Influence of Itch and Pain on Sleep Quality in Patients with Hidradenitis Suppurativa

Karolina KAAZ, Jacek C. SZEPIETOWSKI and Łukasz MATUSIAK
Department of Dermatology, Venereology and Allergology, Wroclaw Medical University, Wroclaw, Poland

There is a lack of data evaluating the influence of hidradenitis suppurativa-related subjective symptoms on sleep quality. The aim of this study was to assess the influence of itch and pain on sleep quality in 108 patients with hidradenitis suppurativa compared with 50 controls. The Athens Insomnia Scale (AIS) and Pittsburgh Sleep Quality Index (PSQI) were used to evaluate a spectrum of sleep disturbances. Mean ± standard deviation AIS and PSQI scores among patients with hidradenitis suppurativa vs. controls were assessed as 5.4 ± 4.3 vs. 5.5 ± 3.4 and 6.5 ± 3.6 vs. 3.1 ± 1.9 points, respectively. The presence of both itch and pain had a significant impact on the frequency of insomnia. Pain was a crucial factor responsible for poor sleep quality among patients with hidradenitis suppurativa; its presence significantly affected subjective sleep quality, sleep duration and daytime dysfunction. Itch and pain have an important impact on insomnia and sleep quality in patients with hidradenitis suppurativa.

Key words: hidradenitis suppurativa; PSQI; itch; pain; quality of life; sleep; AIS; acne inversa; VAS.

Accepted May 9, 2018; Epub ahead of print May 14, 2018

Acta Derm Venereol 2018; 98: 757–761.

Corr: Jacek C. Szepietowski, Department of Dermatology, Venereology and Allergology, Wroclaw Medical University, Chałubińskiego 1, PL-50-368 Wrocław, Poland. E-mail: jacek.szepietowski@umed.wroc.pl

SIGNIFICANCE

- Hidradenitis suppurativa is a chronic, inflammatory, recurrent, debilitating and suppurative disease of the hair follicle manifested by painful abscesses, fistulas and scarring lesions in intertriginous areas. As the skin condition plays an important role in proper sleep activity, it could be suspected that sleep quality could be disturbed in such chronic inflammatory skin disease. Moreover, the hidradenitis suppurativa related symptoms such as pain, itch, unpleasant smell accompanying hidradenitis suppurativa may additionally intensify sleep disturbances.
- This study revealed that the presence of both itch and pain had a significant impact on insomnia frequency. The pain was a crucial factor responsible for poor sleep quality among hidradenitis suppurativa sufferers; its presence affected significantly subjective sleep quality, sleep duration and daytime dysfunction.

Hidradenitis suppurativa (HS) is a chronic, inflammatory, recurrent, debilitating and suppurative disease of the hair follicle, manifested by painful abscesses, fistulas and scarring lesions in the apocrine gland-bearing areas of the body, generally the axillae, inguinal and anogenital regions (1). The mean prevalence of HS in the Caucasian population is estimated as 1%, with a predominance in females (2, 3). HS-related quality of life (QoL) impairment includes an impact on multiple domains of psychophysical functioning among affected patients, resulting in depression, anxiety, stigmatization, fatigue and decreased overall activity (4, 5).

Sleep is a physiological, fundamental, active process that engages approximately one-third of our lives. Sleep is regulated by 2 major processes; the circadian system and homeostatic sleep drive (6). As the skin condition plays an important role in proper sleep activity, including core body temperature control, thermoregulation, sleep onset, and awakenings during sleep, it is possible that sleep quality could be disturbed in chronic inflammatory dermatoses, including HS. The symptoms that accompany HS, such as pain, itch, and unpleasant smell, may also intensify sleep disturbance (7). Furthermore, sleep abnormalities in such chronic disorders could result, in turn, in significant impairment of QoL.

There is a lack of data evaluating the influence of itch and pain on sleep quality in patients with HS. The aim of the current study was to evaluate this issue.

MATERIALS AND METHODS

The study was conducted on 108 Caucasian patients with HS (51 females and 57 males) with the mean ± standard deviation (SD) age of 15–67 years (36.3 ± 12.1) years and 50 sex- and age-matched healthy controls (25 females and 25 males) (**Table I**). Participants were recruited from cohort of patients admitted to the Department of Dermatology, Venereology and Allergology of Wroclaw Medical University, Poland. The diagnosis of HS was established according to well-defined clinical criteria in agreement with the Dessau definition (1). The mean ± SD duration of disease was assessed as 9.1 ± 8.3 years (range 1 month to 46 years). Disease severity was evaluated with Hidradenitis Suppurativa Score (HSS), Hidradenitis Suppurativa Severity Index (HSSI) and Hurley's staging (8–10).

