



Evaluation of Sleep Quality in Infants with Atopic Dermatitis and Their Mothers

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Received: 01.10.2024; Revised: 08.11.2024; Accepted: 11.11.2024

Abstract

Aim: Atopic dermatitis (AD) is a chronic skin disease with relapses that are frequently encountered in infants. The relationship between AD and infant sleep is not clearly known, but it is an essential area of research because sleep plays a vital role in infant development. In this study, we aimed to evaluate the sleep quality of infants with AD and their mothers admitted to the pediatric allergy and immunology outpatient clinic and to examine the relationship with disease severity.

Methods: Eighty patients diagnosed with AD between 1-12 months of age and their mothers constituted the patient group. A control group was formed with 80 healthy infants of the same age group. The BISQ-R (Brief Infant Sleep Questionnaire-Revised) was used to assess the sleep quality of the infants in the patient and control groups, and the Pittsburgh Sleep Quality Index (PSQI) was used to determine the mothers' sleep quality.

Results: There was no statistically significant difference between the patient and control groups regarding age, gender, and maternal age. There was a statistically significant difference between the BISQ-R and PSQI scores of the patient and control groups ($p=0.002$, $p=0.001$, respectively). Infants and their mothers in the patient group had worse sleep quality compared to the control group. A moderate positive linear relationship was found between the objective SCORAD scores of the patients and the PSQI scores of the mothers ($p: 0.04$, $r: 0.32$). A highly negative linear relationship was found between the objective SCORAD scores of the patients and the BISQ-R scores ($p < 0.001$ $r: -0.78$). It was found that the presence of food allergy had a negative effect on infant and maternal sleep quality, whereas breastfeeding had a positive effect.

Conclusion: In this study, the presence of AD was found to negatively affect the sleep quality of the infant and the mother. As the severity of AD increases, the sleep quality of the infant and the mother is more negatively affected. AD patients with food allergies and their mothers should be monitored more closely for sleep disturbance. Encouraging mothers to breastfeed may positively affect infant and maternal sleep quality.

Keywords: Atopic dermatitis, infant, BISQ-R, PSQI.

DOI: 10.5798/dicletip.1608077

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Atopik Dermatit tanılı infant ve annelerinin uyku kalitesinin değerlendirilmesi

Öz

Amaç: Atopik dermatit (AD) infantlarda sıklıkla karşılaşılan, relapslar ile seyreden kronik bir deri hastalığıdır. AD ile infantın uykusu arasındaki ilişki net olarak bilinmemekte olup, uykunun bebek gelişiminde önemli bir rol oynaması nedeniyle önemli bir araştırma alanıdır. Bu çalışmada çocuk alerji ve immünoloji polikliniğine başvuran AD tanılı infant ve annelerinin uyku kalitelerinin değerlendirilmesi ve hastalık şiddeti ile olan ilişkisinin incelenmesi amaçlanmıştır.

Yöntemler: 1 ile 12 aylık AD tanısı alan 80 hasta ve anneleri hasta grubunu oluşturdu. Aynı yaş grubu 80 sağlıklı infant ile de kontrol grubu oluşturuldu. Hasta ve kontrol grubundaki infantların uyku kalitesini değerlendirmek için "BISQ-R (Kısa Bebek Uyku Anketi-Revize)"; annelerin uyku kalitesinin değerlendirilmesi için "PUKI (Pittsburgh Uyku Kalitesi İndeksi)" kullanıldı.

Bulgular: Hasta ve kontrol grupları arasında yaş, cinsiyet ve anne yaşı açısından istatistiksel anlamlı fark yoktu. Hasta ve kontrol gruplarının BISQ-R ve PUKI skorları arasında istatistiksel anlamlı fark saptandı (sırası ile $p = 0.002$, $p = 0.001$). Hasta grubundaki infant ve annelerinin kontrol grubuna göre uyku kalitelerinin daha kötü olduğu görüldü. Hastaların objektif SCORAD skorları ile annelerin PUKI skorları arasında pozitif yönde orta düzeyde doğrusal bir ilişki saptandı ($p: 0.04$ $r: 0.32$). Hastaların objektif SCORAD skorları ile BISQ-R skorları arasında negatif yönde yüksek düzeyde doğrusal bir ilişki saptandı ($p < 0.001$, $r: -0.78$). İnfantın ve annenin uyku kalitesini besin alerjisi varlığının olumsuz, emzirmenin ise olumlu etkilediği saptandı.

