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Original article

Intense symptoms of pain are associated with poor sleep, fibromyalgia, depression and sleep apnea in patients with rheumatoid arthritis and psoriatic arthritis. A register-based study

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INFO ARTICLE

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ABSTRACT

Objectives. – To study whether poor sleep and comorbidities are associated with high symptom levels of patient-reported outcomes (PROs) pain, patient global assessment and fatigue in patients with rheumatoid arthritis (RA) and psoriatic arthritis (PsA), in a nation-wide cross-sectional setting.
Methods. – Clinical data were extracted from The Finnish Rheumatology Quality Register between 1.2021 and 9.2022. Self-reported sleep was categorized as "good" (little/no difficulties) or "poor" (great difficulties/can't) sleep. Data concerning comorbidities were collected from national registers. Descriptive statistics were used. Regression analyses were applied to analyze independent associations of sleep status, comorbidities and disease activity with pain in RA and PsA, adjusting for age and sex.
Results. – Among 13,512 patients with RA, 6052 [mean (SD) age 62 (13), 71% female] had sleep status reported; in PsA 1861/3636 [age 55 (13), 48% female]. In RA, 5072 (84%) reported good and 980 (16%) poor sleep; the corresponding numbers in PsA were 1460 (78%) and 401 (22%). Median values for objective disease activity were low and similar in patients with poor sleep and good sleep in both diseases. Among patients with no swollen joints, the median values for PROs were approximately three times higher for patients with poor sleep vs. good sleep in both diagnoses ($P < 0.001$). In regression analyses, "poor" sleep was independently associated with higher symptoms in pain [B (95%CI) 20 (18,22) in RA and 23 (19, 26) in PsA], followed by comorbid fibromyalgia, as well as depression in RA and sleep apnea in PsA.
Conclusion. – "Poor" sleep quality and comorbidities are independently associated with pain. Patient's sleep status is important to know especially in patients with severe symptoms without objective disease activity.

1. Introduction

Sleep disturbances, which cover problems initiating and maintaining sleep, is a common problem in the general population with a prevalence of 41.5% in women and 35.3% in men [1]. In patients with inflammatory arthritides (IAs), it is even more prevalent, being 50 to 75% in rheumatoid arthritis (RA) [2] and 45 to 85% psoriatic arthritis (PsA) patients [3].

Active untreated disease with painful joints or back naturally disturbs sleeping. In general, studies concerning RA indicate that measures of disease activity are quite weakly associated with various components of sleeping difficulties [4]. However, similar findings haven't been found in cross-sectional studies regarding PsA, where joint counts, number of enthesitides and the levels of

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C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) correlated significantly with sleeping difficulties [5,6]. Although an active disease may play a role in sleep disturbances, more importantly, RA patients who report difficulties to sleep also report increased pain, lower mood [7] and higher tender joint counts as well as general tenderness, compared to those without sleep disturbances [7–9]. In the case of RA, objective findings of active disease such as swollen joint counts have been found to be similar in patients with and without disturbed sleep [10,11].

Sleep disturbances mainly stem from pain in patients with IAs, which, in turn, might stem from active disease. However, several studies have indicated that the correlation between pain and objective inflammatory findings is low [12], whereas depression and pain catastrophizing are important contributors to pain in patients with RA [7,13,14].

Cross-sectional studies concerning sleep disturbances have been conducted mainly with a limited number of patients. Therefore, our objective was to utilize a nation-wide quality register database with data from daily clinical practice, to study, to which degree patient reported difficulties in sleeping as well as certain comorbidities and disease activity are associated with commonly used PROs pain, patient global assessment (PGA) and fatigue [2,11].

2. Methods

2.1. Source of data (register)

The source data of this study is The Finnish Rheumatology Quality Register, which is kept by the Institute for Health and Welfare (THL). The data were collected using monitoring tools such as GoTreatIT Rheuma, BCB, and RaiQu, which are used to facilitate treatment decisions in common clinical practice. The data are collected by the THL to the central database at certain intervals. Monitoring covers data for patients who are being treated in the public rheumatology outpatient clinics in different Finnish health care regions.