The majority of patients with HS were overweight and the majority of controls were in the normal weight range, with mean ± SD body mass index (BMI) 28.8 ± 5.4 and 24.7 ± 3.6 kg/m^2, respectively. Moreover, the groups studied consisted of 72.2% (HS patients) vs. 32% (controls) of current or ex-smokers.

All patients and controls with an itchy/painful skin condition of any type, or who were receiving any anti-pruritics or pain-killers (e.g. antihistamines, immunomodulators/immunosuppressants, etc. (> 5 half-lives washout period)), were excluded. None of the

doi: 10.2340/00015555-2967
Acta Derm Venereol 2018; 98: 757–761

Table I. Characteristics of studied groups

	Patients with HS ($n=108$)	Controls ($n=50$)
Sex, *n*		
Women	51	25
Men	57	25
Age, years, mean±SD	36.3±12.1	40.4±9.1
Range	15–67	23–57
Disease duration, years, mean±SD	9.1±8.3	N/A
Range	1 month–46 years	N/A
Body mass index, kg/m^2, mean±SD	28.8±5.4	24.7±3.6
Range	17.7–42.4	17.9–30.25
Body mass index, kg/m^2, *n*		
<18.5 underweight	1	3
18.5–24.99 – normal weight	31	19
25–29.99 – overweight	34	26
30–34.99 – obese class I (moderately obese)	24	2
35–39.99 – obese class II (severely obese)	15	0
>40 – very obese	3	0
Smoking, *n* (%)		
Current smokers (-ex smokers)	60 (18)	9 (7)
Non-smokers	30	34
Presence of itch due to HS, *n* (%)		
During whole course of disease	66 (61)	N/A
Within last 3 days	56 (51.9)	N/A
Presence of pain due to HS, *n* (%)		
During whole course of disease	93 (86)	N/A
Within last 3 days	86 (79.6)	N/A
Hurley I/II/III, *n*	50/49/9	N/A
HSSI, mean±SD	9.0±4.4	N/A
Range	2–18	N/A
HSS, mean±SD	34.8±32.1	N/A
Range	4–144	N/A
Dermatology Life Quality Index, mean±SD	13.0±8.0	N/A
Range	0–30	N/A

HS: hidradenitis suppurativa; N/A: not applicable; HSSI: Hidradenitis Suppurativa Severity Index; HSS: Hidradenitis Suppurativa Score.

patients or controls had a known primary psychological disorder or disease of any type that may have influenced sleep quality (e.g. obstructive sleep apnoea).

The severity of itch and pain was evaluated with a visual analogue scale (VAS) at the time of patient examination (VAS_{exam}), as both mean (VAS_{mean}) and the most intensive experienced (VAS_{max}) within the last 3 days. VAS is a 10-cm line, in our study oriented horizontally, on which patients indicated the intensity of subjective symptoms by marking the line vertically at the point corresponding to the severity of itch or pain. Scores ranged from 0 points (no itch/pain) to 10 points (worst itch/pain imaginable). Categorization for itch in VAS scoring, mild (>0–<3 points), moderate (≥3–<7 points) and severe or very severe itch (≥7–10 points), as proposed by Reich et al. (11), was used. The respective cut-off points for pain (≤5; >5–7; >7–10) could be distinguished (12).

To evaluate a spectrum of sleep disturbances, all patients and controls were asked to complete the validated version of multiple self-assessment questionnaires, including the Athens Insomnia Scale (AIS) and Pittsburgh Sleep Quality Index (PSQI). In addition, quality of life was assessed with the Dermatology Life Quality Index (DLQI).

AIS is a self-assessment psychometric instrument designed for quantifying sleep difficulty based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) criteria, over a 1-month time interval. It consists of 8 items: sleep induction, awakenings during the night, final awakening, total sleep duration, sleep quality well-being, functioning capacity, and sleepiness during the day. The questionnaire uses 8-item based on a 0–3 scale, in which "3" designates a negative outcome. Total AIS scores range from 0 to 24 points. A total score of ≥6 points reflects a diagnosis of insomnia (13, 14).

