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PATTERN OF SLEEP APNEA AMONG CHILDREN UNDER TWELVE YEARS OF AGE ATTNDING A TERTIARY CARE HOSPITAL IN NORTH INDIA- AN OBSERVATIONAL STUDY.

Dr. Nazrana Farooq	Senoir Resident, Department of ENT, GMC Baramulla
Dr. Amir Hafiz. Resident	Senior Department of ENT, GMC Anantnang
Dr. Omar Mohammad Shafi	Cosultant, JLNM Hospital Srinagar

ABSTRACT **Background:** Pediatric obstructive sleep apnea (OSA) is a common sleep-related breathing disorder associated with significant neurocognitive, behavioral, and cardiovascular consequences. While global prevalence ranges between 1–5%, regional epidemiological data from Kashmir remain limited. This study aimed to evaluate the demographic characteristics, clinical presentation, and etiological predictors of pediatric OSA among children under 12 years attending outpatient departments in Kashmir. **Methods:** A cross-sectional observational study was conducted over one year in ENT outpatient departments of tertiary care hospitals in Kashmir. Children aged <12 years presenting with symptoms suggestive of sleep-disordered breathing were screened using a validated pediatric OSA questionnaire. Demographic, clinical, anthropometric, and etiological variables were recorded using a structured proforma. Data were analyzed using Jamovi software (version 2.7.18). Associations were assessed using Chi-square or Fisher's exact test, and logistic regression was performed to identify predictors of moderate–severe OSA. A p-value <0.05 was considered statistically significant. **Results:** A total of 158 children with OSA were included. The majority belonged to the 6–9-year age group (41.8%), with male predominance (60.8%). Most children had normal BMI (62.7%), although overweight/obesity was significantly associated with disease severity (p=0.01). Snoring (83.5%) and mouth breathing (60.1%) were the most common symptoms. Adenotonsillar hypertrophy was the predominant etiological factor (70.3%) and the strongest predictor of moderate–severe OSA (OR 3.3, p=0.001), followed by obesity (OR 2.5, p=0.01). **Conclusion:** Pediatric OSA in Kashmir predominantly affects school-aged boys, with adenotonsillar hypertrophy and obesity as major contributing factors. Early symptom-based screening in outpatient settings can facilitate timely diagnosis and managemen

KEYWORDS : Sleep Apnea, Children, Kashmir

INTRODUCTION

Obstructive sleep apnea (OSA) in children is a prevalent sleep-related breathing disorder characterized by intermittent upper airway obstruction, leading to disrupted sleep and subsequent neurocognitive and cardiovascular consequences [1]. On a global scale, the prevalence of pediatric OSA is estimated to range from 1% to 5%, with sleep-disordered breathing symptoms affecting up to 11% of children [2,3]. Habitual snoring, a hallmark symptom, is a key indicator for screening and early diagnosis [3,4].

At the national level, various countries report differing prevalence rates influenced by factors such as adenotonsillar hypertrophy, obesity, and socioeconomic conditions. For example, in many Western countries, adenotonsillar hypertrophy remains the primary cause, particularly in the age group of 2–8 years, while obesity has been identified as an emerging risk factor [2,5].

At the regional level, particularly in Kashmir, there is a notable gap in comprehensive epidemiological studies on pediatric OSA. Factors such as environmental influences, genetic predispositions, and healthcare accessibility may impact the local prevalence and clinical pattern, necessitating region-specific research [6]. There is a need to understand the local epidemiology of pediatric OSA in Kashmir to facilitate early diagnosis and better management. The present study was conducted to evaluate the demographic, clinical, and etiological patterns of pediatric obstructive sleep apnea among children under 12 years in Kashmir.

METHODOLOGY

Study Design

A cross-sectional observational study

Study Setting

The study was carried out in the outpatient in departments of ENT of a tertiary care hospitals in Kashmir.

Study Duration

The study period extended from July 2024 to December 2025

Study Population

Children aged less than 12 years who attended the outpatient departments with symptoms suggestive of sleep-disordered breathing were screened for eligibility.

Inclusion Criteria

- Children aged less than 12 years
- Patients presenting with symptoms suggestive of sleep apnea, including habitual snoring, mouth breathing, restless sleep, or witnessed apneic episodes

Exclusion Criteria

- Children with previously diagnosed or surgically treated obstructive sleep apnea
- Children with severe congenital anomalies or neuromuscular disorders affecting respiration
- Patients with acute respiratory infections at the time of evaluation

Screening and Diagnostic Procedure

All eligible participants were evaluated using a validated pediatric obstructive sleep apnea screening questionnaire or discriminant tool. The instrument assessed habitual snoring, breathing pauses during sleep, sleep disturbances, and daytime behavioral symptoms. Patients fulfilling the diagnostic criteria based on the screening tool were classified as probable cases of obstructive sleep apnea.