Sonuç: Bu çalışmada AD varlığının, infantın ve annenin uyku kalitesini olumsuz etkilediği saptanmıştır. AD'nin şiddeti arttıkça infant ve annenin uyku kalitesi daha olumsuz etkilenmektedir. Besin alerjisi bulunan AD hastalarının ve annelerinin uyku bozukluğu açısından daha yakın izlenmesi gerekmektedir. Emzirmeye teşvik etmek infant ve annenin uyku kalitesini olumlu yönde etkileyebilir.

Anahtar kelimeler: Atopik dermatit, infant, BISQ-R, PUKI.

INTRODUCTION

Atopic dermatitis (AD), commonly known as eczema, is the predominant chronic inflammatory skin condition, impacting 15% to 20% of infants and children and 3% to 10% of adults globally. It presents as erythematous skin, pruritus, and diminished sleep quality and overall well-being for both patients and caregivers^{1,2}.

One of the worst parts of AD, according to both parents and children, is the disruption of sleep, which is mainly brought on and made worse by pruritus. Sleep disturbance and the severity of AD were positively correlated in earlier research³. Few studies have examined the effect of AD on the sleep quality of the mother and her baby. These studies have consistently shown adverse outcomes, such as difficulty falling asleep, increased nocturnal waking, and involuntary early morning awakening². Research in this field is limited and usually focuses on children rather than infants.

Therefore, our knowledge of sleep quality in infants with AD and their parents is limited.

This study aimed to evaluate the sleep quality of infants with AD and their mothers admitted to the pediatric allergy and immunology outpatient clinic and to examine its relationship with disease severity.

METHODS

The study was conducted at the pediatric allergy and immunology clinic of Ordu Training and Research Hospital between January 1, 2024, and June 30, 2024. The study included 80 patients aged 1-12 months and their mothers, who were diagnosed with AD according to the Hanifin-Rajka criteria. The control group consisted of 80 patients aged 1-12 months without any health and sleep problems and their mothers. The inclusion criteria were that the child diagnosed with AD did not have any other allergic and concomitant chronic diseases and that there were no other individuals with allergic and concomitant chronic diseases in the

family. Similarly, the infants in the control group had no allergic and concomitant chronic diseases, and no other family members with allergic and concomitant chronic diseases were included in the study. As the primary caregiver of the infants was the mother, only the mother was included in the study. Cases in which the primary caregiver was not the mother were excluded from the study. As the mother was not a confounding factor in assessing sleep quality, only parents with a single child were included in the study. Permission for the study was obtained from the Ordu University Non-Interventional Clinical Research Ethics Committee (E-14647249-000-1014154) and Ordu Provincial Health Directorate.

Age, sex, age at AD diagnosis, maternal age, and breastfeeding status were assessed. Disease severity was evaluated by the same physician using the objective SCORAD index. Skin prick test (SPT) results, hemograms, and specific immunoglobulin E (IgE) values, if performed, were recorded.

"The Brief Infant Sleep Questionnaire-revised (BISQ-R)" was used to evaluate the sleep quality of infants in the patient and control groups, and the "Pittsburgh Sleep Quality Index (PSQI)" was used to evaluate the sleep quality of the mothers. The BISQ-R and the PSQI were administered to infants before treating AD.

Skin Prick Test

Infants underwent SPT for food allergens (cow's milk, egg yolk, egg white, wheat, hazelnut, walnut, peanut, and soybean), which are frequently encountered in our country and in the region where the study was conducted (Diater Laboratorio de Diagnóstico y Aplicaciones Terapéutica, Leganés, Madrid). The test response was evaluated by the person administering the test after 15 min. Test results were considered positive if the measured wheal diameter was 3 mm or more compared to the negative control.