PSQI is a self-rated questionnaire that assesses sleep quality and disturbances over a 4-last week time interval. It is used to evaluate 7 domains of sleep quality: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The questionnaire uses 14 questions based on a 0–3 scale, where "3" defines a negative outcome, and 4 open-ended questions. PSQI scores range from 0 to 21 points. A global score of ≥5 reflects a specific and sensitive measure of poor sleep quality (15, 16).

DLQI is a self-assessment psychometric instrument designed for estimating the impact of a skin disease on the patients' life over the previous week. It is used to assess 6 specific aspects of a patient's life, including symptoms and feelings, daily activities, leisure, work and school, and personal relationships. DLQI uses 10 questions, based on a scale from 0 to 3. Scores range from 0–30 points, with higher scores indicating worse QoL (17).

The study was approved by the ethics committee of Wroclaw Medical University (number KB – 455/2017). Informed written consent to participate in the study was obtained from all studied individuals.

Statistical analysis

All data were assessed for parametric or non-parametric distribution. Pearson's χ^2 test was applied to sets of categorical data. Differences between groups were determined using the Mann–Whitney *U* test and Kruskal–Wallis test or Student's *t*-test with reference to the distribution of evaluated variables (non-normal or normal, respectively). Correlations were determined by Spearman's correlation analysis. The resulting *p*-values were considered nominally significant at $p<0.05$. Statistical analyses were performed using Statistica 12 software (StatSoft, Tulsa, USA).

RESULTS

Itch and pain were experienced by the majority of patients with HS during the whole course of the disease: 61% (66/108) and 86% (93/108), respectively. The respective symptoms were reported by 51.9% (56/108) and 79.6% (86/108) of patients with HS during the last 3 days. Itch intensity was assessed as 4.1±2.9 and 5.0±2.1 points (for VAS_{mean} and VAS_{max}, respectively). Pain severity was evaluated as 4.9±2.9 and 7.3±2.4 points (for VAS_{mean} and VAS_{max}, respectively). Moreover, according to the cut-offs for VAS_{mean}, 73.2% of patients with HS reported having mild-to-moderate itch and pain (**Table II**).

Mean AIS score among patients with HS was assessed as 5.4±4.3 points (range 0–20), whereas controls scored 5.5±3.4 points (range 0–14). No statistically significant differences were found in AIS scores for patients with HS and controls. The results for 39.8% of studied indi-

Table II. Hidradenitis suppurativa-linked itch and pain intensity (VAS_{mean}) among studied individuals

	VAS_{mean} Patients/Controls *n (%)*
Itch	
Mild	22/56 (39.3)
Moderate	19/56 (33.9)
Severe/very severe	15/56 (26.8)
Pain	
Mild	45/86 (52.3)
Moderate	18/86 (20.9)
Severe	23/86 (26.8)

Table III. Sleep quality of hidradenitis suppurativa (HS) patients and controls

Pittsburgh Sleep Quality Index	HS patients Mean ± SD	Control group Mean ± SD	*p*-value
Subjective sleep quality	1.0 ± 0.7	0.9 ± 0.6	0.67
Sleep latency	1.2 ± 0.9	0.7 ± 0.6	**0.001**
Sleep duration	1.0 ± 0.9	0.5 ± 0.6	**0.001**
Habitual sleep efficiency	0.6 ± 0.9	0.1 ± 0.2	**0.001**
Sleep disturbances	1.2 ± 0.6	0.1 ± 0.3	**< 0.0001**
Use of sleeping medication	0.3 ± 0.7	0.04 ± 0.2	0.34
Daytime dysfunction	1.2 ± 0.9	0.8 ± 0.6	**0.02**
Total	6.5 ± 3.6	3.1 ± 1.9	**< 0.0001**

SD: standard deviation. Significant values are shown in bold.

viduals with HS suggested the co-existence of insomnia (AIS ≥ 6). The mean scores for PSQI were 6.5 ± 3.6 points (range 0–18) and 3.1 ± 1.9 points (range 0–7) for patients with HS and control subjects, respectively ($p < 0.0001$). For patients with HS, 70.4%, and, for controls, 22% scored 5 points or more and were classified as poor sleepers ($p < 0.001$). With reference to the above-mentioned data, it seems that patients with HS do not have significantly more frequent insomnia (AIS), but do have significantly more sleep disturbances (PSQI) than controls. Moreover, it should be highlighted that the patients with HS, on average, had more severely affected sleep quality with regard to sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances and daytime dysfunction compared with controls (**Table III**). Nonetheless, no significant between-group differences were established with respect to subjective sleep quality and use of sleeping medication (data not shown).

