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Treatment of allergic rhinitis: does it make a difference in sleep and quality of life?

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Abstract
Objective: Allergic rhinitis (AR) and allergic conjunctivitis (AC) are common atopic conditions of childhood that significantly impair sleep quality and health-related quality of life (HRQoL). Although effective treatment strategies exist, their broader impact on sleep and daily functioning has remained underexplored. This study aimed to evaluate the effect of AR and/or AC treatment on sleep quality and HRQoL in children using validated, parent-reported instruments.
Methods: In this prospective observational cohort study, 98 children aged 6-13 years with AR and/or AC were treated according to standard guidelines. Sleep quality and HRQoL were assessed pre- and post-treatment using the Children's Sleep Habits Questionnaire (CSHQ) and the Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ), respectively. Changes in scores were analyzed using the Wilcoxon Signed-Rank test.
Results: Post-treatment evaluations demonstrated a significant reduction in total CSHQ scores (median: 56-43, $P < 0.001$), indicating improved sleep quality. Similarly, total PRQLQ scores decreased significantly (median: 3.47-2.28, $P < 0.001$), reflecting enhanced QoL. Improvements were observed in most subdomains, including nose and eye symptoms, activity limitations, and other symptoms.
Conclusions: A 4-week standard treatment regimen for AR and/or AC led to significant improvements in sleep quality and HRQoL in children. These findings highlight the importance of early and appropriate management of allergic conditions to enhance both physical and functional well-being in pediatric patients.

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Introduction

Allergic rhinitis (AR) and allergic conjunctivitis (AC) are among the most prevalent atopic conditions worldwide and represent a significant public health concern, especially in the pediatric population.[1] Epidemiologic studies suggest that the prevalence of AR is steadily increasing, affecting up to 40% of children in some regions, often coexisting with AC because of shared pathophysiologic mechanisms.[2,3] These allergic conditions are commonly triggered by environmental allergens, such as pollen, dust mites, molds, and pet dander. Clinical manifestations include persistent nasal congestion, sneezing, itching, rhinorrhea, and ocular symptoms, such as redness, tearing, and pruritus, which can be both distressing and disruptive to daily life.[4]

While AR and AC are not typically life-threatening, their chronic and recurrent disposition can lead to substantial morbidity if left untreated. In children, these conditions are associated not only with reduced participation in physical and social activities but also with impaired cognitive performance and behavioral disturbances.[5] One particularly underrecognized consequence is their impact on sleep quality. Nasal obstruction and ocular irritation, especially during nighttime hours, may lead to sleep fragmentation, frequent awakening, and non-restorative sleep. This in turn contributes to daytime fatigue, irritability, decreased concentration, and academic difficulties.[6,7]

Several studies have highlighted the link between untreated allergic diseases and decreased health-related quality of life (HRQoL), including emotional well-being, social functioning, and daily activity limitations.[8] Despite this, the literature examining whether symptom control through standard treatment strategies directly translates into measurable improvements in sleep and HRQoL remains limited, particularly in pediatric cohorts.

Standard management for AR and AC includes allergen avoidance, oral and topical antihistamines, intranasal corticosteroids, and, in some cases, immunotherapy. These treatments have demonstrated efficacy in relieving allergic symptoms; however, their broader benefits—especially on sleep architecture and QoL—have not been quantified extensively in children.[9]

Therefore, this study aims to evaluate the impact of AR and/or AC treatment on sleep quality and HRQoL in children using validated, parent-reported outcome measures. By comparing pre- and post-treatment scores on the Children's Sleep Habits Questionnaire (CSHQ) and the Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ), we aim to determine whether clinical symptom relief agreed with functional and behavioral improvements in affected children.

Materials and Methods

Study design and population

This study was designed as a prospective, observational cohort study. Pediatric patients aged 6–13 years who presented with symptoms of AR and/or AC to the Pediatric Allergy Clinic, Faculty of Medicine of Erciyes University between December 2023 and December 2024 were enrolled. Inclusion criteria included a clinical diagnosis of AR and/or AC based on standard diagnostic guidelines, and no previous initiation of allergy-specific pharmacologic therapy in the past 4 weeks. Patients with comorbid chronic autoimmune diseases or neurologic disorders were excluded.

