TOROS UNIVERSITY
JOURNAL OF FOOD, NUTRITION AND GASTRONOMY

*Research Article / Araştırma Makalesi*

# The effect of respiratory problems and nutritional characteristics of children on sleep quality and influencing factors: A descriptive study

## *Çocukların solunum problemlerinin ve beslenme özelliklerinin uyku kalitesi üzerindeki etkisi ve etkileyen faktörler: Tanımlayıcı bir çalışma*

**Ferhat Günerigök** [1] **Suzan Yıldız** [2] **Ayşegül Şimşek** [3] **Ali Alpak** [4]

1 Istanbul University- Cerrahpaşa, Institute of Postgraduate Education, Child Health and Diseases Nursing Doctorate Program, İstanbul, Türkiye

2 Istanbul University-Cerrahpasa, Florence Nightingale Faculty of Nursing, Department of Pediatric Nursing, Istanbul, Türkiye

3 Marmara University, Faculty of Health Sciences, Department of Pediatric Nursing, Istanbul, Türkiye

4 Başakşehir Çam and Sakura City Hospital, Department of Sleep, İstanbul, Türkiye

**Article info**

**Keywords:**

Nutrition, Pediatrics, Polysomnography, Sleep Quality, Sleep Problem.

**Anahtar Kelimeler:**

Beslenme, Pediatri, Polisomnografi, Uyku Kalitesi, Uyku Problemi.

**Received:** 18.03.2025

**Accepted:** 08.05.2025

**E-ISSN:** 2979-9511

**DOI:** 10.58625/jfng-2872

Günerigök et al.; The effect of respiratory problems and nutritional characteristics of children on sleep quality and influencing factors: A descriptive study

Available online at https://jfng.toros.edu.tr

**Corresponding Author(s):**

* Ferhat Günerigök

gunerigokferhat@gmail.com

**Abstract**

The aim of this study was to determine the effect of respiratory problems and nutritional characteristics on sleep quality in children and the factors related to this effect. This descriptive and cross-sectional study was conducted in a hospital between October 2023 and July 2024. Data were collected using child information form and Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale. Data were analyzed by computer with 95% confidence interval. A total of 101 children with an average age of 7.3±3.7 years and their mothers participated in the study. The mean sleep quality scale score was 0.22 points. Scale score and number of snacks (p=0.033) and time (p=0.046), daytime sleep status (0.000) and duration of sleep (p=0.000), nighttime awakenings (p=0.023) and number of awakenings (p=0.030), Feature of the room where he sleeps (p=0, 006), presence of health problems (p=0.004), respiratory disorders (p=0.000) and presence of attention-deficit-hyperactivity-disorder and sleep disturbance

diagnosed by polysomnography (p=0.000). The health of their mothers was also found to be an important factor. In order for children to have a healthy growth and development period, their sleep needs should be met in a healthy way. It is important to ensure sleep and nutritional regularity for sleep quality. It was observed that individual and family-based interventions are necessary for a healthy sleep pattern.

**Özet**

Solunum ve beslenme sorunları çocuklarda uyku kalitesini etkileyen faktörlerden biridir. Bu çalışmanın amacı, çocuklarda solunum problemleri ve beslenme özelliklerinin uyku kalitesi üzerine etkisini ve bu etkiyle ilişkili faktörleri belirlemektir. Tanımlayıcı ve kesitsel tipteki bu çalışma Ekim 2023-Temmuz 2024 tarihleri arasında bir hastanede yürütülmüştür. Veriler çocuk bilgi formu ve Pediatrik Uyku Anketi: Uykuda solunum bozuklukları alt ölçeği kullanılarak toplanmıştır. Veriler bilgisayar ortamında %95 güven aralığında analiz edilmiştir. Çalışmaya yaş ortalaması 7,3±3,7 yıl olan toplam 101 çocuk ve anneleri katılmıştır. Ortalama uyku kalitesi ölçeği puanı 0,22 idi. Ölçek puanı ile ara öğün sayısı (p=0,033) ve zamanı (p=0,046), gündüz uyuma durumu (0,000) ve uyuma süresi (p=0,000), gece uyanma durumu (p=0,023) ve uyanma sayısı (p=0,030), uyku ortamını biriyle paylaşma durumu (p=0,006), sağlık problemi varlığı (p=0,004) solunum bozuklukları (p=0,000) ve dikkat-eksikliği-hiperaktivite-bozukluğu varlığı ve polisomnografi ile teşhis edilen uyku bozukluğu (p=0,000) arasında anlamlılık saptandı. Annelerinin sağlığı da önemli bir faktör olarak bulunmuştur. Çocukların sağlıklı bir büyüme ve gelişme dönemi geçirebilmeleri için uyku ihtiyaçlarının sağlıklı bir şekilde karşılanması gerekmektedir. Uyku kalitesi için uyku ve beslenme düzeninin sağlanması önemlidir. Sağlıklı bir uyku düzeni için bireysel ve aile temelli müdahalelerin gerekli olduğu görülmüştür.

