficiency hyperactivity symptoms. Thereafter, subjects completed the rating scales detailed below. The assistant waited until participants answered all questionnaires, and offered help if persons did not understand the meaning of questions.

Data collection took place between May and June 2007. A first attempt was made for 4205 addresses, of which 4055 were valid. If not at home, a maximum of 3 attempts were made to contact the selected person. The initial sample consisted of 4055 subjects, of whom 2510 (61.9%) fully participated. Reasons for dropout included the following: 3 unsuccessful attempts to contact the household or selected household member (9.7%); the household or selected household member disagreed to participate (13.8%); the household member was on a holiday break (1.6%). Furthermore 0.5% of the participants were excluded because they were not able to follow the interview because of illness; 8.6% refused to finish the interview [12]. Three hundred ninety-five randomly selected age- and sex-matched persons of a general population sample were used to establish a control group.

2.2. Measures and questionnaires

By a self-constructed *demographic and medical questionnaire*, data on marital status, educational status, lifetime and current professional status, and in FMS patients, on duration of CWP and time since FMS diagnosis, were assessed.

The Fibromyalgia Survey Questionnaire (FSQ), which includes the fibromyalgia criteria and severity scales for clinical and epidemiological studies [39], was used to assess the modified ACR 2010 diagnostic criteria and symptom severity (polysymptomatic distress) [40]. We used the validated German version of the FSQ [17].

Corresponding to the *trauma list of the PTSD module* [26] of the Munich Composite International Diagnostic Interview [37], 10

major war-related and civilian potential traumatic events were given. Additionally, an inquiry was made on witnessing one of these 10 events in a significant other person and on another potential traumatic event which had not been specified in the previous 10 potential traumatic events. In case a participant had indicated more than one potential traumatic event, he or she was asked to state the most burdensome event and the year of this event. The following questions and the determination of symptoms were then related to this specified event. An item representing the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) A2 criterion (intensive fear, shock, and helplessness) of PTSD followed [2]. In case a major life event that met the A2 criterion was reported, the diagnostic criteria for PTSD according to DSM-IV were assessed with part 3 of the Posttraumatic Diagnostic Scale (PDS) [11]. The PDS is a renowned diagnostic instrument for the assessment of PTSD in clinical study settings. It consists of 17 items that assess the 3 symptom clusters (intrusions, avoidance, and arousal). The answers referred to the occurrence in the last month on a 4-point scale ranging from 0 (“not at all”) to 3 (“several times per week/almost always”). The items cover the criteria B (intrusive re-experiencing of the traumatic event in the form of nightmares and flashbacks, with an exaggerated response to trauma-related reminders/cues), C (persistent avoidance of stimuli associated with the trauma and emotional numbing), and D (persistent symptoms of exaggerated startle response, increased physiological arousal, and sustained preparedness for an instant alarm response) according to DSM-IV. Furthermore, the duration of symptoms (E criterion: at least 1 month) and disability compared to the time before the traumatic event (F criterion) were assessed. PTSD diagnosis according to DSM-IV-TR criteria (cluster ABCDEF) was determined by the algorithm of the PDS: A1 and A2, E, and F criteria met and at least 1 B, at least 3 C, and at least 2 D criteria with scores $\geqslant 1$. The cutoffs for the symptoms severity rating categories are as follows: $\leqslant 10$ mild, $\geqslant 11$ and $\leqslant 20$ moderate, $\geqslant 21$ and $\leqslant 35$ moderate to severe, and $\geqslant 36$ severe [11]. The sensitivity and specificity of the PDS compared to the structured clinical interview for mental disorders of DSM-IV were 64% and 100%, respectively, in the German validation study [14].

Psychological distress was measured by the 4-item Patient Health Questionnaire-4 (PHQ-4) [22]. Two items cover 2 DSM-IV criteria of major depression as “0” (not at all) to “3” (nearly every day). A score of 3 or greater on the depression subscale represents a reasonable cut point for identifying potential cases of major depression or other depressive disorders. A score $\geqslant 3$ has a sensitivity of 82.9% and a specificity of 90% for the diagnosis of major depression, and sensitivity of 62.3% and a specificity of 94% for the diagnosis of any depressive disorder [23]. Two items cover 2 DSM-IV criteria of general anxiety disorder. The total score of the PHQ-4 (minimum 0, maximum 12) is a measure of psychological distress [22]. We used the validated German version of the PHQ-4 [23].