Additionally, children with other allergic or chronic diseases, including atopic dermatitis, asthma, or food allergy, were excluded to ensure that changes in sleep quality specifically were attributable to AR and/or AC. The study initially included 150 pediatric patients diagnosed with AR and/or AC. However, 52 patients were excluded from the final analysis because of either failing to attend the post-treatment follow-up visit or not adhering to the prescribed treatment regimen. Thus, a total of 98 patients who completed the full course of treatment and both pre- and post-treatment assessments were included in the final evaluation. The study protocol was reviewed and approved by the Institutional Review Board of Erciyes University. Written informed consent was obtained from all participants or their legal guardians.

All patients received standard treatment for AR and/or AC according to the current guidelines, including oral antihistamines, intranasal corticosteroids, and/or allergen avoidance strategies. The choice of therapy was individualized based on symptom severity and discretion of physician.

Assessment tools

To evaluate the impact of treatment on sleep and QoL, two validated instruments were used:

1. Children's Sleep Habits Questionnaire (CSHQ): This questionnaire was employed to assess sleep disturbances. It includes items related to bedtime resistance, delay in sleep onset, night waking, and daytime sleepiness. It is widely used in pediatric populations to evaluate sleep behaviors.[10,11]
2. Pediatric Rhinoconjunctivitis Quality of Life Questionnaire (PRQLQ): Specifically designed for children aged 6–12 years with nasal and ocular allergy symptoms, this tool assesses the disease's impact on daily activities, emotional well-being, and social functioning.[12,13]

Both questionnaires were administered prior to initiation of the treatment and repeated after 4 weeks of treatment to assess changes in sleep quality and QoL. The pre-treatment surveys (CSHQ and PRQLQ) were completed at the initial clinic visit prior to starting the treatment, and the post-treatment surveys were administered after 4 weeks of continuous therapy during the follow-up visit at the same allergy clinic. Both questionnaires were filled out by parents under the supervision of a pediatric allergy specialist. The study was conducted between December 2023 and December 2024, encompassing all seasons with a balanced distribution of participants. Standard pharmacologic treatment included non-sedating, second-generation oral antihistamines (cetirizine or loratadine) and intranasal corticosteroids to minimize drowsiness-related confounding.

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics version XX.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic and clinical characteristics. Categoric variables were expressed as frequencies and percentages, while continuous variables were presented as medians and ranges (minimum–maximum) because of non-normal distribution.

The Wilcoxon Signed-Rank test was used to compare pre- and post-treatment scores of both CSHQ and PRQLQ. $P < 0.05$ was considered statistically significant.

Results

Participant characteristics

A total of 98 patients were included in the study, comprising 54 males (55.1%) and 44 females (44.9%). The median age of the participants was 11 (6–13) years. The demographic characteristics of the study population are summarized in Table 1.

Table 1 Clinical characteristics of the study group patients.

	Study group (N = 98) n (%)
Gender	
Male	54 (55.1)
Female	44 (44.9)
Age, median (min–max)	11 (6–13)
Medication used	
Intranasal steroid + antihistamine	49 (50)
Intranasal steroid + antihistamine + eye drops	49 (50)
Eosinophilia	
Yes	26 (26.5)
No	72 (73.5)
Skin prick test	
Positive	57 (58.2)
Negative	41 (41.8)
Conjunctivitis present	
Yes	60 (62.2)
No	38 (38.8)

Treatment characteristics and clinical findings

Regarding medication use, 49 patients (50%) received a combination of intranasal corticosteroids and oral antihistamines, while the remaining 49 (50%) were additionally prescribed antihistamine eye drops because of ocular involvement. Peripheral eosinophilia was present in 26 patients (26.5%), and the skin prick test revealed sensitization to at least one allergen in 57 patients (58.2%). AC was observed in 60 patients (62.2%), whereas 38 patients (38.8%) did not exhibit ocular symptoms.

Sleep quality outcomes (CSHQ)

Sleep quality was assessed using the CSHQ before and after treatment (Table 2). A comparison of pre- and post-treatment scores on the sleep disturbance scale showed that the median score for Sleep Scale Question 1 remained unchanged at 2 (1–4) ($P = 0.467$). In contrast, Sleep Scale Question 2 maintained a median of 3 (1–5), yet the change was statistically significant ($P < 0.001$). Additionally, the total sleep disturbance score significantly decreased from a median of 56 (range: 24–99) to 43 (24–81) after treatment ($P < 0.001$).