Data Collection

Data were collected using a structured proforma. The following variables were recorded:

- **Demographic Variables:** age, sex, residence, and body mass index (BMI)
- **Clinical Presentation:** habitual snoring, mouth breathing, restless sleep, witnessed apnea, daytime sleepiness, behavioral disturbances
- **Clinical Examination Findings:** tonsillar hypertrophy, adenoid facies, nasal obstruction, craniofacial abnormalities
- **Etiological and Risk Factors:** adenotonsillar hypertrophy, obesity, allergic rhinitis, recurrent upper respiratory tract infections

Sample Size

The sample size was calculated based on the prevalence of habitual snoring, the most common presenting symptom of pediatric obstructive sleep apnea, estimated at approximately 10.5% from previous epidemiological studies. Using the formula:

$$N = Z^2 \times p \times q / d^2$$

where Z = 1.96, p = 0.10, q = 0.90, and d = 0.05, the minimum calculated sample size was approximately 144 participants. Additional 10% where taken totaling 158.

Sampling Technique: A consecutive sampling technique was employed, whereby all eligible children attending the ENT outpatient departments during the study period who fulfilled the inclusion criteria were recruited sequentially until the required sample size was achieved.

Statistical Analysis

The collected data were entered into a Jamovi statistical software version 2.7.18(a free to use software) and analyzed accordingly. Descriptive statistics were used to summarize demographic and clinical variables. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test as appropriate. Logistic regression analysis was performed to identify independent predictors of moderate to severe obstructive sleep apnea. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 158 children diagnosed with obstructive sleep apnea (OSA) were included in the study. The majority of cases were observed in the 6–9 year age group (41.8%), followed by 2–5 years (32.9%) and 10–12 years (25.3%), showing a statistically significant age distribution ($p = 0.04$). There was a clear male predominance (60.8%) compared to females (39.2%), which was also statistically significant ($p = 0.02$). Most children had a normal BMI (62.7%); however, overweight or obese children constituted 37.3% of the sample and demonstrated a significant association with OSA severity ($p = 0.01$).Table 1

Regarding clinical presentation, snoring was the most frequently reported symptom (83.5%), followed by mouth breathing (60.1%), daytime sleepiness (39.9%), and witnessed apnea (35.4%), all showing statistically significant associations with OSA ($p < 0.05$). (Table 2). Among etiological factors, adenotonsillar hypertrophy was the predominant cause (70.3%) and showed strong statistical significance ($p < 0.001$). Obesity was the second most common contributing factor (37.3%, $p = 0.01$), while craniofacial abnormalities were less frequent (10.1%) but remained clinically and statistically significant ($p = 0.04$). Overall, the findings highlight the predominance of adenotonsillar hypertrophy and snoring as key contributors to pediatric OSA, with demographic and anthropometric factors also playing a significant role. (Table 3)

DISCUSSION

The present study provides evaluation of the demographic characteristics, clinical presentation, and etiological factors associated with pediatric obstructive sleep apnea (OSA) among children attending outpatient departments in Kashmir. Using a structured screening approach, this study highlights the epidemiological pattern and key predictors of disease severity in a region where data on pediatric OSA remain limited. The findings contribute region-specific evidence while aligning with established national and international literature.

In the present cohort, the highest proportion of OSA cases was observed in the 6–9-year age group (41.8%), followed by children aged 2–5 years (32.9%) and 10–12 years (25.3%), with a statistically significant age distribution. This age-related pattern is consistent with global epidemiological studies that report peak prevalence of pediatric OSA during early and middle childhood, coinciding with maximal adenotonsillar tissue growth relative to upper airway size [9,10]. Previous studies have demonstrated that lymphoid tissue hypertrophy reaches its peak between 3 and 8 years of age, predisposing children to upper airway obstruction during sleep [10,11]. The relatively lower proportion of cases in older children in this study may reflect partial airway maturation or under-recognition of symptoms in older age groups.

