Sleep quality in partners with spouses and children affected by psoriasis and psoriatic arthritis: insights and implications from a pilot study

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Background: **Sleep disturbances are rather common in psoriasis (PsO) and psoriatic arthritis (PsA) patients; however, it is still unclear if they depend intrinsically on PsO/PsA or the predisposing comorbidities such as metabolic syndrome.**

Methods: **This is a multicenter cross-sectional assessing the sleep quality in partners of PsO/PsA patients. Patients and patients' partners were recruited consecutively. After a dermatological visit to the patient, the partner was interviewed to score his/her quality of sleep with Pittsburgh Sleep Quality Index (PSQI).**

Results: **A sample of 84 subjects (aged 45.38±8.55 years, 42 males and 42 females, with an average BMI of 25.24±1.75 kg/m^2) were included. Fifty-two (61.9%) of them developed PsO or PsA before starting the relationship. Although the average PSQI was 4.79±1.47, the prevalence rate of poor sleep raters (PSQI ≥5) was 42 (50.0%). At the multivariate regression, the best independent predictors of sleep quality were "having a PsO/PsA child" and "having a partner affected by PsO since before relationship". More in detail, the former predicted a worse sleep quality [OR 6.98 (95%CI 1.39-35.06)] and the latter a better sleep quality [OR 0.07 (95%CI 0.02-0.23)]. Specifically, performing a subgroup analysis among those who had a child and stratifying according to the presence of an affected child, no differences could be found for each parameter under study, except for PSQI, which was significantly higher in spouses with affected children (6.68±1.11 *versus* 4.35±1.11, p<0.001).**

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Conclusions: **The present study showed that having a child significantly negatively impacted on sleep quality of the parent, whereas having a partner being affected by PsO since before the beginning of the relationship protected against poor sleep quality. Having a child affected by PsO was, instead, a risk factor.**

Keywords: sleep quality; psoriasis; psoriatic arthritis, child, spouses

Psoriatic disease, encompassing both psoriasis (PsO) and psoriatic arthritis (PsA), frequently coexist with metabolic syndrome, cardiovascular, and respiratory diseases (1-7), well-known predisposing factors of sleep disturbances (8). Sleep in PsO patients recently gained interest in the scientific community due to its modulatory effect on daily functionality and quality of life perception (9, 10). For instance, these patients have a higher risk of developing obstructive sleep apnea (OSA) with a prevalence rate of 36.0-81.8% *versus* 2.0-4.0% in the general population, as well as restless legs syndrome (15.1-18.0% *versus* 5.0-10.0%), whereas the burden of insomnia seems comparable with that of the general population (5.9-44.8% *versus* 10-35%) (11).

While it is well-established that PsO and PsA patients suffer from poor sleep quality (9, 10), there is a dearth of data about sleep quality in partners with spouses and children affected by PsO and PsA (11). Therefore, the present study was designed to fill in this knowledge gap.

MATERIAL AND METHODS

Study design and patients' recruitment

The present article is a cross-sectional multicenter observational study involving 3 referral hospitals in Italy (IRCCS Istituto Ortopedico Galeazzi, IRCCS San Donato, IRCCS San Gallicano). After obtaining IRB approval from the involved institutions, patient recruitment took place. Each patient signed an informed consent form.

Irrespective of medication (12-17) and diet (18-22), PsO and PsA patients who visited the clinics in August 2019 were asked to volunteer with their partners in the present study. Patients underwent a detailed dermatological assessment, whilst partners medical and pharmacological history were screened, ruling out conditions and drugs that may suggest or cause sleep disturbances.

In particular, the exclusion criteria in the pharmacological history were the habitual or occasional use of benzodiazepines, psychostimulant drugs and antihistamines. In addition, in medical history there were diagnoses of obstructive sleep apnea, narcolepsy, seizure, presence or history of brain tumor, restless leg syndrome, night works or jet-lag (23), a recent change of diet (18-22) and depression.

Clinical measurements

In the dermatological examination, PsO and PsA severity was determined using the "Psoriasis Area of Severity Index" (PASI) and the "Disease Activity in Psoriatic Arthritis" (DAPSA) (24) scores, respectively. DAPSA is a composite indicator that considers several parameters, including clinical symptoms (tender and swollen joints), laboratory findings (CRP) and patient-reported outcomes. Two independent board-certified dermatologists performed all these measurements and two independent board-certified rheumatologists.-Sleep quality measurement was conducted using the Pittsburgh Sleep Quality Index (PSQI) (25) in both partners and patients. The scale comprises 19 items, assessing seven components: namely, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications and daytime dysfunctions; scores in each domain of sleep quality range from 0 to 3 with the global PSQI ranging from 0 to 21. A total score equal to or greater than 5 has been considered poor sleep quality. All the measurements were collected only if the interobserver agreement were higher than 90%, and the final score was the result of the average between the two measurements.

