Snoring and Sleep-Disordered Breathing in Childhood: Regional Prevalence in Balıkesir, Türkiye

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ABSTRACT

OBJECTIVE

There is limited research on the prevalence of sleep-related disordered breathing (SRDB) in children in Turkey. This study aimed to assess the prevalence of habitual snoring and SRBD among schoolchildren in the city center of Balıkesir, located in the Northern Aegean region, using a Pediatric Sleep Questionnaire.

METHODS

This single-center, cross-sectional, prospective study was conducted from January to May 2022. The study included children aged 5 to 13 years who attended preschools, primary schools, and lower secondary schools in central Balıkesir, Turkey. Using *simple random sampling*, 13 schools were selected. From these schools, *systematic sampling* was used to recruit students. The Pediatric Sleep Questionnaire (PSQ) was distributed to the parents of 1300 students.

RESULTS

A total of 856 children (66%) whose families returned completed questionnaires correctly were included in the study. The prevalence of habitual snoring was 5.6%, while SRBD was identified in 9.1% of children aged 5 to 13. Gender and age did not have a statistically significant effect on the prevalence of SRDB or habitual snoring ($p > 0.05$). Witnessed sleep apnea was reported in 2.3% of children and was positively correlated with both habitual snoring ($p = 0.001$) and SRDB ($p < 0.001$). Morbidities such as enuresis nocturna, morning headaches, growth retardation, and attention-deficit/hyperactivity disorder (ADHD) were observed more frequently in both the habitual snoring and SRDB groups ($p < 0.05$).

CONCLUSION

Conducting school-based surveys and questionnaires can increase awareness of habitual snoring and SRBD. Due to limited access to sleep labs and the high cost of polysomnography worldwide, validated sleep questionnaires may act as practical screening tools.

Key words: snoring, polysomnography, of sleep-related disordered breathing

INTRODUCTION

Sleep disorders are health problems that are rarely studied and hard to diagnose in children. Children with sleep disorders experience a significant disease burden because of related physiological, psychological, and social issues. Sleep-related breathing disorders (SRBD), habitual snoring, Upper Airway Resistance Syndrome (UARS), and Obstructive Sleep Apnea Syndrome (OSAS) are part of a progressive group of disorders. These conditions are marked by fragmented sleep, hypoxemia, hypercapnia, and notable changes in the intrathoracic pressurfield.[1,2]

Habitual snoring is the most common and recognizable symptom of all SRBD. It is often used as a clinical marker for SRBD and, when chronic, may independently indicate serious health issues. Although habitual snoring and SRBD can occur at any age in children, they are most commonly observed during preschool and early school years. Epidemiological studies show that the prevalence of habitual snoring among school-aged children ranges from 3.2% to 12.1% [3-6], while the prevalence of obstructive sleep apnea ranges from 1% to 3%. It is also known that over 80% of adults with OSAS were undiagnosed during childhood.[7]

Although SRBD is well-understood in adults, its prevalence and diagnosis are likely underestimated in children, mainly due to the limited number of pediatric sleep laboratories. Recent years have seen an increase in research on the epidemiology, risk factors, diagnosis, and treatment of childhood SRBD. However, in Turkey, only a few studies specifically focus on habitual snoring and SRBD in children. Because polysomnography, the gold standard for diagnosing OSAS, is challenging to perform, several standardized questionnaires have been developed for screening. The Pediatric Sleep Questionnaire (PSQ) was initially developed by Chervin et al.[8] and validated against polysomnographic results. A Turkish validation of the questionnaire is also available.

This study aimed to examine the prevalence of snoring and SRBD among schoolchildren in the city center of Balıkesir, located in the Northern Aegean region, using PSQ.

METHODS

This study was carried out by the Division of Pediatric Allergy & Immunology at Balıkesir University from January to May 2022. It was designed as a single-center, prospective, cross-sectional survey-based study. The study received approval from the Clinical Research Ethics Committee of Balıkesir University Faculty of Medicine (Decision No. 2021/276). It was conducted in line with the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants at the start of the study.

