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Poor Sleep Quality and Associated Factors in Patients with Common Variable Immunodeficiency

Yaygın Değişken İmmün Yetmezlik Hastalarında Kötü Uyku Kalitesi ve İlişkili Faktörler

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Abstract

Objective: This study aimed to examine the sleep quality of common variable immunodeficiency (CVID) patients and to investigate the relationship between sleep quality and depression, anxiety, fatigue, excessive daytime sleepiness and naturel killer (NK) cell counts.

Materials and Methods: The study included 53 patients followed with CVID diagnosis. To determine sleep quality and conditions associated with sleep quality in CVID patients, Pittsburgh sleep quality index (PSQI), fatigue severity scale (FSS), Hamilton depression scale (HAM-D), Hamilton anxiety scale (HAM-A) and Epworth sleepiness scale (ESS) were used.

Results: Fatigue was found in 37 (70%) patients, poor sleep quality in 34 (64%), depression in 20 (38%), anxiety in 16 (30%), and excessive daytime sleepiness in 11 (21%) patients. All patients CVID patients received immunoglobulin replacement therapy: Intravenous immunoglobulin (IVIG) in 37 (72%) and subcutaneous immunoglobulin (SCIG) in 16 (28%) patients. The PSQI, HAM-A, HAM-D and FSS scores of the patients receiving IVIG treatment were higher than those of the patients receiving SCIG treatment (all, $p<0.05$). According to the multivariate logistic regression analysis, lower NK cell counts [odds ratio (OR) =13.384, 95% confidence interval (CI)= 2.478-72.284, p=0.003] and depression (OR=7.030, 95% CI=1.320-37.435, p=0.022) were risk factors for poor sleep quality.

Conclusion: Our results showed that patients with CVID had a higher frequency of poor sleep quality, depression, anxiety, fatigue, and excessive daytime sleepiness than the general population. Therefore, sleep quality and mental status should be questioned in detail during routine control in patients with CVID.

Keywords: Common variable immunodeficiency, sleep quality, depression, anxiety, natural killer cells

Öz

Amaç: Bu çalışmanın amacı, yaygın değişken immün yetmezlik (YDİY) hastalarının uyku kalitesini incelemek ve uyku kalitesi ile depresyon, anksiyete, yorgunluk, gündüz aşırı uyku hali ve doğal öldürücü (NK) hücre sayıları arasındaki ilişkiyi araştırmaktır.

Gereç ve Yöntem: Çalışmaya YDİY tanısı ile takip edilen toplam 53 hasta dahil edilmiştir. YDİY hastalarında uyku kalitesi ve uyku kalitesi ile ilişkili durumları belirlemek için Pittsburgh uyku kalitesi indeksi (PUKİ), yorgunluk şiddet ölçeği (YŞÖ), Hamilton depresyon ölçeği (HAM-D), Hamilton anksiyete ölçeği (HAM-A) ve Epworth uykululuk ölçeği (EUÖ) kullanılmıştır.

Bulgular: Hastaların 37'sinde (%70) yorgunluk, 34'ünde (%64) kötü uyku kalitesi, 20'sinde (%38) depresyon, 16'sında (%30) anksiyete ve 11'inde (%21) gündüz aşırı uykululuğu saptanmıştır. Tüm YDİY hastaları immünoglobulin (IVIG) replasman tedavisi almakta idi [37 (%72) hastada intravenöz IVIG ve 16 (%28) hastada subkütan immünoglobulin (SCIG)]. IVIG tedavisi alan hastaların PUKİ, HAM-A, HAM-D ve YŞÖ skorları SCIG tedavisi alan hastalardan daha yüksekti (tümü, $p<0,05$). Çok değişkenli lojistik regresyon analizine göre, düşük NK hücre sayısı [olasılık oranı (OO)=13,384, %95 güven aralığı (GA)=2,478-72,284, p=0,003] ve depresyon (OO=7,030, %95 GA=1,320-37,435, p=0,022) kötü uyku kalitesi için risk faktörü olarak saptandı.