Pain-related disability was assessed by the validated German version of the Pain Disability Index [8,34]. Respondents rate the degree to which pain interferes with their functioning in 7 broad areas: family/home responsibilities, recreation, social activity, occupation, sexual behaviour, self-care, and life-support activity. Scores are assigned based on an 11-point scale ranging from 0 (no disability) to 10 (total disability). The total scores range from 0 to 70.

2.3. Statistical analysis

Up to 25% of missing data in the FSQ, PSD, Pain Disability Index, and PHQ-4 were coded with 0. If more than 25% of items in a questionnaire were not answered, the questionnaire was excluded from analysis. If more than 2 questionnaires had to be excluded and/or if >25% of the demographic and medical data were missing, the patient was excluded from analysis.

Statistical analyses were conducted with the SPSS 15.0 statistical package (SPSS Inc, Chicago, IL, USA). In addition to descriptive methods, χ^2 tests and nonparametric tests were applied to test for group differences.

2.4. Ethics

The study was reviewed and approved by the institutional ethics review board of the Medical Faculty of the Ludwig-Maximilian-University Munich (Project-Number 010-12).

There was no external funding for the study. The patients were not paid for the participation in the study.

3. Results

3.1. Demographics, and (potential) traumatic events and frequency of depression and PTSD in both study samples

Five hundred twenty-nine FMS patients were screened for eligibility; 84 patients refused to take part in the study; 35 patients could not be included due to organizational problems (absence of study physician); 15 patients were excluded because of missing data. There were no significant differences in age (mean age [SD] of excluded patients 53.8 [8.9] years; $t = -1.1$, $P = 0.32$) and gender (93.0% female, $\chi^2 = 0.01$, $P = 0.99$) between excluded and included patients. Three hundred ninety-five FMS patients were included into analysis.

The majority of FMS patients were women aged 40–60 years. The average duration of CWP was 12.8 (SD 9.7) years, and average time since FMS diagnosis was 4.5 (SD 4.9) years. Three hundred thirty-four (84.6%) participants met the type A criterion and 13 (3.3%) the type B criterion of the modified diagnostic ACR 2010 criteria of FMS.

FMS patients lived more frequently with a partner or in a family and were more frequently without a job than population controls (both *P*-values <0.001) (Table 1).

Two hundred ninety-four of 395 (74.4%) FMS patients reported at least one potential traumatic event and 278 (70.3%) at least one traumatic event. One hundred of 395 (25.3%) population controls reported at least one potential traumatic event and 69 (17.5%) traumatic events. In FMS patients, the most burdensome traumatic experiences were a terrible event not specified by the trauma list (37.5% of patients), witnessing a terrible event in another person (9.6% of patients), and sexual abuse before age 14 years (6.1% of patients). In population controls, the most burdensome traumatic experiences were witnessing a terrible event in another person (4.3%), diagnosis of a life-threatening illness (3.5%), and a terrible event not specified by the trauma list (2.8%) (Table 2). FMS patients with PTSD reported other terrible life events (51.9%), witnessing terrible life event in another person (15.1%), sexual abuse at <14 years of age (9.5%), severe physical violence (7.3%), severe accident and rape (each 3.4%), war effort and eviction (1.1% each), and prisoner (0.6%), to have been the most burdensome traumatic experience. Population controls with PTSD reported that war effort (8.3%), severe physical violence (8.3%), natural catastrophe (8.3%), witnessing terrible life event in another person (8.3%), diagnosis of life-threatening illness (16.6%), other terrible life event (24.9%), and sexual abuse at age <14 years (24.9%) to have been the most burdensome traumatic experience.

The prevalence of PTSD (45.3% vs 3.0%) and of a potential depressive disorder (65.6% vs 4.8%) was higher in FMS patients than in population controls (both *P*-values < 0.001) (Table 1). The prevalence of PTSD did not differ between the study centres (details available on request).

Table 1
Demographic and clinical data of 395 FMS patients and 395 age- and sex-matched controls.