Statistical analysis

Before starting any statistical processing (including data handling and manipulation), Fig.s were visually inspected for capturing any potential outlier. Normality of data distribution was verified by conducting the Shapiro-Wilk's test, which was preferred to other statistical tests given the small sample size (less than 100 subjects). Continuous data

were expressed as means ± standard deviation, whereas categorical parameters were computed as percentages, where appropriate.

Relevant socio-demographic (age, gender, marital status) and clinical (body mass index, BMI, familiarity for PsO, PASI, DAPSA, pharmacological treatment, and PSQI) information were extracted from clinical charts.

Both univariate (Student's t-test or its non-parametric version in case of violation of normal data distribution, and chi-squared test) and multivariate (multivariate regressions) analyses were conducted to shed light on the determinants of sleep quality among partners with spouses or children affected by PsO.

Figures with a p-value equal to or less than 0.05 were considered statistically significant. All statistical analyses were carried out using the commercial software "Statistical Package for Social Sciences" (SPSS version 24.0, IBM, Armonk, NY, USA). In addition, graphs were generated utilizing the commercial software MedCalc version 18.11.3 (MedCalc Software bvba, Ostend, Belgium).

Table I. *Main characteristics of the sample.*

Parameter	Value
Age (years; mean±standard deviation)	45.38±8.55
Sex (n; %)	
Male	42 (50.0%)
Female	42 (50.0%)
BMI (kg/m^2; mean±standard deviation)	25.24±1.75
Familiarity for PsO (n; %)	32 (38.1%)
PSQI (mean±standard deviation)	4.79±1.47
Poor sleeper (n; %)	42 (50.0%)
Marital status (n; %)	
Living together	25 (29.8%)
Legally married	59 (70.2%)
Relationship duration (years; mean±standard deviation)	12.18±6.99
Partner's age (years; mean±standard deviation)	45.68±8.97
Partner affected before relationship (n; %)	52 (61.9%)
Partner's familiarity for PsO (n; %)	26 (31.0%)
Partner's disease duration (mean±standard deviation)	13.86±8.42
Partner's PASI (mean±standard deviation)	4.99±2.73
Partner with PsA (n; %)	26 (31.0%)
Partner's DAPSA (mean±standard deviation)	5.26±8.39
Partner with past erythroderma (n; %)	24 (28.6%)
Partner 's pharmacological treatment (n; %)	
Adalimumab	17 (20.2%)
Apremilast	9 (10.7%)
Etanercept	22 (26.2%)
Golimumab	1 (1.2%)
Ixekizumab	3 (3.6%)
Metothrexate	9 (10.7%)
Secukinumab	12 (14.3%)
Ustekinumab	11 (13.1%)
With children (n; %)	68 (81.0%)
Affected children (n; %)	19 (27.9%)

BMI: Body Mass Index; DAPSA: Disease Activity Index for Psoriatic Arthritis; PsO: Psoriasis; PsA: Psoriatic Arthritis, PASI: Psoriasis Area Severity Index; PSQI: Pittsburgh Sleep Quality Index.

RESULTS

Characteristics of partners of PsO/PsA patients

We enrolled 84 subjects (42 males and 42 females) with an average age of 45.38±8.55 years and a BMI of 25.24±1.75 kg/m^2. Interestingly, thirty-two (38.1%) had a positive family history of psoriasis. In the cohort, 59 (70.2%) subjects were legally married, whereas 25 (29.8%) lived together, with a relationship lasting on average 12.18±6.99 years.

Characteristics of PsO/PsA patients

Fifty-two (61.9%) patients had been affected by PsO before starting the relationship with a disease duration of 3.86±8.42 years and a current severity quantifiable with PASI of 4.99±2.73. Slightly less than one-third of them (n=26; 31.0%) reported a family history of PsO. Twenty-six are also affected by PsA with a mean DAPSA of 5.26±8.39. From a therapeutic point of view, sixty-six (78.6%) patients were under biologics, 9 (10.7%) under small molecules and 9 (10.7%) on methotrexate. The great majority of the couples had children (n=68, 81.0%), and only 19 (27.9%) children display PsO and/or PsA (Table I).