Data regarding comorbidities were collected from the Hospital Discharge Register (HILMO) and Finnish Care Register (avoHILMO) which both include diagnoses determined by treating physicians. Both are upheld by the THL. The HILMO database covers all dates and causes of hospitalization and outpatient care since 1969. AvoHILMO includes all primary health care contacts, such as visits to nurses and general practitioners, at health centers, and it was first introduced in 2011. The diagnoses have been coded according to the Finnish version of ICD-10.

Patient data between registries were linked using a unique personal identification number.

2.2. Patients and the date for outpatient clinic visit

A total of 13,512 patients with RA and 3636 patients with PsA were identified from the database.

Data from the most recent outpatient visit or remote contact between 1st January 2021 to 1st September 2022 were used.

2.3. Variables

2.3.1. Demographics

Demographic data included variables such as sex, age, and disease duration, which is measured in years.

2.3.2. Laboratory data

A level of < 10 mg/L was normal for CRP. ESR was considered normal if it was < 20 mm/h for women < 50 years, < 30 mm/h for women aged 50 to 85 years, and < 42 mm/h for women over 85 years. Correspondingly, ESR was considered normal if it was < 15 mm/h for men < 50 years, < 20 mm/h for men between 50 and 85 years, and < 30 mm/h for men over 85 years.

2.3.3. Serology

Patients were considered seropositive if they had a positive titer for rheumatoid factor (RF) and/or antibodies for anti-citrullinated proteins (ACPA) at any time of the disease course. A level of $\geq$ 15 IU/mL was considered elevated for RF and a level of $\geq$ 7 kU/L was considered elevated for ACPA according to the laboratory reference values.

2.3.4. Disease activity

Joint counts included swollen joint count (SJC) and tender joint count (TJC), on 66/68 joints, assessed by the examining physician.

2.3.5. Disease Activity Score (DAS28)

Scored from 0 to 10, it was used to measure disease activity of RA. A value of < 2.6 was used as a cut-off point for remission. In this study, we used DAS28-ESR, which is calculated by swollen and tender joint counts on 28 joints, PGA-VAS and ESR [15]. DAS28 (3), which includes SJC28, TJC28 and ESR, was used to describe the disease activity of RA and PsA in the linear regression analyses, as it doesn't include any subjective measurement tools.

2.3.6. Clinical Disease Activity Score in Psoriatic Arthritis (cDAPSA)

It was used to study the disease activity of PsA. cDAPSA is a sum of VAS-scores for pain and PGA, both on a scale of 0 to 10 cm, SJC66 and TJC68 and it can receive scores from 0 to 154. A score of 4 or less stands for remission, $\leq$ 13 for low disease activity, $\leq$ 27 for moderate disease activity and > 27 for high disease activity [16].

2.3.7. Visual Analog Scale (VAS) – values of pain, fatigue, and PGA

The values for pain, fatigue and PGA were collected from patient self-reports on the 0–100 mm VAS-scale, where 0 equals no symptoms and 100 = maximum intensity.

2.3.8. Patient functional capacity

Functional capacity was collected using the Stanford Health Assessment Questionnaire (HAQ). It is a patient's self-evaluation for difficulties in eight domains of performing activities in daily living. It is scored from 0 to 24 and then divided by 8, so that it can receive scores from 0 to 3, without counting "aids and devices", so that a score of $\geq$ 0.5 stands for deteriorated functional status [17,18].

2.3.9. Patient self-reported difficulty to sleep

It was obtained from the Multi-Dimensional Health Assessment Questionnaire (MDHAQ)-questionnaire, employed as part of usual clinical care. The question: "over the last week, were you able to get a good night's sleep" was used with the options of 0 = without any difficulty, 1 = some difficulty, 2 = much difficulty and 3 = unable to sleep [19]. In this study, patients who answered 0 or 1 to the question were considered to have "good sleep" and those who answered 2 or 3 were considered to have "poor sleep". This MDHAQ question was only available in centers that employ GoTreatIT monitoring.