Sonuç: Sonuçlarımız YDİY hastalarının genel popülasyona göre daha yüksek oranda kötü uyku kalitesi, depresyon, anksiyete, yorgunluk ve aşırı gündüz uykululuğuna sahip olduğunu göstermiştir. Bu nedenle YDİY'de rutin kontroller sırasında uyku kalitesi ve mental durum detaylı olarak sorgulanmalıdır.

Anahtar Kelimeler: Yaygın değişken immün yetmezlik, uyku kalitesi, depresyon, anksiyete, doğal öldürücü hücreler

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Introduction

Common variable immunodeficiency (CVID) is an inborn errors of immunity (IEI) (formerly defined as primary immunodeficiency) characterized by hypogammaglobulinemia (1,2). Patients may present with heterogenous complaints and comorbidities, including recurrent bacterial infections, autoimmune disorders, gastrointestinal disease, chronic lung disease and lymphoma (3).

Increasing awareness, rapid diagnosis, and early initiation of immunoglobulin replacement therapy have significantly improved the life expectancy of CVID patients (4). Various factors can improve quality of life in CVID, particularly the use of subcutaneous immunoglobulin applied by the patients at home (5,6).

Nevertheless, both the quality of life and mental health of CVID patients are negatively affected. Previous studies have shown that adults diagnosed with CVID have an increased risk of anxiety and depression (7). In addition, higher rates of fatigue have also been reported in CVID patients than in the general population.

A growing body of evidence shows a relationship between sleep and the immune system. Sleep disorders are likely to be both a cause and a symptom of various immune disorders (8,9). Results suggest strong relationships between short sleep duration and naturel killer (NK) cell functions (10).

There are few studies in the literature that have evaluated the prevalence of depression, anxiety and fatigue in CVID patients. Moreover, there are no reported investigations into relationships between sleep quality, anxiety, depression, and fatigue in CVID patients. The aims of this study were to examine the sleep quality of CVID patients and to investigate relationships between excessive daytime sleepiness, fatigue, depression, anxiety and NK cell counts.

Materials and Methods

Study design

This study was carried out in the adult immunology clinic of a university hospital between August 2020 and January 2021. The study included 53 patients over the age of 18 who were followed up with the diagnosis of CVID and received immunoglobulin replacement therapy.

Patients were excluded from the study if they were aged <18 years, had used steroids within the previous 3 months, were diagnosed with sleep disorder because of another systemic disease (primarily other respiratory diseases), had been diagnosed with a psychiatric disorder such as depression or anxiety disorder before the diagnosis of CVID, had been diagnosed with a sleep disorder before the CVID diagnosis and were receiving treatment.

A record was made for each patient containing age, sex, disease duration and immunoglobulin replacement therapy (intravenous/subcutaneous). As laboratory parameters, serum immunoglobulin (Ig) levels (IgG, IgM and IgA) at diagnosis, and peripheral lymphocyte subgroups were recorded.

Ethics approval

Approval for the study was given by the Necmettin Erbakan University Ethics Committee (decision no: 2020/2709-2021/3495).

Data collection

The scales listed below [Pittsburgh sleep quality index (PSQI), Hamilton depression scale (HAM-D), Hamilton anxiety scale (HAM-A), Epworth sleepiness scale (ESS), fatigue severity scale (FSS) were used to determine sleep quality, and conditions that could be associated with sleep quality, in CVID patients. These tests were applied to the patients and recorded by a psychiatrist. Measurements were taken after the immunoglobulin replacement therapy. Patients were questioned about their symptoms before and throughout the whole infusion cycle, including the days after.

PSQI: The PSQI was used to evaluate the subjective quality of sleep of the patients. A score of ≤5 points indicates good sleep quality, >5 points poor sleep quality. Validity and reliability studies of the application of PSQI to Turkish populations were conducted by Agargun et al (11).

FSS: Patient complaints of fatigue were evaluated using the FSS. The total points of the scale range from 9 to 63, with points of ≥36 accepted as fatigue. The validity and reliability of applying the FSS to a Turkish population was analyzed previously by Armutlu et al (12).