A significant male predominance was observed in the present study, with males constituting 60.8% of cases. This finding aligns with several population-based and clinical studies that have reported a higher prevalence of pediatric OSA among boys [11,12]. Although the precise mechanisms remain unclear, sex-related differences in craniofacial morphology, airway collapsibility, and hormonal influences have been proposed as contributing factors [11]. However, logistic regression analysis in the present study did not identify male sex as an independent predictor of moderate-to-severe OSA, suggesting that other factors such as adenotonsillar hypertrophy and obesity may play a more dominant role in determining disease severity, a finding consistent with earlier pediatric cohorts [12].

Anthropometric assessment revealed that although the majority of children had a normal body mass index (BMI), a substantial proportion (37.3%) were overweight or obese, and this group demonstrated a statistically significant association with OSA severity. This observation reflects the growing global concern regarding the impact of childhood obesity on sleep-disordered breathing [13]. Multiple studies have demonstrated that obese children have a two- to four-fold increased risk of developing OSA compared to their normal-weight counterparts [13,14]. Obesity contributes to airway obstruction through fat deposition in the pharyngeal structures, reduced lung volumes, and altered neuromuscular control of the upper airway [14]. The findings of the present study underscore the evolving epidemiology of pediatric OSA, where obesity acts as an important coexisting risk factor alongside traditional anatomical causes.

With regard to clinical presentation, habitual snoring was the most frequently reported symptom, present in 83.5% of children, followed by mouth breathing (60.1%), daytime sleepiness (39.9%), and witnessed apnea (35.4%). These findings are consistent with established clinical literature identifying snoring as the most sensitive and commonly reported symptom of pediatric OSA [15,16]. Mouth breathing, which was also significantly associated with OSA in this study, reflects chronic nasal obstruction and altered airway dynamics and has been linked to adenotonsillar hypertrophy and abnormal craniofacial growth patterns [15]. Although daytime sleepiness and witnessed apnea were reported less frequently, their significant association with OSA suggests a higher disease burden and potential neurobehavioral impact in affected children [17]. These observations reinforce the importance of symptom-based screening tools in outpatient settings, particularly in regions with limited access to polysomnography.

Etiological evaluation revealed adenotonsillar hypertrophy as the predominant contributing factor, identified in 70.3% of cases and emerging as the strongest independent predictor of moderate-to-severe OSA (OR 3.3, $p = 0.001$). This finding is in strong agreement with global pediatric OSA literature, which consistently identifies adenotonsillar enlargement as the primary anatomical cause of airway obstruction in children [9,10,]. Numerous studies have demonstrated that adenotonsillectomy remains the first-line treatment for pediatric OSA and results in significant improvement in symptoms and quality of life in the majority of cases [17]. The high prevalence of adenotonsillar hypertrophy in the present study highlights the critical role of early ENT evaluation and timely intervention.

Obesity emerged as the second most common etiological factor and was independently associated with moderate-to-severe OSA (OR 2.5, $p = 0.01$). This finding mirrors global trends indicating a shift toward a more complex phenotype of pediatric OSA, where obesity contributes to persistent or severe disease even after adenotonsillectomy [14,15]. The coexistence of obesity and adenotonsillar hypertrophy in a subset of children underscores the need for a multidisciplinary approach to management, incorporating weight reduction strategies alongside surgical or medical interventions.

Craniofacial abnormalities, although less prevalent (10.1%), were significantly associated with OSA in this cohort. Structural anomalies affecting maxillofacial development have been recognized as important contributors to upper airway narrowing and increased airway resistance during sleep [12]. While their prevalence was lower compared to adenotonsillar hypertrophy and obesity, their identification is clinically relevant, particularly in children with persistent symptoms despite standard treatment [12].

Logistic regression analysis further demonstrated that age greater than six years, adenotonsillar hypertrophy, obesity, and mouth breathing were significant predictors of moderate-to-severe OSA. These findings are consistent with previous studies showing that disease severity is influenced by a combination of anatomical obstruction, anthropometric factors, and clinical symptomatology [13,17]. The identification of mouth breathing as an independent predictor highlights its potential role as a marker of chronic airway obstruction and disease severity.

Overall, the findings of the present study indicate that the clinical and etiological profile of pediatric OSA in Kashmir closely parallels global trends while providing valuable regional data. The predominance of adenotonsillar hypertrophy and habitual snoring underscores the importance of early recognition in outpatient settings. Additionally,

the significant contribution of obesity emphasizes the need for preventive strategies addressing childhood overweight and obesity as part of comprehensive OSA management.

Ethical Consideration

Ethical approval was obtained from the Institutional Ethics Committee prior to study initiation. Written informed consent was obtained from parents or legal guardians of all participating children, and age-appropriate assent was obtained from children older than seven years whenever feasible. Participation was voluntary, and confidentiality of all patient information was maintained.

