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Research Article

Subjective sleep impairment and obstructive sleep apnea risk in rosacea: a case–control study

Rozaseada öznel uyku bozukluğu ve obstrüktif uyku apnesi riski: bir olgu-kontrol çalışması

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Abstract

Aim: Emerging evidence suggests that rosacea may be associated with sleep disorders, alongside multiple systemic comorbidities. We aimed to evaluate sleep quality and obstructive sleep apnea risk in rosacea and their relationships with dermatology-specific quality of life.

Material and Methods: In this cross-sectional case-control study, adults with rosacea (n = 130) and controls (n = 114) completed the Pittsburgh Sleep Quality Index (PSQI), Berlin Questionnaire (BQ), and, for patients, the Dermatology Life Quality Index (DLQI). Analyses used non-parametric tests, chi-square, Spearman correlations, and backward logistic regression.

Results: Rosacea participants had higher global PSQI scores than controls (mean 6.21 ± 3.42 vs 4.87 ± 2.70; p = 0.002) and more often met the poor-sleep threshold (PSQI > 5: 63.1 % vs 46.5 %). BQ-defined high OSA risk did not differ significantly (30.8 % vs 25.4 %; p = 0.356). Among patients, mean DLQI was 6.86 ± 6.06; poor sleepers reported greater impairment (7.69 ± 6.23 vs 5.47 ± 5.56; p = 0.021). In multivariable modeling, higher BMI (adjusted OR 1.078; p = 0.006) and higher PSQI (OR 1.143; p = 0.004) independently predicted rosacea status. PSQI and BQ did not differ by clinical subtype or severity.

Conclusion: In this study, rosacea was associated with reduced subjective sleep without a parallel increase in questionnaire-defined OSA risk versus controls. Within rosacea, worse sleep related to higher dermatologic quality-of-life burden. Sleep health and metabolic risk appear actionable in rosacea care; incorporating brief sleep assessment, weight optimization, and selective OSA screening may support holistic management.

Keywords: rosacea, sleep quality, obstructive sleep apnea

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Öz

Amaç: Rozaseanın sistemik birçok komorbiditeyle birlikte genel sağlığı etkileyen uyku bozukluklarıyla da ilişkili olabileceği düşünülmektedir. Bu çalışmada rozasea hastalarında uyku kalitesi ve obstrüktif uyku apnesi (OUA) riski değerlendirildi; ayrıca bu değişkenlerin dermatolojiye özgü yaşam kalitesi ile ilişkileri incelendi.

Gereç ve Yöntem: Kesitsel olgu-kontrol tasarımındaki bu çalışmada, rozasea tanılı erişkinler (n=130) ve sağlıklı kontroller (n=114) Pittsburgh Uyku Kalitesi İndeksi (PUKİ), Berlin Anketi (BA) ve hastalar için Dermatoloji Yaşam Kalitesi İndeksi (DYKİ) ile değerlendirildi. İstatistiksel analizlerde non-parametrik testler, ki-kare testi, Spearman korelasyonu ve Backward LR ikili lojistik regresyon kullanıldı.

Bulgular: Rozasea grubunda global PUKİ puanı kontrollerden daha yüksekti (ortalama 6,21 ± 3,42'ye karşı 4,87 ± 2,70; p = 0,002) ve kötü uyku kalitesi oranı daha fazlaydı (PUKİ > 5: % 63,1'e karşı % 46,5). BA ile tanımlanan yüksek OSA riski gruplar arasında anlamlı farklılık göstermedi (% 30,8'e karşı % 25,4; p = 0,356). Hastalarda ortalama DYKİ 6,86 ± 6,06 idi; kötü uyuyanlarda DYKİ daha yüksekti (7,69 ± 6,23'e karşı 5,47 ± 5,56; p = 0,021). Çok değişkenli modellemede, daha yüksek BKİ ve daha yüksek PUKİ, rozasea ile bağımsız olarak ilişkiliydi (BKİ için aOR = 1,078; p = 0,006; PUKİ için OR = 1,143; p = 0,004). PUKİ ve BA puanları klinik alt tipe veya şiddete göre fark göstermedi.