	FMS patients (n = 395)	Population controls (n = 395)	Comparison
Female gender, n (%)	371 (93.9)	371 (93.9)	
Age, years: Mean, SD	52.3 (8.8)	52.3 (8.8)	
Living situation			χ^2 = 19.6
Partner/family	300 (79.3)	278 (70.3)	P < 0.001
Living alone, n (%)	78 (20.6)	117 (29.6)	
Educational level, n (%)			χ^2 = 34.6
No school finished	8 (2.1)	6 (1.5)	P < 0.001
Primary school	146 (38.1)	211 (53.4)	
Secondary school	136 (35.5)	136 (34.4)	
High school	36 (9.4)	23 (5.8)	
University	57 (14.9)	19 (4.8)	
Current professional situation, n (%)			χ^2 = 156
			P < 0.001
Working with and without sick leave	220 (57.7)	259 (65.6)	
Without job	42 (11.0)	17 (4.2)	
Homemaker	35 (9.2)	60 (15.2)	
Pensioner	84 (22.0)	59 (18.2)	
Posttraumatic stress disorder; n (%)	179 (45.3)	12 (3.0)	χ^2 = 193
			P < 0.001
Probable depressive disorder; n (%)	259 (65.6)	19 (4.8)	χ^2 = 319
			P < 0.001
Depression [PHQ 4]	3.4 (1.7)	0.6 (2.0)	F = 838
Depression score (0–6)]; Mean (SD)			P < 0.001

FMS, fibromyalgia syndrome PHQ, Patient Health Questionnaire.
Some discrepancies in the absolute and relative numbers in some rows and columns are due to missing values.

Table 2
Frequency of reported potential traumatic events and traumatic experiences of 395 FMS patients and 395 age- and sex-matched controls.

	FMS patients (n = 395)	General population controls (n = 395)	χ^2 test
Potential traumatic events, n (%)			
1. War effort	5 (1.3)	4 (1.0)	0.57
2. Bombed	9 (2.3)	8 (2.0)	0.58
3. Severe physical violence	68 (10.4)	6 (1.6)	< 0.001
4. Rape	42 (10.9)	6 (1.6)	< 0.001
5. Sexual abuse before 14 years	69 (17.5)	7 (1.7)	< 0.001
6. Displacement from home/eviction	17 (4.4)	7 (1.7)	< 0.001
7. Natural catastrophe	3 (0.8)	3 (0.8)	0.99
8. Severe accident	60 (15.4)	14 (3.6)	< 0.001
9. Prisoner/hostage	2 (0.5)	1 (0.2)	0.56
10. Diagnosis of life-threatening illness	38 (9.6)	18 (4.6)	0.01
11. Witnessed one severe life event	95 (24.0)	35 (8.9)	< 0.001
12. Other severe life event	214 (55.3)	17 (4.4)	< 0.001
Number of potential traumatic events, n (%)			< 0.001
0	101 (25.5)	320 (81.0)	
1	122 (30.9)	49 (12.4)	
2	95 (24.0)	16 (4.1)	
3	38 (9.6)	3 (0.8)	
>3	39 (9.8)	7 (1.8)	
Most burdensome traumatic event, n (%)			
1. War effort	2 (0.05)	1 (0.003)	0.34
2. Bombed	0	1 (0.003)	0.32
3. Severe physical violence	19 (4.8)	1 (0.003)	< 0.001
4. Rape	12 (3.0)	1 (0.003)	0.002
5. Sexual abuse before age 14 years	24 (6.1)	4 (1.0)	< 0.001
6. Displacement from home/eviction	3 (0.08)	0	0.08
7. Natural catastrophe	0	2 (0.05)	0.16
8. Severe accident	12 (3.0)	8 (2.0)	0.36
9. Prisoner/hostage	1 (0.0025)	0	0.32
10. Diagnosis of life-threatening illness	19 (4.8)	14 (3.5)	0.47
11. Witnessed one severe life event	38 (9.6)	17 (4.3)	0.03
12. Other traumatic experience	148 (37.5)	11 (2.8)	< 0.001

FMS, fibromyalgia syndrome.