Quality of life outcomes (PRQLQ)

Similarly, the PRQLQ scores were evaluated before and after treatment in children with rhinoconjunctivitis (Table 3). The median nose symptoms score decreased from 4.75 (1–6) to 3 (0.5–6) ($P < 0.001$), while eye symptoms improved from 2.25 (0–6) to 1.25 (0–6) ($P < 0.001$). Although the practical problems subscale showed a minor decline from 3.6 (0.6–5.8) to 3.4 (0.6–6), this change was not statistically significant ($P = 0.298$). Significant improvements were also observed in other symptoms, decreasing from 3.4 (0–6) to 2 (0–6) ($P < 0.001$), and in activity limitations, which declined from 3.75 (0–6) to 2.25 (0–6) ($P < 0.001$). The total PRQLQ score significantly improved from 3.47 (0.91–5.91) to 2.28 (0.43–6) ($P < 0.001$).

The findings of the present study were evaluated in the context of previous studies assessing sleep quality and health-related quality of life in children with allergic rhinitis and/or conjunctivitis, as summarized in Table 4.

Discussion

This study aimed to evaluate the impact of AR and/or AC treatment on sleep quality and HRQoL in pediatric patients.

Table 2 Comparison of pre- and post-treatment sleep disturbance scores in children.

Values	Pre-treatment	Post-treatment	P value
Sleep scale question 1	2 (1–4)	2 (1–4)	0.467
Sleep scale question 2	3 (1–5)	3 (1–5)	**<0.001**
Sleep questionnaire total score	56 (24–99)	43 (24–81)	**<0.001**

Note: Wilcoxon Signed-Rank test was used to determine differences between the groups.

Table 3 Comparison of PRQLQ scores in children with rhinoconjunctivitis before and after treatment.

Values	Pre-treatment	Post-treatment	P value
Nose symptoms	4.75 (1-6)	3 (0.5-6)	**<0.001**
Eyes symptoms	2.25 (0-6)	1.25 (0-6)	**<0.001**
Practical problems	3.6 (0.6-5.8)	3.4 (0.6-6)	0.298
Other symptoms	3.4 (0-6)	2 (0-6)	**<0.001**
Activity limitations	3.75 (0-6)	2.25 (0-6)	**<0.001**
Total PRQLQ	3.47 (0.91-5.91)	2.28 (0.43-6)	**<0.001**

Notes: Wilcoxon Signed-Rank test was used to determine differences between the groups. PRQLQ: Pediatric Rhinoconjunctivitis Quality of Life Questionnaire.

Table 4 Comparison of the present study findings with previous studies evaluating sleep quality and quality of life in children with allergic rhinitis and/or conjunctivitis.

Study (Author, Year)	Population	Key Measure(s)	Main Findings	Consistency with Current Study
Meltzer et al., 2009 [14]	Children & adults with AR (U.S.)	Sleep adequacy, HRQoL	AR associated with poorer sleep and QoL	Similar
Aycan & Çay, 2024 [15]	Turkish children with AR	CSHQ	Higher sleep disturbance vs. controls	Similar
Liu et al., 2020 [16]	Meta-analysis (240M individuals)	Sleep duration, quality	No difference in sleep duration; poorer quality	Partially similar
Juniper et al., 1994 [17]	Adolescents with rhinoconjunctivitis	PRQLQ	Improved QoL after intranasal corticosteroids	Similar
Present study (Özkaya et al., 2026)	98 Turkish children with AR/AC	CSHQ, PRQLQ	Significant improvement in sleep and QoL after 4-week treatment	—

Notes: QoL: quality of life; HRQoL: health-related quality of life; CSHQ: Children's Sleep Habits Questionnaire; PRQLQ: Pediatric Rhinoconjunctivitis Quality of Life Questionnaire.

The findings demonstrated that a 4-week treatment regimen significantly improved both sleep-related parameters and QoL scores, as measured by CSHQ and PRQLQ, respectively. The baseline median CSHQ score in our cohort (56) was notably higher than the normative values reported for healthy Turkish children (mean scores around 42-45), confirming that sleep quality was impaired before treatment.[11]