Sleep evaluation of partners of PsO/PsA patients

Partners displayed an average PSQI of 4.79±1.47, with 50% classified as poor sleep quality subjects due to their PSQI ≥5 points. Comparing partners of patients that experienced PsO/PsA before starting or

Table II. *Characteristics of the recruited sample stratified according to whether the partner had been affected by psoriasis (PsO) already before the commencement of the relationship.*

Parameter	Partner affected before relationship		Statistical significance
	Yes (n=52)	No (n=32)	
Age	46.08±8.34	44.25±8.90	NS
Sex			NS
Male	26 (50.0%)	16 (50.0%)	
Female	26 (50.0%)	16 (50.0%)	
BMI	25.00±1.91	25.63±1.41	NS
Familiarity for PsO	19 (36.5%)	13 (40.6%)	NS
PSQI	4.37±1.46	5.47±1.24	p<0.001

BMI: *Body Mass Index;* ***PsO:*** *Psoriasis;* ***PSQI:*** *Pittsburgh Sleep Quality Index.*

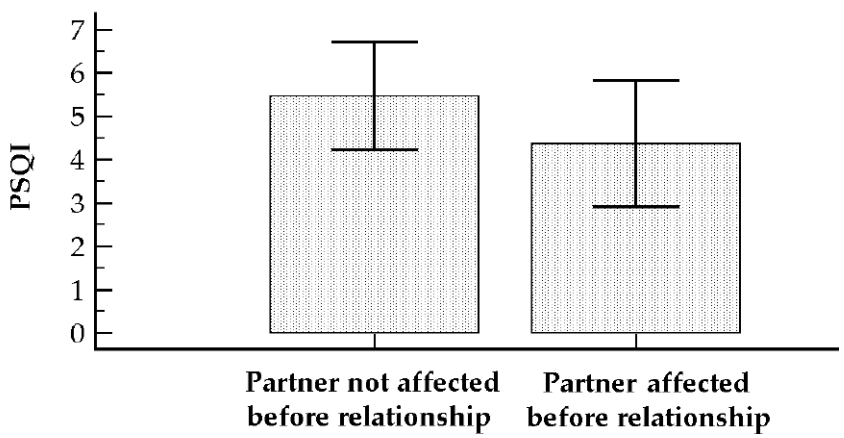

Fig. 1. *Impact of being affected before relationship on the global PSQI score. PSQI: Pittsburgh Sleep Quality Index.*

during the relationship, the PSQI was statistically different (4.37±1.46 vs 5.47±1.24, p<0.001) (Table II). Furthermore, subjects with partners being already affected before the relationship was found to be protected against poor sleep quality [crude OR 0.08 (95%CI 0.02-0.23)] (Fig. 1).

Stratifying according to the presence of a child (Table III), PsA prevalence (25.0% versus 56.2%, p=0.016), and severity (3.88±7.36 versus 11.13±10.10, p=0.002) in the affected, together with sleep quality (5.00±1.53 *versus* 3.88±0.72, p=0.004; Fig. 2) resulted statistically significant. Furthermore, having a child ends up being a risk factor for poor sleep quality [OR 5.83 (95%CI 1.52-22.35)].

At the multivariate regression, the most accurate predictors of sleep quality were "having a child" and "having a partner affected by PsO since before starting the relationship". More in detail, the former predicted a worse sleep quality [OR 6.98 (95%CI 1.39-35.06)] and the latter a better sleep quality [OR 0.07 (95%CI 0.02-0.23)].

Specifically, performing a subgroup analysis among those who had a child and stratifying according to the presence of an affected child (Table IV), no differences could be found for each parameter under study, except for PSQI, which was significantly higher in spouses with affected children (6.68±1.11 *versus* 4.35±1.11, p<0.001; Fig. 3). For further details, the reader is referred to Table III. At the multivariate regression analysis, adjusting for the confounding factors, the presence of an affected child remained statistically significant (regression coefficient=2.70, standard error=0.31, t=8.80, p<0.001, $r_{partial}$=0.77, $r_{semipartial}$=0.68).