Conflict of Interest: Nil

Limitations

Being a Cross-sectional hospital-based design,limits causal inference and generalizability to the community population. Diagnosis based on screening tools rather than polysomnography may introduce misclassification bias.

Table 1. Demographic Profile of Participants (n = 158)

Variable	Category	Frequency (n)	Percentage (%)	χ^2 value	df	p-value
Age Group	2–5 years	52	32.9	6.32	2	0.04
	6–9 years	66	41.8			
	10–12 years	40	25.3			
Gender	Male	96	60.8	5.18	1	0.02
	Female	62	39.2			
BMI Category	Normal	99	62.7	6.45	1	0.01
	Overweight/ Obese	59	37.3			

Table 2. Clinical Presentation & Etiological Factors (n = 158)

Risk Factor	Odds Ratio (OR)	95% CI	p-value
Adenotonsillar hypertrophy	3.3	1.9–5.8	0.001
Obesity	2.5	1.4–4.3	0.01
Male sex	1.5	0.9–2.6	0.08
Age >6 yrs	2.0	1.2–3.4	0.02
Mouth breathing	1.9	1.1–3.2	0.03

Table 3. Association Between Risk Factors and Moderate–Severe OSA (n = 158)

Symptom	Present (n)	Percentage (%)	χ^2 value	df	p-value
Snoring	132	83.5	18.76	1	<0.001
Mouth breathing	95	60.1	5.32	1	0.02
Daytime sleepiness	63	39.9	4.68	1	0.03
Witnessed apnea	56	35.4	4.11	1	0.04

REFERENCES

1. Lumeng JC, Chervin RD. Epidemiology of pediatric obstructive sleep apnea. Sleep Med Rev. 2008.
2. Kaditis AG, Alvarez MLA, Boudewyns A, et al. Obstructive sleep disordered breathing in children. Eur Respir J. 2016.
3. StatPearls. Pediatric Obstructive Sleep Apnea. NCBI Bookshelf. 2024 update.
4. Marcus CL, Brooks LJ, Draper KA, et al. Diagnosis and management of childhood OSA. Pediatrics. 2012.
5. Lumeng JC, Chervin RD. Snoring as a predictor of sleep-disordered breathing in children. Sleep Med Rev.
6. Katz ES, D'Ambrosio CM. Pediatric obstructive sleep apnea syndrome. Clin Chest Med. 2010. Kaditis AG, Alonso Alvarez ML, Boudewyns A, Alexopoulos EI, Ersu R, Joosten K, et al. Obstructive sleep disordered breathing in 2- to 18-year-old children: diagnosis and management. Eur Respir J. 2016;47(1):69-94.
7. Marcus CL, Brooks LJ, Draper KA, Gozal D, Halbower AC, Jones J, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics. 2012;130(3):576-584.
8. Lumeng JC, Chervin RD. Epidemiology of pediatric obstructive sleep apnea. Proc Am Thorac Soc. 2008;5(2):242-252.
9. 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.
10. Esteller E. Obstructive sleep apnea-hypopnea syndrome in children: beyond adenotonsillar hypertrophy. Acta Otorrinolaringol Esp. 2015;66(2):111-119.
11. Menzies V, Baillieul S, de Jesus O. Common sleep disorders in children: assessment and treatment. Children (Basel). 2023;10(5):1-15.
12. Villa MP, Evangelisti M, Martella S, Barreto M. Pediatric sleep respiratory disorders: epidemiology and risk factors. Children (Basel). 2023;10:1-17.
13. Wang J, Li Y, Huang Z, et al. Correlations between obstructive sleep apnea and adenotonsillar hypertrophy in children of different weight status. Sci Rep. 2019;9:11433.
14. Valera FC, Demarco RC, Anselmo-Lima WT. Obstructive sleep apnea syndrome in mouth-breathing children. Braz J Otorhinolaryngol. 2022;88(5):755-762.
15. Zhang X, Li S, Liu Y, et al. Subtypes of obstructive sleep apnea in children and related factors. Nat Sci Sleep. 2022;14:1697-1708.
16. Alqarni AA, et al. Awareness and knowledge regarding pediatric obstructive sleep apnea symptoms and risk factors. Cureus. 2024;16:exxxxx.
17. Brietzke SE, Gallagher D. The effectiveness of adenotonsillectomy for obstructive sleep apnea in children: a meta-analysis. Otolaryngol Head Neck Surg. 2006;134(6):979-984.