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Authors

Smith, Payton
Jin, Joy
Spencer, Riley
et al.

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BRIEF REPORT

Psoriasis and Sleep Disturbance: A US Population-Based Study Using the NHANES Database

Payton Smith · Joy Q. Jin · Riley K. Spencer · Kareem G. Elhage · Chandler E. Johnson · Kathryn Haran · Allison Kranyak · Mitchell S. Davis · Marwa Hakimi · Aric A. Prather · Katie L. Stone · Wilson Liao · Tina Bhutani

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ABSTRACT

***Introduction*:** Psoriasis, a chronic inflammatory skin condition, affects approximately 3.0% of the US population, with patients often experiencing significant sleep disturbances. These disturbances include a higher prevalence of conditions such as obstructive sleep apnea, restless leg syndrome, and insomnia. Given the additional risks for cardiovascular disease, metabolic disorders, and depression linked to both poor sleep and psoriasis, addressing sleep issues in this patient group is critical.

***Methods*:** The study utilized National Health and Nutrition Examination Survey (NHANES) data, focusing on individuals aged ≥ 20 years who provided information on psoriasis status and sleep. Multistage stratified survey methodology was applied, with multivariable logistic regression models used to examine the association between psoriasis and sleep issues, adjusting for factors such as age, gender, and health history.

***Results*:** Psoriasis diagnosis was significantly associated with trouble sleeping (adjusted odds ratio [aOR] 1.88; 95% confidence interval [CI] 1.44–2.45). There was no significant association between psoriasis and sleep quantity. Older age, female gender, and a history of sleep disorders were predictors of trouble sleeping among psoriasis patients.

***Conclusions*:** Psoriasis is significantly associated with sleep disturbances, independent of sleep duration. This underscores the need for clinical screening focusing on sleep quality rather than quantity in psoriasis patients to effectively identify and treat sleep-related comorbidities. Further research using objective sleep measures is warranted to guide clinical management and improve patient quality of life.

Payton Smith and Joy Q. Jin contributed equally to this study.

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P. Smith (✉) · J. Q. Jin · R. K. Spencer · K. G. Elhage · C. E. Johnson · K. Haran · A. Kranyak · M. S. Davis · M. Hakimi · W. Liao · T. Bhutani
Department of Dermatology, University of California at San Francisco, 2340 Sutter St., Box 0808, Floor 04, Room N426, San Francisco, CA 94115, USA
e-mail: payton.smith@ucsf.edu

J. Q. Jin
School of Medicine, University of California at San Francisco, San Francisco, CA, USA

A. A. Prather
Department of Psychiatry and Behavioral Sciences, University of California at San Francisco, San Francisco, CA, USA

K. L. Stone
California Pacific Medical Center Research Institute, San Francisco, CA, USA

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Key Summary Points
The study identified a significant association between psoriasis and sleep disturbances, highlighting that individuals with psoriasis are much more likely to experience trouble sleeping
There is no significant link between psoriasis and the quantity of sleep, emphasizing the impact of psoriasis on sleep quality rather than duration
Key predictors of sleep disturbances in psoriasis patients include older age, female gender, and a history of sleep disorders
The findings emphasize the need for clinical screenings that focus on sleep quality and call for further research using objective sleep measures to enhance patient care

INTRODUCTION

Psoriasis is a chronic inflammatory skin condition that affects roughly 2–3% of the population [1]. According to the Global Burden of Disease 2019 study, the highest burden is seen in the 60–64 and 65–69 age groups, and it is relatively consistent between males and females across all age groups [2]. Prior research has shown that psoriasis patients experience subjective sleep disturbance and have a high prevalence of sleep disorders, including obstructive sleep apnea (OSA), restless leg syndrome, and insomnia [3]. Chronic poor sleep has detrimental health effects and represents an independent risk factor for cardiovascular disease, metabolic disorders, and depression—comorbid conditions that psoriasis patients are already at increased risk for [4–6].

