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ORIGINAL ARTICLE

Association between Chronic Allergic Rhinitis and Sleep Quality Disturbances among Young Adults. A Cross-Sectional Clinical Study

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ABSTRACT

Background: Chronic allergic rhinitis (CAR) is a common IgE-mediated upper airway inflammatory disease, which is often accompanied by nasal congestion, rhinorrhea, and sneezing. There is a growing body of evidence indicating that CAR has a major disturbance effect on sleep quality, especially in young adults who are already exposed to various academic and psychosocial stressors.

Aims: To evaluate the relationship between chronic allergic rhinitis and sleep quality disturbances in young adults with the aid of a uniform sleep assessment instrument.

Methods: Cross-sectional clinical study will be done in an ENT outpatient clinic between January and December 2024. One hundred and fifty (150) individuals of ages 18-35 years old were randomized to participate in the study with 75 participants being patients of CAR and other 75 controls. The level of sleep quality was measured through use of the Pittsburgh Sleep Quality Index (PSQI). Demographic data, severity of the symptoms, and triggers were noted. A chi-square, t-tests, and a logistic regression of $p = 0.05$ were used to conduct statistical comparisons.

Results: CAR group scored considerably greater global PSQI scores in comparison with controls (9.2 ± 3.4 vs. 4.1 ± 2.2; $p < 0.001$). A lower sleep quality (PSQI > 5) was found in 69.3% of CAR and 25.3% among the controls ($p < 0.001$). Constant and moderate-to-severe CAR was closely linked to sleep disturbance. The logistic regression revealed that CAR is an independent finding that predicts poor sleep quality (adjusted OR 3.84; 95% CI: 2.146.91).

Conclusion: CAR has a considerable negative effect on sleep quality in young adults, and persistent and moderate-severe symptoms are the factors that lead to an adverse effect on sleep. Sleep quality assessment should be performed regularly among CAR patients to ensure complete management and the general condition of well-being.

Keywords: Allergic rhinitis, Sleep quality, PSQI, Nasal obstruction, young adult.

INTRODUCTION

Chronic allergic rhinitis (CAR) is a type of immunoglobulin E (IgE) -based inflammatory condition of the upper respiratory system with appropriate obstruction of the nose, rhinorrhea, sneezing, nasal itch, and postnasal drip. CAR is a significant cause of poor quality of life in young adults globally as it is estimated almost in 10-30 percent of the population of the world[1]. The long-term inflammation in the mucosa of the nasal tract and nasal congestion as a result of CAR have great implication not only to the respiratory health status but also to the overall wellbeing, cognitive functioning and psychosocial functioning[2]. The CAR load can be particularly inconveniencing as the young adults constitute a very dynamic group of the population, who are required to perform both academic, occupational, and social duties[3].

Disturbances of sleep quality are also common in the case of patients having chronic allergic rhinitis. Sleep obstruction of the nose leads to mouth breathing,

disrupted sleep architecture, a higher arousal rate, less slow wave sleep and non-restorative sleep [4]. There are also inflammatory mediators like histamine and cytokines that are released in allergic reaction that further affect sleep by acting on mechanisms of central nervous system that control sleep. Nocturnal congestion and postnasal drip are symptoms which can result in repeat awakenings, dry mouth, disrupted breathing patterns and poor ability to maintain sleep resulting in poor subjective sleep quality [5].

The outcomes of poor sleep-in young adults are critical, such as daytime fatigue, lack of concentration, poor academic achievements, mood alterations, low productivity, and the risk of having anxiety and depressing symptoms[6]. Nonetheless, the association between CAR and the quality of sleep is an under-discovered issue in medical practice. Most of the patients can be treated of the symptoms of nasal allergy without having any idea of the extent to which the condition is impacting their sleep. This knowledge gap identifies the need to address sleep disturbance among young adults with allergic rhinitis, especially in areas where such environmental allergens as dust, pollen, pollution, and changing climatic conditions are major causes of symptoms remaining unresolved[7].