HAM-D: This scale was used to evaluate depression in the patients. Validity and reliability studies of the scale for a Turkish population were conducted by Akdemir et al. (13); ≥28 points indicates severe depression, 16-27 points moderate depression, 8-15 points mild depression and 0-7 points no depression.

HAM-A: This scale was used to evaluate anxiety in the patients. Validity and reliability studies of the scale for a Turkish population were conducted by Yazici et al. (14); ≥15 points indicates major anxiety, 6-14 points minor anxiety and 0-5 points no anxiety.

ESS: The ESS is used for the evaluation of excessive daytime sleepiness. A score of >10 points represents excessive daytime sleepiness. The ESS was adapted for Turkish populations by Izci et al. (15).

Immunological analysis

Serum Ig concentrations (IgG, IgA and IgM) were determined with particle-enhanced immunonephelometry using a Siemens BN II/BN ProSpec system (Eschborn, Germany). Complete blood counts were performed with Sheath reagent using the Abbott Cell Dyn 3700 series (USA). Peripheral blood lymphocyte subsets were measured with a BD FACSCanto II 8-color flow cytometer system (Erembodegem, Belgium) with fluorescence-labeled antibodies. Measurements were taken of T-cells ($CD3^+$), helper T-cells ($CD3^+$ $CD4^+$), cytotoxic T-cells ($CD3^+$ $CD8^+$), NK cells ($CD16^+$ $CD56^+$), B-cells ($CD19^+$) and switched memory B (SMB) cells ($CD19^+$ $CD27^+$ IgD^-).

Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS for Windows v. 22.0 software. Continuous variables

were presented as mean ± standard deviation or median (minimum-maximum) values, and categorical variables as number (n) and percentage (%). Mann-Whitney U test was used to evaluate continuous data was used. Spearman's correlation test was used to assess the association between PSQI scores and NK cell counts. Multivariate and univariate logistic regression analyses were used to identify risk factors for poor sleep quality. All variables with p-values <0.1 in univariate analyses were entered into forward stepwise multivariate logistic regression analyses. P-values <0.05 were considered to be statistically significant.

Results

Clinical and laboratory features of patients

The study included a total of 53 patients comprising 24 (45%) males and 29 (55%) females with a mean age of 39.21±14.15 years. The mean disease duration was 5 (0.5-24) years; 6 (1-24) years for females and 5 (0.5-24) years for males. All patients were receiving regular Ig replacement therapy, as intravenous immunoglobulin (IVIG) in 37 (72%) of the patients and subcutaneous immunoglobulin (SCIG) in 16 (28%) (Table 1).

Evaluation of sleep quality, anxiety, depression, fatigue and daytime sleepiness

Sleep quality was poor according to the PSQI results in 34 (64%) patients. Anxiety was detected in 16 (30%) patients according to the HAM-A scale, depression in 20 (38%) patients according to the HAM-D scale, excessive daytime sleepiness in 11 (21%) patients according to the ESS and fatigue in 37 (70%) patients according to the FSS data (Table 2).

Of the patients with poor sleep quality according to the PSQI scale, fatigue was determined in 25 (73.5%), depression in 19 (56%), anxiety in 12 (35%), and excessive daytime sleepiness in eight (23.5%) (Table 3).

NK cell counts were found to be lower in patients with poor sleep quality according to PSQI (p=0.004) (Table 3).

The relationship between immunoglobulin replacement therapy with sleep quality, fatigue, depression, anxiety and daytime sleepiness

The PSQI, FSS, HAM-D, HAM-A and ESS scores of the patients receiving IVIG treatment were higher than those of the patients receiving SCIG treatment (p=0.001, p=0.001, p=0.003, p=0.001, p=0.191, respectively) (Table 4).

Correlation between PSQI scores and NK cell counts

There was a negative correlation between PSQI scores and NK cell counts (r=-0.514, p<0.001) (Figure 1).