Given the potential for compounded risk, screening for and treating sleep difficulties may be particularly important for this population. However, psoriasis patients note that insufficient time is dedicated to discussion of sleep-related concerns during clinic visits, and limited knowledge exists regarding which aspects of sleep are most impacted [7, 8].

Most prior studies examining the association between psoriasis and sleep disturbance utilize small sample sizes or single-center designs [9, 10]. There are limited studies that compare sleep patterns in individuals with and without psoriasis using a large, nationally representative dataset, which can inform how to prioritize population-level screening. The Trovato et al. [11] study, which used the Pittsburgh Sleep Quality Index (PSQI) to measure sleep quality, found a trend of worsening sleep quality with increasing psoriasis severity. However, these differences were not statistically significant, indicating the potential for further research to explore this relationship in more detail [11].

Additionally, few studies have assessed whether patients are more likely to report insufficient sleep quantity, poor sleep quality, or both [3, 12]. This information would help focus clinical screening questions to better identify psoriasis patients needing treatment for their sleep issues. To address these gaps, this cross-sectional study aims to measure the association between psoriasis and sleep patterns (both sleep duration and sleep quality) using data from the 2011–2014 cycles of the US NHANES.

METHODS

NHANES is nationally representative of non-institutionalized US individuals and inclusive of traditionally underrepresented populations, employing multistage, stratified survey methodology, population-specific sample weights, and over-sampling of Black, Hispanic, Asian, and low-income White individuals.[1] The years 2011–2014 were selected for analysis as these two cycles (1) were the most recently published NHANES cycles with data on psoriasis diagnosis and severity, (2) used the same sampling methods, and (3) included questions about sleep quantity and quality. Data were collected from participants via completion of a health survey

questionnaire conducted by interview; no skin examination was performed. The Institutional Review Board (IRB) of the University of California, San Francisco, classified this study as non-human subject research; informed consent was waived as the data used were deidentified and publicly available (National Center for Health Statistics Research Ethics Review Board Protocol No. 2011-17). This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [13].

We included individuals aged ≥ 20 years who responded to questions about psoriasis and sleep (**Supplemental Table I**). All statistical tests were performed using Stata (Version 15.1, Statacorp) utilizing the complex survey function for the NHANES population data. The exposed group was those who had been told they had a diagnosis of psoriasis by any healthcare professional. The outcomes of interest included (1) sleep quantity (mean hours slept per night on weekdays or workdays) and (2) sleep quality (self-reported trouble sleeping).

RESULTS

Data from 12,625 participants, including 329 with psoriasis (2.60%), were included (mean [SD] age, 32.80 [24.10] years; 6492 females [51.40%]; 4828 non-Hispanic White individuals [38.20%]) (Table 1). In a multivariable logistic regression model adjusted for age, gender, race/ethnicity, body mass index (BMI), history of depression, and diagnosis of sleep disorders, psoriasis diagnosis was significantly associated with trouble sleeping (aOR 1.88; 95% CI 1.44–2.45) (Table 2). Further multivariate analysis of individuals with psoriasis found older age (aOR 1.02 per year; 95% CI 1.00–1.03), female gender (aOR 1.91; 95% CI 1.14–3.22), and history of sleep disorders (aOR 0.13; 95% CI 0.05–0.29)—but not psoriasis severity, BMI, history of depression, or psoriatic arthritis—to be associated with trouble sleeping (**Supplemental Table II**). No association between psoriasis diagnosis and average nightly sleep quantity (divided into < 7 vs. ≥ 7 h based on the American Academy of Sleep Medicine definition of insufficient sleep) was found [14]. Further sensitivity analyses using different cut points and sleep quantity as a continuous variable did not change results.