## INTRODUCTION

Sleep is critical for children's physical, cognitive and emotional development. Problems related to physiological systems such as the gastrointestinal system and respiratory system can affect sleep. For example, respiratory problems such as Obstructive Sleep Apnea (OSA) cause upper airway obstruction during sleep, making it difficult for children to enter a healthy sleep process (1). According to studies, OSA affects approximately 1-5% of children and can lead to growth, learning and behavioral problems (2). In a study conducted on children aged 6-10 years in Turkey, 62.9% of children were found to have sleep problems (3). The most common sleep problems are difficulty falling asleep, night awakenings and sleep-disordered breathing. In addition, it has been reported that sleep-disordered breathing symptoms increase with advancing age and this situation negatively affects the general health of children (19).

Scales can be used to assess sleep quality (20). Sleep scales often help to assess children's sleep patterns and symptoms associated with sleep disorders based on parental observation. However, objective measurement methods such as polysomnography (PSG) are also needed. Thus, it can be used as a supportive tool in screening sleep disorders in larger populations and in clinical evaluations (4). Polysomnography is one of the gold standard methods in the diagnosis of sleep disorders. It evaluates sleep quality by measuring many biophysiological parameters such as brain waves, eye movements, muscle activity, heart rhythm and respiratory patterns during sleep while the child is sleeping (5, 6).

Respiratory problems during sleep can lead to decreased sleep duration, frequent awakenings and sleep interruptions in children and may cause long-term consequences such as attention deficit, learning difficulties and behavioral problems (1). Therefore, early detection and treatment of respiratory problems in children is important. When sleep is considered in line with the United Nations Sustainable Development Goals (SDGs), it is seen that it is an important factor in areas such as health and quality of life, ending hunger

and quality education (7). If sleep is of good quality, the child grows and develops healthily. At the same time, their cognitive, social and emotional characteristics mature. For this reason, it is necessary to carry out studies to improve sleep quality. In this regard, it is important to first determine the presence of the problem and to identify the factors affecting the problem. In this study, the effects of respiratory disorders on sleep quality in children will be discussed and the importance of this relationship in terms of children's general health will be evaluated. At the same time, it will be discussed how approaches to the management of respiratory diseases can play a role in improving sleep quality. Based on this information, our study aims to determine the effect of respiratory problems and nutritional characteristics on sleep quality in children and the factors related to this effect.

## MATERIAL AND METHODS

### Study design

It is descriptive and cross-sectional.

### Research questions

- What is the extent to which the presence of respiratory problems affects sleep quality?
- What factors affect sleep quality in children with respiratory problems?
- Does nutrition affect sleep quality?
- How do parental health and environmental factors affect sleep quality in children with respiratory diseases?

### Participants

The study was conducted between October 2023 and July 2024 with children who applied to the pediatric outpatient clinic of a hospital. The population of the study consisted of children who applied to the outpatient clinic within the specified date range, and all children who met the inclusion criteria were selected from the population by non-probability random sampling method. The inclusion criteria were knowing Turkish and being younger than 18 years of age, while the exclusion criteria were cognitive or neurological disease (acute or chronic). The study was completed with 101 children.

### Data collection tools

Data were collected using a child information form and the Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale.

**Child information form:** It consists of 3 sections including information about the child (sociodemographic information, respiratory and nutritional characteristics), information about the family and information about the child's sleep and pattern, and a total of 55 questions.

**Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale (PSQ: SBS);** It was developed in 2001 and adapted to Turkish in 2011 (21, 22). The scale consists of 22 questions and 4 sub-dimensions (insomnia=4 items, snoring=4 items, attention deficit=6 items and other problems=8 items) in 3-point Likert type. Those who answer yes to the items score 1 point, while other answers are recorded as 0. The number of yes responses in the scale is divided by the number of items. The result ranges from 0.0 to 1.0 and scores above 0.33 are considered positive and indicate the risk of pediatric sleep-related breathing disorder. The total Cronbach's Alpha value of the scale was reported to be 0.83 (22), while it was found to be 0.64 in our study.

### Data collection

After obtaining the necessary scale permission and institutional permission, ethics committee approval was obtained. Then, the data were collected by one of the researchers working in the unit where the study would be conducted and taking part in the research team. After verbal and written information was given about the purpose of the study, the study was conducted with those who agreed to participate. Data were collected by face-to-face interview method (about 15-20 minute).

### Data analysis

The data obtained from the study were analyzed with a computer- supported statistical program (SPSS, v26). In the first stage, frequency analysis was performed. Mean, minimum, maximum, standard deviation and median values of

continuous data and number and percentages of categorical data were calculated. Normality distributions were examined with Shapiro Wilk test. Then, comparisons between scale mean scores and variables were measured by Chi-Square Test, Ona Way Anova, Kruskal Wallis Test, Mann Whitney U-Test, and Pearson Chi-square test. Significance was accepted at 95% confidence interval.

**Ethical aspects of the study**

The necessary scale use permission, hospital permission and ethics committee approval (dated 22.11.2022 and numbered 22-131) were obtained before the study. In addition, the parents of the children and the children in a language they could understand were informed about the study and their verbal and written informed consent was obtained. Helsinki Declaration of Human Rights was followed in the study.