Participants

To estimate the number of children enrolled in preschools, primary schools, and lower secondary schools in the central district of Balıkesir, the sample size was calculated using the StatCalc program. Assuming a snoring prevalence of 7%, with a standard error of 2%, and a 95% confidence level, a sample size of 603 was needed. For sleep-disordered breathing (SDB), with a prevalence of 15%, a standard error of 2.5%, and a 95% confidence level, the required sample size was 750.

After listing all 14 preschools, 23 primary schools, and 27 lower secondary schools in the city center by student enrollment, four preschools, four primary schools, and five lower secondary schools were selected by *simple random sampling*. *Systematic sampling* was then used to choose classes within the relevant age groups from each school. A total of 1300 questionnaire forms were distributed to students. Parents completed the forms and returned them one week later.

Questionnaire

The Pediatric Sleep Questionnaire (PSQ) was given to the parents. Initially developed by Chervin et al., the PSQ is a sleep assessment tool whose validity and reliability have been established through comparison with polysomnographic results. The validated Turkish short version of the questionnaire, consisting of 22 items, is called the "Pediatric Sleep Subscale." Compared with polysomnography, the gold standard for diagnosing OSAS, the scale shows 81% sensitivity and 87% specificity.

The 22-item questionnaire includes subscales that evaluate snoring, daytime sleepiness, and other symptoms (such as witnessed apneas, enuresis, growth delay, obesity, and morning headaches), as well as items based on DSM-5 criteria for Attention-Deficit/Hyperactivity Disorder (ADHD). Each question provides three responses: "Yes" (1 point), "No" (0 points). The total score is divided by the number of questions to determine the final scale score. A score above 0.33, which is the most effective cutoff for validity and reliability, indicates the presence of sleep-disordered breathing (SRBD). Children who answer "Yes" to snoring items are considered to have habitual snoring.

Statistical Analysis

Statistical analyses were performed using SPSS version 20 (SPSS Inc., Chicago, IL, USA). Parametric tests were applied to data that followed a normal distribution, while nonparametric tests were used for data that did not meet normality criteria or were categorical. Normality was assessed with the Kolmogorov-Smirnov test. For comparisons between two independent groups, Student's t-test was used for parametric data, and the Mann-Whitney U test was employed for nonparametric data. The Chi-square test was utilized for comparisons involving nominal variables. For paired samples, the paired t-test was used under parametric conditions, and the Wilcoxon signed-rank test was used under nonparametric conditions. McNemar's test was applied to compare proportions.

The scale's internal consistency was assessed using Cronbach's alpha. Descriptive statistics were reported as n (%). Categorical data were analyzed with Pearson's Chi-square and Fisher's exact tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Of the 1300 questionnaires distributed to schools, 904 (69%) were returned by parents. After excluding forms with missing or inaccurate responses, 856 questionnaires (66%) were included in the final analysis.

The internal consistency reliability of the questionnaire used in this study was assessed using Cronbach's alpha, which yielded a value of 0.783.

Among the participating children, 411 (48.01%) were boys and 445 (51.99%) were girls. Demographic characteristics of the participants are shown in **Table 1.** A total of 99 children (11.58%) were reported to have a chronic condition requiring medical follow-up.

Table 1. Distribution of Demographic Characteristics

	Groups	n (%)
Gender	Female	445 (51.99)
	Male	411 (48.01)
Age (years)	5–6	337 (39.37)
	9	191 (22.31)
	11–13	328 (38.32)
School Type	Kindergarten	119 (13.90)
	Primary School (Grades 1–4)	409 (47.78)
	Middle School (Grades 6–8)	328 (38.32)

Habitual Snoring

Habitual snoring was observed in 47 children (5.58%). The prevalence was 5.7% in girls and 5.4% in boys. By school grade, snoring rates were 6.7% in preschool, 7.5% in first grade, 5.3% in fourth grade, 3.1% in sixth grade, and 4.9% in eighth grade. Across age groups, the prevalence of habitual snoring was 7.3% in the 5–6 age group, 5.3% in 9-year-olds, and 4% in the 11–13 age group (Figure 1). No significant associations were observed between habitual snoring and gender (p = 0.868), age group (p = 0.198), school grade (p = 0.432), or school type (p = 0.306) **(Table 2).**

