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RESEARCH ARTICLE
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# IMPACT OF SLEEP APNEA ON PEDIATRIC ENT HEALTH

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**Abstract**

**Background:** OSA in children is an established sleep condition involving episodic closing of the upper airways mainly because of enlarged adenoid and tonsils. The condition plays an essential role in causing numerous ENT complications that affect otitis media and create nasal blockages in addition to triggering speech developmental issues and craniofacial structural problems. Untreated pediatric obstructive sleep apnea can lead to three significant consequences for both cognitive development and hearing abilities as well as life quality which strongly support early medical intervention.

**Objectives:** to analyzes pediatric OSA's effects on ENT-associated diseases while investigating how severe OSA relates to different ear-nose-throat complications.

**Study design:** A prospective cohort study**.**

**Place and duration of study.** Department of ENT MTI KGN BMC Bannu from jan 2021 to Dec 2021

**Methods:** A prospective cohort analysis evaluated 100 pediatric OSA patients through polysomnography diagnosis. Evaluation through thorough ENT examinations included three tests: otoscope examination and tympanometry and nasopharyngoscopy. The research gathered information about ENT symptoms and diagnoses for analysis. The severity of OSA received categories according to the medical measurement known as apnea-hypopnea index (AHI). Statistical calculations were carried out through SPSS v25 software where p values less than 0.05 denoted significant relationships between varia A prospective cohort analysis evaluated 100 pediatric OSA patients through polysomnography diagnosis. Evaluation through thorough ENT examinations included three tests: otoscope examination and tympanometry and nasopharyngoscopy. The research gathered information about ENT symptoms and diagnoses for analysis. The severity of OSA received categories according to the medical measurement known as apnea-hypopnea index (AHI). Statistical calculations were carried out through SPSS v25 software where p values less than 0.05 denoted significant relationships between variables.bles.

**Results:** One hundred pediatric patients with mean age of 6.4 ± 2.1 years participated in the study. Seventy-two percent had moderate-to-severe OSA. Eighty-five percent of patients showed enlarged adenoids and tonsils during clinical examination. The occurrence of recurrent otitis media turned out to be greater in patients with severe obstructive sleep apnea (p=0.032). The survey revealed nasal obstruction and chronic mouth breathing affected 68% and 59% of the total participants. The test results from tympanometry detected Eustachian tube dysfunction in 42% of these patients. The study results confirmed a statistically important connection between AHI score ratings and ENT medical condition counts using a p value of 0.017.

**Conclusion:** The effects of Pediatric OSA upon ENT health are substantial because it causes chronic otitis media and nasal obstruction and upper airway inflammation. Preventive measures such as early identification along with treatments from multiple healthcare professionals should combine with adenotonsillectomy procedures to prevent lasting medical complications. All protocols for managing OSA in children should include regular ENT assessments.

**Keywords:** Pediatric, Sleep Apnea, ENT, Otitis Media

## INTRODUCTION

The sleep-related breathing disorder pediatric obstructive sleep apnea (OSA) shows itself through upper airway blockages that cause intermittent hypoxia and sleep fragmentation during sleep periods [1]. New data indicates pediatric individuals have OSA prevalence rates between 1% to 5% and maximum occurrences happen during ages two through eight which corresponds to tonsil and adenoid tissue growth [2,3]. Long-standing hypertrophy of adenoids and tonsils represents the major factor leading to OSA development but obesity and craniofacial irregularities and allergic rhinitis and neuromuscular disorders and genetic conditions affecting Down syndrome and Pierre Robin sequence also contribute to the condition [4,5]. OSA shows its clinical signs which go past noisy nighttime breathing and nighttime sleep disturbances. The typical manifestation of children with OSA includes behavioral problems and academic decline together with urge incontinence and extreme daytime sleepiness [6]. OSA significantly affects the ENT health of children. External studies indicate that OSA leads to anatomical modifications which generate multiple ENT conditions that affect patients by producing chronic otitis media with effusion together with Eustachian tube dysfunction and recurrent tonsillitis and nasal obstruction and chronic rhinitis and speech delay [7]. During apnea the negative pressure in the chest space can lead to middle ear aeration changes and increased ear infections [8]. Workers associated with OSA who breathe through their mouth exhibit an increased risk of maxillofacial anomalies along with high-arched palates and malocclusion which strengthen ENT complications [9]. Surgical treatment outcomes vary between children therefore complete responses are infrequent which leads to needing a proper ENT examination together with multidisciplinary medical care. Study of OSA severity-related ENT complications will direct both early medical treatments and help prevent long-term issues with speech development and auditory processing together with cognitive impairments [11]. This research evaluates the ear-nose-throat health status of children who receive OSA diagnoses while identifying potential relationships between sleep apnea severity and these conditions to support effective medical practices.