## RESULTS

The distribution of the characteristics of the children and their comparison with the scale score are shown in Table 1. Accordingly, it was determined that the mean age of the children was 7.3±3.7 years, 52.5% were male and 37.6% attended kindergarten. 70.3% of the children had health problems (esophageal reflux, asthma, bronchitis, hyperactivity, allergic asthma) and 78.2% of those with health problems had respiratory problems and 24.8% used regular medication due to health problems. In addition, 9.9% had attention deficit hyperactivity disorder (ADHD).

Table 2 shows the distribution of sleep characteristics of the children and their comparison with the scale score. Accordingly, it was determined that the children slept for a mean of 1.1±1.14 hours during the day and 8.2±1.36 hours at night. 35.6% of the children woke up at night. 42.6% of the children had sleep problems, but only 4% of them came to the hospital because

**Table 1**. Distribution of child-related characteristics and comparison with scale score

| **Characteristics** | | **Mean±Sd** | **Min-max (Med)** | **PSQ: SBS p** |
|---|---|---|---|---|
| Age of the child (years) | | 7.3±3.7 | 3-17 (6) | *0.167 |
| Number of siblings (including self) | | 1.5±0.9 | 1-7 (1) | *0.505 |
| | | **n** | **%** | |
| Gender | Girl | 48 | 47.5 | **0.691 |
| | Boy | 53 | 52.5 | |
| Education level | Kindergarten | 38 | 37.6 | ***0.179 |
| | Primary School | 37 | 36.6 | |
| | Middle School | 16 | 15.8 | |
| | High School | 10 | 9.9 | |
| Presence of health problems | Yes | 71 | 70.3 | **0.004** |
| | No | 30 | 29.7 | |
| Presence of problems with the respiratory system | Yes | 79 | 78.2 | **0.000** |
| | No | 22 | 21.8 | |
| Presence of ADHD | Yes | 10 | 9.9 | **0.000** |
| | No | 91 | 90.1 | |
| Medication use | Yes | 25 | 24.8 | **0.466 |
| | No | 76 | 75.2 | |
| | **TOTAL** | **101** | **100** | |

*Sd: Standard derivation; min: minimum; max: maximum; med: Median; n: number; %: percentage; *One-way Anova; **Mann Whitney U test; ***Kruskal Wallis test; p<0.05*

*PSQ: SBS= Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale; ADHD: Attention deficit hyperactivity disorder*

**Table 2.** Distribution of the child's sleep characteristics and comparison with the scale score

| **Characteristics** | | **Mean±Sd** | | **Min-max (med)** | | **PSQ: SBS p** |
|---|---|---|---|---|---|---|
| Daytime sleep duration (hours) | | 1.1±1.1 | | 0-3 (1) | | ***0.000** |
| Night sleep duration (hours) | | 8.2±1.3 | | 5-10 (8) | | *0.130 |
| Number of awakenings from sleep at night | | 1.2±1.9 | | 0-8 (0) | | ***0.030** |
| | | **n** | | **%** | | |
| Diagnosis by polysomnography | Yes | 16 | | 15.8 | | ****0.000** |
| | No | 85 | | 84.2 | | |
| Type of lighting while sleeping | Darkness | 75 | | 74.3 | | ****0.160** |
| | Brightness | 4 | | 4.0 | | |
| | Night light | 22 | | 21.8 | | |
| Feature of the room where he sleeps | In own room | 43 | | 42,6 | | *****0.006** |
| | In the same room with siblings | 25 | | 24.8 | | |
| | In the same room with parents | 33 | | 32.7 | | |
| Presence of sleep problems | Yes | 43 | | 42.6 | | ****0.000** |
| | No | 58 | | 57.4 | | |
| Presence of daytime sleepiness | Yes | 55 | | 54.5 | | ****0.000** |
| | No | 46 | | 45.5 | | |
| Awakening from night sleep | Yes | 36 | | 35.6 | | ****0.023** |
| | No | 65 | | 64.4 | | |
| Admission to hospital with sleep problems | Yes | 4 | | 4.0 | | ****0.357** |
| | No | 97 | | 96.0 | | |
| Child's sleep routine | Prayers | 2 | | 2.0 | | *****0.624** |
| | By itself | 45 | | 44.6 | | |
| | Reading a book | 31 | | 30.7 | | |
| | Music | 4 | | 4.0 | | |
| | The Game | 2 | | 2.0 | | |
| | Shaking to sleep | 3 | | 3.0 | | |
| | Hug, kiss | 3 | | 3.0 | | |
| | Sleeping with your mother | 11 | | 10.9 | | |
| Sleep support person | | Kindergarden | Primary school | Middle school | High school | |
| | By itself | 6 (15.8) | 18 (48.6) | 16 (100.0) | 10 (100.0) | ******0.000** |
| | Her mother | 22 (57.9) | 10 (27.0) | 0 (0.0) | 0 (0.0) | |
| | Father | 0 (0.0) | 1 (2.7) | 0 (0.0) | 0 (0.0) | |
| | One of the parents | 10 (26.3) | 8 (21.6) | 0 (0.0) | 0 (0.0) | |
| **TOTAL** | | | | | | |

*Sd: Standard derivation; min: minimum; max: maximum; med: Median; n; number; 5: percentage; *One-way Anova; **Mann Whitney U test; ***Kruskal Wallis test; ****Pearson Chi-square test; p<0.05*

*PSQ: SBS= Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale*

of sleep problems, while 15.8% were diagnosed with sleep disorders by polysomnography. 42.6% of the children slept alone in their own room and 74.3% of them slept in the dark. Only 9.9% slept alone in their own bed and room.

