Research Article

Analysis of Clinical Characteristics of Children with Obstructive Sleep Apnea Syndrome

Osman Ansar and Xiang Ping Ma[*]

Department of Pediatrics , the First Affiliated Hospital of Xinjiang Medical University, Urumqi, Xinjiang, China

Abstract

Obstructive Sleep Apnea Syndrome (OSAS) is a notable health issue affecting children globally. Characterized by recurring partial or complete blockage of the upper airway during sleep, OSAS presents various health challenges for children, including disruptions in sleep patterns, cognitive impairments, and cardiovascular risks. This study aimed to analyze the clinical characteristics of pediatric patients diagnosed with Obstructive Sleep Apnea Syndrome (OSAHS). Patients were categorized into three severity groups: mild, moderate, and severe. Clinical parameters including snoring, mouth breathing, restless sleep, and apnea were assessed across these groups. Additionally, height, weight, and Body Mass Index (BMI) were measured to investigate potential associations with OSAHS severity. Statistical analysis revealed no significant differences in height or weight among the severity groups. However, a significant difference in BMI was observed, indicating its potential utility as a marker for OSAHS severity in pediatric patients. Surprisingly, no significant variations were found in clinical characteristics across the severity groups, suggesting that these symptoms may not directly correlate with OSAHS severity in children. This study underscores the importance of BMI assessment in pediatric OSAHS diagnosis and highlights the need for further research to elucidate the complex factors influencing OSAHS severity in this population.

Keywords: OSAS; Children; BMI; Height; Weight; Snoring; Apnea

Introduction

Obstructive Sleep Apnea Syndrome (OSAS) represents a significant health concern among pediatric populations worldwide [1]. Defined by recurrent partial or complete upper airway obstruction during sleep, OSAS poses a myriad of challenges to children's health, including disturbances in sleep architecture, cognitive deficits, and cardiovascular complications [2]. Understanding the clinical characteristics of OSAS in children is paramount for effective management and intervention strategies. The prevalence of OSAS among children has been steadily increasing, paralleling the rise in obesity rates and other risk factors such as adenotonsillar hypertrophy and craniofacial abnormalities [3,4]. Globally, epidemiological studies have underscored the magnitude of this condition, indicating a substantial burden on healthcare systems and highlighting the urgent need for comprehensive research and clinical approaches [5]. According to recent estimates, OSAS affects approximately 1% to 5% of children worldwide, making it one of the most common sleep disorders in this demographic. In China, as in many other regions, the prevalence of pediatric OSAS has shown a notable uptrend in recent years [5]. Rapid urbanization, dietary shifts, and lifestyle changes have contributed to an increased prevalence of risk factors associated with OSAS, including obesity and sedentary behaviors [5,6]. Furthermore, cultural factors and parental awareness may influence the recognition and management of OSAS in children. Recent studies in China have reported prevalence rates ranging from 2% to 8% among different pediatric age groups, indicating a considerable public health challenge that warrants attention [7,8]. Given the diverse etiological factors and clinical presentations of pediatric OSAS, a comprehensive understanding of its clinical characteristics is essential for accurate diagnosis and tailored treatment plans [9,10]. Children with OSAS often exhibit a spectrum of symptoms, including snoring, mouth breathing, nocturnal enuresis, and daytime sleepiness, although the presentation may vary widely among individuals [11,12]. Moreover, the impact of OSAS extends beyond sleep disturbances, encompassing neurocognitive deficits, behavioral problems, and cardiovascular sequelae, which can significantly impair quality of life and academic performance [13,14]. This research aims to contribute to the existing body of knowledge by providing a detailed analysis of the clinical characteristics of children with OSAS, with a particular focus on the population within China. By examining demographic trends, symptomatology, diagnostic modalities, and treatment outcomes, this study seeks to enhance our understanding of pediatric OSAS and inform evidence-based practices for its management and prevention.

Methods

Study design and setting

A cross-sectional study was conducted at the 1st Affiliated Hospital of Xinjiang Medical University in Urumqi, Xinjiang, People's Republic of China. The study spanned from January 2022 to December 2023. Pediatric patients aged 1 to 18 years old, of both genders, were included in the study.

Inclusion and exclusion criteria

Participants were children exhibiting symptoms such as snoring, observed apneas, restless sleep, or daytime sleepiness, indicative of possible Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS). Patients with known comorbidities affecting sleep patterns or respiratory function, as well as those previously diagnosed and treated for OSA, were excluded from the study.