Table III. *Characteristics of the recruited sample stratified according to the presence of a child.*

Parameter	With a child		Statistical significante
	Yes (n=68)	No (n=16)	
Age	45.79±8.47	43.63±8.94	NS
Sex			NS
Male	34 (50.0%)	8 (50.0%)	
Female	34 (50.0%)	8 (50.0%)	
BMI	25.22±1.75	25.31±1.82	NS
Familiarity for PsO	26 (38.2%)	6 (37.55%)	NS
Partner's age	46.37±8.61	42.75±10.12	NS
Partner's disease duration	14.04±8.37	13.06±8.84	NS
Partner affected before relationship	40 (58.8%)	12 (75.0%)	NS
Partner's PASI	5.29±2.69	3.69±2.55	NS
Partner's familiarity for PsO	23 (33.8%)	3 (18.8%)	NS
Partner with PsA	17 (25.0%)	9 (56.2%)	0.016
Partner's DAPSA	3.88±7.36	11.13±10.10	0.002
Partner with past erythroderma	21 (30.9%)	3 (18.8%)	NS
Relationship duration	12.88±7.22	9.19±5.02	NS
Marital status			
Legally married	49 (72.1%)	10 (62.5%)	NS
PSQI	5.00±1.53	3.88±0.72	0.004

BMI: *Body Mass Index;* ***DAPSA:*** *Disease Activity Index for Psoriatic Arthritis;* ***PsA:*** *Psoriatic arthritis;* ***PsO:*** *Psoriasis;* ***PSQI:*** *Pittsburgh Sleep Quality Index.*

DISCUSSION

The present study demonstrated that having a child and, specifically, a child affected by PsO negatively impacted the sleep quality of partners of PsO patients, whereas having a partner affected by PsO since before the beginning relationship protected against poor sleep quality.

In the existing scholarly literature, sleep is generally studied at the individual level and rarely from the dyadic (the couple, i.e., the two-bed partners) or triadic (partners and children) perspective (26). Moreover, according to Dittami and colleagues (27), co-sleeping is generally perceived as being more disturbing for women than for men, a finding that Troxel confirmed in a review study (28). However, we could not find any gender-related impact on sleep quality. We could, instead, replicate the so-called effect of social *zeitgebers*, such as children, who, besides the first months of life, dramatically impact sleep-wake rhythms and lifestyles (29).

The impact of having an affected partner/child, even though expected, has been overlooked in the literature, is limited to the impact of partners/children with snoring, OSA or other sleep disturbances (26, 30, 31). Few other diseases, such as diabetes or chronic pain, have been studied and family dynamics dissected (32-34). A recent study by Angelhoff and coworkers assessed using a qualitative approach sleep perceptions in a sample of 12 parents (11 mothers and 1 father) of children aged less than 2 years with atopic dermatitis. Authors found that parents had implemented different coping strategies and skills: namely, i) accepting to have an affected child and its consequence in terms of poor sleep quality and sleep loss, ii) modifying and changing one's lifestyles, and iii) needing support to manage one' sleep disturbances. Interestingly, the first coping strategy led to normalization of parental sleep quality and loss, which is in line with our findings (35). Furthermore, the fatherhood/motherhood wish among psoriatic patients is a complex issue since both the PsO heredity, sexual dysfunction and fertility (36-38) seem to heavily impact families with affected members, and this hardship may be reflected in partners poor sleep quality. In particular, besides the presence of psoriasis in social areas (face, scalp and hands) also, the itch (39, 40) is capable of triggering social stigmatization and impoverishing sleep quality, as recently suggested by Sommer et colleagues (41).

We observed, indeed, that spouses of partners affected before the commencement of the relationship had low PSQI scores and, as such, better sleep quality than their counterparts whose partner had developed PsO after the beginning of the relationship (42). Interestingly, other variables such as duration of the relationship, disease duration and activity/severity had no effect in our investigation, differently from the literature (43-45).

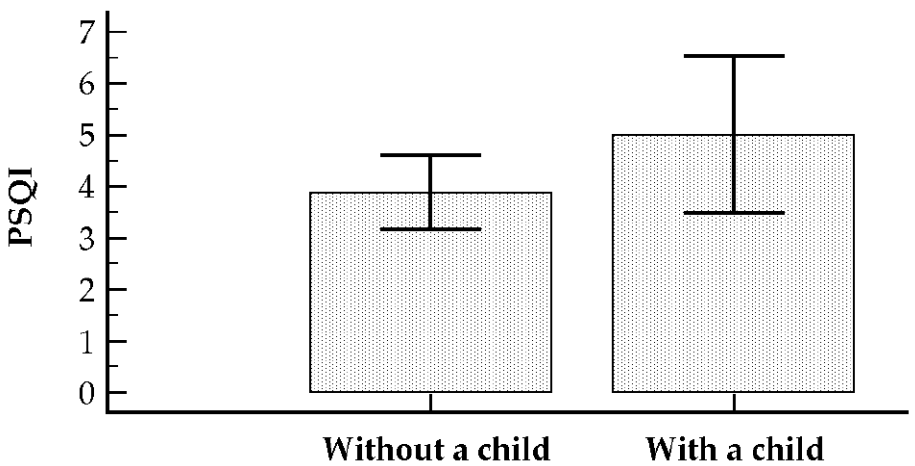

Fig. 2. *Impact of having a child on the global PSQI score. PSQI: Pittsburgh Sleep Quality Index.*