The presence of both itch and pain had a significant impact on frequency of insomnia, but the pain was additionally a crucial factor responsible for poor sleep quality among patients with HS ($p = 0.02$), with no itch-related impact on PSQI scores ($p = 0.3$). In addition, the presence of pain significantly affected subjective sleep quality ($p = 0.03$), sleep duration ($p = 0.01$) and daytime dysfunction ($p = 0.04$).

Furthermore, the severity of itch (VAS_{mean}) and pain (VAS_{mean}) was significantly correlated with AIS scores ($R = 0.24$, $p = 0.03$; for both correlations). This trend was observed also for PSQI scores with regard to pain intensity (VAS_{mean}), but did not reach statistical significance (**Fig. 1**).

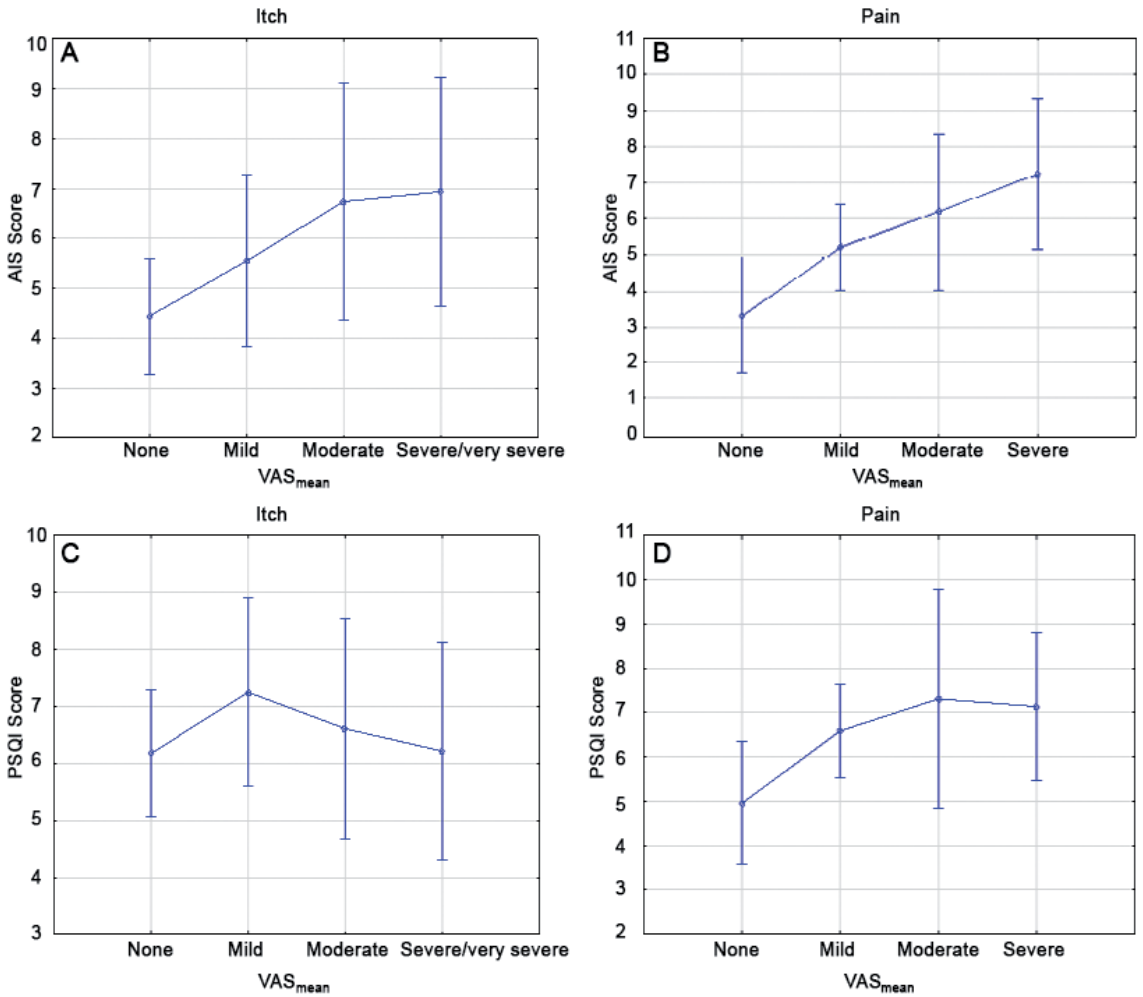

Fig. 1. Dependences of Athens Insomnia Scale (AIS) **and Pittsburgh Sleep Quality Index** (PSQI) **scores among patients with hidradenitis suppurativa** (HS) **with regard to itch or pain intensity (cut-offs).**

AIS and PSQI scores were independent of age, sex, BMI, smoking habits, localization of the lesions, and disease duration and its severity assessed with HSS and Hurley staging (detailed data not shown). However, the scores on both questionnaires correlated significantly with DLQI results ($p < 0.0001$).

DISCUSSION

HS is generally known to impair QoL (5, 18); however, the impact of HS on sleep impairment has not been thoroughly investigated. Itch is one of the subjective symptoms associated with HS, mostly as an initial sensation, in the acute and chronic phases of the disease, although HS is not usually described as an itchy skin condition (7, 19). Nonetheless, its mean intensity, estimated with VAS, ranges from 3.7 to 3.9 points (7, 20), thus the patients with HS had moderate itch (11). Pain in HS is described as burning, hot, stretching, pressing, cutting, taut, splitting, gnawing and aching, and it is reported by patients with HS as the most troublesome subjective symptom negatively influencing QoL, with its intensity assessed as mean VAS 4.5 to 4.6 points (8, 7). In concordance with previous studies, itch and pain mean intensity in our study were assessed as 4.1 and 4.9 points, respectively.

Potential predictors of sleep quality, such as cognitive and somatic arousal, itch, pain, depression, mood, anxiety and obstructive sleep apnoea (OSA), have been identified in previous studies (21, 22). Thus, itch accompanying dermatoses, such as atopic dermatitis (AD) or plaque psoriasis (Ps), has also been implicated in poor sleep quality (23–25). Similarly to itch, Gezer et al. (26) established that pain negatively influenced the quality of sleep in patients with psoriatic arthritis (PsA) compared with healthy controls. Furthermore, chronic pain contributed to insomnia, as has been shown by Ohayon (27) in chronic painful physical conditions, such as fibromyalgia, arthritis, lower back pain and headaches.