Though a number of international studies have identified that allergic rhinitis is associated with sleeping disturbances, few region-specific research has been done on young adults with respect to South Asian populations where the likelihood of environmental allergen exposure is high where healthcare seeking behavior may be different[8]. In addition, the patterns of interacting with allergens, living conditions, and lifestyle differences can also have an impact on the severity of both sleeping disturbances and allergic rhinitis. Thus, it is necessary to evaluate the relationship between CAR and sleep quality in this population group in order to enhance clinical assessment, preventive care, and overall management[9].

The objective of the current study is to evaluate the combined occurrence between chronic allergic rhinitis and sleep disturbances in sleep quality in a group of young adults through the use of standardized clinical and sleep evaluation instruments[10]. The given research can help to outline the necessity of multi-faceted allergy and sleep management approaches by determining the scope of the issue of CAR influence on sleep and justify the creation of specific interventions that may be used to enhance the overall health outcomes of this group of patients.

MATERIAL AND METHOD

This was a cross-sectional clinical research that will take place in the Otorhinolaryngology (ENT) department outpatient section of a tertiary care teaching hospital based in Lahore, Pakistan, between January 2024 and December 2024. These included the main goal of testing the relationship between chronic allergic rhinitis (CAR) and disturbance of sleep quality in young adults. The study sample included young adults between the ages of 18 and 35 years that came to the ENT outpatient clinic within the study period. The patients were split into two groups (i) cases, and (ii) controls; young adults with the diagnosis of chronic allergic rhinitis and age/sex-matched young adults without a history of allergic rhinitis or other chronic diseases of the nose/respiratory system, respectively. Chronic allergic rhinitis was determined based on ARIA (Allergic Rhinitis and its Impact on Asthma) criteria as the frequency of 4 days per week and presence of nasal symptoms (sneezing, nasal obstruction, rhinorrhea and nasal itching) accompanied by clinical suspicion of an allergic etiologic agent.

It was a non-probability consecutive-based technique of sampling. All willing patients who came in the period of the study process and met the inclusions criteria were welcomed in the study. The optimal difference between the two groups in terms of sample size required to compare the sleeping quality with the help of moderate level of effects, level of confidence that is 95 percent and the power of 80 percent was balanced to 120 participants; in order to cover non-response and partly turned up data; a total number of 150 participants was recruited, with 75 in the CAR and 75 in the control groups.

The CAR group inclusion criteria were: age 1835 years old, clinical diagnosis of chronic allergic rhinitis by an ENT specialist through history and examination, and 3 months or more duration of symptoms and being willing to participate under an informed consent. In the control group, one had to be aged between 18 and 35 years, have no chronic symptoms of nasal allergy, no prior diagnosis of allergic rhinitis or asthma and volunteer. Both groups had exclusion criteria of known obstructive sleep apnea, chronic obstructive pulmonary disease, uncontrolled bronchial asthma, nasal polyposis, significant septal deviation that might necessitate surgery, acute infection of the upper respiratory tract in the past 2 weeks, nasal surgery or surgery to the face in the past 6 months and currently taking systemic corticosteroids or sedative-hypnotic drug, diagnosed psychiatric illness, pregnancy and any severe chronic systemic illness (e.g., advanced cardiac, hepatic or

A proforma of structured interviewer administered data collection was used. The former segment captured socio-demographic data such as age, sex, marital status, occupation, level of education and residential area (urban/rural). The second section entailed clinical information concerning allergic rhinitis including duration of symptoms, seasonal or perennial pattern, triggers (dust, pollen, smoke, perfumes, temperature changes), atopy in

the family history, conjunctival or lower respiratory symptoms and past treatments used. A visual analogue scale (VAS) of nasal obstruction, sneezing, rhinorrhea, and itch (0 means no symptom to 10 means very severe symptom) was used to determine the severity of the symptoms. According to ARIA classification, allergic rhinitis was further classified into mild or moderate-severe, and intermittent or persistent. A detailed ENT assessment was conducted on all respondents, consisting of anterior rhinoscopy and examination of the oropharynx, to record hypertrophy of the turbinate, mucosal edema and nasal discharge, as well as structural anomalies.