Brief Infant Sleep Questionnaire-Revised

It was used to assess the sleep status of infants and children aged 0-36 months. All the mothers participating in the study completed the BISQ-R. It was developed by Sadeh et al. to test for the presence of sleep problems by assessing parents' views on infant sleep⁴. Boran et al. conducted a Turkish validity and reliability study of the questionnaire in 2014 and reported that it could be used to evaluate sleep-related problems in children aged 0-36 months⁵. The original scale was revised in 2019 by Mindell et al⁶. The lower the BISQ-R score, the poorer the sleep quality. The BISQ-R contains 33 questions based on an assessment of the last two weeks—three subscales for scoring (infant sleep, parental perception, and parental behavior). The total score is calculated as the average of the three subscales. It ranges from 0 to 100, with higher scores indicating better sleep quality, more positive perceptions of infant sleep, and parental behaviors that promote healthy sleep⁴⁻⁶.

Pittsburgh Sleep Quality Index

All the mothers participating in the study completed the PSQI, which assesses sleep quality. The PSQI was developed by Buysse et al. to evaluate sleep quality in the last month⁷. The validity and reliability of the scale in our country were assessed by Ağargün et al⁸. The PSQI is used to define good or poor sleep quality rather than the presence or absence of a disease that causes sleep disturbance. The higher the PSQI score, the poorer the sleep quality. The PSQI consists of 7 components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction). Each component is scored on a 0-3 point scale. The sum of these seven component scores gives the total PSQI score. The total PSQI score ranges from 0 to 21. Individuals with a total score of 5 or less are considered to have "good" sleep

quality, while individuals with a score above 5 are considered to have "poor" sleep quality^{7,8}.

Objective SCORAD Index

Disease severity was assessed by the same physician for all patients using the objective SCORAD index. The objective SCORAD index was calculated by "excluding subjective symptoms" of the SCORAD index, obtained by measuring only prevalence (A) and severity (B). It is obtained by measuring only prevalence (A) and severity (B) (objective SCORAD=A/5+7B/2). The maximum score is 83.

Statistical Analysis

The statistical software SPSS was used to conduct the analyses. Visually, using probability graphs and histograms and analytically, using Kolmogorov-Smirnov/Shapiro-Wilk tests, the variables were checked for conformance to a normal distribution. For properly distributed variables, descriptive statistics are shown as mean and standard deviation; for non-normally distributed variables, they are shown as median. In cases where the data distribution was not expected, the Mann-Whitney test was utilized instead of the Student's t-test for comparing quantitative variables. The chi-square test was employed to compare the qualitative variables. P less than 0.05 was determined to be statistically significant.

RESULTS

The median age of the infants in the patient group (n=80) was seven months (6-9), and 52.5% (n=42) were male. The median age of the infants in the control group (n=80) was six months (5-9), and 55% (n=44) were male. There was no statistically significant difference between the patient and control groups regarding age or sex (p=0.06). There were no statistically significant differences between the mothers' ages (Table 1).

Table 1: Comparison of the study group in terms of demographic, clinical, laboratory, BISQ-R score and PSQI score

	Patient group (n=80)	Control group (n=80)	p
Age (month)*	7 (6-9)	6 (5-9)	0.6
Age of mother*	27 (24-32)	29 (23-33)	0.3
Gender **			
Male	42 (52.5)	44 (55)	0.7
Girl	38 (47.5)	36 (45)	
Total BISQ-R score***	40.5 (±23.1)	61.1 (±20.3)	0.002
Total maternal PSQI score*	7.5 (3-12)	5 (3-8.75)	0.001

*: Median (Interquartile range)**: n (%) ***: Mean (±Standard deviation) BISQ-R: Brief Infant Sleep Questionnaire-Revised PSQI: Pittsburgh Sleep Quality Index

The mean BISQ-R score was 40.5 (±23.1) in the patient group and 61.1 (±20.3) in the control group, and a statistically significant difference was found between the two groups (p = 0.002). The median PSQI score was 7.5 (3-12) in the mothers of the patient group and five (3-8.75) in those of the control group, and a statistically significant difference was found between the two groups (p = 0.001).

In the patient group, the age of onset of the first AD complaint was five (3-6) months, and the most common site of initial involvement was the head and neck region. When the patients were classified as "mild, moderate, and severe" according to the objective SCORAD index, the "moderate severity" group had the largest number of patients. The other clinical and laboratory characteristics of the AD group are shown in Table 2.