However, despite its novelty, our study is not without any limitations. The main shortcoming is the small sample size utilized in the present investigation. Another drawback is the cross-sectional study design, which does not capture the potential changes in the PSQI score throughout the time. Therefore, further longitudinal studies employing a larger sample size focusing on patient-reported outcomes (i.e. pruritus and pain) are urgently needed. In addition, these studies could investigate the relationship between partners/children affected and other variables/constructs, such as further sleep-related parameters (for example, chronotype, excessive daytime sleepiness and couple sleep concordance), mood, and generally, mental

Table IV. *Characteristics of the recruited sample stratified according to the presence of children affected.*

Parameter	Children affected		Statistical significance
	Yes (n=19)	No (n=49)	
Age	47.89±7.09	44.98±8.88	NS
Sex			NS
Male	7 (36.8%)	27 (55.1%)	
Female	12 (63.2%)	22 (44.9%)	
BMI	24.95±2.01	25.33±1.65	NS
Familiarity for PsO	8 (42.1%)	18 (36.7%)	NS
Partner's age	49.26±6.92	45.24±8.99	NS
Partner's disease duration	16.74±9.13	13.00±7.91	NS
Partner affected before relationship	13 (68.4%)	27 (55.1%)	NS
Partner's PASI	4.47±2.34	5.61±2.78	NS
Partner's familiarity for PsO	5 (26.3%)	18 (36.7%)	NS
Partner with PsA	7 (36.8%)	10 (20.4%)	NS
Partner's DAPSA	6.00±9.15	3.06±6.46	NS
Partner with past erythroderma	8 (42.1%)	13 (26.5%)	NS
Relationship duration	13.68±7.34	12.57±7.23	NS
Marital status			
Legally married	11 (57.9%)	38 (77.6%)	NS
PSQI	6.68±1.11	4.35±1.11	p<0.001

BMI: *Body Mass Index;* ***DAPSA:*** *Disease Activity Index for Psoriatic Arthritis;* ***PsA:*** *Psoriatic arthritis;* ***PsO:*** *Psoriasis;* ***PSQI:*** *Pittsburgh Sleep Quality Index.*

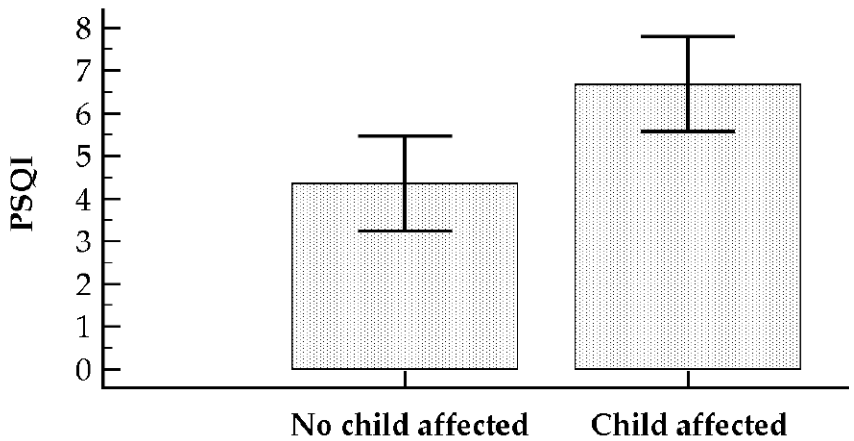

Fig. 3. *Impact of having a child affected by psoriasis on the global PSQI score. PSQI: Pittsburgh Sleep Quality Index.*

health, health-related quality of life, and relationship quality, among others.

This study suggests that having a child or a spouse with psoriasis deeply affects the sleep quality of both parents/partners. Furthermore, the child effect of parents' sleep quality is minimized if the partner developed psoriasis before the relationship. This is an interesting factor that should polarize clinicians' effort to sensitize the population with educative/informative campaigns focusing on psoriasis awareness. This aspect is even more important during the COVID-19 pandemic, in which psoriatic patients are more vulnerable (46-49) and may experience flares due to both SARS-CoV-2 (50) and COVID-19 vaccines (51, 52).

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IRB status: Approved.

Conflict of interests:

There is no conflict of interest to declare.

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