Sonuç: Bu çalışmada rozaseanın daha kötü öznel uyku kalitesiyle ilişkili olduğu ancak OSA riskinde artış olmadığı gösterildi. Rozasea hastalarında daha kötü uykunun daha yüksek dermatolojik yaşam kalitesi yükü ile bağlantılı olabileceği tespit edildi. Uyku sağlığı ve metabolik risk, rozasea yönetiminde değerlendirilebilecek alanlar olabilir; kısa uyku taramalarının eklenmesi, kilo ve risk faktörü optimizasyonu ile seçici OSA taraması bütüncül tedaviyi destekleyebilir.

Anahtar Kelimeler: rozasea, uyku kalitesi, obstrüktif uyku apnesi

Introduction

Rosacea is a chronic inflammatory disorder of the facial skin characterized by recurrent flushing, persistent centrofacial erythema, telangiectasia, papules, and pustules [1]. Traditionally, rosacea has been classified into four subtypes: erythematotelangiectatic, papulopustular, phymatous, and ocular, though overlap is common [2]. It primarily affects adults, particularly middle-aged women, with a global prevalence estimated to be 1% and 20% [3]. Beyond cosmetic concerns, rosacea can impair patients' quality of life, especially when burning and flushing are pronounced [4]. In recent years, rosacea has increasingly been viewed as a systemic condition rather than an isolated skin disease [5]. It has been associated with comorbidities, including metabolic syndrome (hypertension, dyslipidemia, obesity), gastrointestinal disturbances, and neuropsychiatric disorders, suggesting a multifactorial pathophysiology involving innate immune dysregulation, neurovascular abnormalities, and the gut-skin axis [5].

Sleep is a core regulator of immunologic tone, neuroendocrine balance, thermoregulation, and tissue repair [6-9]. Impaired sleep quality is known to adversely affect both the nervous and immune systems, promoting systemic inflammation and stress responses [7]. Given these wide-ranging effects, disrupted sleep has been implicated in several chronic inflammatory disorders [7]. Sleep disruption may aggravate rosacea through mechanisms such as systemic inflammation, heightened sympathetic activity, and reduced barrier repair [10,11]. Conversely, the discomfort and flushing associated with rosacea can impair sleep, establishing a bidirectional cycle between the two conditions [11].

Therefore, the present study aimed to investigate the relationships between rosacea, sleep quality, and obstructive sleep apnea (OSA). We conducted a cross-sectional case–control study to (1) compare subjective sleep quality in rosacea patients versus healthy controls using the Pittsburgh Sleep Quality Index (PSQI); (2) assess the risk of OSA via the Berlin Questionnaire (BQ); and (3) evaluate the impact of sleep disturbance and OSA risk on dermatology-specific quality of life in rosacea patients. We additionally explored correlations between sleep quality, disease severity, and other clinical parameters, and performed multivariable analyses to identify independent predictors of rosacea status.

Materials and Methods

This case-control study included 130 adult patients with rosacea and 114 healthy adult controls, and was conducted at Ankara Etlik City Hospital. The study was approved by the local institutional ethics committee (No: AEŞH-BADEK-2024-645) and carried out in accordance with the Declaration of Helsinki, with all participants providing written informed consent.

Rosacea patients aged ≥18 years were recruited randomly from dermatology outpatient clinics. Diagnosis was made clinically by a dermatologist according to standard criteria, defined as centrofacial erythema with papulopustular, phymatous, and/or telangiectatic features. The control group comprised individuals who presented to the same dermatology outpatient clinic for benign non-inflammatory conditions such as melanocytic nevus or epidermal cyst. Controls were randomly selected and matched to rosacea patients by age and sex with no personal or family history of rosacea or other chronic skin diseases. Exclusion criteria for both groups included other causes of facial erythema (e.g., lupus erythematosus, menopausal flushing, carcinoid syndrome), pregnancy or breastfeeding, systemic illnesses such as diabetes mellitus, hypertension, ischemic heart disease, chronic kidney or liver disease, uncontrolled thyroid disease, major psychiatric disorders, and the use of medications that could markedly affect sleep (e.g., sedative-hypnotics). All eligible volunteers who met the inclusion criteria and agreed to participate were enrolled, yielding a participation rate of approximately 85%.