In FMS patients with PTSD, the mean total PDS score was 28.7 (SD 9.6). Severity of PTSD symptoms was mild in 3 (1.7%), moderate in 50 (27.9%), moderate to severe in 83 (46.4%), and severe in 33 (18.4%) patients. In population controls with PTSD, the mean total PDS score was 21.2 (SD 8.3). Severity of PTSD symptoms was mild in 2 (16.7%), moderate in 3 (25.0%), moderate to severe in 6 (50.0%), and severe in 1 (8.3%) participant.

There was no significant difference between FMS patients with and without potential depressive disorder in the frequency of at least one major life event (77.6% vs 82.6%; χ^2 1.9, P = 0.16) and in the frequency of at least one traumatic experience (78.1% vs 69.1%; χ^2 3.8, P = 0.43). There was a significant difference between population controls with and without potential depressive disorder in the frequency of at least one major life event (52.6% vs

17.2%, χ^2 14.8, $P < 0.001$), and in the frequency of at least one traumatic experience (33.3% vs 4.0%; χ^2 20.8, $P < 0.001$).

3.2. Temporal relationship between traumatic experiences and FMS and PTSD symptoms

One hundred seventy-six FMS patients with PTSD reported the year of the most burdensome traumatic experience. In 117 (66.5%) patients, the most burdensome traumatic experience preceded the onset of CWP with an average of 17.0 (SD 13.3; 1–58) years. In 52 (29.5%) patients, the most burdensome traumatic experience happened after the onset of CWP with an average of 9.0 (SD 8.0; 1–33) years. Seven (4.0%) patients reported that the most burdensome traumatic experience and PTSD symptoms and CWP happened in the same year. Fifty-two (29.5%) patients reported that the most burdensome traumatic experience happened in the ages <20 years. Seventy-three (41.5%) reported that the most burdensome traumatic experience happened between the ages of 20 and 40 years, and 51 (29.0%) reported that the most burdensome traumatic experience happened in the ages >40 years.

3.3. Impact of PTSD on clinical outcome

There were no differences between FMS patients with and without PTSD in demographic variables and the duration of CWP and FMS diagnosis (Table 3). FMS patients with and without PTSD reported that other major life events not reported in the list of traumas, witnessing a severe life event in another person, and sexual abuse before 14 years of age were the most terrible major events in their lives (Table 4). FMS patients with PTSD were more frequently without a job or on sick leave (Table 4), reported more pain sites, more somatic and psychological distress and more disability, and met more frequently the criteria of a potential depressive disorder than patients without PTSD (Table 5).

4. Discussion

4.1. Summary of main results

The prevalence of PTSD in a multicentre study with FMS patients was 45%. Other terrible life events (52%), witnessing terrible life event in another person (15%), and sexual abuse at age <14 years (10%) were reported to have been the most burdensome traumatic experiences. In 66% of patients, traumatic life events and PTSD symptoms preceded the onset of CWP. In 30% of patients, traumatic life events and PTSD symptoms followed the onset of CWP. In 4% of patients, traumatic life events, PTSD symptoms, and CWP occurred in the same year. PTSD had a negative impact on clinical outcomes: FMS patients with PTSD reported more pain sites, somatic and psychological distress and disability, and were more frequently without a job than FMS patients without PTSD.

4.2. Comparison with other studies

The study confirms the results of systematic reviews of case-control studies in which FMS patients reported higher rates of sexual and physical abuse of FMS patients compared to controls [18,25]. The most burdensome traumatic experiences in our sample were terrible events not specified by the trauma list and witnessing a terrible event in another person, which had not been assessed by the studies on which the systematic reviews [18,25] were based. Sudden and unexpected death and diagnosis of a life-threatening illness were the most frequently reported traumatic experiences in a single-rheumatology-centre Israeli study [5]. Other terrible events not specified by the trauma list and sexual abuse at age <14 years were the most frequently reported traumatic experiences in our general population sample. However, these major life events and their experience to be traumatic were more frequently reported by FMS patients than by population controls in our study. We conclude that traumatic life events happen more frequently to FMS patients than to controls, and/or FMS patients are more susceptible to experience major life events as traumatic.