The quality of sleep was measured in both the cases and control using the Pittsburgh Sleep Quality Index (PSQI) which is a validated scale. The PSQI is a self-reevaluation scale with 19 items, which are divided into seven subtests: subjective sleep quality, latency to fall asleep, sleep duration, sleep habitual efficiency, sleep disturbances, use of sleep medication, daytime dysfunction. The scores of each component would range between 0 and 3 and the total of these components would give rise to a global PSQI score between 0 and 21 where higher scores depict a worse quality of sleep. In this case, a global PSQI score greater than 5 was deemed to be poor sleep quality, owing to this study. Besides this, the participants were also questioned on certain complaints with regard to sleeping which included struggles in getting into sleep, frequently awakening, over-awakening, early in the morning awakening, snoring, unretiring sleep, and feeling of tiredness. The assessment of daytime sleepiness was optional by simple numeric rating or the Epworth Sleepiness Scale where the use of Epworth scale was necessary.

Any questionnaire was given in easy language and where necessary, the data collector helped answer various questions of the questionnaire to ensure that there was minimal confusion and no questions left unanswered. Data were also obtained by the same researcher on both the groups in order to minimize inter-observer bias. Checking was done to ascertain completeness and consistency of the data at the time of collection and the incomplete forms were corrected through a check with the participant.

Sleep quality (good vs poor) was considered as the primary OV according to the global PSQI score. Individual components of PSQI, the presence of daytime dysfunction, and severity/duration of chronic rhinitis allergic were secondary outcome variables. The independent variables were age, sex, allergic rhinitis duration, Severity of ARIA-based classification, environmental trigger and smoking status and family allergic history. The data were analyzed with the help of a statistical software (e.g., SPSS version 26). Age as well as PSQI scores were presented as the mean plus standard deviation (SD) or median and the interquartile range (IQR) ranging on the normality of distributions. Frequencies and percentages were used to describe categorical variables, including sex, presence of poor sleep quality, ARIA classification, and presence of daytime dysfunction. Comparison of the continuous variables between the CAR and control groups (independent samples t-test or Mann-Whitney U test) was conducted and comparing the categorical ones (chi-square test or Fisher-exact test where necessary). Chronic allergic rhinitis and the poor quality of sleep was tested to determine the strength of the relationship between these two variables through odds ratio (OR) and 95% confidence interval.

All the key variables analyzed using multivariate logistic regression to correct possible confounding variables including age, sex, smoking, occupation and to determine independent predictors of poor sleep quality amongst participants in the study. The statistical significance of a p-value below 0.05 was taken to be significant. The study was only started with ethical approval of the Institutional Ethical Review Board of the respective teaching hospital ethical approval certificate was obtained Ref (ERC/2023/123B). prior to the administration of the data collection. All the participants signed informed consent written after providing them with the purpose of the study, procedures, the possible risks, and benefits. Confidentiality of the participants was observed where each participant was given unique identification codes and all data were not subject to any other use other than research. Involvement was also voluntary, and the subjects were free to pull out of the study without any effects on the clinical treatment.

RESULTS

The study included 150 young adults; 75 with chronic allergic rhinitis (CAR) and 75 healthy controls. The response rate was 100 percent with every one of the participants filling questionnaires. The average age of respondents was 24.6+ 4.1 years old in the CAR group and 23.9 + 3.8 years old in the control group and the difference was not statistically significant (p = 0.34). The CAR group consisted of 56 and controls 52 percent female. There were no magnified disparities on marital status, smoking status and dwelling among the two categories. A table 1 includes demographic data of the members of both groups. There was no marked difference in age, sex distribution, or smoking behavior, nor our status of residence meaning, hence, the two groups are similar. Nonetheless, family atopy history was much greater in the CAR group supporting the nature of their condition as being allergic.