2.3.10. Pain Catastrophizing Score

Pain catastrophizing score was measured using a two-item questionnaire developed by Jensen et al. in 2003 [20]. It contains two questions; "when I have pain, it's terrible and I think it's never going to get any better" and "when I have pain, I feel like I can't stand it anymore". Both are scored by the patient on a scale of 0 to 6, where 0 stands for "never", 3 for "now and then" and 6 for "always". The total score is the mean of the points from these two

Table 1
Comparison of patients who had sleep status available versus who did not.

Variable	RA – patients with sleep status recorded	RA – patients without a record of sleep status	PsA – patients with sleep status recorded	PsA – patients without a record of sleep status
n	6052	7460	1861	1775
Mean (SD) age	62 (13)	63 (15)***	55 (13)	55 (15)
Female patients *n*, %	4308 (71%)	5455 (73%)*	935 (50%)	946 (53%)
Median (IQR) disease duration	8.2 (2.6, 19.0)	9.5 (2.8, 21.0)**	6.2 (2.2, 14)	7.7 (2.4, 16)
Median (IQR) DAS28	1.9 (1.6, 2.7)	2.0 (1.4, 2.7)	1.9 (1.6, 2.6)	1.9 (1.4, 2.6)
Median (IQR) VAS – pain	22 (7, 49)	31 (12, 60)***	25 (8, 52)	34 (16, 61)***
Median (IQR) VAS – fatigue	24 (5, 51)	33 (12, 61)***	25 (6, 55)	39 (15, 66)***
Median (IQR) VAS – PGA	27 (10, 50)	30 (13, 53)***	24 (9, 50)	30 (14, 55)***

DAS28: Disease Activity Score-28; VAS: Visual Analog Score. All *P*-values are adjusted for age and gender. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

questions. In this study, a score of ≥ 4 was set as a threshold for high pain catastrophizing score.

2.3.11. Comorbidities

The prevalences of several comorbidities that are known to affect sleep were also analyzed. Restless legs syndrome was excluded as there were almost no registrations for the condition. Instead, we included fibromyalgia (M79.7), sleep apnea (G47.3), any diagnosis for a depressive disorder (F32.0–32.9, F33.0–33.3, F33.8, F33.9, F34.1, and F41.2) and any diagnosis for an anxiety related disorder (F40–F42). Inclusion criteria for the presence of comorbidities were at least one coding of the diagnosis in any of the aforementioned registers between 1.1.2011 and 1.8.2022.

2.4. Setting

This study was conducted in a cross-sectional setting.

2.5. Statistical methods

Descriptive statistics were used with mean values with standard deviation (SD) and median values with interquartile ranges (IQR) depending on the distribution of the variable. Chi^2 test was used in the comparison of categorical variables. Regression models were used to compare clinical and demographic variables, adjusted for age and gender and additionally for pain catastrophizing and disease activity in the comparisons of PROs. ANOVA was used for the comparison of continuous variables and logistic regression for dichotomous correlatives and for comparisons of median values transformed as median splits. Associates with pain as dependent variable were explored in univariate linear regression analyses; adjusting for age and gender, with disease activity measure DAS28 (3) in the model. $P = 0.05$ was set as a threshold for statistical significance.

Analyses were conducted using the R Statistical language on Ubuntu 20.04.5 LTS.

2.6. Ethics

This study was conducted as a register-based study using data from the Finnish Rheumatology Quality Register. It is managed by the THL, which granted approval for the study and the permission to use patient data for secondary purposes, being scientific research in this case. The data used in this study was pseudonymized. Patient consent was not required with this study setting.

3. Results

The database included 13,512 patients with RA (9763, 72% female) and 3636 (1881, 52% female) patients with PsA with a visit between 1st January 2021 to 1st September 2022. Sleep status was available for 6052 (45%) patients with RA and for 1861 (51%) patients with PsA who were seen in centers that use the GoTreatIT monitoring tool and were included in the analyses.