Sleep-Related Breathing Disorders

SRDB was identified in 78 children (9.2%). The prevalence was 9.4% in girls and 8.8% in boys. By school grade, the prevalence of SRBD was 5.0% in preschool, 9.2% in 1st grade, 10.5% in 4th grade, 7.5% in 6th grade, and 12.0% in 8th grade. By age group, SRBD prevalence was 7.7% in ages 5–6, 10.5% at age 9, and 9.8% in ages 11–13 (Figure 2). No statistically significant differences in SRBD prevalence were observed based on gender (p = 0.730), age (p = 0.500), school grade (p = 0.288), or school type (p = 0.251) **(Table 2).**

Sleep Apnea

Sleep apnea was observed in 1.6% of children without snoring and 11.6% of those with habitual snoring **(Table 3).** A significant association was found between habitual snoring and witnessed sleep apnea (p = 0.001). Witnessed sleep apnea occurred in 0.7% of children without SRBD and 20% of those with SRBD. There was also a significant relationship between SRBD and witnessed apnea (p < 0.001).

Enuresis Nocturna

Enuresis nocturna was present in 2.7% of children without habitual snoring and 10.9% of those with habitual snoring. A statistically significant relationship was observed (p = 0.011). The prevalence of

Table 2. Demographic Characteristics by SRBD and Snoring Status

Groups	No SRBD n (%)	SRBD n (%)	p (SRBD)	No Snoring n (%)	Snoring n (%)	p (Snoring)
Gender						
Female	403 (90.6)	42 (9.4)	0.730	413 (94.3)	25 (5.7)	0.868
Male	375 (91.2)	36 (8.8)		382 (94.6)	22 (5.4)	
Age (years)						
5–6	311 (92.3)	26 (7.7)	0.500	307 (92.7)	24 (7.3)	0.198
9	171 (89.5)	20 (10.5)		179 (94.7)	10 (5.3)	
11–13	296 (90.2)	32 (9.8)		309 (96.0)	13 (4.0)	
Grade						
Kindergarten	113 (95.0)	6 (5.0)	0.288	111 (93.3)	8 (6.7)	0.432
1st Grade	198 (90.8)	20 (9.2)		196 (92.5)	16 (7.5)	
4th Grade	171 (89.5)	20 (10.5)		179 (94.7)	10 (5.3)	
6th Grade	149 (92.5)	12 (7.5)		154 (96.9)	5 (3.1)	
8th Grade	147 (88.0)	20 (12.0)		155 (95.1)	8 (4.9)	

Table 3. Relationship of Habitual Snoring and Sleep-Related Breathing Disorder (SRBD) with Obesity, Growth Retardation, Morning Headache and Apnea.

Variables	Groups	No Snoring n (%)	Snoring n (%)	p (Snoring)	No SRBD n (%)	SRBD n (%)	p (SRBD)
Obesity	No (n=761/772)	724 (92.23)	37 (84.09)	0.081	712 (92.71)	60 (80.00)	<0.001
	Yes (n=68/71)	61 (7.77)	7 (15.91)		56 (7.29)	15 (20.00)	
Growth Retardation	No (n=805/819)	766 (97.46)	39 (84.78)	<0.001	752 (97.54)	67 (89.33)	0.001
	Yes (n=27/27)	20 (2.54)	7 (15.22)		19 (2.46)	8 (10.67)	
Morning Headache	No (n=764/776)	729 (95.17)	35 (83.33)	0.006	728 (96.94)	48 (68.57)	<0.001
	Yes (n=44/45)	37 (4.83)	7 (16.67)		23 (3.06)	22 (31.43)	
Apnea	No (n=787/799)	749 (98.4)	38 (88.3)	0.001	743 (99.3)	56	<0.001
	Yes (n=17/19)	12 (1.6)	5 (11.7)		5 (0.7)	14	

enuresis nocturna was 1.8% in children without SRBD and 17.1% in those with SRBD. This difference was also statistically significant ($p < 0.001$).