Table 3 shows the nutritional characteristics of the children and their comparison with the scale score. Accordingly, it was determined that the mean weight of the children was 23.9±15.08 kilograms and they had 3.3±0.6 main meals and 2.1±0.74 snacks during the day. When the last feeding time at night was analyzed, it was found that 38.6% of the children fed between 20:01-22:00, 28.7% used vitamins, 28.7% had allergies, and dust allergy was reported most frequently with 18.9%.

The distribution of the characteristics of the child's mother and their comparison with the scale score are presented in Table 4.

Table 5 shows the total and subscale mean scores of the "Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale" shows the total and subscale mean scores. Accordingly, the mean total score was 0.22 (min-max: 0.0-0.5). There was a statistically significant difference between the scale score and the presence of health problems (p=0.004), respiratory problems (p=0.000) and ADHD (p=0.000) (Table 1). A statistically significant difference was found between the scale score and daytime sleeping status (p=0.000), daytime sleep duration (p=0.000), nighttime waking status (p=0023), nighttime waking frequency (p=0.030), presence of sleep problems (p=0.000), diagnosis of sleep disorder by polysomnography (X2= 32.168; p=0.000), feature of the room where he sleeps (p=0,006) and having someone with them

**Table 3.** Distribution of the child's nutrition characteristics and comparison with the scale score

| **Characteristics** | | **Mean±Sd** | **Min-max (Med)** | **PSQ: SBS p** |
|---|---|---|---|---|
| Weight of the child (kilogram) | | 23.9±15.0 | 10-74 (18) | *0.260 |
| Number of main meals | | 3.3±0.6 | 2-5 (3) | *0.464 |
| Number of snacks | | 2.1±0.7 | 1-3 (2) | ***0.033** |
| | | **n** | **%** | |
| Last feeding at night | 18:00-20:00 | 26 | 25.7 | ***0.046** |
| | 20:01-22:00 | 39 | 38.6 | |
| | 22:01-24:00 | 26 | 25.7 | |
| | 00:01-02:00 | 10 | 10.0 | |
| Vitamin use | Yes | 29 | 28.7 | **0.252 |
| | No | 72 | 71.3 | |
| Presence of allergy | Yes | 29 | 28.7 | **0.315 |
| | No | 72 | 71.3 | |
| Cause of allergy | Dust | 19 | 66.0 | ***0.074 |
| | Drugs | 3 | 10.2 | |
| | Walnut | 2 | 6.8 | |
| | Banana | 1 | 3.4 | |
| | Perfume | 1 | 3.4 | |
| | Mosquito | 1 | 3.4 | |
| | Virus | 1 | 3.4 | |
| | Egg White | 1 | 3.4 | |
| **TOTAL** | | **101** | **100** | |

*Sd: Standard derivation; min: minimum; max: maximum; med: Median; n; number; 5: percentage; *One-way Anova; **Mann Whitney U test; ***Kruskal Wallis test; p<0,05*

*PSQ: SBS= Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale*

**Table 4.** Distribution of characteristics of the child's mother and comparison with the scale score

| **Characteristics** | | **Mean±Sd** | **Min-max (med)** | **PSQ: SBS p** |
|---|---|---|---|---|
| Age of mother | | 33.3±5.7 | 24-49 (32) | *0.079 |
| Current stress score | | 6.8±2.1 | 1-10 (7) | *0.110 |
| | | **n** | **%** | |
| Mother's education level | Literate | 4 | 4.0 | ***0.309 |
| | Illiterate | 2 | 2.0 | |
| | Primary / Secondary School | 38 | 37.6 | |
| | High School | 6 | 5.9 | |
| | University and above | 51 | 50.5 | |
| Number of children | 1 | 44 | 43.6 | ***0.191 |
| | 2 | 35 | 34.7 | |
| | 3 and above | 22 | 21.7 | |
| Nurse/midwife support after pregnancy | Yes | 21 | 20.8 | **0.020 |
| | No | 80 | 79.2 | |
| Is there support after childbirth | Yes | 65 | 64.4 | **0.101 |
| | No | 36 | 35.6 | |
| Husband support | Yes | 52 | 51.5 | **0.040 |
| | No | 49 | 48.5 | |
| Health problems in the mother | Yes | 28 | 27.7 | **0.001 |
| | No | 73 | 72.3 | |
| Medication use | Yes | 29 | 28.7 | **0.001 |
| | No | 72 | 71.3 | |
| Use of maternal vitamins | Yes | 26 | 25.7 | **0.362 |
| | No | 75 | 74.3 | |
| The mother's expectation of her own sleep | No expectations | 52 | 51.5 | ***0.049 |
| | Normal sleep patterns | 12 | 11.9 | |
| | Being sleepy | 37 | 36.6 | |
| In which areas of childcare do you most need help * | Feeding | 40 | 23.4 | ***0.187 |
| | Bathroom | 28 | 16.4 | |
| | Dressing | 9 | 5.3 | |
| | Sleep | 33 | 19.3 | |
| | Education | 38 | 22.2 | |
| | Breastfeeding | 5 | 2.9 | |
| | Disease | 3 | 1.8 | |
| | Other | 15 | 8.8 | |
| Sleep problems in siblings | Yes | 11 | 10.9 | **0.446 |
| | No | 90 | 89.1 | |
| Sibling sleep problem solution | No | 96 | 95.0 | ***0.858 |
| | It got better when I grew up | 1 | 1.0 | |
| | We haven't found a solution yet | 1 | 1.0 | |
| | With herbal medicine under doctor's supervision | 1 | 1.0 | |
| | Spontaneous | 2 | 2.0 | |
| **TOTAL** | | **101** | **100** | |