Demographic and lifestyle data (age, sex, education, smoking, alcohol), anthropometrics (height, weight, body mass index [BMI]), and disease duration (months, for rosacea patients) were recorded. Rosacea subtype (erythematotelangiectatic, papulopustular, phymatous) and severity (mild, moderate, severe) were graded using the Rosacea Clinical Scorecard, based on the National Rosacea Society Expert Committee system [12].

Measures

Pittsburgh Sleep Quality Index: PSQI is a self-report instrument that evaluates sleep quality over the past month across seven domains. Total scores range from 0 to 21, with scores > 5 commonly interpreted as indicating poor sleep quality [13]. We recorded both the total PSQI score and the categorical sleep-quality status (poor vs good) for each participant. The reliability and validity of the Turkish version of the scale were established by Ağargün et al. in 1996 [14].

Berlin Questionnaire for OSA: BQ assesses the risk of OSA across three domains: snoring/observed apneas, daytime somnolence, and hypertension/obesity. Classification as high risk requires positive findings in at least two domains. [15]. BQ was administered to all participants. The Turkish validity and reliability of the test was evaluated by Ulaşlı et al. in 2014 [16].

Dermatology Life Quality Index (DLQI): To quantify rosacea's impact, we used the DLQI, a 10-item questionnaire widely employed in dermatology [17]. DLQI evaluates effects on daily activities, work/school, relationships, and psychological well-being. Scores range from 0 to 30; higher scores denote greater impairment. The Turkish version was validated in 2006 by Öztürkcan et al. [18].

Statistical Analysis

Statistical analyses were conducted using SPSS (IBM SPSS Statistics 27). Descriptive statistics and frequency tables were used to summarize the data. For variables not normally distributed, non-parametric tests were applied: the Mann–Whitney U test for comparisons between two independent groups and the Spearman correlation coefficient for associations between quantitative variables. Relationships between categorical variables were examined using Pearson's chi-square (χ^2) test. Factors influencing disease risk were identified through binary logistic regression with the backward LR method. A two-sided p value < 0.05 was considered statistically significant.

Results

Participant Characteristics

A total of 244 individuals (130 rosacea patients and 114 controls) were analyzed. The rosacea and control groups were well-matched in terms of age (mean 41.2±13.6 vs 43.0±13.5 years; p = 0.26) and sex (73.8% vs 74.6% female; p = 0.90) distribution (Table 1).

Patients with rosacea had a significantly higher average BMI than controls (mean 27.8 vs 25.6 kg/m^2, p = 0.002). The proportion of current smokers was lower among rosacea patients than controls (19.4% vs. 35.1%; p = 0.006), whereas alcohol use did not differ significantly between the groups (4.7% vs. 9.6%; p = 0.127). Educational attainment was on average higher in the rosacea group, 38.7% of patients had an associate degree or higher, compared with 15.9% controls (p < 0.001) (Table 1).

Table 1. Baseline characteristics of participants (mean±SD or n [%]).			
Characteristic	Rosacea (n=130)	Controls (n=114)	p value
Age (years)	41.2±13.6	43.0±13.5	0.26
Female sex	96 (73.8%)	85 (74.6%)	0.90
BMI (kg/m^2)	27.8±5.4	25.6±5.0	**0.002**
Education ≥Associate	36 (27.7%)	18 (15.8%)	**<0.001**
Current smoker	25 (19.4%)	40 (35.1%)	**0.006**
Alcohol use (any)	6 (4.7%)	11 (9.6%)	0.127
p < 0.05 was considered statistically significant. BMI: body mass index.			