Obesity

Obesity was reported in 61 children without habitual snoring (7.77%) and in 7 children with habitual snoring (15.91%). The relationship between habitual snoring and obesity was not statistically significant ($p = 0.081$) **(Table 3)**. In contrast, SRBD was significantly linked to obesity ($p < 0.001$). Obesity was found in 7.29% of children without SRBD and in 20% of those with SRBD.

Growth Retardation

A statistically significant link was found between habitual snoring and growth retardation ($p < 0.001$). Among children without habitual snoring, 2.54% experienced growth retardation, compared to 15.22% of those with habitual snoring. Likewise, growth retardation was significantly more common in children with SRBD (10.67%) than in those without SRBD (2.46%) ($p = 0.001$).

Morning Headaches

A statistically significant link was identified between habitual snoring and morning headaches ($p = 0.006$). Morning headaches were reported by 4.83% of children without habitual snoring and 16.67% of those with habitual snoring. Additionally, morning headaches were significantly more prevalent in children with SRBD (31.43%) compared to those without SRBD (3.06%) ($p < 0.001$).

Behavioral Problems (ADHD)

All ADHD-related items except one in the questionnaire were significantly linked to habitual snoring. All ADHD-related items were significantly associated with SRBD.

DISCUSSION

This study assessed 856 children aged 5–13 in the north Aegean region of Turkey. The prevalence of habitual snoring was 5.58%, and SRBD was 9.11%. Witnessed sleep apnea was reported in 2.3% of participants and was significantly linked to both habitual snoring and SRBD. Recent epidemiological studies have used validated sleep questionnaires to evaluate snoring and SRBD. A 2021 meta-analysis of 37 studies that used both PSQ and OSA-18 questionnaires found that PSQ had 76% sensitivity and 43% specificity, making it the most sensitive screening tool when using an AHI > 1 threshold.[9]

Because there is no standardized, universally accepted objective method for defining snoring, surveys are often used in research. However, differences in clinicians' interpretation and variations in respondents' understanding may lead to inconsistent prevalence reports. Additionally, variations in study design, age range of the population, environmental conditions, and racial/ethnic factors can influence snoring prevalence. For example, Daniel K. Ng et al. reported a snoring prevalence of 10.9% among 3047 children aged 6–12 in Hong Kong, while Albert M. Li et al. found a prevalence of 7.2% among 6349 Chinese children aged 5–14. In Portugal, Ferreira et al. reported an 8.6% rate of loud, persistent snoring among 988 children aged 6–13. Studies in Italy by Corbo et al.[15] and Cazzolla et al.[16] reported rates of 5.6% and 4%, respectively. One study in Iran involving 2,900 adolescents aged 11–17 reported a prevalence of 7.9. A meta-analysis by Lumeng et al.[18] identified a global parental-reported prevalence of snoring of 7.45%.

In Turkey, although limited, prevalence studies have been conducted across different age groups in various years. Ersu et al. found a snoring prevalence of 7% among 2147 children aged 5–13 in Istanbul. Other studies reported rates between 3.5% and 4.8% (8,9,19). Our finding of 5.58% aligns with these reports. In addition to overall prevalence studies, research has been carried out on the frequency of

SRBD in asthmatic schoolchildren and preschool children, as well as the relationship between SRBD and asthma control . When applied to children with asthma, the prevalence was higher in those with poorly controlled asthma, as expected.