*Sd: Standard derivation; min: minimum; max: maximum; med: Median; n: number; %: percentage; *One-way Anova; **Mann Whitney U test; ***Kruskal Wallis test; p<0,05; * More than one answer was given.*

*PSQ: SBS= Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale*

while sleeping (p=0.000) (Table 2). There was a statistically significant difference between the scale score and the number of snacks (p=0.033) and the time of last feeding at night (p=0.046) (Table 3). When the scale score was compared with the characteristics of the child's mother, a statistically significant difference was found between the scale score and the support received from the spouse and health professionals during pregnancy (p=0.020), the presence of health problems in herself (p=0.001), medication use (p=0.001) and expectations from her own sleep (p=0.049).

## DISCUSSION AND CONCLUSION

In this study, the links between children's sleep patterns, eating habits, health status, presence of respiratory problems and factors related to their mothers were examined and important findings were obtained. The results of the study were compared and interpreted with similar studies in the literature.

Sleep is one of the basic needs for healthy growth and development of children. When sleep quality is impaired, all biopsychosocial systems are affected both directly and indirectly. There are many intrinsic and extrinsic factors that affect sleep. Extrinsic factors are mostly environmental factors such as noise, heat, light, pillow. Intrinsic factors consist of characteristics related to the child (23). When we look at the factors affecting sleep quality, nutrition can take the lead. Nutrition type (main meal, snack), frequency, duration or content may affect sleep. Especially pre-sleep eating habits may negatively affect sleep (8). Considering the results obtained in our study, it was determined that the frequency of snacks affected sleep quality. Especially the high number of evening snacks and the last snack close to sleep negatively affected sleep quality and caused respiratory problems during sleep. Other studies have also reported a relationship between diet and sleep (24, 25). In particular, it has been reported that irregular eating habits and excessive consumption of snacks may negatively affect sleep quality (26). One of the factors affecting sleep patterns may be the content of dinner or snacks. It has been reported that carbohydrate-dominated dinners may shorten sleep duration, whereas a balanced diet in terms of protein and healthy fats is associated with better sleep (16). This information shows that children's snacks or main meals should be organized considering their sleeping hours. In our study, the frequency of snacks and the time of the last meal before bedtime were found to affect the scale score (Table 3). It should be kept in mind that establishing a regular sleep and nutrition routine is important for the regularity of the child's life as well as growth and development.

Among the factors affecting sleep quality is whether the child meets his/her daily sleep needs. It is important that the child completes a daily, age-appropriate sleep period (27). Sleep can be in the form of daytime and nighttime sleep, or only nighttime sleep as the age progresses. Daytime sleep time and nighttime sleep time should be regular and balanced. If the child takes daytime naps at different times and for varying durations every day, or if daytime naps are skipped when they should be taken, this directly affects nighttime sleep. The shorter the time between daytime sleep and nighttime sleep, the routine of falling asleep and waking up at night may be disrupted (28). In our study, it was determined that the daytime sleep duration of sleep quality

**Table 5.** Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale total and subscale mean scores

| **Questionnaire** | | **Mean±Sd** | **Min-Max** | **Med** |
|---|---|---|---|---|
| **PSQ:SBS** | Total | 0.2±0.1 | 0.0-0.5 | 0.2 |
| | Snoring | 0.1±0.2 | 0.0-1.0 | 0.0 |
| | Inattention | 0.0±0.2 | 0.0-1.0 | 0.0 |
| | Sleepiness | 0.4±0.2 | 0.0-1.0 | 0.5 |
| | Other problems | 0.2±0.1 | 0.0-0.6 | 0.1 |

*Sd: Standard derivation; Min: minimum; max: max: maximum; Med: median*

*PSQ: SBS= Pediatric Sleep Questionnaire: Sleep-disordered breathing subscale*

was short and the child woke up at least once a night. Studies on sleep disorders have revealed that children who wake up frequently during the night have negative effects on both cognitive and physical development (10). It has also been reported that inadequate sleep duration and quality are closely related to school achievement, attention span and emotional regulation in children (29). This suggests that there is a balance between daytime sleep and nighttime sleep.

Of course, it is not correct to attribute sleep quality only to sleep routine or regularity. The presence of a disease in the child may also affect this (10). In our study, it was determined that the majority of the children had health problems (physical or psychosocial) and 78.2% of them had a disorder related to the respiratory system. In addition, these problems were found to affect sleep quality ($p<0.001$). In previous studies, respiratory disorders and attention deficit-hyperactivity disorders (ADHD) have been shown to negatively affect sleep duration and quality (12). In particular, obstructive sleep apnea syndrome has been reported to be associated with daytime sleepiness and decreased cognitive performance in children (11). In children with ADHD, problems such as difficulty falling asleep, frequent awakenings and short sleep duration were reported to be more common (30). Considering that frequent awakenings at night affected sleep quality in our study, it can be said that this is an issue that should be emphasized.