DISCUSSION

To our knowledge, this study is the first large-scale, population-based study comparing sleep characteristics between individuals with and without psoriasis. The results confirm widespread prevalence (38.30%) of trouble sleeping in psoriasis patients using a nationally representative database, as reflected in our dataset demographics. Individuals with psoriasis were significantly more likely to report trouble sleeping compared to those without psoriasis, despite no significant difference in the reported duration of sleep. This indicates that inquiring about sleep quantity alone may not be sufficient to screen for sleep issues in this population. Rather, asking about the type of sleep disturbance and quality of sleep may be more important to assess the risk of sleep-related comorbidities (e.g., OSA, restless leg syndrome), especially among older patients and females, which may prompt changes in diagnosis and management. Furthermore, individuals with a history of sleep disorders paradoxically reported significantly fewer perceived sleep disturbances, warranting further research in this area.

Of note, subclinical and clinical airway inflammation, respiratory comorbidities of psoriasis characterized by elevated fractional exhaled nitric oxide (FeNO) levels and increased inflammatory cytokines, can exacerbate previously mentioned sleep disturbances. These disturbances, such as OSA and insomnia, are further worsened by respiratory symptoms like nocturnal coughing, shortness of breath, and increased airway resistance. These inflammatory processes impair lung function, disrupting sleep patterns and decreasing overall sleep quality [15, 16].

Narrowband ultraviolet B phototherapy has been shown to reduce proinflammatory cytokine levels (TNF-a, IL-1, IL-6, IL-8, IL-17, and IL-12), which not only improves psoriasis symptoms but also ameliorates airway inflammation, leading to better control of respiratory comorbidities

Table 1 Comparison of demographic factors between patients with and without psoriasis

Characteristic	Participants		*P* value
	No psoriasis (*n* = 12,296)	Psoriasis (*n* = 329)	
Age, mean years (95% CI)	45.6 (45.2–45.9)	51.4 (49.5–53.3)	< 0.001
Gender, *n* (%) [95% CI]			
Male	5,978 (48.6) [47.7–49.5]	155 (47.1) [41.8–52.5]	0.59
Female	6,318 (51.4) [50.5–52.3]	174 (52.9) [47.5–58.2]	
Race and ethnicity[a], *n* (%)			
Mexican American	1,549 (12.6) [12.0–13.2]	21 (6.4) [4.2–9.6]	< 0.001
Non-Hispanic White	4,650 (37.8) [37.0–38.7]	178 (54.1) [48.7–59.4]	
Non-Hispanic Black	2,948 (24.0) [23.2–24.7]	44 (13.4) [10.1–17.5]	
Non-Hispanic Asian	1,586 (12.9) [12.3–13.5]	40 (12.2) [9.0–17.5]	
Other Hispanic	1,184 (9.6) [9.1–10.2]	32 (9.7) [7.0–13.4]	
Other[b]	379 (3.1) [2.8–3.4]	14 (4.3) [2.5–7.1]	
BMI, mean (95% CI)	28.5 (28.4–28.7)	29.8 (29.0–30.7)	0.002
Sleep quantity[c], mean hours slept (95% CI)	6.9 (6.9, 6.9)	6.8 (6.7, 7.0)	0.36
Trouble sleeping[d] (%)			
Yes	2,830 (23.0) [22.3–23.8]	126 (38.3) [33.2–43.7]	< 0.001
No	9,463 (77.0) [76.2–77.7]	203 (61.7) [56.3–66.8]	

[a]Race and ethnicity were self-reported

[b]Included multiracial participants. NHANES did not provide a detailed list of all races and ethnicities included in this category

[c]Sleep quantity was obtained as self-reported average hours of sleep per night on weekdays or workdays

[d]Self-reported trouble sleeping ever reported to a doctor or other health professional

BMI body mass index, *CI* confidence interval, *SD* standard deviation

such as asthma [17]. Other therapies may also help manage these inflammatory processes and improve sleep quality in psoriasis patients. Understanding the multifaceted benefits of these therapies is crucial for developing comprehensive treatment plans that address skin symptoms and associated comorbidities, including sleep disturbances.