Risk factors for poor sleep quality

Univariate logistic analyses revealed that lower IgM levels [odds ratio (OR), 0.303; 95% confidence interval (CI), 0.074-1.245, p=0.098], lower IgA levels (OR, 0.246; 95% CI, 0.048-1.258, p=0.092), lower NK cell counts (OR, 6.875; 95% CI, 1.858-25.432, p=0.004), and higher HAM-D scores (OR, 4.750; 95% CI, 1.302-7.327, p=0.018) were associated with poor sleep quality in CVID patients (Table 5).

Table 1. Clinical and laboratory characteristics of the patients with CVID

Clinical characteristics		
Age, years*	39.2±14.1	
Sex, n (%)		
Female	29 (55)	
Male	24 (45)	
Duration of disease, years**	5 (0.5-24)	
Immunoglobulin replacement therapy, n (%)		
IVIG	38 (72)	
SCIG	15 (28)	
Laboratory characteristics**		**Reference ranges**
IgG (mg/dL)	448 (33-690)	700-1600
IgM (mg/dL)	26 (4-147)	40-230
IgA (mg/dL)	26 (5-224)	70-400
Total lymphocyte (cell/µL)	1080 (700-2670)	1000-4800
T-cells, $CD3^+$ (cell/µL)	810 (422.4-2275)	723-2737
T-cells, $CD3^+$ $CD4^+$ (cell/µL)	409.5 (56-876)	404-1612
T-cells, $CD3^+$ $CD8^+$ (cell/µL)	410.40 (166.1-1525)	220-1129
B-cells, $CD19^+$ (cell/µL)	63.8 (0-266)	80-616
SMB cells (cell/µL)	24.3 (0-175.7)	7.3-40
NK cells (cell/µL)	87.4 (12-344)	84-724

IVIG: Intravenous immunoglobulin, Ig: Immunoglobulin, SCIG: Subcutaneous immunoglobulin, SMB: Switched memory B, NK: Natural killer, *Mean ± SD, **median (minimum-maximum), SD: Standard deviation

According to the multivariate logistic regression analysis, lower NK cell counts (OR, 13.384; 95% CI, 2.478-72.284, p=0.003) and higher HAM-D scores (OR, 7.030; 95% CI, 1.320-37.435, p=0.022) were risk factors for poor sleep quality (Table 5).

Discussion

This is the first study to evaluate sleep quality and associated conditions in CVID patients. Our results show that the sleep quality is poor in CVID patients and 64% of the participants have poor sleep quality. Sleep quality was found to be worse in CVID patients with high depression scores and low NK cell counts. It was also found that the sleep quality of CVID patients who received IVIG treatment was worse than those who received SCIG treatment.

Table 2. Distributions of depression, anxiety, fatigue, sleep quality and daytime sleepiness by scales in COVID patients

Scales	Scores*		n	%
PSQI	6 (1-18)	>5	34	64
		≤5	19	36
FSS	43 (5-63)	≥36	37	70
		<36	16	30
HAM-D	4 (1-29)	0-7	33	62
		8-15	18	
		16-27	1	38
		≥28	1	
HAM-A	4 (0-17)	0-5	37	70
		6-14	15	30
		≥15	1	
ESS	6 (0-22)	>10	11	21
		≤10	42	79

FSS: Fatigue severity scale, PSQI: Pittsburgh sleep quality index, HAM-A: Hamilton anxiety scale, HAM-D: Hamilton depression scale, ESS: Epworth sleepiness scale, *Median (min-max), COVID: Coronavirus

Table 3. The relationships between the scales used in the study

		n (%)	
Scales	**Scores**	**PSQI scores**	
		>5	≤5
		34 (64)	19 (36)
FSS	≥36	25 (73.5)	12 (63)
	<36	9 (26.5)	7 (37)
HAM-D	>7	19 (56)	4 (21)
	≤7	15 (44)	15 (79)
HAM-A	>5	12 (35)	4 (21)
	≤5	22 (65)	15 (79)
ESS	>10	8 (23.5)	3 (16)
	≤10	26 (76.5)	16 (84)
NK cells (cell/µL)*		60.75 (12-344)	150 (40-304.8)