Not only physical factors but also psychosocial factors can affect sleep quality in children (31). The child's sleep routine and the characteristics of the sleeping environment affect this situation (32). Children need a routine and order during growth and development (33). Based on this, it is important to establish a sleep routine as of infancy. In the sleep routine, organizing the sleep environment is the foremost practice. Answers to questions such as where the child sleeps, with whom and how the child sleeps should be organized. If the child is young, he/she may need a pre-sleep routine and support while sleeping (parent, sleeping object, toy, reading a book, listening to music). These make it easier for the child to fall asleep and improve sleep quality (29). In our study, it was determined that the average age of the children was 7 years, 74.3% of them slept in the dark, 29.7% read books before sleep, 32.7% slept alone in their own room and 24.8% slept in the same room with their siblings. It was also determined that the sleep quality of children was affected by the people they shared their rooms with and the support of a caregiver during sleep (49.5% maternal support). In the literature, it has been reported that children sharing a room with their parents may create a sense of security, especially at an early age, but may delay the development of independent sleep habits (13). At the same time, bedtime routines (e.g., a regular bedtime, reading books and avoiding electronic devices) have been shown to improve sleep quality in children (34). Although most of the children in our study were found to have a bedtime routine, the number of children who slept in the same room with their parents was also high, and the lower-than-average sleep quality (PSG: SBS = 0.2 points) was attributed to this. In line with this information, it is important to diagnose the presence of a sleep problem and to make improvements accordingly. Sleep disorders can be diagnosed by polysomnography. However, as reported in the literature, the rate of sleep disorder diagnosis was very low in our study (15.8%). Among the reasons for this, it is thought that parents do not perceive sleep problems as a disease, and the findings of our study are in this direction. In addition, it is thought that the effect of lack of sleep routine on sleep disorders is not known.

The knowledge of parents, especially the mother, who is the primary caregiver, is important in establishing a sleep routine. In addition, it is known that the psychological and physical health status of mothers affects their role in child care and this is reflected in children's sleep habits (15). In particular, it has been reported that mothers' depression and anxiety levels may directly affect their children's sleep quality (14). When the findings related to the mothers were analyzed, it was determined that 27.7% of the mothers had health problems, about half of them had insufficient sleep and almost all of them needed support in child care. In previous

studies, it has been emphasized that mothers' sleep deprivation is linked to children's sleep patterns and that family stress can negatively affect this process (17). In particular, it has been reported that the importance that parents attach to sleep is a critical factor in determining the duration and quality of children's sleep (18).

In conclusion, it was determined that children's existing health problems, especially respiratory problems, the presence of attention deficit hyperactivity disorder, the presence of daytime sleep and duration of sleep, the type of lighting while sleeping, sharing the sleeping room and the presence of a supportive person while sleeping, night waking status and frequency of waking, the presence of sleep problems and having a diagnosis of sleep disorder with polysomnography affected the scale score. It was also found that the number of snacks and feeding time of the child also affected the scale score.

The findings of our study are in line with the United Nations Sustainable Development Goals (SDG) goal 3: "Health and Quality of Life". At the same time, considering the need to support children's mental health and psychosocial well-being, which is emphasized by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), our study findings are in parallel (35). A healthy growth and development process (biopsychosocial) is necessary for health and quality of life, and it is important that nutrition and sleep requirements are met in a healthy, equal and balanced manner.

In line with this information, it can be said that sleep is an important factor in maintaining healthy growth and development. It can also be concluded that nutrition is also an important component. Nutrition affects sleep, sleep affects growth and development, and this turn continues throughout life with rapid direct or direct effects. For healthy sleep and nutrition behaviors, it may be recommended to support children starting in the family, especially to adopt family-child centered approaches. Such studies on children's sleep patterns and health status contribute to the realization of the SDGs and support efforts to build a healthier and more sustainable future. Future research is recommended to include interventions that improve individual sleep habits. Increasing the number of studies including children's food diaries in which nutrition-related characteristics are examined in depth may facilitate the planning of strategies to address sleep-nutrition related problems.

### *Limitations of the study*

The limitation of the study is that it was a single-center study. Another limitation of the study is that children's food diaries were not kept. Although the lack of similar studies comparing polysomnography, nutrition and sleep-related characteristics in children while evaluating sleep quality limits the possibility of discussion, the fact that it is one of the pioneering studies in the literature is a strength of the study.

### *Author contributions*

Conceptualization: FG, SY, AS and AA; Data curation: FG and AS; Formal Analysis: FG, SY, AS and AA; Funding acquisition: FG, SY, AS and AA; Research: FG, AS and AA; Methodology: FG, SY, AS and AA; Project management: FG, SY, AS and AA; Resources: FG, SY, AS and AA; Software: FG, SY, AS and AA; Supervision: FG, SY, AS and AA; Verification: FG, SY and AS; Visualization: FG and AA; Writing - original draft: FG, SY, AS and AA

### *Acknowledgements*

We would like to thank the children and their parents who shared their valuable time and knowledge with us during the data collection phase.