The prevalence rates of PTSD in FMS patients are within the range of previous studies conducted in Israel, the United States, and Germany. Fifty-seven percent of 77 FMS patients of one Israeli rheumatology department were each diagnosed with PTSD by a structured clinical interview [5]. In 2 community-based U.S. studies, the prevalence of PTSD, assessed by structured clinical interview, in 52 and 149 FMS patients was 27% and 14%, respectively [28,29]. Fifty-six percent of 39 FMS patients at one U.S. pain medicine centre reported clinically significant levels of PTSD symptoms [32]. Twenty percent of 571 FMS patients with and without chronic fatigue syndrome of a U.S. referral centre were diagnosed with PTSD by a structured clinical interview [30]. In a German,

Table 3
Demographic and clinical data of FMS patients with and without PTSD.

	With PTSD (n = 179)	Without PTSD (n = 216)	Comparison
Female gender, n (%)	171 (95.5)	200 (92.6)	$\chi^2 = 1.5$; $P = 0.23$
Age, years: Mean (SD)	52.7 (7.7)	51.9 (9.6)	T = 0.9 $P = 0.33$
Living situation, n (%)			$\chi^2 = 0.07$; $P = 0.96$
Partner/family	136 (79.5)	164 (79.2)	
Living alone	35 (20.5)	43 (20.8)	
Educational level, n (%)			$\chi^2 = 12.4$; $P = 0.03$
No school finished	5 (2.3)	3 (1.4)	
Primary school	63 (57.1)	83 (39.7)	
Secondary school	51 (37.5)	85 (40.7)	
High school	21 (12.1)	15 (7.2)	
University	34 (19.5)	23 (11.0)	
Current professional situation, n (%)			$\chi^2 = 14.0$; $P = 0.02$
Working without sick leave	48 (28.4)	78 (38.0)	
Working with sick leave	52 (30.8)	35 (17.1)	
Without job	23 (13.6)	19 (9.3)	
Homemaker	15 (8.9)	20 (9.8)	
Pensioner	31 (18.3)	53 (25.6)	
Applying for disability pension, n (%)	54 (35.8)	45 (25.1)	$\chi^2 = 5.1$; $P = 0.53$
Duration since CWP, years (Mean, SD)	13.4 (10.0)	12.3 (4.7)	T = 1.0; $P = 0.31$
Duration since FMS diagnosis, years: Mean (SD)	4.6 (4.7)	4.4 (5.1)	T = 0.31; $P = 0.75$

FMS, fibromyalgia syndrome; PTSD, Posttraumatic Stress Disorder; CWP, chronic widespread pain.
Some discrepancies in the absolute and relative numbers in some rows and columns are due to missing values.

Table 4
Frequency of reported potential traumatic events and traumatic experiences of FMS patients with and without PTSD.

	With PTSD (n = 179)	Without PTSD (n = 216)
Potential traumatic events, n (%)		
1. War effort	5 (2.8)	0
2. Bombed	7 (3.9)	2 (0.1)
3. Severe physical violence	52 (29.1)	16 (7.4)
4. Rape	29 (16.2)	13 (6.0)
5. Sexual abuse before 14 years	40 (22.3)	28 (13.0)
6. Displacement from home/eviction	14 (7.8)	3 (1.4)
7. Natural catastrophe	0	3 (1.4)
8. Severe accident	36 (20.1)	24 (11.1)
9. Prisoner/hostage	2 (1.1)	0
10. Diagnosis of life-threatening illness	28 (15.6)	10 (4.6)
11. Witnessed one severe life event	64 (35.6)	31 (14.4)
12. Other severe life event	142 (79.3)	71 (32.9)
Number of potential traumatic events, n (%)		101(46.6)
0	66 (36.9)	56 (25.9)
1	50 (27.9)	45 (20.8)
2	30 (16.8)	8 (3.7)
3	33 (18.4)	6 (2.8)
>3		
Most burdensome potential traumatic event, n (%)		
1. War effort	2 (1.1)	0
2. Bombed	0	0
3. Severe physical violence	13 (7.3)	6 (2.8)
4. Rape	6 (3.4)	3 (1.4)
5. Sexual abuse before 14 years	17 (9.5)	8 (3.7)
6. Displacement from home/eviction	2 (1.1)	1 (0.05)
7. Natural catastrophe	0	0
8. Severe accident	6 (3.4)	6 (2.8)
9. Prisoner/hostage	1 (0.5)	0
10. Diagnosis of life-threatening illness	12 (6.7)	6 (2.8)
11. Witnessed one severe life event	27 (15.1)	11 (5.1)
12. Other traumatic experience	95 (53.0)	45 (20.8)

FMS, fibromyalgia syndrome; PTSD, Posttraumatic Stress Disorder.