Data collection and processing method

A total of 450 patients were included in the study, categorized into three groups based on severity: mild, moderate, and severe. Pediatric patients presenting with symptoms suggestive of OSAHS were evaluated. Data on weight, height, and Apnea-Hypopnea Index (AHI) were collected and analyzed. Participants underwent comprehensive diagnostic evaluations to confirm the presence of OSA. This included the use of Portable Monitors (PM) or Home Sleep Apnea Testing (HSAT) for selected cases based on clinical judgment and resource availability.
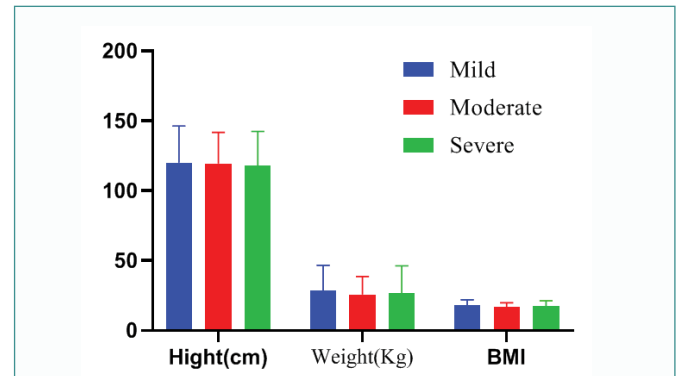
Statistical analysis

Statistical analysis was performed using SPSS software package, version 26.0. The $\chi 2$ test was utilized to compare counting data, and chi-square division was employed to compare percentages between groups. Measurement data following a normal distribution were expressed as mean ± standard deviation (x ± s). One-way ANOVA was used for comparison between groups, with the LSD-t test applied for uniform variance and Tamhane's T2 test used for variance discrepancy. Skewed distribution data were expressed in terms of median and range using the Kruskal-Wallis H test.

Results

The general characteristics of the three groups (mild, moderate, and severe) of pediatric patients with Obstructive Sleep Apnea Syndrome (OSAHS) were examined and are presented in Figure 1. The mean heights of patients in the mild, moderate, and severe groups were 120.13 cm, 119.49 cm, and 117.76 cm, respectively. There was no statistically significant difference in height observed between the three groups (F=0.28, p=0.755). In terms of weight, patients in the mild group had a mean weight of 28.56 kg, while those in the moderate and severe groups had mean weights of 25.75 kg and 26.35 kg, respectively. The difference in weight between the groups was not statistically significant (F=1.633, p=0.19) Table 1. However, when considering Body Mass Index (BMI), a statistically significant difference was observed between the groups. The mean BMI for patients in the mild, moderate, and severe groups were 17.86, 16.78, and 17.18, respectively. The analysis revealed a statistically significant difference in BMI between the three groups (F=4.586, p=0.011).

In Figure 2 presents the clinical characteristics of the three groups (mild, moderate, and severe) of pediatric patients with Obstructive Sleep Apnea Syndrome (OSAHS). In the mild group, 76 out of 235 patients (44.4%) reported snoring, 70 patients (44.9%) reported mouth breathing, 102 patients (49.0%) reported restless sleep, and 92 patients (48.7%) reported apnea. For the moderate group, 62 out of 183 patients (36.3%) reported snoring, 52 patients (33.3%) reported mouth breathing, 75 patients (36.1%) reported restless sleep, and 64 patients (33.9%) reported apnea. In the severe group, 33 out of 82 patients (19.3%) reported snoring, 34 patients (21.8%) reported mouth breathing, 31 patients (14.9%) reported restless sleep, and 33 patients (17.5%) reported apnea. Statistical analysis revealed no significant differences between the groups in terms of snoring (p=0.427), mouth breathing (p=0.086), restless sleep (p=0.660), or apnea (p=0.60) Table 1.

The clinical characteristics of pediatric patients across three severity groups of Obstructive Sleep Apnea Syndrome (OSAHS) were analyzed, as presented in Figure 3. In the mild group, out of 235 patients, 76 (44.4%) reported snoring, 70 (44.9%) reported mouth breathing, 102 (49.0%) reported restless sleep, and 92 (48.7%) reported


Figure 1: A comprehensive comparison of the general condition, encompassing various health indicators, among three distinct groups, providing insights into their overall health status.

apnea. Among the moderate group, consisting of 183 patients, 62 (36.3%) reported snoring, 52 (33.3%) reported mouth breathing, 75 (36.1%) reported restless sleep, and 64 (33.9%) reported apnea. In the severe group, comprising 82 patients, 33 (19.3%) reported snoring, 34 (21.8%) reported mouth breathing, 31 (14.9%) reported restless sleep, and 33 (17.5%) reported apnea Table 1. Statistical analysis revealed no statistically significant differences (p>0.05) between the groups for any of the clinical characteristics assessed, including snoring, mouth breathing, restless sleep, and apnea.