### *Funding*

No funding.

### **Conflict of interest**

The authors declare that there is no conflict of interest.

## REFERENCES


1. Marcus, C. L., Brooks, L. J., Draper, K. A., Gozal, D., Halbower, A. C., Jones, J., Schechter, M. S., Sheldon, S. H., Spruyt, K., Ward, S. D., Lehmann, C., Shiffman, R. N., & American Academy of Pediatrics. (2012). Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics. 130*(3), 576-84. https://doi.org/10.1542/peds.2012-1671.

2. Lumeng, J. C., & Chervin, R. D. (2008). Epidemiology of pediatric obstructive sleep apnea. *Proc Am Thorac Soc. 5*(2), 242-52. https://doi.org/10.1513/pats.200708-135MG.

3. Ersin, F., Öztürk, S., & Kılıç, M. (2018). Prevalence of sleep problems in children and associated factors: A cross-sectional study. Turkish Archives of Pediatrics. 53(2), 78-85. https://www.turkarchpediatr.org/EN/june-2018-0030

4. Spruyt, K., & Gozal, D. (20119. Pediatric sleep questionnaires as diagnostic or epidemiological tools: a review of currently available instruments. *Sleep Med Rev. 15*(1), 19-32. https://doi.org/10.1016/j.smrv.2010.07.005.

5. Iber, C., Ancoli-Israel, S., Chesson, A., & Quan, S. F. (2007). The AASM manual for the scoring of sleep and associated events: Rules, terminology and technical specifications. American Academy of Sleep Medicine. https://aasm.org/clinical-resources/scoring-manual/

6. Kaditis, A. G., Alonso Alvarez, M. L., Boudewyns, A., Alexopoulos, E. I., Ersu, R., Joosten, K., Larramona, H., Miano, S., Narang, I., Trang, H., Tsaoussoglou, M., Vandenbussche, N., Villa, M. P., Van Waardenburg, D., Weber, S., & Verhulst, S. (2016). Obstructive sleep disordered breathing in 2- to 18-year-old children: diagnosis and management. *Eur Respir J. 47*(1), 69-94. https://doi.org/10.1183/13993003.00385-2015.

7. United Nations. (2015). Sustainable Development Goals: Goal 3 – Ensure healthy lives and promote well-being for all at all ages. United Nations. https://sdgs.un.org/goals/goal3

8. Çelik, H. T., & Yalçın, S. S. (2019). The relationship between sleep problems, eating habits and anthropometric measurements of school children. Journal of Turkish Sleep Medicine, 6(3), 107-114. https://jtsm.org/archives/2019-006-002

9. Mindell, J. A., Sadeh, A., Kwon, R., & Goh, D. Y. (2014). Cross-cultural differences in the sleep of preschool children. *Sleep Med. 15*(12), 1595-6. https://doi.org/10.1016/j.sleep.2013.09.002.

10. Sadeh, A., Gruber, R., & Raviv, A. (2002). Sleep, neurobehavioral functioning, and behavior problems in school-age children. *Child Dev. 73*(2), 405-17. https://doi.org/10.1111/1467-8624.00414.

11. Beebe, D. W., Byars, K. C., & Owens, J. A. (2017). Sleep disorders. In M. K. Dulcan (Ed.), Dulcan's textbook of child and adolescent psychiatry. 2nd edition, American Psychiatric Association Publishing. pp. 477-491

12. Cortese, S., Faraone, S.V., Konofal, E., & Lecendreux, M. (2009). Sleep in children with attention-deficit/hyperactivity disorder: meta-analysis of subjective and objective studies. *J Am Acad Child Adolesc Psychiatry. 48*(9), 894-908. https://doi.org/10.1097/CHI.0b013e3181ac09c9.

13. Mileva-Seitz, V. R., Bakermans-Kranenburg, M. J., Battaini, C., & Luijk, M. P. (2017). Parent-child bed-sharing: The good, the bad, and the burden of evidence. *Sleep Med Rev. 32*, 4-27. https://doi.org/10.1016/j.smrv.2016.03.003.

14. Bayer, J. K., Hiscock, H., Hampton, A., & Wake, M. (2007). Sleep problems in young infants and maternal mental and physical health. Journal of Paediatrics and Child Health, 43(1-2), 66-73. https://doi.org/10.1111/j.1440-1754.2007.01005.x

15. Tikotzky, L., & Sadeh, A. (2009). Maternal sleep-related cognitions and infant sleep: a longitudinal study from pregnancy through the 1st year. *Child Dev. 80*(3), 860-74. https://doi.org/10.1111/j.1467-8624.2009.01302.x.

16. Chaput, J.P., Dutil, C., & Sampasa-Kanyinga, H. (2019). Sleeping hours: What is the ideal number and how does age impact this? Nature and Science of Sleep, 11, 421-430. https://doi.org/10.2147/NSS.S163071

17. McQuillan, M. E., Bates, J. E., Staples, A. D., & Deater-Deckard, K. (2019). Maternal stress, sleep, and parenting. *J Fam Psychol. 33*(3), 349-359. https://doi.org/10.1037/fam0000516.