The present study is limited by the absence of objective data, such as polysomnography and multiple sleep latency testing, due to the cross-sectional nature and design of the NHANES questionnaire. Moving forward, continued studies are needed to evaluate sleep quality in psoriasis patients, especially as effective therapeutic interventions for sleep disturbance exist (e.g., app-based interventions, digital cognitive behavioral therapy, and image relief therapy) but are likely underutilized and not discussed during outpatient dermatology visits [7, 18]. Data from accelerometry, actigraphy, and polysomnography could serve as more objective clinical benchmarks for treatment goals by detailing the number of awakenings, movements, and sleep efficiency [19]. Ultimately, increased identification and treatment of sleep disturbance, together with standard psoriasis

Table 2 Multivariable analysis of factors associated with trouble sleeping among patients with and without psoriasis

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	*P* value
Psoriasis[a] (ever diagnosed vs. never diagnosed)	2.08 (1.66–2.60)	1.88 (1.44–2.45)	< 0.001
Age (per additional year)		0.98 (0.97–0.99)	0.002
Gender (female vs. male)		1.43 (0.89–2.31)	0.143
Race and ethnicity (non-Hispanic White vs. all other)		0.98 (0.95–1.01)	0.18
BMI (per additional point)		1.01 (1.00–1.03)	0.031
History of depression		0.98 (0.50–1.91)	0.943
History of sleep disorders		0.01 (0.01–0.02)	< 0.001

[a]Psoriasis was reported as ever-diagnosed if the patient had ever been told by a doctor or other health care professional that they had psoriasis

BMI body mass index, *CI* confidence interval, *OR* odds ratio

therapies, could lead to meaningful improvements in patient health and quality of life.

CONCLUSION

In conclusion, this study underscores the significant association between psoriasis and impaired sleep quality, highlighting a critical area for clinical focus and intervention. Psoriasis is significantly associated with sleep disturbances independent of sleep duration, suggesting a need for more detailed and targeted screening processes that prioritize sleep quality issues. The findings call for a nuanced approach in clinical settings to effectively address and manage sleep disturbances, which are prevalent but often under-discussed in psoriasis patients. Incorporating comprehensive sleep assessments into routine care could greatly enhance treatment outcomes and improve the overall health and well-being of individuals suffering from this chronic condition.

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Author Contributions. Conception: Joy Q. Jin and Tina Bhutani. Methodology: Aric A. Prather, Katie L. Stone, and Tina Bhutani. Formal analysis and investigation: Joy Q. Jin and Tina Bhutani. Writing—original draft preparation: Payton Smith, Joy Q. Jin. Writing—review and editing: all authors. Supervision: Wilson Liao and Tina Bhutani.

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Data Availability. The authors confirm that the data supporting this study's findings are publicly available [https://wwwn.cdc.gov/nchs/nhanes/]. The IRB of the University of California, San Francisco, classified this study as non-human subject research. Informed consent was waived, as the data used were non-identifiable and publicly available. No recognizable patient photographs or other identifiable material was included. Reprint requests can be sent to Dr. Tina Bhutani, M.D., M.A.S. No data from the study has previously been published.

Declarations

Conflict of Interests. Joy Q. Jin has received research grant funding from the National Psoriasis Foundation and institutional funding from the University of California, San Francisco. Aric A. Prather has received research funding from Eisai and Big Health and serves as an advisor to NeuroGeneces. Wilson Liao has received research grant funding from Abbvie, Amgen, Janssen, Leo, Novartis, Pfizer, Regeneron, and TRex Bio. Tina Bhutani has received research grant funding from Novartis and Regeneron and is a principal investigator for trials sponsored by Abbvie, Castle, CorEvitas, Dermavant, Galderma, Mindera, and Pfizer. Tina Bhutani has served as an advisor for Abbvie, Arcutis, Boehringer-Ingelheim, Bristol Myers Squibb, Janssen, Leo, Lilly, Novartis, Pfizer, Sun, and UCB. The remaining authors have no conflicts of interest to disclose.