FSS: Fatigue severity scale, PSQI: Pittsburgh sleep quality index, HAM-A: Hamilton anxiety scale, HAM-D: Hamilton depression scale, ESS: Epworth sleepiness scale, *p=0.004, Mann-Whitney U test, data are shown as median with minimum-maximum

Poor sleep quality

Poor sleep quality is one of the common health problems in the population and in clinical practice, and they may lead to serious outcomes that affect the quality of life and health of the patient (16). Sleep-related problems are associated with increased use of health resources, poorer health and increased risk of mortality (17). Poor sleep quality prevalence in the general population ranges from 3.9-40% (18). There are no studies examining sleep quality in CVID patients. In the present analysis of sleep quality in CVID patients, poor sleep quality was present in 64% of the patients (>5 points on the subjective PSQI scale). Interestingly, poor sleep quality was not related to age, gender, or disease duration. However, of the patients exhibiting poor sleep quality, fatigue was determined in 73.5%, depression in 56%, anxiety in 35% and excessive daytime sleepiness in 23.5%.

Fatigue

Sleep disorder is a common clinical condition characterized by maintaining sleep or difficulty falling asleep and accompanied

Table 4. Comparisons of the scale scores according to the immunoglobulin replacement therapy

	Scores		
Scales	**IVIG**	**SCIG**	**p***
PSQI	7 (2-18)	4 (1-13)	**0.001**
FSS	52 (7-63)	32 (5-49)	**0.001**
HAM-D	8 (1-29)	2 (1-10)	**0.003**
HAM-A	5 (0-17)	2 (0-9)	**0.001**
ESS	7 (0-22)	4 (0-12)	0.191

IVIG: Intravenous immunoglobulin, SCIG: Subcutaneous immunoglobulin, FSS: Fatigue severity scale, PSQI: Pittsburgh sleep quality index, HAM-A: Hamilton anxiety scale, HAM-D: Hamilton depression scale, ESS, Epworth sleepiness scale, *Mann-Whitney U test, data are shown as median with minimum-maximum

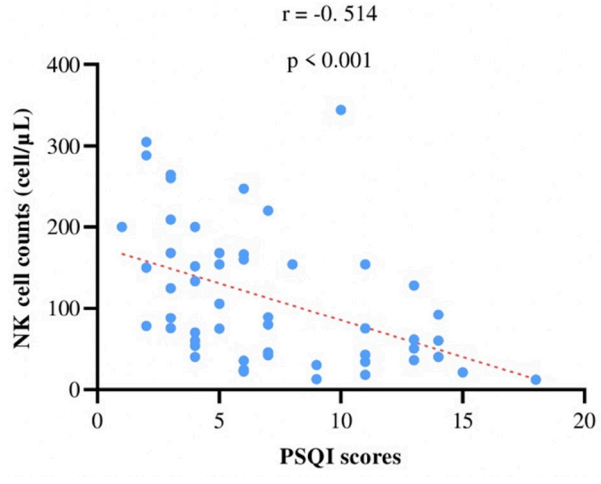

Figure 1. Correlation between NK cell counts and PSQI scores

NK: Natural killer, PSQI: Pittsburgh sleep quality index

by symptoms such as excessive daytime sleepiness or fatigue. The relationship between sleep and fatigue has been widely reported (19,20). Fatigue affects 6-7.5% of healthy adults. Several studies have examined the frequency and causes of fatigue in IEI patients; reports suggest that fatigue affects one in five IEI patients. The same study found that CVID had the highest prevalence of fatigue among IEI patients (21). In another study that investigated the relationship between primary antibody deficiency and chronic fatigue syndrome, fatigue was found in approximately half of the patients (7). In the current study, the FSS was used to evaluate fatigue, which was present in 70% of CVID patients. In our assessment, fatigue was not a risk factor for poor sleep quality in CVID. However, the close relationship between the two conditions suggests that the fatigue experienced by some patients may be a sign of poor sleep quality.