The clinical characteristics of pediatric patients across three severity groups of Obstructive Sleep Apnea Syndrome (OSAHS) were analyzed, as presented in Figure 3. In the mild group, out of 235 patients, 76 (44.4%) reported snoring, 70 (44.9%) reported mouth breathing, 102 (49.0%) reported restless sleep, and 92 (48.7%) reported apnea. Among the moderate group, consisting of 183 patients, 62 (36.3%) reported snoring, 52 (33.3%) reported mouth breathing, 75 (36.1%) reported restless sleep, and 64 (33.9%) reported apnea. In the severe group, comprising 82 patients, 33 (19.3%) reported snoring, 34 (21.8%) reported mouth breathing, 31 (14.9%) reported restless sleep, and 33 (17.5%) reported apnea. Statistical analysis revealed no statistically significant differences (p>0.05) between the groups for any of the clinical characteristics assessed, including snoring, mouth breathing, restless sleep, and apnea Table 1.

Table 1: Comparison of general condition, clinical characteristics, respiratory sleep events, and adenoid hypertrophy across three groups.

Parameters	Mild	Moderate	Severe	P
Height(cm)	120.13±26.09	119.49±22.199	117.76±24.73	0.755
Weight(Kg)	28.56±18.10	25.75±12.88	26.35±19.91	0.19
BMI	17.86±4.01	16.78±2.93	17.18±4.09	0.011
Snore	76(44.4%)	62(36.3%)	33(19.3%)	0.427
Mouth breathing	70(44.9%)	52(33.3%)	34(21.8%)	0.086
Restless sleep	102(49.0%)	75(36.1%)	31(14.9%)	0.66
Apnea	92(48.7%)	64(33.9%)	33(17.5%)	0.6
Total record time	5.75±2.37	5.64±2.35	5.41±2.23	0.532
Total sleep time	5.15±1.57	4.89±1.63	4.88±1.1.59	1.97
Sleep efficiency	60.81±17.37	60.23±17.62	63.08±19.59	0.478
AHI	8.40±5.05	8.61±5.00	10.22±5.49	0.018
Adenoid(mm)	10±2	12±2	15±2	<0.05
Adenoid hypertrophy (%)	47.00%	36.60%	16.4	<0.05
A/N	0.6	0.7	0.8	<0.05
Adenoid and tonsil hypertrophy (%)	30%	40%	55%	<0.05

018   2024 | Volume 5 | Article 1043
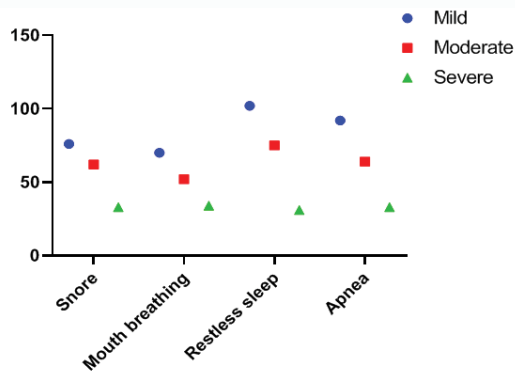
Figure 2: Presents an in-depth analysis of the clinical characteristics exhibited by individuals within each of the three groups, shedding light on the unique profiles and medical attributes observed.
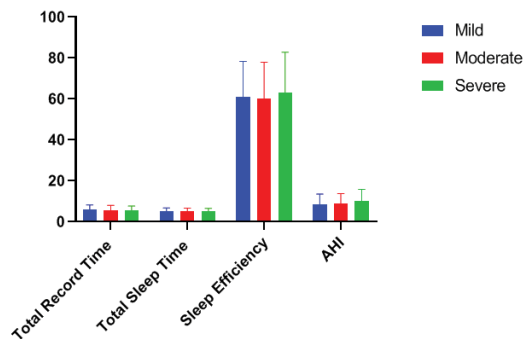
Figure 3: The occurrences and patterns of respiratory sleep events observed within each of the three groups, offering valuable insights into the respiratory health dynamics during sleep among the studied populations.