3.1. Comparison of patients who had sleep status available versus who did not

No major differences were seen in demographic variables among patients who had sleep status available vs. who did not. PROs were higher for patients without available sleep status, but DAS28 was similar between the groups (Table 1).

3.2. Comparison of patients who reported good sleep vs. poor sleep

A total of 5072 (84%) patients with RA reported good sleep and 980 (16%) reported poor sleep. For patients with PsA, the corresponding numbers were 1460 (78%) and 401 (22%) (Table 2). Patients who reported good sleep vs. poor sleep were slightly older and more often females. The median values for SJC66, TJC68, CRP, ESR, DAS28, cDAPSA, and Dr global were low and similar in patients with poor sleep and good sleep, although the differences were statistically significant (Table 2), adjusted for age and gender.

The median VAS-values for pain, fatigue and PGA, the prevalence of patients with high pain catastrophizing score and the median HAQ-values were significantly higher in patients with poor sleep compared to patients with good sleep (Table 2), adjusted for age, gender, disease activity and pain catastrophizing.

3.3. Comorbidities

The prevalences of fibromyalgia, sleep apnea, depressive disorders and anxiety disorders were 3%, 11%, 12% and 7% for patients with RA and 4%, 17%, 17% and 12% for patients with PsA. Twenty-four percent of patients with RA and 35% of patients with PsA had any sleep-related comorbidities. All diagnoses were significantly more prevalent in patients with poor sleep. For fibromyalgia, the difference was the largest (Table 2).

3.4. Associates with pain

In univariate linear regression models, having “poor” sleep was independently associated with pain, as well as a diagnosis of fibromyalgia and DAS28 (3) for both diseases. In patients with RA, depression was significantly associated with pain, whereas in patients with PsA, the same was seen for sleep apnea. Other than that, there were no significant associations for comorbidities and pain (Table 3).

Table 2
Demographic and clinical variables of patients with RA and PsA by sleep status.