Depression

The lifetime risk of depression in the general population ranges from 15-18% (22). Sleep problems are one of the symptoms of depression. The prevalence of poor sleep quality in patients suffering from depression is much higher than in the general population (16). Therefore, when examining sleep quality, it should be considered that it may be related to depression. In our study, we found evidence of depression in 38% of the patients with CVID. In the current study, we found a strong association between poor sleep quality and depression in CVID patients. 56% of patients with poor sleep quality had depression and depression was a risk factor for poor sleep quality.

Anxiety

In our study, 30% of CVID patients reported anxiety. Similar to depression, the prevalence of poor sleep quality in patients suffering from anxiety is higher than in the general population (16). Although we could not find a relationship between sleep quality and anxiety, anxiety was detected in 35% of patients with poor sleep quality.

Excessive daytime sleepiness

Excessive daytime sleepiness is a frequent symptom that may lead to an increased risk of accidents and an impaired quality of life. It affects 12% of the general population (23). Excessive daytime sleepiness was found in 21% of patients with CVID and in 23.5% of patients with CVID with poor sleep quality. However, excessive daytime sleepiness was not a risk factor for poor sleep quality.

The relationship between immunoglobulin replacement therapy with sleep quality, fatigue, depression, anxiety and daytime sleepiness

To prevent recurrent infections and associated comorbidities, CVID requires lifelong Ig replacement therapy (3). Although both SCIG and IVIG replacement therapies reduce morbidity and mortality, patients are at risk of physical, social and psychological problems, and have poor quality of life. Previous studies have shown that patients treated in hospital have a worse quality of life than those treated at home (24-26). All patients in the current study were receiving regular Ig replacement therapy. IVIG replacement therapy was received by 72% of the patients, and SCIG by 28%. The PSQI, FSS, HAM-A and HAM-D scores were significantly higher in the

Table 5. Logistic regression analysis results of risk factors for sleep disorders in CVID patients

Variables	Univariate analysis			Multivariate analysis		
	OR	95% CI	p	OR	95% CI	p
Sex (female vs. male)	2.221	0.708-6.970	0.171			
Age (≥40 vs. <40 years)	1.222	0.394-3.794	0.728			
Duration of disease (≥5 vs. <5 years)	1.200	0.378-3.811	0.757			
IgG (<448 vs. ≥448 mg/dL)	0.408	0.129-1.297	0.129			
IgM (<40 vs. ≥40 mg/dL)	0.303	0.074-1.245	**0.098**	0.276	0.040-1.929	0.194
IgA (<70 vs. ≥70 mg/dL)	0.246	0.048-1.258	**0.092**	0.243	0.030-1.984	0.187
Total lymphocytes (<1000 vs. ≥1000 cell/µL)	0.688	0.221-2.141	0.518			
T-cells, $CD3^+$ (<723 vs. ≥723 cell/µL)	0.935	0.291-3.006	0.910			
T-cells, $CD3^+$ $CD4^+$ (<404 vs. ≥404 cell/µL)	0.574	0.185-1.786	0.338			
T-cells, $CD3^+$ $CD8^+$ (<220 vs. ≥220 cell/µL)	0.258	0.022-3.047	0.282			
B-cells, $CD19^+$ (<80 vs. ≥80 cell/µL)	0.338	0.093-1.232	0.100			
SMB cells (<7.3 vs. ≥7.3 cell/µL)	0.862	0.237-3.138	0.821			
NK cells (<84 vs. ≥84 cell/µL)	6.875	1.858-25.432	**0.004**	13.384	2.478-72.284	**0.003**
FSS scores (≥36 vs. <36)	1.620	0.486-5.401	0.432			
HAM-D scores (>7 vs. ≤7)	4.750	1.302-7.327	**0.018**	7.030	1.320-37.435	**0.022**
HAM-A scores (>5 vs. ≤5)	2.045	0.553-7.567	0.284			
ESS scores (>10 vs. ≤10)	1.641	0.379-7.107	0.508			

Ig: Immunoglobulin, NK: Natural killer, FSS: Fatigue severity scale, HAM-D: Hamilton depression scale, HAM-A: Hamilton anxiety scale, ESS: Epworth sleepiness scale, CI: Confidence interval, OR: Odds ratio, CVID: Common variable immunodeficiency

patients receiving IVIG treatment than in the patients receiving SCIG. Consistent with our data, previous reports indicate higher fatigue and depression scores in patients receiving IVIG replacement therapy (27,28).