Due to the impracticality of widespread use of polysomnography, sleep questionnaires are often used to estimate SRBD prevalence. In a Chinese study across five regions, Guo et al. found a 13.4% prevalence of SRBD among 3994 children aged 3–14. Paduano et al. reported a 10.9% prevalence among 1642 Italian children aged 6–12, identifying them as high-risk for OSAS. Sakamoto et al. , in a large-scale study in Japan, found SRBD prevalence ranging from 8.5% to 11.3% in 17,769 children. Our findings align with these international results. Differences in prevalence may result from whether questionnaires were administered face-to-face under supervision or self-completed at home, and whether parents of symptomatic children were more motivated to respond. For example, Paduano et al. found no statistically significant differences in SRBD prevalence across age groups. Some studies report a decline in SRBD with increasing age.

Few studies are using the PSQ to investigate the frequency of SRBD in Turkey. Ersu et al. [4] identified obstructive apnea in 16.9% of snoring children in Istanbul. Gökdemir et al.[5] found a 15.5% prevalence in a nationwide study of 9045 children aged 8.5 ± 1.3 years. The higher prevalence in their study may be due to their use of cluster sampling, which is less reliable than the simple random sampling used in our research. Additionally, their surveys were mailed and not administered face-to-face. Our survey was distributed in collaboration with school principals and collected via classroom teachers, ensuring better participation and data integrity. Our scale had a Cronbach's alpha of 0.783, supporting its reliability for estimating SRBD prevalence. Other Turkish studies using the PSQ have focused on children with asthma, showing higher SRBD prevalence among those with poorly controlled asthma [19,20].

Although not statistically significant, our observation of decreasing snoring rates with increasing age may be explained by regression of adenoid hypertrophy in school-age children. A similar trend was reported by Sahin et al.[6], who found snoring rates of 4.6%, 3.6%, and 2.7% in children aged 7–8, 9–10, and 11–13, respectively. Ersu et al. reported snoring rates of 7.5%, 5.7%, and 12.9% in children aged 5–8, 9–10, and 11–13[4]. In contrast, studies including adolescents showed increased snoring with age, possibly due to rising Body Mass Index (BMI), hormonal changes, and smoking[17,24].

Witnessed apnea, the most serious clinical sign of SRBD, was seen in 2.3% of our sample, aligning with previous research. This supports the validity of the PSQ in predicting OSAS risk and suggests that children with witnessed apnea should be prioritized for polysomnography.

Enuresis nocturna, morning headaches, growth retardation, and ADHD were more common among children with SRBD or habitual snoring, reinforcing the utility of the questionnaire. One study found that children over 5 years old with both snoring and enuresis had a significantly higher rate of moderate-to-severe OSAS [25].

Obesity, another well-known SRBD comorbidity, was significantly linked to SRBD but not to habitual snoring. A 2021 review highlighted a bidirectional relationship between obesity and OSAS. In a 2022 study of obese children evaluated through polysomnography, the PSQ predicted moderate-to-severe OSAS (AHI > 5) with 80% sensitivity and 100% specificity. This supports using the PSQ for screening obese children when access to sleep studies is limited. However, a limitation of our study was the absence of BMI calculations based on height and weight.

Morning headaches are also linked to SRBD. While the prevalence in the general population is 5–6%, it increases to 12–18% in individuals with OSA. In children, such headaches may lead to learning difficulties, poor academic performance, and behavioral problems.

SRBD significantly affects sleep quality. ADHD is also closely linked to sleep problems. A 2022 study comparing children with and without ADHD found that SRBD-related symptoms were much more common in those with ADHD, especially in externalizing behaviors. OSAS has been connected to attention issues in up to 95% of cases, and 20–30% of children with ADHD might have undiagnosed OSAS. Interventional studies indicate that treating OSAS can improve behavior and attention. Additionally, some studies show a link between snoring severity and behavioral or cognitive issues. In a cohort of 229 children aged 2–13, Chervin et al. found that habitual snoring and daytime sleepiness predicted the development of hyperactivity over a 4-year period.[34] In our study, children who snored habitually showed more symptoms of attention and hyperactivity than their peers. Similarly, all behavioral symptoms were more common among those with SRBD.