18. Williamson, A. A., Mindell, J. A., Hiscock, H., & Quach, J. (2019). Child sleep behaviors and sleep problems from infancy to school-age. *Sleep Med. 63*, 5-8. https://doi.org/ 10.1016/j.sleep.2019.05.003.

19. İlkşen Hocaoğlu, Z., & Şişmanlar Eyüboğlu, T. (2022). Classification of sleep disorders, In: *Pediatric Sleep Disorders* (Ed. Özçelik U, Aslan AT, Erdem) Logos Publishing; Istanbul, Türkiye. p:30-56

20. Şahin, B., Önal, B. S., & Hoşoğlu, E. (2021). Anxiety Levels and Sleep Problems in Children of Healthcare Workers with COVID-19. *Turkish*

*Journal of Child and Adolescent Mental Health, 28*(1), 41-48. https://doi.org/10.4274/tjcamh.galenos.2021.83803.

21. Chervin, R. D., Hedger, K., Dillon, J. E., & Pituch, K. J. (2000) Pediatric sleep questionnaire (PSQ): validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems. *Sleep Med. 1*(1), 21-32. https://doi.org/10.1016/s1389-9457(99)00009-x.

22. Yüksel, H., Söğüt, A., Yılmaz, O., & Kutluay, E. (2011). Reliability and validity of the Turkish version of the pediatric sleep questionnaire: a tool for prediction of sleep related breathing disorder. *Tuberk Toraks. 59*(3), 236-41. https://doi.org/10.5578/tt.2467

23. Şenol, V., Soyuer, F., Pekşen Akça, R., & Argün, M. (2012). Sleep quality and affecting factors in adolescents. *Kocatepe Medical Journal, 13*(2), 93-102. https://doi.org/10.18229/ktd.02830

24. Demir Uysal, D., & Çalışır, H. (2024). The relationship between sleep problems, nutrition habits and anthropometric measurements of school children. Turkish Journal of Sleep Medicine, 11(1), 60-67. https://doi.org/10.4274/jtsm.galenos.2023.61224

25. Ward, A. L., Reynolds, A. N., Kuroko, S., Fangupo, L. J., Galland, B. C., & Taylor, R. W. (2021). Bidirectional associations between sleep quality or quantity, and dietary intakes or eating behaviors in children 6-12 years old: A systematic review with evidence mapping. The American Journal of Clinical Nutrition, 113(6), 1441-1459. https://doi.org/10.1093/nutrit/nuaa125.

26. St-Onge, M. P, Mikic, A., & Pietrolungo, C. E. (2016). Effects of Diet on Sleep Quality. *Adv Nutr. 7*(5), 938-49. https://doi.org/10.3945/an.116.012336.

27. Minges, K. A., & Redeker, N. S. (2011). Sleep patterns of children with chronic illness: A review of the literature. Journal of Pediatric Nursing, 26(6), 500-510. https://doi.org/10.1016/j.pedn.2010.07.013.

28. Özdemir, S., & Çolak, İ. (2019). Determination of sleep problems in children aged 0-3 years. *Zeynep Kamil Medical Bulletin, 50*(1), 1-6. https://jag.journalagent.com/z4/download_fulltext.asp?pdir=zkmj&plng=eng&un=ZKMJ-08870

29. Mindell, J. A., & Williamson, A. A. (2018). Benefits of a bedtime routine in young children: Sleep, development, and beyond. *Sleep Medicine Reviews, 40*, 93-108. https://doi.org/10.1016/j.smrv.2017.10.007

30. Hiscock, H., Sciberras, E., Mensah, F., Gerner, B., Efron, D., Khano, S., & Oberklaid, F. (2015). Impact of a behavioural sleep intervention on symptoms and sleep in children with attention deficit hyperactivity disorder, and parental mental health: randomised controlled trial. *BMJ. 350*, h68. https://doi.org/10.1136/bmj.h68.

31. Liu, X., Liu, L., Owens, J. A., & Kaplan, D. L. (2005). Sleep patterns and sleep problems among schoolchildren in the United States and China. *Pediatrics, 115*(1), 241-249. https://doi.org/10.1542/peds.2004-0815F.

32. Ward, T. M., Gay, C., Anders, T. F., Alkon, A., & Lee, K. A. (2008). Sleep and napping patterns in 3-to-5-year old children attending full-day childcare centers. *Journal of pediatric psychology, 33*(6), 666-672. https://doi.org/10.1093/jpepsy/jsm102

33. Ertan, P., Yilmaz, O., Caglayan, M., Sogut, A., Aslan, S., & Yuksel, H. (2009). Relationship of sleep quality and quality of life in children with monosymptomatic enuresis. *Child Care Health Dev. 35*(4), 469-74. https://doi.org/10.1111/j.1365-2214.2009.00940.x.

34. Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Med Rev. 21*, 50-8. https://doi.org/10.1016/j.smrv.2014.07.007.

35. World Health Organization (2022) Mental Health, Brain Health and Substance Use https://www.who.int/teams/mental-health-and-substance-use/promotion-prevention/unicef-and-who-joint-programme-on-mental-health-and-psychosocial-well-being-and-development-of-children-and-adolescents