With reference to the general healthy population, the mean PSQI score in our study was 3.1 points, and was slightly lower than in normative German or Austrian populations (5.0 and 4.5 points, respectively) (28, 29). The PSQI total score of 6.5 points for patients with HS in this study was significantly higher than for controls, and seems to be higher than among general populations evaluated in previous studies (28, 29). Moreover, patients with other dermatoses, including AD and Ps, seem to have comparable mean PSQI scores, assessed as 7.0 and 7.0–9.2 points, respectively (21, 30, 31).

Patients with AD had significantly impacted subjective sleep quality and daytime dysfunction (30) compared with controls, but patients with Ps were severely affected with regard to subjective sleep quality, habitual sleep efficiency and daytime dysfunction (31). In addition to habitual sleep efficiency and daytime dysfunction, the results of the current study regarding patients with HS showed significant involvement of sleep latency, sleep duration and sleep disturbance domains.

It is notable that HS, as a chronic skin disease, seems to have a similar, or even more major, effect on sleep quality than severe systemic conditions, including systemic lupus erythematosus (SLE), chronic obstructive pulmonary disease (COPD) or Hodgkin's lymphoma (HL) and non-Hodgkin's lymphoma (NHL). For instance, the researchers reported mean PSQI scores of 6.5 points and 8.1 points among SLE patients without and with metabolic syndrome, respectively (32). Moreover, a total PSQI score of 6.0 points in patients with COPD was reported (33). In a large study from a population-based German regional cancer registry, involving 515 patients with long-term survivors of HL and NHL, 48.2% were classified as poor sleepers, with mean PSQI scores of 5.8 and 6.4 points for HL and NHL, respectively (34). Therefore, it could be assumed that the itch and pain accompanying HS has considerable influence on patient's sleep quality, as was confirmed in our study. The only research into sleep quality in HS was the study conducted by Vossen et al. (35), who found that itch affected sleep and activities of daily living, according to the Modified 5-Dimensional (5-D) Itch Scale. Our study also revealed that itch and pain had a substantial impact on insomnia frequency and sleep quality. The presence of both itch and pain had a significant impact on frequency of insomnia, but the pain was also a crucial factor responsible for poor sleep quality among patients with HS. More precisely, the presence of pain has a significant debilitating influence on subjective sleep quality ($p = 0.03$), sleep duration ($p = 0.01$) and daytime dysfunction ($p = 0.04$). Furthermore, the severity of itch and pain correlated significantly with insomnia scores. As in a previous study by Vossen et al. (35), we emphasize the importance of pain, which seems to be a crucial factor impairing sleep quality.