Table 5
Somatic and psychological symptom burden of FMS patients (entire study sample and patients with and without PTSD).

	Total (n = 395)	With PTSD (n = 179)	Without PTSD (n = 216)	Comparison PTSD vs non-PTSD patients
Number of pain sites (WPI 0-19), Mean (SD)	11.7 (4.1)	12.5 (4.0)	11.1 (4.0)	T = 3.6; $P < 0.001$
Polysymptomatic distress (total score FSQ 0-31), Mean (SD)	20.1 (5.5)	21.7 (5.3)	18.7 (5.6)	T = 5.6; $P < 0.001$
Psychological distress (PHQ 4 Total score 0–12); Mean (SD)	6.9 (3.1)	8.2 (2.8)	5.8 (3.0)	T = 8.1; $P < 0.0001$
Potential depressive disorder, n (%)	259 (65.6)	138 (77.1)	121 (56.0)	$\chi^2 = 19.3$; $P < 0.001$
Disability (0–60), Mean (SD)	34.0 (17.1)	37.7 (16.8)	30.8 (16.7)	T = 4.0; $P < 0.001$

FMS, fibromyalgia syndrome; PTSD, Posttraumatic Stress Disorder; WPI, Widespread Pain Index; FSQ, Fibromyalgia Survey Questionnaire.
Some discrepancies in the absolute and relative numbers in some rows and columns are due to missing values.

single-centre rheumatology study with 115 FMS patients, 41% reported PTSD symptoms in a questionnaire and 8% met the criteria of PTSD in a structured clinical interview [35].

Our data confirm the findings of Italian [7], Israeli [1], and U.S. [32] studies, that PTSD has a negative impact on FMS: FMS patients with PTSD report more somatic and psychological symptoms and disabilities than FMS patients without PTSD. Our study demonstrated for the first time that PTSD has a negative impact on working status in FMS patients.

Population controls retrospectively assessed 50 of 75 (66.6%) potential traumatic events to be traumatic. Twelve of 50 (24%) population controls who reported traumatic events met the criteria of a PTSD. FMS patients assessed 290 of 294 (98.6%) potential traumatic events as traumatic. One hundred seventy-nine of 290 (61.7%) FMS patients who reported traumatic events met the criteria of a PTSD. We assume that catastrophizing defined as a set of cognitive and emotional processes [9] encompasses not only pain, but also major life events in FMS patients. In addition, PTSD is assumed to represent a marker of stress vulnerability rather than a reaction after exposure to a trauma. The underlying biology of PTSD consists of pretraumatic biological and physiological risk factors that affect the ability to cope with the traumatic event [27].

4.3. The temporal relationship of traumatic experiences, PTSD, and CWP

Our data confirm the hypothesis that traumatic experiences and PTSD increase the risk of FMS [27], because the majority of FMS patients with PTSD reported that CWP developed after the traumatic event and after the onset of PTSD symptoms. Probably, major life events alone do not increase the risk of FMS, but major life events experienced to be traumatic and leading to PTSD symptoms: PTSD moderated the relationship between childhood victimization and pain 30 years later in a prospective follow-up of a cohort study of individuals with court-documented early childhood abuse/neglect [28], and between traumatic experiences and CWP in a cross-sectional study with persons aged 60–85 years in a representative population sample [15]. PTSD, but not major depressive disorder,

mediated the relationship between rape and FMS in a community-based U.S. sample [4].

Furthermore, our data confirm the assumption that FMS and PTSD are comorbid conditions because of an association with a common antecedent trauma [27]. In 4% of patients, CWP and PTSD symptoms developed in the same year after a traumatic experience.