Ethical Approval. This study was conducted in accordance with the Declaration of Helsinki and its later amendments. Ethical review and approval were waived by the Institutional Review Board (IRB) of the University of California, San Francisco, due to the non-human subject research classification, as the data used were deidentified and publicly available. Informed consent was waived by the same IRB for the same reasons. The research involved no direct interaction with human participants by the researchers, and all analyses were performed on previously collected data that are publicly accessible and maintained in the NHANES database. The NHANES study protocols were reviewed and approved by the National Center for Health Statistics (NCHS) Research Ethics Review Board, and informed consent was obtained from all individual participants included in the original NHANES study. Our study strictly followed the ethical guidelines for secondary data analysis, ensuring the confidentiality and anonymity of the data subjects. No identifiable personal data or images were used in this study.

REFERENCES

1. Armstrong AW, Mehta MD, Schupp CW, Gondo GC, Bell SJ, Griffiths CEM. Psoriasis prevalence in adults in the United States. JAMA Dermatol. 2021;157(8):940–6. https://doi.org/10.1001/jamadermatol.2021.2007. (**PubMed PMID: 34190957; PubMed Central PMCID: PMC8246333**).

2. Damiani G, Bragazzi NL, Karimkhani Aksut C, Wu D, Alicandro G, McGonagle D, et al. The global, regional, and national burden of psoriasis: results and insights from the global burden of disease 2019 study. Front Med (Lausanne). 2021;8:743180. https://doi.org/10.3389/fmed.2021.743180. (**Epub 20211216; PubMed PMID: 34977058; PubMed Central PMCID: PMC8716585**).

3. Gupta MA, Simpson FC, Gupta AK. Psoriasis and sleep disorders: a systematic review. Sleep Med Rev. 2016;29:63–75. https://doi.org/10.1016/j.smrv.2015.09.003. (**Epub 20150921; PubMed PMID: 26624228**).

4. Chiu HY, Hsieh CF, Chiang YT, Tsai YW, Huang WF, Li CY, et al. Concomitant sleep disorders significantly increase the risk of cardiovascular disease in patients with psoriasis. PLoS ONE. 2016;11(1):e0146462. https://doi.org/10.1371/journal.pone.0146462. (**Epub 20160108; PubMed PMID: 26745869; PubMed Central PMCID: PMC4712908**).

5. Itani O, Jike M, Watanabe N, Kaneita Y. Short sleep duration and health outcomes: a systematic review, meta-analysis, and meta-regression. Sleep

Med. 2017;32:246–56. https://doi.org/10.1016/j.sleep.2016.08.006. (**Epub 20160826; PubMed PMID: 27743803**).

6. Spiegel K, Leproult R, Van Cauter E. Impact of sleep debt on metabolic and endocrine function. Lancet. 1999;354(9188):1435–9. https://doi.org/10.1016/S0140-6736(99)01376-8. (**PubMed PMID: 10543671**).

7. Krajewska-Włodarczyk M, Owczarczyk-Saczonek A, Placek W. Sleep disorders in patients with psoriatic arthritis and psoriasis. Reumatologia. 2018;56(5):301–6. https://doi.org/10.5114/reum.2018.79501. (**Epub 20181031; PubMed PMID: 30505012; PubMed Central PMCID: PMC6263298**).

8. Hawro T, Hawro M, Zalewska-Janowska A, Weller K, Metz M, Maurer M. Pruritus and sleep disturbances in patients with psoriasis. Arch Dermatol Res. 2020;312(2):103–11. https://doi.org/10.1007/s00403-019-01998-7. (**Epub 20191015; PubMed PMID: 31616971**).