Within the rosacea patient cohort (n=130), the median duration of disease since diagnosis was 24 months (range 2- 480). Most patients (60.8%) had the erythematotelangiectatic subtype, about one-third (36.1%) had papulopustular rosacea, and 3.1% had phymatous changes. By design, ocular rosacea cases were not specifically recruited, and none of the patients had isolated ocular involvement. Nearly half of the patients (45.4%) were classified as having severe rosacea; 41.5% had moderate disease and 13.1% mild.

Sleep Quality and OSA Risk

Rosacea patients exhibited significantly diminished sleep quality compared with controls, as quantified by the PSQI. The mean global PSQI score in the rosacea group was 6.21 ± 3.42, notably higher than the mean of 4.87 ± 2.70 in the control group. The difference in PSQI was statistically significant (p = 0.002). Overall, 63.1% of rosacea patients had PSQI >5, meeting the criterion for poor sleep quality, whereas 46.5% of controls were poor sleepers (Table 2).

Component-level analysis revealed significantly worse subjective sleep quality and lower sleep efficiency in the rosacea group (p < 0.001 and p < 0.016 respectively) (Table 2). Patients also showed a trend toward longer sleep latency and shorter sleep duration (on a 0–3 scale where higher scores indicate shorter sleep); however, these differences did not reach statistical significance. Sleep disturbances, medication use, and daytime dysfunction components were low overall and similar between groups (Table 2).

Table 2. Responses to the PSQI by component scores.					
Variables	Patients (n=130)		Controls (n=114)		Test statistic*
	Ẋ±S.D.	Median [IQR]	Ẋ±S.D.	Median [IQR]	P value
Sleep quality	1,42±0,70	1,0 [1,0]	0,89±0,65	0,0 [1,0]	Z=-5,608 p<0,001
Sleep onset latency	1,28±0,94	1,0 [1,0]	1,11±0,93	1,0 [2,0]	Z=-1,519 p=0,129
Sleep duration	0,97±0,98	1,0 [2,0]	0,79±1,03	0,0 [1,0]	Z=-1,801 p=0,072
Sleep efficiency	0,66±0,94	1,0 [1,0]	0,40±0,79	0,0 [1,0]	Z=-2,402 p=0,016
Sleep disturbance	1,24±0,56	1,0 [1,0]	1,12±0,54	1,0 [0,0]	Z=-1,361 p=0,174
Hypotic drugs	0,08±0,28	0,0 [0,0]	0,09±0,28	0,0 [0,0]	Z=-0,030 p=0,976
Daytime dysfunction	0,67±0,91	0,0 [0,0]	0,50±0,74	0,0 [1,0]	Z=-1,162 p=0,245
PSQI global score	6,21±3,42	6,0 [4,0]	4,87±2,70	4,0 [3,0]	Z=-3,134 p=0,002
PSQI sleep quality index					
Good sleep quality n (%)	48 (36,9)		61 (53,5)		p=0,009
Bad sleep quality n (%)	82 (63,1)		53 (46,5)		
*In cases where the data did not follow a normal distribution, the Mann-Whitney U test (Z statistic) was used to compare measurement values between two independent groups. p < 0.05 was considered statistically significant. PSQI: Pittsburgh Sleep Quality Index, S.D.: Standard Deviation					

In contrast to the marked differences in sleep quality, the overall risk of OSA did not differ significantly between rosacea and control groups. On the BQ, 30.8% of patients and 25.4% of controls were classified as high risk for OSA (p = 0.356). By category, rates of snoring and witnessed apneas (Category 1) were nearly identical, while rosacea patients showed a nonsignificant trend toward more daytime sleepiness (Category 2) and higher prevalence of obesity or hypertension (Category 3) (Table 3). To be classified as high OSA risk, a participant needed positive responses in at least two of the above categories. Many rosacea patients triggered Category 3 due to elevated BMI, and some also had daytime sleepiness (Category 2), yielding the 30.8% high-risk rate; however, a substantial fraction of controls (25.4%) were also flagged as high risk. Thus, in our sample, rosacea per se was not associated with significantly elevated OSA risk once accounting for metabolic factors.