Twenty-nine percent of FMS patients with PTSD reported that traumatic events and PTSD symptoms happened after the onset of CWP and even after the diagnosis of FMS. For these patients, FMS can be regarded as an additive burden that strained coping resources when confronting life stress [31]. However, we cannot rule out the possibility that some of the patients who reported multiple traumatic experiences have been confronted with traumatic experiences before the onset of CWP but did report the date of this traumatic event, because the instruments used required report of only the date of the most burdensome traumatic experience.

Our data do not support the hypothesis that the association of FMS and PTSD is moderated by depressive disorder. Although the rates of potential depressive disorders in FMS patients with PTSD were higher than in FMS patients without PTSD, we found substantial rates of potential depressive disorders in FMS patients without PTSD. In addition, there were no significant differences in the frequency of major life events and traumatic experiences between patients with and without potential depressive disorder in FMS patients. A prospective community-based survey of fibromyalgia-like pain complaints following the World Trade Center terrorist attacks failed to detect a significant increase in symptoms consistent with a diagnosis of FMS and to account new onsets of FMS symptoms to prior depressive symptoms [29].

4.4. Limitations

(1) The study was conducted with the natural setting of routine clinical care. A structured clinical interview was not possible because the resources were not available in most study centres. However, the items of the PTSD are identical to the questions of the structured clinical interview for mental disorders of the DSM IV [37].
(2) FMS patients tend to report high levels of somatic and psychological symptoms [41]. Therefore, the prevalence of mental disorders based on self-report instruments might be overestimated in FMS patients.
(3) False-positive diagnosis of PTSD in patients with FMS and/or depression are possible because 2 symptoms of the D criterion of PTSD, namely sleeping and concentration problems, are main symptoms of FMS [19,39,40] and symptoms of major depression [2]. One symptom of the C criterion of PTSD, namely loss of interest/activities, is a main symptom of major depression according to DSM IV [2]. The PTSD rate in the study sample was 38.9% after removing these 3 items from the algorithm of the PDS (data available on request). In addition, the "symptom confounding hypothesis" of FMS and PTSD had been ruled out in a study by Raphael et al. [27].
(4) Eighty-four patients declined to participate in the study. We do not know if these patients experienced more or less traumatic events or would have met the criteria of PTSD than patients who participated.
(5) The instruments used for the assessment of potential traumatic experience did not allow distinguishing between type 1 (one single traumatic experience) and type 2 (repeated and multiple traumatic experiences) [20].
(6) All data on major life events and duration of CWP were based on retrospective self-reports, which are subject to recall and response biases [6].
(7) The general population participants were not screened for FMS.

4.5. Conclusions

4.5.1. Etiology of FMS

An integrative biopsychosocial model that conceptualizes FMS as a stress disorder has been proposed [36]. PTSD can be viewed as a marker of stress vulnerability in which persons susceptible to stress are more likely to develop CWP and other health problems including FMS, when a potential traumatic event occurs [28]. Whether comorbidity of PTSD with FMS may be partly due to shared genetic factors needs to be tested.

4.5.2. Research

The question of whether the association of pain and PTSD is specific for FMS or valid for other unspecific (eg, chronic low back pain) and specific chronic pain syndromes (eg, complex regional pain syndrome) remains to be studied. Future research should replicate the findings in a prospective study. The effectiveness of tailored psychological therapies for a subgroup of FMS patients with PTSD should be compared to standard cognitive-behavioural pain therapy [24].

4.5.3. Clinical practice

Screening for mental disorders including PTSD in patients with FMS by primary care physicians, pain specialists, and rheumatologists has been recommended. Screening-positive patients should be referred to mental health care specialists for further evaluation [21].

Conflict of interest statement

W.H. received one consultancy honorarium by Daiichi Sankyo and one honorarium for a lecture by Abbott and Pfizer. V.K. received honoraria for educational lectures by for lectures from Servier, Astra-Zeneca, Actelion, Bayer, Glaxo Smith Kline, and Grünenthal. J.L. received one honorarium for a lecture by Abbott. A.W. was a principal investigator of a study with pregabalin in FMS patients, sponsored by Pfizer. The other authors have no conflicts of interest to declare.

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