Discussion

The examination of clinical features in children with varying degrees of Obstructive Sleep Apnea Syndrome (OSAHS) offers invaluable insights into the multifaceted nature of the condition and its diverse impacts on pediatric patients [15,16]. Through meticulous analysis, we gain a deeper understanding of how different severity levels manifest in clinical presentations and physiological markers, guiding personalized diagnostic and therapeutic interventions [17]. Firstly, the comprehensive assessment presented in Table 1 reveals intriguing insights into the physical growth characteristics of children across OSAHS severity groups. While height and weight show no significant variations, the BMI exhibits a notable difference (P=0.011), suggesting a nuanced relationship between body composition and the trajectory of the illness. This highlights the importance of considering not just physical dimensions but also metabolic factors in evaluating OSAHS severity. Moving beyond anthropometric measures, Table 1 underscores the complexity of symptomatology in pediatric OSAHS. Despite the severe group exhibiting a tendency towards more frequent apnea events, common symptoms such as mouth breathing, snoring, apnea, and restless sleep do not significantly differ among severity groups (P>0.05 for the majority). This challenges conventional assumptions regarding symptom severity as a direct indicator of OSAHS severity and emphasizes the need for comprehensive assessment tools [18,19]. Table 1's analysis of respiratory sleep events further enriches our understanding by highlighting the Apnea-

Hypopnea Index (AHI) as a reliable marker for assessing the severity of children's sleep-disordered breathing. The significant correlation observed between OSAHS severity and AHI (P=0.018) underscores the importance of polysomnographic criteria in evaluating disease progression and treatment efficacy. Moreover, the anatomical aspects elucidated in Table 1 shed light on the role of adenotonsillar hypertrophy in OSAHS pathogenesis. Significant differences (P<0.05) in tonsil and adenoid hypertrophy, with the severe group exhibiting higher rates of combined hypertrophy and larger adenoids, suggest a structural component contributing to airway obstruction. This emphasizes the need for comprehensive anatomical assessments in OSAHS diagnosis and treatment planning [20,21]. The nuanced trends observed in clinical features across OSAHS severity groups underscore the imperative for personalized approaches in pediatric OSAHS management. By integrating anthropometric, symptomatic, physiological, and anatomical evaluations, healthcare professionals can tailor interventions to individual patient needs, optimizing treatment outcomes and long-term prognosis [22,23]. Future research endeavors should further explore the intricate interplay between clinical manifestations, disease severity, and treatment responses, paving the way for enhanced therapeutic strategies and improved quality of life for children with OSAHS.

Conclusion

The study examined pediatric patients with Obstructive Sleep Apnea Syndrome (OSAHS) across mild, moderate, and severe severity groups. While no significant differences were found in height, weight, or most clinical characteristics among the groups, a noteworthy discrepancy emerged in Body Mass Index (BMI), indicating its potential relevance as an indicator of OSAHS severity in children. Despite this, clinical symptoms such as snoring, mouth breathing, restless sleep, and apnea did not vary significantly across severity groups, suggesting that these symptoms may not directly correlate with OSAHS severity in pediatric patients. Further research is needed to better understand the factors influencing OSAHS severity in this population.

References

1. Chamseddin BH, Johnson RF, Mitchell RB. Obstructive sleep apnea in children with Down syndrome: demographic, clinical, and polysomnographic features. Otolaryngol Head Neck Surg. 2019;160(1):150-7.

2. Tal A. Obstructive sleep apnea syndrome: pathophysiology and clinical characteristics. Principles and practice of pediatric sleep medicine. New York, NY: Elsevier. 2014;215-20.

3. Mitchell RB, Garetz S, Moore RH, Rosen CL, Marcus CL, Katz ES, et al. The use of clinical parameters to predict obstructive sleep apnea syndrome severity in children: the Childhood Adenotonsillectomy (CHAT) study randomized clinical trial. JAMA Otolaryngol Head Neck Surg. 2015;41(2):130-6.

4. Xu Z, Wu Y, Tai J, Feng G, Ge,W, Zheng L, et al. Risk factors of obstructive sleep apnea syndrome in children. J Otolaryngol Head Neck Surg. 2020;49(1):11.

5. Bitners AC, Arens R. Evaluation and management of children with obstructive sleep apnea syndrome. Lung. 2020;198(2):257-70.