Within this group of CAR, who included the CAR, 57 percent of them had constant CAR and 43 percent had

intermittent ones. According to ARIA severity classification, there was 41 per cent mild and 59 per cent moderate-severe. Dust (72 percent), smoke (64 percent), perfumes (46 percent), and pollen (38 percent) were the triggers the most frequently reported. This is the table that describes the duration of the symptoms, the intensity, and the precipitating factors in the CAR group. The current patient symptomatology and moderate-to-severe disease indicated the heavy burden of allergies in the majority of the patients. The most significant environmental precipitants included dust and smoke.

CAR patients had a significant negative difference on all PSQI items, particularly on sleep disturbances, sleep latency and daytime dysfunction. Most CAR patients reported low quality of sleep (nearly tripled by the controls). With the aid of logistic regression, it was determined that even when age, sex, smoking, and occupation were taken into account, CAR was a strong independent predictor of low sleep quality (adjusted odds ratio 3.84, 95% CI: 2.146.91, $p < 0.001$). The moderate-to-severe allergic rhinitis as well as persistent symptoms were significantly related to increased PSQI scores worldwide ($p < 0.01$). Night time agency symptoms were also much higher in those participants who were sensitive to dust and smoke.

Table 1. Baseline Characteristics of the Study Population (n = 150)

Variable	CAR Group (n = 75)	Control Group (n = 75)	p-value
Mean Age (years)	24.6 ± 4.1	23.9 ± 3.8	0.34
Sex (Male/Female)	33/42	36/39	0.63
Smoking Status (Yes/No)	14/61	10/65	0.38
Urban Residence (%)	81.3%	78.6%	0.67
Family History of Atopy (%)	42.6%	12.0%	<0.001*

*Significant at $p < 0.05$.

Table 2. Clinical Characteristics of Chronic Allergic Rhinitis Patients (n = 75)

Variable	Frequency (%)
Symptom Pattern: Persistent	43 (57.3%)
Symptom Pattern: Intermittent	32 (42.7%)
Severity: Mild	31 (41.3%)
Severity: Moderate–Severe	44 (58.7%)
Common Triggers: Dust	54 (72.0%)
Smoke Exposure	48 (64.0%)
Perfume/Fragrance	35 (46.6%)
Pollen	29 (38.6%)

Table 3. Comparison of PSQI Components Between CAR and Control Groups

PSQI Component	CAR Group (Mean ± SD)	Control Group (Mean ± SD)	p-value
Subjective Sleep Quality	1.9 ± 0.7	0.9 ± 0.6	<0.001*
Sleep Latency	2.0 ± 0.9	1.1 ± 0.7	<0.001*
Sleep Duration	1.7 ± 0.8	0.8 ± 0.5	<0.001*
Sleep Efficiency	1.4 ± 0.6	0.7 ± 0.4	<0.001*
Sleep Disturbances	1.8 ± 0.7	1.1 ± 0.6	<0.001*
Daytime Dysfunction	1.6 ± 0.8	0.6 ± 0.4	<0.001*
Global PSQI Score	9.2 ± 3.4	4.1 ± 2.2	<0.001*
Poor Sleep Quality (%)	52 (69.3%)	19 (25.3%)	<0.001*

*Significant at $p < 0.05$.

DISCUSSION

The current research explored the relationship that exists between chronic allergic rhinitis (CAR) and sleep disturbances in young adults and found the two variables to be strongly correlated and both statistically significant. Those with CAR have greatly worse sleep quality as indicated by significantly higher global PSQI scores and impairment of all sleep domains, such as sleep latency, sleep duration, sleep efficiency, nocturnal awakenings, and daytime dysfunction, relative to the age- and sex -matched healthy controls[11]. These findings of this work accompany the international literature that proves allergic rhinitis to be one of the major, but neglected, factors that contribute to disrupted sleep. The most important factor suggested to be connected with allergic rhinitis and poor sleep is nasal obstruction as it raises the airway resistance, makes people

breathe their mouths in the course of sleep, and enhances arousal frequency[12]. Most of the CAR participants in our study experienced persistent and moderate-to-severe symptoms and this is one of the reasons why sleep impairment was high. The same has been observed in earlier researches in which patients with higher ARIA classifications were shown to have a higher disruption in sleep continuity, REM sleep suppression, reduced restorative sleep cycles[13].