CONCLUSION

This prevalence study conducted in Balıkesir—one of Turkey's socioeconomically advanced provinces—used optimal epidemiological methods to identify high rates of snoring, sleep-disordered breathing (SRBD), and sleep apnea, especially among younger children. Limited access to polysomnography and sleep laboratories remains a significant factor contributing to the global uncertainty about the true prevalence of SRBD in children.

Our study indicates that more children should be screened with validated and reliable questionnaires. We emphasize that questionnaire-based research is a valuable tool for early diagnosis and treatment of children with physical and cognitive issues related to sleep-disordered breathing.

The study received approval from the Clinical Research Ethics Committee of Balıkesir University Faculty of Medicine (Decision No. 2021/276).

Authors' specific contributions:

Ertuğrul Canlı: Study concept and design, Collecting Data, Statistical analysis, Drafting of the manuscript

Berna Uzunoğlu: Technical support, Statistical analysis, Collecting Data

Sultan Eser: Study concept and design, Statistical analysis, Critical revision of the manuscript for intellectual content.

Demet Can: Study concept and design, Statistical analysis, Critical revision of the manuscript for intellectual content.

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REFERENCES

1. Genç S. The new Classification of Sleep Disorders (ICSD-3): The Changes in The Classification Of Sleep Related Breathing Disorder with ICSD-3. The Medical Journal of Mustafa Kemal University 2017; 8:23-31.
2. Damian A, Gozal D. Pediatric Obstructive Sleep Apnea: What's in a Name? Adv Exp Med Biol 2022; 1384:63-78.
3. Lugaresi E, Plazzi G. Heavy snorer disease: from snoring to the sleep apnea syndrome--an overview. Respiration 1997; 64 Suppl 1:11-14.
4. Ersu R, Arman AR, Save Det al. Prevalence of snoring and symptoms of sleep-disordered breathing in primary school children in istanbul. Chest 2004; 126:19-24.
5. Gokdemir Y, Civelek E, Cakir Bet al. Prevalence of sleep-disordered breathing and associated risk factors in primary school children in urban and rural environments. Sleep Breath 2021; 25:915-922.
6. Sahin U, Ozturk O, Ozturk M, Songur N, Bircan A, Akkaya A. Habitual snoring in primary school children: prevalence and association with sleep-related disorders and school performance. Med Princ Pract 2009; 18:458-465.
7. Sogut A, Yilmaz O, Dinc G, Yuksel H. Prevalence of habitual snoring and symptoms of sleep-disordered breathing in adolescents. Int J Pediatr Otorhinolaryngol 2009; 73:1769-1773.
8. Chervin RD, Hedger K, Dillon JE, Pituch KJ. Pediatric sleep questionnaire (PSQ): validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems. Sleep Med 2000; 1:21-32.
9. Yüksel H, Söğüt A, Yılmaz O, Kutluay E. Reliability and validity of the Turkish version of the pediatric sleep questionnaire: a tool for prediction of sleep related breathing disorder. Tuberk Toraks 2011; 59:236-241.
10. Öner P, Barut Y, Öner Öet al. [Reliability and validity of Turkish translation of the pediatric sleep questionnaire]. Klinik Psikofarmakol Bulteni 2009; 19:382-395.
11. Incerti Parenti S, Fiordelli A, Bartolucci ML, Martina S, D'Antò V, Alessandri-Bonetti G. Diagnostic accuracy of screening questionnaires for obstructive sleep apnea in children: A systematic review and meta-analysis. Sleep Medicine Reviews 2021; 57:101464.
12. Ng DK, Kwok KL, Cheung JMet al. Prevalence of sleep problems in Hong Kong primary school children: a community-based telephone survey. Chest 2005; 128:1315-1323.