Table 3. Analysis of the relationship between Berlin Questionnaire categories and study groups.

BQ Components	Patients (n=130)		Controls (n=114)		Test statistic*
	n	%	n	%	P value
Category 1					
Absent	88	67,7	77	76,5	χ^2=0,001
Present	42	32,3	37	32,5	p=0,980
Category 2					
Absent	81	62,3	84	73,7	χ^2=3,590
Present	49	37,7	30	26,3	p=0,058
Category 3					
Absent	79	60,8	82	71,9	71,9
Present	51	39,2	32	28,1	28,1
BQ overall risk					
Low risk	90	69,2	85	74,6	χ2=0,851
High risk	40	30,8	29	25,4	p=0,356

*Pearson's chi-square (χ^2) cross-tabulation test was used to examine the relationship between two categorical variables. p < 0.05 was considered statistically significant. BQ: Berlin Questionnaire

Quality of Life and Correlations

Among rosacea patients, mean DLQI was 6.86 ± 6.06, indicating a moderate average impact with considerable variability. Poor sleepers (PSQI > 5) reported higher DLQI than good sleepers (7.69 ± 6.23 vs 5.47 ± 5.56; p = 0.021), and those at high Berlin risk reported higher DLQI than low-risk peers (8.35 ± 6.23 vs 6.19 ± 5.89; p = 0.021). PSQI correlated positively with DLQI (Spearman ρ = 0.284, p = 0.001), supporting a link between sleep disruption and greater dermatologic life-quality burden. However, PSQI and BQ scores did not differ significantly by rosacea severity or by subtype.

Multivariable Model

In logistic regression, higher BMI and higher PSQI independently predicted rosacea status. Each 1-kg/m² increase in BMI was associated with 7.8% higher odds of rosacea (adjusted OR 1.078, 95% CI 1.022–1.136; p = 0.006), and each 1-point increase in PSQI was associated with 14.3% higher odds (OR 1.143, 95% CI 1.043–1.252; p=0.004). Smoking status, educational level, and BQ high-risk classification were initially considered in the model but were not significantly associated with rosacea and therefore were therefore not retained in the final regression model.

Discussion

In this study, we evaluated sleep quality and OSA risk in rosacea patients and examined how these factors relate to rosacea's impact on quality of life. Our results confirm and extend the emerging evidence that rosacea is not merely a superficial skin condition, but one that intersects with systemic health domains such as sleep and metabolism [11].

We found that patients with rosacea had markedly reduced

sleep quality compared with controls, as measured by the PSQI. Nearly two-thirds of the rosacea group were "poor sleepers", a significantly higher proportion than in the control group. This aligns with previous studies, including that of Wang et al., who observed a high prevalence of sleep disturbances among rosacea patients [4]. Wang's case-control study (608 rosacea vs 608 controls) noted that over 50% of rosacea patients had PSQI-defined poor sleep quality (versus 24% of controls) and that mean was higher in the rosacea group. Similarly, a study from Yunnan, China (141 rosacea vs 123 controls) found significantly higher PSQI scores and a greater proportion of individuals with suboptimal sleep among rosacea patients (58% vs 33%) [19]. Notably, in the Yunnan cohort, sleep quality improved after treatment, with reductions in both total PSQI and the proportion of participants with sleep disturbance. Our smaller study yields comparable figures (63.1% vs 46.5%), supporting the robustness of this association across different populations. Moreover, logistic regression indicated that impaired sleep quality was independently associated with rosacea, suggesting potential causal or mechanistic links. Patients with rosacea might experience nocturnal discomfort, for example, burning or stinging sensations on the face that can flare up at night, or simply heightened anxiety/stress about their condition, which could interfere with the ability to fall or stay asleep [11]. Although we did not find a direct correlation between objectively graded rosacea severity and PSQI, the subjective distress caused by rosacea (captured indirectly by DLQI) did correlate with reduced sleep quality. Conversely, it is also plausible that sleep disturbance could exacerbate rosacea. Growing experimental evidence indicates bidirectional interactions: sleep deprivation can provoke or worsen skin inflammation and vascular dysregulation [4]. In murine experiments, acute sleep deprivation intensified rosacea-like inflammation. This was accompanied by increased skin expression of mediators such as TLR2 and cathelicidin (LL-37), highlighting a mechanistic link between sleep loss and rosacea pathogenesis [4]. Sleep loss may tip the balance of the immune system further, promoting a rosacea flare. Sleep disruption also activates the hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system, leading to surges in cortisol and catecholamines [11]. Catecholamine release and autonomic activation may be particularly relevant: they can trigger vasomotor instability and flushing [11]. Additionally, loss of sleep impairs skin barrier function and wound healing, potentially making the skin more sensitive to triggers [20]. Taken together, there appears to be a biologically plausible pathway whereby insufficient or disrupted sleep may exacerbate rosacea's inflammatory and neurovascular processes.