**Methods:** This prospective observational study was conducted over 12 months in the Department of ENT MTI KGN BMC Bannu from jan 2021 to Dec 2021 Pediatric Sleep Medicine at a tertiary care hospital. A total of 100 children between the ages of 2 and 12 years who were diagnosed with OSA through overnight polysomnography were enrolled. Detailed ENT evaluations were conducted, including anterior rhinos copy, otoscope, nasopharyngoscopy, and tympanometry. OSA severity was categorized using the apnea-hypopnea index (AHI) into mild, moderate, and severe. ENT comorbidities such as chronic otitis media, adenoid hypertrophy, nasal obstruction, mouth breathing, and speech delay were documented. Data were recorded using a standardized preform, and informed consent was obtained from parents or guardians. Institutional ethical approval was secured prior to study commencement.

**Inclusion Criteria:** The research included children between ages 2–12 who received both a polysomnography diagnosis of OSA and necessary ENT evaluation.

**Exclusion Criteria:** The criteria excluded children who had received ENT surgery or displayed craniofacial syndromes or neurological conditions impacting respiratory control for the purpose of controlling potential factors that could affect ENT and sleep quality.

**Data Collection:** Research data came from three sources - clinical examinations conducted by medical ENT professionals and parent interviews and sleep study reports. The study recorded both ENT examination results and sleeping metrics and a list of confounding illnesses. The procedure of tympanometry supported middle ear status assessment. Research personnel documented both demographic information and medical history data of every participant to conduct correlation tests and subgroup comparisons.

**Statistical Analysis:** The analysis utilized SPSS version 24.0 provided by IBM Corp. from Armonk, NY. A summary of patient characteristics along with clinical findings appeared in the descriptive statistics report. Chi-square tests assessed categorical variables. The correlation between OSA severity and ENT comorbidities was measured through analysis with Pearson's correlation coefficient. A statistical significance occurred at a p-value less than 0.05.

**Results:** Research included 100 pediatric patients who had OSA diagnosis averaging 6.4 ± 2.1 years of age. The patient group included sixty percent male participants along with forty percent female participants. Based on AHI results 28% of patients had mild OSA whereas 35% experienced moderate OSA and 37% had severe OSA. The research participants showed adenotonsillar hypertrophy affecting 85% of the sample group. A majority of affected patients experienced persistent nasal blockage totaling 68% while 59% of these children had developed regular nose-breathing habits. A diagnosis of otitis media with effusion occurred in 46% of the participants with a special incidence among patients who experienced moderate-to-severe OSA (p=0.032). Eustachian tube dysfunction could be detected by tympanometry in 42% of the patient sample. A total of 19 percent of children with OSA presented speech delays and this condition mostly affected severe OSA patients. Subjects showed a statistically substantial relationship where AHI severity matched with the amount of ENT comorbidities (r=0.47, p=0.017). Severe obstructive sleep apnea patients showed a higher number of ear nose and throat medical conditions than patients with mild obstructive sleep apnea. The study found no meaningful variations between male and female patients regarding their rates of ENT complications.

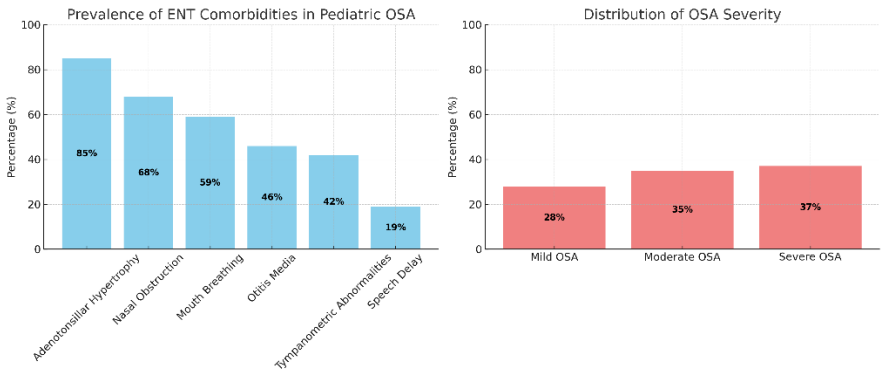


**Table 1. Demographic Characteristics of Study Participants (n = 100)**

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Age (mean ± SD) | – | 6.4 ± 2.1 years |
| Gender | | |
| • Male | 60 | 60% |
| • Female | 40 | 40% |
| OSA Severity | | |
| • Mild | 28 | 28% |
| • Moderate | 35 | 35% |
| • Severe | 37 | 37% |