Although Sleep Scale Question 1 did not show a significant change, both Sleep Scale Question 2 and total CSHQ score improved significantly following the treatment. These results suggest that while certain sleep behaviors, such as bedtime resistance, may be less influenced by allergic symptoms, other aspects such as nighttime awakenings and daytime functioning, are more directly impacted and responsive to symptom control. These findings were consistent with previous studies reporting sleep disturbances as a key morbidity associated with allergic diseases and their subsequent improvement following appropriate therapy. Meltzer et al. demonstrated in a large US cohort study that individuals with AR reported significantly worse scores in sleep adequacy, QoL, cognitive functioning, and productivity, compared to nonallergic individuals, emphasizing the considerable burden of allergic symptoms on daily functioning.[14] Similarly, a recent study conducted by Aycan and Özcanlı Çay in Turkey determined that children with AR had significantly higher sleep disturbance scores than healthy controls, further supporting the negative impact of allergic symptoms on sleep quality.[15] However, although our findings indicate improvements in sleep quality after treatment, not all studies reported consistent results. A systematic review and meta-analysis by Liu et al., involving more than 240 million individuals, found no significant difference in sleep duration between AR patients and controls.[16] Nevertheless, AR was associated with poorer sleep quality, increased sleep latency, greater use of sleep medications, and higher risks of sleep-related dysfunctions. The overall quality of evidence was rated low, suggesting the need for further high-quality research to confirm these associations.

Similarly, significant improvements were observed in nearly all PRQLQ subscales, particularly nose and eye symptoms, other systemic symptoms, and activity limitations. These findings were in line with previous studies demonstrating that appropriate treatment of AR and AC leads to meaningful improvements in HRQoL. Juniper et al. showed that intranasal corticosteroids significantly

improved PRQLQ scores in children with seasonal AR.[17] These results support the clinical relevance of symptom control not only for physical relief but also for improving functional well-being in affected children. The nonsignificant change in the practical problems subscale may reflect external factors, such as family routines or school-related challenges, that persist despite lessenig of symptoms. Nonetheless, significant reduction in the total PRQLQ score indicates an overall positive shift in patients' daily functioning and well-being. This was consistent with the framework proposed by the ARIA initiative, which emphasizes that AR is not a localized condition but a systemic disorder that significantly impairs daily life and often coexists with asthma. ARIA promotes a patient-centered classification and guideline-based treatment approach, aiming not only to relieve symptoms but also to improve the overall QoL and daily functioning.[18]

These findings highlight the multidimensional burden of AR and AC in children, affecting not only physical symptoms but also sleep, emotions, and social life. Importantly, they underline the value of early and appropriate treatment not just for symptom relief but also for improving broader QoL outcomes.

The study's strengths include its prospective design, use of validated assessment tools, and a relatively homogeneous patient population. However, certain limitations should be acknowledged. The follow-up duration was limited to 4 weeks, and long-term outcomes were not evaluated. Additionally, adherence to treatment was based on caregiver report, which may introduce bias. Future studies with longer follow-up period, objective adherence monitoring, and larger multicenter samples are warranted to further validate these findings.

Conclusion

In conclusion, this study demonstrates that standard guideline-based treatment for allergic rhinitis and/or allergic conjunctivitis results in meaningful improvements in both sleep quality and health-related quality of life in children. A relatively short, four-week treatment period was sufficient to produce significant reductions in overall sleep disturbance and notable gains across most quality-of-life domains, underscoring the close interplay between allergic symptom control, sleep, and daily functioning.

These findings emphasize that allergic rhinitis and conjunctivitis should not be viewed as conditions limited to nasal or ocular symptoms alone. Instead, they represent systemic disorders with broader functional consequences that directly affect children's well-being, behavior, and participation in daily activities. Early recognition and appropriate treatment may therefore yield benefits that extend beyond symptom relief, contributing to improved sleep patterns and overall quality of life.

Future studies with longer follow-up periods and objective sleep assessments are warranted to further clarify the long-term impact of sustained allergic disease control. Nonetheless, the present results support the importance of timely, comprehensive management of pediatric allergic conditions as a key component of holistic child health care.

Mandatory Disclosure on Use of Artificial Intelligence

The authors declare that no AI-assisted tools were used in the preparation of this manuscript. All references have been manually verified for accuracy and relevance.

Author Contributions

MÖ conceptualized and designed the study, supervised the data collection process, and authored the article. ZB, EÖ, and BÖE contributed to patient recruitment and data collection. MKG contributed to psychiatric assessments and the interpretation of psychological data. FT conceptualized and designed the study, supervised the data collection process, and contributed to the interpretation of the article and the review of the data.

Conflict of Interest

All authors confirmed that there was no conflict of interest that needed to be disclosed or any relationship or activity that required reporting.

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