Table II: Clinical and laboratory data of the patient group

	Patient group (n=80)
Age at onset of first AD complaints (month)*	5 (3-6)
Site of onset of first AD complaints*	
Head	57 (71.3)
Extremity	16 (20)
Neck	4 (5)
Body	3 (3.8)
Objective SCORAD score*	27.5 (14-36.75)
Objective SCORAD index (Disease severity)**	
Mild	27 (33.8)
Moderate	41 (51.2)
Severe	12 (15)
Total serum IgE (IU/L)*	72.5 (45.2-141)
Percentage of eosinophils (%)*	2 (1-4)
Absolute eosinophil count (/mm3)*	230 (110-335)

*: Median (Interquartile range)**: n (%)AD: Atopic dermatitis
SCORAD: Severity scoring of atopic dermatitis

A moderate positive linear relationship was found between the objective SCORAD scores of the patients and the PSQI scores of the mothers ($p = 0.04$, $r = 0.32$). A highly negative linear relationship was found between the objective SCORAD scores of the patients and BISQ-R scores ($p < 0.001$, $r = -0.78$). The comparison of PSQI and BISQ-R scores according to the severity of atopic dermatitis is shown in Table 3.

Table III: Evaluation of sleep quality in patients with atopic dermatitis according to disease severity groups

	Mild	Moderate	Severe	P
BISQ-R, total score*	20.1 (± 23.7)	45.3 (± 19.7)	62.25 (± 12.7)	0.001
PSQI, total score**	9 (4-14)	8 (3-12)	4 (3-4.75)	0.012

BISQ-R: Brief Infant Sleep Questionnaire-Revised PSQI: Pittsburgh Sleep Quality Index *: Mean (\pm standard deviation) **: Median (Interquartile range)

In the patient group, 25 (31.3%) mothers completely discontinued breastfeeding at the time of recruitment, while 55 (68.8%) mothers continued breastfeeding. The median PSQI score was 9.6 in mothers who completely discontinued breastfeeding and 6.6 in mothers who did not; there was a statistically significant

difference between them ($p = 0.012$). The median BISQ-R score of infants of mothers who completely discontinued breastfeeding was 29.7 compared to 45.4 in mothers who did not completely discontinue breastfeeding; this difference was statistically significant ($p = 0.001$).

Patients with at least one positive SPT result with the specified nutrient antigens were defined as "SPT positive," and patients with negative results for all nutrient antigens were described as "SPT negative." The SPT was positive in 24 (30%) patients and negative in 56 (70%) patients. The median PSQI scores were 10.6 in SPT positive patients and 6.2 in SPT negative patients, respectively, with a statistically significant difference ($p < 0.001$). The mean BISQ-R scores were 29.7 in SPT positive patients and 45.3 in SPT and SPT-negative patients, respectively, with a statistically significant difference ($p = 0.005$).

DISCUSSION

AD is a chronic skin disease affecting up to 15% of infants and has a high relapse rate². Although the effects of AD on the sleep patterns of mothers and children have been studied in the past, little is known about the relationship between infantile AD and the quantity and quality of sleep. This study found that AD negatively affects infant and maternal sleep quality. As the severity of AD increased, the sleep quality of infants and mothers was negatively affected at a higher rate. It has been shown that as the infant's sleep quality improves, the mother's sleep quality also improves.

Although the clinical manifestations of atopic dermatitis occur at any period of life, they most commonly begin in the head and neck region between 3 and 6 months of age. It is characterized by recurrent eczematous lesions, the characteristics of which vary according to the course of the disease². In our study, it was

observed that the lesions mostly started in the first 3-6 months of life and in the head-neck region, which is in accordance with the literature.

At all stages of the disease, dry skin and severe itching affect quality of life. Pruritus is also reported to be a major contributor to sleep disturbances. It has been reported that pruritus, circadian rhythm disturbance, and changes in the immunologic system may be effective⁹. Sleep disorders have been shown to be present in 47-80% of pediatric patients with AD. The most commonly reported sleep disturbances in children and adults with AD include difficulty initiating sleep, recurrent nocturnal awakenings, and excessive daytime somnolence. Children diagnosed with AD reported challenges in morning awakening and prolonged wakefulness post-bedtime⁹. In our study, we found that infants with AD and their mothers had poor sleep quality compared to healthy infants and mothers in the control group.