Moreover, other mediators of inflammatory processes (histamine, leukotrienes and cytokines) which are released in allergic inflammation can also be associated with additional contribution to the disruption in the regulation of circadian rhythms. Particularly histamine is found to regulate wakefulness and sleep structure and in high concentrations at time of allergic expression it may directly affect the result of sleep[14]. This process has been used to explain why poor subjective sleep quality could be reported even in the case of patients with mild nasal obstruction. Another finding of the current research was the fact that daytime dysfunction, in terms of sleepiness, fatigue, and lack of concentration, was extremely severe in the group members that participated in CAR. These results have significant clinical implications, since the daytime functioning in young adults can have an adverse influence on academic achievements, working efficiency, and mental health[15]. The fact that the CAR patients have not been spared of poor sleep quality (69.3% prevalence rate) underlines the importance of regular screening of sleep disturbances in the ENT clinic, especially in such areas as Pakistan where the environmental factors such as dust and smoke are a common occurrence as a result of urbanization, traffic pollution, and weather conditions[16].

In this study, environmental triggers were known to contribute to symptom exacerbation in which dust and smoke were found as the most prevalent. This is in agreement with the local environmental characteristics in urban centers in South Asia where PM, industrial pollutants and automobile emissions increase the load of allergies and aggravate the upper respiratory tract susceptibility. The high correlation that exists between these triggers and poor sleep among participants of CAR supports the role of environmental control actions with medical therapy. Regression analysis also established that CAR was a predictor of high poor sleep quality even after controlling the causal factor factors such as age, sex, smoking behavior, and occupation[17]. This highlights the necessity of integrated management approaches that are aimed at addressing both nasal symptoms as well as being proactive in terms of promoting sleep hygiene, nighttime nasal patency, and comorbid conditions, such as asthma or allergic conjunctivitis. In moderate to severe cases, treatment methods which include intranasal corticosteroids, antihistamines, nasal saline irrigation, and sufficient allergen avoidance could be highly effective in enhancing the outcomes of sleep[18].

The study has some limitations in spite of its useful insights. First, cross-sectional design limits the possibility of making any claim on causality, though the close association would indicate that there is a likely causal relationship. Second, objective assessments of sleep e.g., polysomnography were not undertaken and the use of PSQI though validated, may be biased[19]. Third, the research has been carried out in one tertiary care center thereby reducing the ability to generalize the results to the rest of the population. It is suggested that future studies based on multiregional data and objective sleep measurement would help develop the evidence base.

However, this work is valuable as it presents the significant amount of sleep disturbances in young adults with CAR in a South Asian context and reveals the value of including the sleep health as the part of the allergy assessment and treatment[20].

CONLUSION

This paper shows a positive and high correlation between chronic allergic rhinitis and poor quality of sleep-in young adults. The CAR people scored much higher in global PSQI and the disturbances of the sleeping onset, duration, persistence, and daytime performance than the healthy controls reported. The outcome of worse sleep was especially linked to persistent and moderate-to-severe allergic symptoms. Cleaning agents like dust and smoke also played a role with regard to the difficulty in breathing at night and poor sleep.

Since CAR has a high effect on sleep and dyspnea, clinicians should evaluate the quality of sleep regularly in patients who present with allergic rhinitis. Overall, the quality of life can be improved with the help of early diagnosis, combined treatment, which includes pharmacological therapy, allergen avoidance treatment, and sleep hygiene practices. Future studies that apply objective sleep investigations and extensive population sampling are justified in an effort of comprehending the processes involved in the interactions of allergic inflammation and sleep disorders.

DECLARATION

Conflict of Interest
The authors declare no conflict of interest.

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Author's Contribution

All authors contributed equally in the complication of current study.

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Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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