However, we found no significant difference in BQ-assessed OSA risk between rosacea patients and controls. This contrasts with some large database studies that reported a higher prevalence of sleep apnea diagnoses among individuals with rosacea [21]. In our sample, BMI was higher in the rosacea group; once BMI and PSQI were considered, Berlin classification did not contribute independently. These data suggest that any rosacea-OSA association in population studies may be largely mediated by shared metabolic risk -obesity and hypertension- rather than rosacea itself. It remains possible that male sex and obesity confer higher OSA risk among patients with rosacea; our predominantly female cohort and questionnaire-based screening may have limited detection of such effects. Polysomnography-based studies are needed to clarify whether objective sleep-disordered breathing is truly more prevalent in rosacea and whether treatment (e.g., CPAP) modifies dermatologic outcomes.

Another aspect of our study is the demonstration that sleep disturbances correlate with worse dermatologic quality of life in rosacea. Poor sleepers (PSQI > 5) had higher DLQI scores, indicating that their rosacea was impacting them more negatively in day-to-day life. The Yunnan study reported that rosacea patients had higher anxiety scores than controls and, interestingly, that treatment of rosacea improved both anxiety and sleep scores [19]. We did not explicitly measure anxiety/depression in our cohort, but it is plausible that those with poor sleep had more psychosocial strain.

Limitations of the study

Limitations include the cross-sectional design, reliance on self-reported rather than objective sleep measures, potential selection bias, and lack of psychiatric assessment. The moderate sample size may have limited subgroup analyses. Additionally, the rosacea group had a higher mean BMI and a

lower smoking rate than controls, which could have influenced sleep-related parameters. A more balanced metabolic and lifestyle factors between groups might have provided a stronger basis for interpreting differences in sleep health.

In conclusion, in this study, rosacea was associated with reduced subjective sleep quality and greater dermatologic life-quality burden, whereas questionnaire-defined OSA risk was not significantly increased compared with matched controls. Within rosacea, poor sleepers reported higher DLQI, and in multivariable analysis higher BMI and PSQI independently characterized case status. These findings position sleep health and metabolic risk as modifiable domains in rosacea management. Incorporating brief sleep assessment, promoting weight and risk-factor optimization, and selectively screening for OSA represent pragmatic steps toward holistic care. Prospective and interventional studies are needed to determine whether improving sleep can attenuate rosacea severity and improve patient-centered outcomes.

Declaration of conflicting interests

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Ethics approval

This study was approved by Ankara Etlik City Hospital lokal Ethics Committee with protocol number (No: AEŞH-BADEK-2024-645).

Authors' contribution should be written

F.H. contributed to conceptualization, study design, methodology, data collection, formal analysis, and drafting of the manuscript. G.U, E.B.Y., participated in patient recruitment, clinical data acquisition, and interpretation. S.P.K., supervised the study and provided critical revision of the manuscript. All authors reviewed, edited, and approved the final version of the manuscript.

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