6. Palma JA, Iriarte J, Fernandez S, Valencia M, Alegre M, Artieda J, et al. Characterizing the phenotypes of obstructive sleep apnea: clinical, sleep, and autonomic features of obstructive sleep apnea with and without hypoxia. Clin Neurophysiol. 2014;125(9):1783-91.

7. Durdik P, Sujanska A, Suroviakova S, Evangelisti M, Banovcin P, Villa MP. Sleep architecture in children with common phenotype of obstructive sleep apnea. J Clin Sleep Med. 2018;4(1):9-14.

8. Kang KT, Weng WC, Lee CH, Hsiao TY, Lee PL, Hsu WC. Clinical risk assessment

model for pediatric obstructive sleep apnea. Laryngoscope. 2016;126(10):2403-9.

9. Andersen IG, Holm JC, Homøe P. Obstructive sleep apnea in children and adolescents with and without obesity. Eur Arch Otorhinolaryngol. 2019;276(3):871-8.

10. Lee CF, Lee CH, Hsueh WY, Lin MT, Kang KT. Prevalence of obstructive sleep apnea in children with Down syndrome: a meta-analysis. J Clin Sleep Med. 2018;14(5):867-75.

11. Kang KT, Weng WC, Lee CH, Hsiao TY, Lee PL, Lee YL, et al. Detection of pediatric obstructive sleep apnea syndrome: history or anatomical findings? Sleep Med. 2015;16(5):617-24.

12. Qubty WF, Mrelashvili A, Kotagal S, Lloyd RM. Comorbidities in infants with obstructive sleep apnea. J Clin Sleep Med. 2014;10(11):1213-6.

13. Alonso-Álvarez ML, Cordero-Guevara JA, Terán-Santos J, Gonzalez-Martinez M, Jurado-Luque MJ, Corral-Peñafiel J, et al. Obstructive sleep apnea in obese community-dwelling children: the NANOS study. Sleep. 2014;37(5):943-9.

14. Rosen CL, Wang R, Taylor HG, Marcus CL, Katz ES, Paruthi S, et al. Utility of symptoms to predict treatment outcomes in obstructive sleep apnea syndrome. Pediatrics. 2015;135(3):e662-e71.

15. Esteller E, Villatoro J, Agüero A, Lopez R, Matiñó E, Argemi J, Girabent-Farrés M. Obstructive sleep apnea syndrome and growth failure. Int J Pediatr Otorhinolaryngol. 2018;108:214-8.

16. Isaiah A, Hamdan H, Johnson RF, Naqvi K, Mitchell RB. Very severe obstructive sleep apnea in children: outcomes of adenotonsillectomy and risk factors for persistence. Otolaryngol Head Neck Surg. 2017;157(1):128-34.

17. Patel AP, Meghji S, Phillips JS. Accuracy of clinical scoring tools for the diagnosis of pediatric obstructive sleep apnea. The Laryngoscope. 2020;30(4):1034-43.

18. Cho YW, Kim KT, Moon HJ, Korostyshevskiy VR, Motamedi GK, Yang KI. Comorbid insomnia with obstructive sleep apnea: clinical characteristics and risk factors. J Clin Sleep Med. 2018;14(3):409-17.

19. Vieira BB, Itikawa CE, de Almeida LA, Sander HH, Aragon DC, Anselmo-Lima WT, et al. Facial features and hyoid bone position in preschool children with obstructive sleep apnea syndrome. Eur Arch Otolaryngol. 2014;271(5):1305-9.

20. Bush D, Galambos C, Ivy DD, Abman SH, Wolter-Warmerdam K, Hickey F. Clinical characteristics and risk factors for developing pulmonary hypertension in children with Down syndrome. The J Pediatr. 2018;202:212-9,e212.

21. Sudarsan SS, Paramasivan VK, Arumugam SV, Murali S, Kameswaran M. Comparison of treatment modalities in syndromic children with obstructive sleep apnea-a randomized cohort study. Int J Pediatr Otorhinolaryngol. 2014;78(9):1526-33.

22. Saji T. Clinical characteristics of pulmonary arterial hypertension associated with D own syndrome. Pediatrics Int. 2014;56(3):297-303.

23. Weinstock TG, Rosen CL, Marcus CL, Garetz S, Mitchell RB, Amin R, Weng J. Predictors of obstructive sleep apnea severity in adenotonsillectomy candidates. Sleep. 2014;37(2):261-9.