Variable	RA patients with sleep status recorded	RA with good sleep	RA with poor sleep	PsA patients with sleep status recorded	PsA with good sleep	PsA with poor sleep	Available data for patients with RA	Available data for patients with PsA
Demographics								
n	6052	5072 (84%)	980 (16%)	1861	1460 (78%)	401 (22%)		
Mean (SD) age	62 (13)	61 (13)	63 (13)**	55 (13)	54 (14)	56 (12)**	6052 (100%)	1861 (100%)
Female patients *n*, %	4308 (71%)	3553 (70%)	755 (77%)**	935 (50%)	701 (48%)	234 (58%)**	6052 (100%)	1861 (100%)
Median (IQR) disease duration	8 (3, 19)	8 (3, 18)	10 (4, 20)*	6 (2, 14)	6 (2, 14)	7 (3, 16)	4149 (69%)	1036 (56%)
Seropositive *n*, %	4271 (71%)	3787 (75%)	712 (73%)	109 (14%)	85 (14%)	24 (17%)	4499 (74%)	919 (49%)
Disease activity								
Median (IQR) SJC66	0 (0, 1)	0 (0,1)	0 (0, 2)***	0 (0, 1)	0 (0, 1)	0 (0, 1)	4434 (73%)	1316 (71%)
Proportion of patients with no swollen joints *n*, %	2858 (64%)	2459 (66%)	399 (57%)***	940 (71%)	763 (73%)	177 (67%)		
Median (IQR) TJC68	0 (0, 2)	0 (0, 2)	1 (0, 4)***	0 (0, 2)	0 (0, 2)	1 (0, 4)***	4434 (73%)	1316 (71%)
Proportion of patients with no tender joints *n*, %	2356 (53%)	2088 (56%)	268 (38%)***	696 (53%)	599 (57%)	97 (37%)***		
Median (IQR) Dr. Global	5 (0, 17)	5 (0, 15)	10 (5, 22)***	5 (0, 16)	5 (0, 10)	10 (2, 20)***	4285 (71%)	1273 (68%)
Median (IQR) CRP	3 (1, 5)	3 (1, 5)	3 (2, 6)**	3 (1, 5)	3 (1, 5)	3 (1, 5)	4761 (79%)	1417 (76%)
Median (IQR) ESR	8 (5, 16)	8 (4, 16)	9 (5, 20)**	6 (2, 13)	6 (2, 13)	7 (2, 14)	4703 (78%)	1398 (75%)
Median (IQR) DAS28	1.9 (1.6, 2.7)	1.9 (1.6, 2.6)	2.3 (1.7, 3.1)***	1.9 (1.6, 2.7)	1.9 (1.6, 2.5)	2.2 (1.7, 3.1)***	4273 (71%)	1262 (68%)
DAS28 remission *n*, %	3049 (71%)	2662 (74%)	387 (57%)***	945 (75%)	788 (78%)	157 (61%)***		
Median (IQR) cDAPSA	7.3 (3.3, 13)	6.2 (2.8, 12.0)	14.0 (9.1, 20.0)***	7.5 (3.1, 13.0)	5.7 (2.4, 11.0)	14.0 (10.0, 19.0)***	4365 (72%)	1293 (69%)
Low cDAPSA or remission on cDAPSA *n*, %	3319 (76%)	3003 (82%)	316 (45%)	998 (77%)	879 (85%)	119 (46%)		
Patient reported outcomes								
Median (IQR) VAS – pain	22 (7, 49)	18 (6, 40)	54 (29, 74)***	35 (11, 59)	20 (6, 41)	59 (35, 74)***	6018 (99%)	1852 (100%)
Median (IQR) VAS – fatigue	24 (5, 51)	17 (4, 42)	64 (43, 80)***	25 (6, 55)	17 (4, 40)	66 (44, 81)***	5985 (99%)	1846 (99%)
Median (IQR) VAS – PGA	27 (10, 50)	23 (9, 46)	56 (39, 72)***	24 (9, 50)	19 (6, 38)	56 (38, 73)***	5957 (98%)	1819 (98%)
Median (IQR) HAQ	0.50 (0, 1.0)	0.38 (0, 0.88)	1.1 (0.62, 1.8)***	0.5 (0, 0.94)	0,25 (0, 0.75)	1.0 (0.62, 1.5)***	1859 (100%)	6017 (99%)
Median (IQR) Pain Catastrophizing Score	1.0 (0, 2.5)	1 (0, 2)	3 (2, 4)***	1.0 (0, 2.5)	1 (0, 2)	3 (2, 4)***	5169 (85%)	1597 (86%)
Proportion of patients with a high (≥ 4) Pain Catastrophizing Score	338 (7%)	138 (3%)	200 (24%)***	150 (9%)	54 (4%)	96 (29%)***		
Comorbidities	*n* = 5979		*n* = 1842					
Any sleep-related comorbidity	1425 (24%)	1055 (21%)	370 (38%)***	645 (35%)	447 (31%)	198 (50%)***		
Fibromyalgia	156 (3%)	86 (2%)	70 (7%)***	73 (4%)	35 (2%)	38 (10%)***		
Sleep apnea	633 (11%)	473 (9%)	160 (17%)***	312 (17%)	227 (16%)	85 (22%)**		
Depression	714 (12%)	496 (10%)	218 (23%)***	321 (17%)	207 (14%)	114 (29%)***		
Anxiety	443 (7%)	316 (6%)	127 (13%)***	215 (12%)	150 (10%)	65 (16%)*		

Values for VAS – pain, VAS – fatigue, VAS – PGA and HAQ were adjusted for age, gender, pain catastrophizing and disease activity. SJC66: swollen joint count on 66 joints; TJC68: tender joint count on 68 joints; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; DAS28: Disease Activity Score 28; cDAPSA: Clinical Disease Activity Index for Psoriatic Arthritis; VAS: Visual Analog Scale. The prevalences of comorbidities were determined on 5979 patients with RA and 1842 patients with PsA. All *P*-values are adjusted for age and gender. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Table 3
Associations with pain in patients with RA and PSA in a univariate linear regression model.