13. Li AM, Au CT, So HK, Lau J, Ng PC, Wing YK. Prevalence and risk factors of habitual snoring in primary school children. Chest 2010; 138:519-527.
14. Ferreira AM, Clemente V, Gozal Det al. Snoring in Portuguese primary school children. Pediatrics 2000; 106:E64.
15. Corbo GM, Forastiere F, Agabiti Net al. Snoring in 9- to 15-year-old children: risk factors and clinical relevance. Pediatrics 2001; 108:1149-1154.
16. Cazzolla AP, Lacarbonara V, Pellegrino B, Testa NF, Fidanza F, Lacaita MG. Sleep-disordered breathing in a sample of 495 children in Southern Italy. Eur J Paediatr Dent 2010; 11:189-192.
17. Bidad K, Anari S, Aghamohamadi A, Gholami N, Zadhush S, Moaieri H. Prevalence and correlates of snoring in adolescents. Iran J Allergy Asthma Immunol 2006; 5:127-132.
18. Lumeng JC, Chervin RD. Epidemiology of pediatric obstructive sleep apnea. Proc Am Thorac Soc 2008; 5:242-252.
19. Ginis T, Akcan FA, Capanoglu Met al. The frequency of sleep-disordered breathing in children with asthma and its effects on asthma control. J Asthma 2017; 54:403-410.
20. Capanoglu M, Ginis T, Buyuktiryaki Bet al. The frequency of sleep-disordered breathing in preschool children with asthma and its effects on control of asthma. Allergol Immunopathol (Madr) 2024; 52:38-43.
21. Guo Y, Pan Z, Gao Fet al. Characteristics and risk factors of children with sleep-disordered breathing in Wuxi, China. BMC Pediatr 2020; 20:310.
22. Paduano S, Paduano FP, Aiello Det al. OSAS in developing age: Screening of a Southern Italy population. Eur J Paediatr Dent 2019; 20:302-305.
23. Sakamoto N, Gozal D, Smith DLet al. Sleep Duration, Snoring Prevalence, Obesity, and Behavioral Problems in a Large Cohort of Primary School Students in Japan. Sleep 2017; 40.
24. Dayyat E, Kheirandish-Gozal L, Gozal D. Childhood Obstructive Sleep Apnea: One or Two Distinct Disease Entities? Sleep Med Clin 2007; 2:433-444.
25. Alexopoulos EI, Malakasioti G, Varlami V, Miligkos M, Gourgoulianis K, Kaditis AG. Nocturnal enuresis is associated with moderate-to-severe obstructive sleep apnea in children with snoring. Pediatr Res 2014; 76:555-559.
26. di Palmo E, Filice E, Cavallo Aet al. Childhood Obesity and Respiratory Diseases: Which Link? Children (Basel) 2021; 8.
27. Umano GR, Rondinelli G, Luciano Met al. Pediatric Sleep Questionnaire Predicts Moderate-to-Severe Obstructive Sleep Apnea in Children and Adolescents with Obesity. Children (Basel) 2022; 9.
28. Russell MB, Kristiansen HA, Kværner KJ. Headache in sleep apnea syndrome: epidemiology and pathophysiology. Cephalalgia 2014; 34:752-755.
29. Russell MB. Sleep apnea headache: a growing concern in an increasingly obese population? Expert Rev Neurother 2013; 13:1129-1133.
30. Pelayo R, Sivan Y. Increased behavioral morbidity in school-aged children with sleep-disordered breathing. Pediatrics 2005; 116:797-798; author reply 798.
31. Kim KM, Lim MH, Ha M, Kwon HJ. Associations Between Sleep-Disordered Breathing and Behavioral and Cognitive Functions in Children With and Without Attention-Deficit/Hyperactivity Disorder. J Acad Consult Liaison Psychiatry 2022; 63:234-243.
32. Youssef NA, Ege M, Angly SS, Strauss JL, Marx CE. Is obstructive sleep apnea associated with ADHD? Ann Clin Psychiatry 2011; 23:213-224.
33. Li JM, Hu JT, Luo XM, Cai YM, Liu JM. [Correlation of snoring with attention deficit and hyperactivity-impulsivity in school age children from Changsha City]. Zhongguo Dang Dai Er Ke Za Zhi 2009; 11:562-565.
34. Chervin RD, Ruzicka DL, Archbold KH, Dillon JE. Snoring predicts hyperactivity four years later. Sleep 2005; 28:885-890.