In conclusion, itch and pain have an important impact on insomnia and sleep quality in patients with HS. Intervention studies on itch and pain management may be essential for improving sleep quality in patients with HS. Further research into objective measurements of sleep quality, in the form of questionnaire-based epidemiological surveys (over a longer period of time), are needed in order to understand the nature of poor sleep in patients with HS. Furthermore, in order to improve sleep quality, the management of patients with HS should include strategies for itch and pain relief.

ACKNOWLEDGEMENT

Funding sources: Research grant by Wroclaw Medical University (grant number STM.C260.16.030).

The authors have no conflicts of interest to declare.

REFERENCES

1. Zouboulis CC, Desai N, Emtestam L, Hunger RE, Ioannides D, Juhász I, et al. European S1 guideline for treatment of hidradenitis suppurativa/acne inversa. J Eur Acad Dermatol Venereol 2015; 29: 619–644.
2. Jemec GB, Heidenheim M, Nielsen NH. The prevalence of hidradenitis suppurativa and its potential precursor lesions. J Am Acad Dermatol 1996; 35: 191–194.
3. Revuz JE, Canoui-Poitrine F, Wolkenstein P, Viallette C, Gabison G, Pouget F, et al. Prevalence and factors associated with hidradenitis suppurativa: results from two case-control studies. J Am Acad Dermatol 2008; 59: 596–601.
4. Matusiak Ł, Bieniek A, Szepietowski JC. Hidradenitis suppurativa markedly decreases quality of life and professional activity. J Am Acad Dermatol 2010; 62: 706–708.
5. Matusiak Ł, Bieniek A, Szepietowski JC. Psychophysical aspects of hidradenitis suppurativa. Acta Derm Venereol 2010; 90: 264–268.
6. Gupta MA, Gupta AK. Sleep-wake disorders and dermatology. Clin Dermatol 2013; 31: 118–126.
7. Matusiak Ł, Szczęch J, Kaaz K, Lelonek E, Szepietowski JC. Clinical characteristics of pruritus and pain in patients with hidradenitis suppurativa. Acta Derm Venereol 2018; 98: 191–194.
8. Sartorius K, Emtestam L, Jemec GB, Lapins J. Objective scoring of hidradenitis suppurativa reflecting the role of tobacco smoking and obesity. Br J Dermatol 2009; 161: 831–839.
9. Grant A, Gonzalez T, Montgomery MO, Cardenas V, Kerdel FA. Infliximab therapy for patients with moderate to severe hidradenitis suppurativa: a randomized, double-blind, placebo-controlled crossover trial. J Am Acad Dermatol 2010; 62: 205–217.
10. Hurley HJ. Axillary hyperhidrosis, apocrine bromhidrosis, hidradenitis suppurativa and familial benign pemphigus. Surgical approach. In: Roenigk RK, Roenigk HH, editors. Roenigk & Roenigk's dermatologic surgery: principles and practice (2nd edn). New York: Marcel Dekker, 1996: p. 623–645.
11. Reich A, Chatzigeorkidis E, Zeidler C, Osada N, Furue M, Takamori K, et al. Tailoring the cut-off values of the visal analogue scale and numeric rating scale in itch assessment. Acta Derm Venereol 2017; 97: 759–760.
12. Chien CW, Bagraith KS, Khan A, Deen M, Syu JJ, Strong J. Establishment of cutpoints to categorize the severity of chronic pain using composite ratings with Rasch analysis. Eur J Pain 2017; 21: 82–91.
13. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. Athens Insomnia Scale: validation of an instrument based on ICD-10 criteria. J Psychosom Res 2000; 48: 555–560.
14. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. The diagnostic validity of the Athens Insomnia Scale. J Psychosom Res 2003; 55: 263–267.
15. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193–213.