9. Vlami K, Pantelidi K, Dalamaga M, Karagianni F, Theodoropoulos K, Papiris S, et al. Psoriatic Insomnia: A Subjective and Objective Sleep Evaluation. Acta Derm Venereol. 2023;103:adv00864. Epub 20230214. https://doi.org/10.2340/actadv.v103.4507. PubMed PMID: 36786739; PubMed Central PMCID: PMC9940723.

10. Nowowiejska J, Baran A, Lewoc M, Grabowska P, Kaminski TW, Flisiak I. The Assessment of Risk and Predictors of Sleep Disorders in Patients with Psoriasis-A Questionnaire-Based Cross-Sectional Analysis. J Clin Med. 2021;10(4). Epub 20210209. https://doi.org/10.3390/jcm10040664. PubMed PMID: 33572270; PubMed Central PMCID: PMC7916004.

11. Trovato E, Marruganti C, Valenti A, Cioppa V, Grandini S, Rubegni P. Association between psoriasis, sleep, and dermatological quality of life: results of a cross-sectional study. Ital J Dermatol Venerol. 2023;158(2):140–8. https://doi.org/10.23736/S2784-8671.23.07564-3. (**PubMed PMID: 37153949**).

12. Halioua B, Chelli C, Misery L, Taieb J, Taieb C. Sleep disorders and psoriasis: an update. Acta Derm Venereol. 2022;102:adv00699. https://doi.org/10.2340/actadv.v102.1991. (**Epub 20220427; PubMed PMID: 35191513; PubMed Central PMCID: PMC9574693**).

13. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495–9. https://doi.org/10.1016/j.ijsu.2014.07.013. (**Epub 20140718; PubMed PMID: 25046131**).

14. Watson NF, Badr MS, Belenky G, Bliwise DL, Buxton OM, Buysse D, et al. Recommended amount of sleep for a healthy adult: a joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society. Sleep. 2015;38(6):843–4. https://doi.org/10.5665/sleep.4716. (**Epub 20150601; PubMed PMID: 26039963; PubMed Central PMCID: PMC4434546**).

15. Damiani G, Radaeli A, Olivini A, Calvara-Pinton P, Malerba M. Increased airway inflammation in patients with psoriasis. Br J Dermatol. 2016;175(4):797–9. https://doi.org/10.1111/bjd.1454662. (**Epub 20160620; PubMed PMID: 26991762**).

16. Damiani G, Pacifico A, Rizzi M, Santus P, Bridgewood C, Bragazzi NL, et al. Patients with psoriatic arthritis have higher levels of FeNO than those with only psoriasis, which may reflect a higher prevalence of a subclinical respiratory involvement. Clin Rheumatol. 2020;39(10):2981–8. https://doi.org/10.1007/s10067-020-05050-2. (**Epub 20200402; PubMed PMID: 32240433**).

17. Malerba M, Damiani G, Radaeli A, Ragnoli B, Olivini A, Calzavara-Pinton PG. Narrowband ultraviolet B phototherapy in psoriasis reduces proinflammatory cytokine levels and improves vitiligo and neutrophilic asthma. Br J Dermatol. 2015;173(6):1544–5. https://doi.org/10.1111/bjd.13988. (**Epub 20151103; PubMed PMID: 26130316**).

18. Luik AI, Bostock S, Chisnall L, Kyle SD, Lidbetter N, Baldwin N, et al. Treating depression and anxiety with digital cognitive behavioural therapy for insomnia: a real world NHS evaluation using standardized outcome measures. Behav Cogn Psychother. 2017;45(1):91–6. https://doi.org/10.1017/S1352465816000369. (**Epub 20160726; PubMed PMID: 27456542**).

19. Lee PH. Validation of the National Health And Nutritional Survey (NHANES) single-item self-reported sleep duration against wrist-worn accelerometer. Sleep Breath. 2022;26(4):2069–75. https://doi.org/10.1007/s11325-021-02542-6. (**Epub 20211130; PubMed PMID: 34845630; PubMed Central PMCID: PMC9663342**).