Variable	RA Pain VAS (0–100 mm) B (95% CI)	PsA Pain VAS (0–100 mm) B (95% CI)
Higher age	0.29 (0.24, 0.34)***	0.27 (0.17, 0.36)***
Gender (male)	−0.93 (−2.4, 0.57)	−2.9 (−5.5, −0.29)*
Poor sleep	20 (18, 22)***	23 (19, 26)***
Higher DAS28 (3)	6.9 (6.2, 7.5)***	6.1 (4.7, 7.4)***
Fibromyalgia	18 (14, 22)***	14 (7.3, 21)***
Sleep apnea	1.1 (−1.1, 3.3)	6.2 (2.6, 9.8)***
Depression	5.1 (2.6, 7.5)***	2.4 (−1.4, 6.2)
Anxiety	1.2 (−1.8, 4.3)	4.3 (−0.23, 8.8)

DAS28: Disease activity 28; 95% CI: 95% confidence interval. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Table 4
Clinical variables in patients with PsA and RA with no swollen joints on SJC66.

Variable	RA patients with no swollen joints, total	RA patients with good sleep	RA patients with poor sleep	PsA patients with no swollen joints, total	PsA patients with good sleep	PsA patients with poor sleep
n	2858	2459	399	940	763	177
DAS28 remission *n*, %	2484 (90%)	2178 (92%)	306 (80%)***	811 (90%)	673 (92%)	138 (80%)***
Low cDAPSA or remission on cDAPSA *n*, %	2483 (88%)	2236 (93%)	247 (63%)***	515 (55%)	698 (93%)	100 (58%)***
Median (IQR) VAS – pain	16 (4, 38)	13 (4, 31)	48 (22, 69)***	20 (6, 48)	15 (4, 34)	53 (26, 73) ***
Median (IQR) VAS – fatigue	19 (4, 48)	14 (3, 36)	63 (42, 81)***	22 (5, 53)	16 (3, 39)	64 (41, 80)***
Median (IQR) VAS – PGA	22 (8, 47)	19 (6, 38)	51 (34, 70)***	21 (7, 47)	18 (4, 36)	55 (38, 71)***
Median (IQR) HAQ	0.75 (0.25, 1.20)	0.25 (0, 0.75)	1.0 (0.50, 1.60)***	0.38 (0, 0.88)	0.25 (0, 0.62)	1.0 (0.50, 1.40)***
Median (IQR) Pain Catastrophizing Score	1 (0, 2)	1 (0, 1.5)	2 (1, 3.5)***	1 (0, 2.5)	1 (0, 2)	3 (1.5, 4)***
High (≥ 4) Pain Catastrophizing Score *n*, %	119 (5%)	52 (3%)	67 (20%)	69 (9%)	25 (4%)	44 (29%)

DAS28: Disease Activity Score-28; cDAPSA: Clinical Disease Activity Index for Psoriatic Arthritis; VAS: Visual Analog Score; PGA: patient global activity. All *P*-values are adjusted for age and gender. *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