In a study conducted by Kahn et al. in 2019, the sleep quality of 10 patients with moderate and severe AD aged between 6 months and 15 years was evaluated, and a significant improvement in sleep quality was observed after AD treatment¹⁰. In our country, Sarı et al. evaluated the sleep quality of the mothers of 50 patients diagnosed with AD between the ages of 6 months and 6 years with PSQI in 2020 and showed that they had significantly worse sleep quality compared to the healthy group ($p < 0.001$)¹¹. To the best of our knowledge, no research has examined how well newborns with AD sleep. In many studies, infants have been compared with older children. However, the infant period includes a very special sleep period and differs from other age groups. Our study showed that AD in infants negatively affected both infant and maternal sleep quality. In addition, as the severity of AD in infants

increases, the sleep quality of both the mother and infant becomes more negatively affected.

In our study, the sleep quality of mothers who completely discontinued breastfeeding was worse than that of mothers who did not completely discontinue breastfeeding. In addition, the sleep quality of infants who were still breastfeeding was better than that of infants who had completely stopped breastfeeding. Our findings suggest that breastfeeding improves sleep quality in both mothers and infants. This finding is based on the fact that parents prepare formula when they wake up to feed their babies at night, unlike breast milk, which is always ready and has an appropriate temperature and ideal nutrient composition. The process of preparing formula interrupts mothers' sleep. A study in the United States found that women who exclusively breastfed averaged 30 minutes more sleep at night compared to those who used formula¹². Prolactin and other lactation hormones assist moms in adjusting to the demands of raising their children, which can include sleep disturbances¹³.

Filiz et al. showed that food allergies negatively affect the sleep quality of children and their mothers¹⁴. Our study similarly demonstrated that the sleep quality of AD patients with food allergies, as well as their mothers, was inferior to that of the control group. This may be associated with food allergies intensifying atopic dermatitis¹⁵.

Sleep is an essential physiological need for infants and mothers, and its impaired quality is associated with many comorbid conditions. The findings of the current study indicate that more severe AD is linked to worse infantile sleep outcomes because insufficient sleep in babies has been linked to mood disorders and has been linked to behavioral and attention-regulation difficulties in later life¹⁶. Numerous studies have proposed or demonstrated a link between sleep disturbances and adverse outcomes in children

with AD. Behavioral problems (e.g., excessive dependency, clinginess, and fearfulness), headaches, impaired child daytime functioning (e.g., impaired social activities and school performance), obesity, growth impairment, and impaired cognitive functioning are some of these. There is also an increased frequency of AD-related absences from daycare or school^{7,17}. It may be an appropriate approach to evaluate infants with moderate-to-severe AD and atopy on SPT in terms of sleep and routine recommendations.

This study provides an overview of the relationship between AD and sleep disorders, as there is very little data in the literature on this topic. Our results are limited by the fact that they rely in part on proxy measures, like parental questionnaires rather than patient ones, and actigraphy, which is limited to inferring patterns of movement rather than being able to definitively determine whether a subject is asleep. Moreover, research utilizing subjective and objective measures of sleep disturbances has revealed some discrepancies in their assessment. There are very few studies on infant sleep quality in AD; therefore, some of our findings could not be adequately discussed. We did not have a numerical parameter to measure sleep, but we obtained information about the mothers and their infants. Another limitation of our study is that it did not evaluate the effect of atopic dermatitis treatment on sleep quality. The most crucial point of our research is that it is one of the first to focus on sleep quality, including only infant AD patients and their mothers.

CONCLUSION

In our study evaluating the sleep quality of infants diagnosed with atopic dermatitis and their mothers who are primary caregivers, it was shown that AD negatively affected the sleep quality of the infant and the mother, and the sleep quality of the mother and infant was more negatively impacted as the severity of the

disease increased. Food allergies had a negative effect on infant and maternal sleep quality, whereas breastfeeding had a positive impact. Sleep quality can be improved by the early detection of AD and appropriate treatment approaches. Encouraging mothers to breastfeed is also essential in this process. To improve the health and quality of life for mothers and their infants, future multicenter prospective studies on the pathophysiology and treatment of these sleep disorders are necessary.

Ethics Committee Approval: Ethical protocol was approved by Ordu University Non-Interventional Clinical Research Ethics Committee, approval number (E-14647249-000-1014154).

Conflict of Interest: The authors declared conflicts of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

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