**Table 2. Prevalence of ENT Comorbidities in Pediatric OSA (n = 100)**

| ENT Comorbidity | Frequency (n) | Percentage (%) |
|---|---|---|
| Adenotonsillar hypertrophy | 85 | 85% |
| Nasal obstruction | 68 | 68% |
| Mouth breathing | 59 | 59% |
| Otitis media with effusion | 46 | 46% |
| Tympanometry abnormalities | 42 | 42% |
| Speech delay | 19 | 19% |

**Table 3. Association Between OSA Severity and ENT Comorbidities**

| ENT Comorbidity | Mild OSA (n=28) | Moderate OSA (n=35) | Severe OSA (n=37) | p-value |
|---|---|---|---|---|
| Adenotonsillar hypertrophy | 21 (75%) | 31 (89%) | 33 (89%) | 0.081 |
| Otitis media with effusion | 6 (21%) | 17 (49%) | 23 (62%) | 0.032* |
| Tympanometry abnormalities | 4 (14%) | 15 (43%) | 23 (62%) | 0.019* |
| Speech delay | 2 (7%) | 5 (14%) | 12 (32%) | 0.041* |

## Discussion

obstructive sleep apnea in children strongly links with multiple ENT conditions which proves the complex ways OSA affects otolaryngology health. This study confirms existing findings which show lymphoid tissue hypertrophy as the main cause of respiratory obstruction in children because its presence was identified in 85% of patients [12]. Medically removal of adenoids and tonsils stands as the primary therapy for pediatric OSA while research shows substantial clinical benefits after surgical intervention [13]. The relationship established in previous research between negative intrathoracic pressure during apnea episodes and Eustachian tube dysfunction supports our findings about tympanometry problems in patients with moderate to severe OSA [14]. Research from Chervin et al. indicated that sleep-disordered breathing children showed higher middle ear infection rates because their ear ventilation suffered impairment [15]. Kool et al. proposed that intermittent hypoxia together with inflammatory reactions increase the risk of chronic otitis media in children [16]. Scientific evidence shows that hypoxia due to OSA impairs cognitive and language development in children [17The research of Goal et al shows untreated pediatric OSA negatively impacts cognitive abilities especially memory and attention and verbal skills among early developing children [18]. Our results demonstrate the significance of rapid identification and treatment for both respiratory condition improvement and neurodevelopmental benefits. At the same time the study shows a statistical link between oxygen desaturation events per hour (apnea-hypopnea index) scores and the number of ENT comorbidities. When OSA progresses to severe categories the number of ENT-related illnesses becomes more significant. The survey results match results from Bhattacharjee et al. who found that kids with serious OSA would still maintain their persistent ENT symptoms following adenotonsillectomy procedures [19]. The findings highlight the requirement for dual sleep medicine specialist and otolaryngologist management in pediatric OSA care along with consideration of non-surgical contributors like allergic rhinitis obesity and craniofacial abnormalities [20]. Future research demands larger study groups and extensive patient monitoring to investigate these connections between OSA and ENT pathology in children. Including regular ENT examinations as part of pediatric OSA diagnosis pathways will boost early comorbidities detection and improve total patient results.

**Conclusion:** Childhood obstructive sleep apnea has a negative influence on ENT health because it commonly develops together with enlarged adenoids and tonsils and middle ear infections and poor speech development. OSA severity affects the number of ENT conditions which develop in patients.

A timely multidisciplinary approach along with ENT assessment stands essential for treating affected children to prevent consequences while enhancing both their breathing functions and brain development and communication abilities.

**Limitations:** The conclusions could be less widely applicable due to the research design and small number of participants. The study did not evaluate factors like allergic rhinitis or obesity together with craniofacial anomalies so they could influence ENT and OSA outcomes. The authors did not include any long-term measurement data.

**Future Directions:** Large-scale research with extended follow-up on multiple centers needs to evaluate how long-term OSA therapy affects ENT medical health. More complete understanding of multifactorial factors would result from including variables that measure obesity status and allergies as well as craniofacial morphology features. Protection of patients' neurocognitive health after therapy will help ensure more proper clinical guidance.

**Abbreviations**

1. **OSA** - Obstructive Sleep Apnea
2. **ENT** - Ear, Nose, and Throat
3. **AHI** - Apnea-Hypopnea Index
4. **SPSS** - Statistical Package for the Social Sciences
5. **SD** - Standard Deviation
6. **n** - Number of participants in the sample
7. **p-value** - Probability value
8. **IBM** - International Business Machines Corporation
9. **OSD** - Obstructive Sleep Disorder

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**Authors Contribution**

Concept & Design of Study: **Saadat ullah khan[1]**
Drafting: **Suhail Ahmad[2]**
Data Analysis: **Saadat ullah khan[1]**
Critical Review: **Saadat ullah khan[1]**
Final Approval of version: **All Mentioned Authors Approved**

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