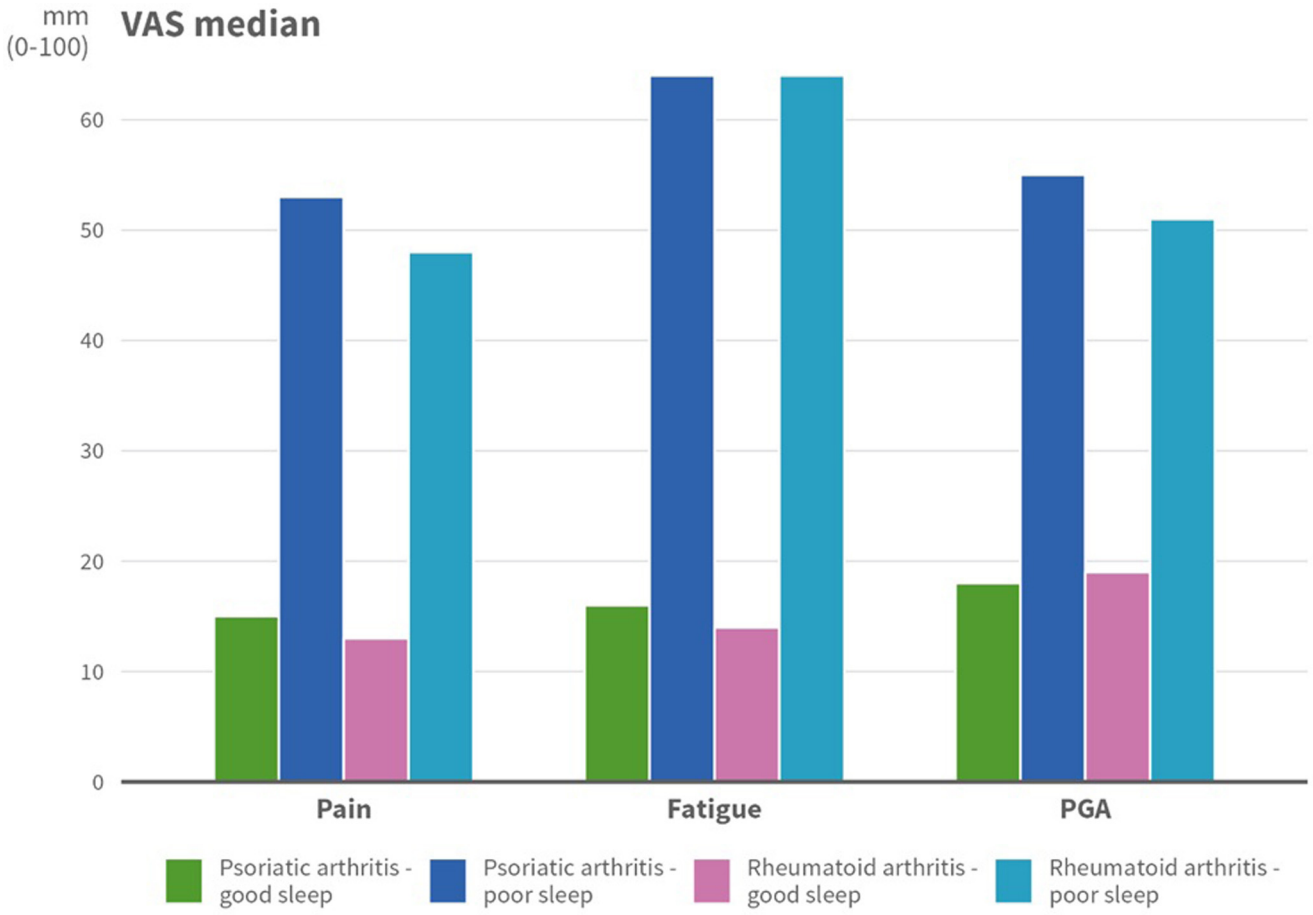

Fig. 1. Median VAS (0–100 mm) PROs in patients with PsA and RA with an SJC66 of 0, by sleep status. PGA: Patient Global Assessment.

3.5. Clinical variables by sleep status in patients with no swollen joints on a 66 joint count

Among patients with RA with no swollen joints on SJC66, a total of 92% of patients with good sleep and 80% of patients with poor sleep were in remission by DAS28 ($P < 0.001$). Among PsA patients with no swollen joints, 93% with good sleep and 58% of patients with poor sleep had remission/low disease activity by cDAPSA ($P < 0.001$) (Table 4).

Among patients with no swollen joints on SJC66, the median values for pain, fatigue and PGA were approximately three times higher in patients who reported poor sleep vs. good sleep, in both diseases (Table 4, Fig. 1). Patients who reported poor sleep also reported higher HAQ and Pain Catastrophizing scores (Table 4).

4. Discussion

Our main observation was that sleep disturbances and comorbidities were independently associated with pain.