Our study was the first to reveal the relationship between Ig replacement therapy and sleep in patients with CVID. Sleep quality was worse in patients who received IVIG treatment than in those who received SCIG. The disrupted sleep quality in patients receiving IVIG could be due to the pharmokinetic differences between IVIG and SCIG. With IVIG treatment, IgG reaches peaks by entering the vascular compartment in high concentrations, then spreads through the tissue and is catabolized slowly. Therefore, IVIG therapy leads to high peaks and low troughs between infusions, which results in an unstable Ig serum concentration. However, with SCIG therapy, less fluctuations in serum IgG concentrations occur, resulting in fewer systemic side-effects (28-30). In addition, the adminstration of IVIG is only performed in hospitals our country. IVIG replacement is repeated every 3-4 weeks and each infusion takes up to 4-6 h, which constitutes an additional burden for the patient.

Sleep quality and NK cells

CVID patients exhibiting NK cell deficiency have a phenotype with more severe infectious and inflammatory complications (31). Chronic inflammation plays a role in the development and progression of diseases such as depression and sleep disturbances, as well as cardiovascular diseases (32). Studies show that sleep disturbances are associated with severe inflammatory changes (33). Our results, combined with those of previous studies, suggest that low NK cell counts in patients with CVID are associated with poor sleep quality. Studies have revealed the negative effects of lack of sleep on the immune system, and that it decreases NK cell counts and activity (34-37). However, no studies had examined the effects of NK cell counts on sleep until now. In this study, we found that low NK cell counts increased the risk of poor sleep quality in CVID patients.

In this study evaluating sleep quality and related conditions in CVID patients, depression and low NK cell count were found to be associated with poor sleep quality.

Study Limitations

However, our study has some limitations; (1) Although objective tests such as polysomnography make a stronger contribution to the assessment of sleep, trained personnel and special equipment are needed. Therefore, PSQI, which is one of the subjective evaluation scales that is easier and can be applied by everyone, was used in this study. A limitation of our study is that the PSQI, which we use to evaluate sleep quality, is a subjective scale. (2) Since the study was cross-sectional and all patients were under treatment, the effect of treatment on sleep quality could not be investigated. Only the difference between the treatment methods was determined. Despite this, we think that our study met its goal in evaluating poor sleep quality and risk factors in CVID patients. It also provides data that serves as a reference for future studies to analyze poor sleep quality and its causes.

Conclusion

Considering that sleep affects both physical and mental health, in chronic diseases such as CVID, sleep quality and mental states should be evaluated in detail.

Our results showed that the frequency of poor sleep quality, depression, anxiety, excessive daytime sleepiness and fatigue is higher in CVID patients than in the general population. Patients may not be able to express these complaints easily or may not care enough to tell the physician in the shadow of other noise symptoms. Therefore, CVID patients should be routinely questioned for sleep quality, fatigue, depression, anxiety, and excessive daytime sleepiness during follow-up appointments.

Ethics

Ethics Committee Approval: Approval for the study was given by the Necmettin Erbakan University Ethics Committee (decision no: 2020/2709-2021/3495).

Informed Consent: Informed consent form was taken from all participants.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: E.Y., Ş.A., B.T.Y., F.Ç., A.A., Design: E.Y., Ş.A., B.T.Y., D.T.B., F.Ç., A.A., Data Collection or Processing: E.Y., R.E., F.S.A., M.K., G.A., Analysis or Interpretation: E.Y., D.T.B., R.E., F.S.A., M.K., G.A., A.A., Literature Search: E.Y., R.E., F.S.A., M.K., G.A., Writing: E.Y., Ş.A., B.T.Y., D.T.B., F.Ç.

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