16. Backhaus J, Junghanns K, Broocks A, Riemann D, Hohagen F. Test-retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. J Psychosom Res 2002; 53: 737–740.
17. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI) – a simple practical measure for routine clinical use. Clin Exp Dermatol 1994; 19: 210–216.
18. von der Werth JM, Jemec GB. Morbidity in patients with hidradenitis suppurativa. Br J Dermatol 2001; 144: 809–813.
19. Ring HC, Theut Riis P, Zarchi K, Miller IM, Saunte DM, Jemec GB. Prodromal symptoms in hidradenitis suppurativa. Clin Exp Dermatol 2017; 42: 261–265.
20. Riis PT, Vinding GR, Ring HC, Jemec GB. Disutility in patients with hidradenitis suppurativa: a cross-sectional study using EuroQoL-5D. Acta Derm Venereol 2016; 96: 222–226.
21. Henry AL, Kyle SD, Chisholm A, Griffiths CEM, Bundy C. A cross-sectional survey of the nature and correlates of sleep disturbance in people with psoriasis. Br J Dermatol 2017; 177: 1052–1059.
22. Henry AL, Kyle SD, Bhandari S, Chisholm A, Griffiths CE, Bundy C. Measurement, classification and evaluation of sleep disturbance in psoriasis: a systematic review. PLoS One 2016; 11:e0157843.
23. Chang YS, Chou YT, Lee JH, Dai YS, Sun C, Lin YT, et al. Atopic dermatitis, melatonin, and sleep disturbance. Pediatrics 2014; 134: e397–405.
24. Sherry HY, Attarian H, Zee P, Silverberg JI. Burden of sleep and fatigue in US adults with atopic dermatitis. Dermatitis 2016; 27: 50–58.
25. O'Neill JL, Chan YH, Rapp SR, Yosipovitch G. Differences in itch characteristics between psoriasis and atopic dermatitis patients: results of a web-based questionnaire. Acta Derm Venereol 2011; 91: 537–540.
26. Gezer O, Batmaz İ, Sariyildiz MA, Sula B, Ucmak D, Bozkurt M, et al. Sleep quality in patients with psoriatic arthritis. Int J Rheum Dis 2017; 20: 1212–1218.
27. Ohayon MM. Relationship between chronic painful physical condition and insomnia. J Psychiatr Res 2005; 39:151–159.
28. Hinz A, Glaesmer H, Brähler E, Löffler M, Engel C, Enzenbach C, et al. Sleep quality in the general population: psychometric properties of the Pittsburgh Sleep Quality Index, derived from a German community sample of 9284 people. Sleep Med 2017; 30: 57–63.
29. Zeitlhofer J, Schmeiser-Rieder A, Tribl G, Rosenberger A, Bolitschek J, Kapfhammer G, et al. Sleep and quality of life in the Austrian population. Acta Neurol Scand 2000; 102: 249–257.
30. Bender BG, Leung SB, Leung DY. Actigraphy assessment of sleep disturbance in patients with atopic dermatitis: an objective life quality measure. J Allergy Clin Immunol 2003; 111: 598–602.
31. Melikoglu M. Sleep quality and its association with disease severity in psoriasis. Eurasian J Med 2017; 49: 124–127.
32. Margiotta DPE, Basta F, Dolcini G, Batani V, Navarini L, Afeltra A. The relation between, metabolic syndrome and quality of life in patients with systemic lupus erythematosus. PLoS One 2017; 12: e0187645.
33. Aras YG, Tunç A, Güngen BD, Güngen AC, Aydemir Y, Demiyürek BE. The effects of depression, anxiety and sleep disturbances on cognitive impairment in patients with chronic obstructive pulmonary disease. Cogn Neurodyn 2017; 11: 565–571.
34. Hammersen F, Lewin P, Gebauer J, Kreitschmann-Andermahr I, Brabant G, Katalinic A, et al. Sleep quality and health-related quality of life among long-term survivors of (non-) Hodgkin lymphoma in Germany. PLoS One 2017; 12: e0187673.
35. Vossen ARJV, Schoenmakers A, van Straalen KR, Prens EP, van der Zee HH. Assessing pruritus in hidradenitis suppurativa: a cross-sectional study. Am J Clin Dermatol 2017; 18: 687–695.