In the univariate linear regression models, having "poor" sleep during the last week, fibromyalgia and DAS28 (3) were independent contributing factors to pain for both RA and PsA. Depression was an independent factor for RA and sleep apnea for PsA. No significant associations were otherwise seen for comorbidities (Table 3). This

finding was somewhat in line with earlier research, as it has previously been demonstrated that depression reduced the probability of reaching remission less for PsA patients than for RA patients [21].

We demonstrated that the median values for pain, fatigue and PGA were approximately three times higher in patients with poor sleep vs. good sleep, (analyses were adjusted for age, sex, disease activity and pain catastrophizing). To further examine this phenomenon, we ran the analyses in patients who had no swollen joints on the 66 joint count, which can be interpreted as no objective indication of disease activity. This didn't change the outcome. This same finding was seen with other subjective clinical variables such as tender joint count, HAQ, and pain catastrophizing, but not in any objective variables (Tables 2 and 4).

The differences in VAS-scores for PGA and pain in patients with PsA (approximately 20 versus 60 in patients with good sleep vs. poor sleep) were similar to a recent Norwegian study, that used a Pittsburgh Sleep Quality Index (PSQI)-score of 5 as a threshold for poor sleep (median 70 versus 25 for PGA and 66 versus 27 for pain for patients with poor sleep vs. good sleep, respectively) [3]. In a Korean study of 130 RA patients, 50 patients with a PSQI-score of > 5, had a mean pain-VAS score of 48 compared to 31 for 80 patients that slept well [22] which is a slightly lower difference than what was found in our study.

For Pain Catastrophizing Score, a Norwegian study of 209 RA patients who started their first bDMARD showed that patients with a pain catastrophizing score of > 1.5 had approximately two times higher mean joint pain VAS (56), modified HAQ (0.84) and PGA (60) despite similar ESR, CRP and SJC-values [23]. The same trend was seen in our study, as a pain catastrophizing score of $\geq$ 4 was noticeably more prevalent for patients with poor sleep presenting more intense symptoms but not objective findings.

This study shows that a considerable proportion of patients with RA (16%) and PsA (22%) reported "much difficulties" with sleep or were "unable to sleep" at least during the last week. However, the proportion of patients who report difficulties to sleep is considerably lower compared to previous studies and may reflect different measurement tools compared to earlier studies. The most common measurement tool used in studies regarding the sleep quality of RA and PsA patients is the PSQI as it has both high specificity and sensitivity for identifying patients with sleeping problems. However, filling PSQI takes approximately 5 to 10 minutes [24]. On the contrary, the MDHAQ question concerning difficulties in sleeping is one question only, and is completed by the patients as part of daily routine practice where patients also complete questionnaires concerning activities of daily living, various symptoms concerning joints and skin (in PsA), lifestyle choices, etc. Responses are being reviewed in making treatment decision. It has been noted that patient questionnaires can be extensive and detailed in research programs but ought to be simple and focused in daily clinical practice [25]. The MDHAQ-questionnaire has previously been used in several clinical trials for patients with RA, but it isn't a validated tool for studying sleep quality, which is why it doesn't have set threshold values. However, it has been shown that it does correlate well with Medical Outcomes Study (MOS), a validated sleep disturbance scale for patients with RA [26]. Studies using similar non-validated measurement tools for sleep quality in patients with IAs, such as numeric rating scale (NRS) from 0 to 10, have been previously published [27,28].

5. Strengths and limitations

The main strength of this study was its large nationwide patient population. To our knowledge, only a few studies of this scale have been conducted to study sleeping status in patients with IAs.

In this observational study, the completeness of data was high among those who were included in the analyses (from centers that used the GoTreatIT monitoring) and ranged from 68% for Dr. Global in PsA to 90–100% for most of the other variables.

A weakness of this study was our measurement tool for sleep for not being a large research questionnaire. However, a simple question concerning sleep is feasible in everyday clinical practice, as discussed above.

In conclusion, this study highlights the importance of the evaluation of sleep and comorbidities such as fibromyalgia, sleep apnea, depression and anxiety in patients with RA and PsA who present intense symptoms, especially in patients with no objective signs of an active disease.

Disclosure of interest

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