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Assessment of the Influence of OSA and Associated Risk Factors on Postoperative Complications in Pediatric Adenotonsillectomy

Dr. Afroza Suraya Majumder[1*], Dr. Md. Iqbal Hossen[1], Dr. Zahid Mahmud[2], Prof. Dr Md Alamgir Choudhury[3], Dr. Kazi Mohammad Faruque[4]

[1]Associate Professor, Department of ENT, Head & Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh
[2]Medical Officer, Department of ENT, Head & Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh
[3]Professor, Department of ENT, Head & Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh
[4]Registrar, Department of Otolaryngology–Head and Neck Surgery, Sir Salimullah Medical College and Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Afroza Suraya Majumder
Associate Professor, Department of ENT, Head & Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh

Abstract | **Original Research Article**

***Introduction*:** Obstructive Sleep Apnea (OSA) is a significant pediatric health concern, often attributed to hypertrophy of lymphatic tissue, particularly the tonsils and adenoids. Adenotonsillectomy remains the primary treatment modality, though the procedure is not without risk. This study aimed to assess the influence of OSA and associated risk factors on postoperative complications in children undergoing adenotonsillectomy. ***Methods*:** This retrospective observational study was conducted in the Department of Otolaryngology–Head and Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh, from December 2022 to December 2024. In this study, we included 143 pediatric patients with obstructive sleep apnea (OSA) who underwent adenotonsillectomy within the study period at the otolaryngology department of our institution. ***Result*:** The majority of patients were aged 5–8 years (39.16%), with a slight male predominance (56.64%). Comorbidities were present in 53 patients (37.06%), with rhinitis being the most common (29.37%). Most procedures were completed within 20–40 minutes (72.73%). Per-operative hemorrhage was noted in 22.38% of patients. The most common postoperative complication was sore throat (78.32%), followed by sneezing (29.37%), pain (26.57%), and cough (20.28%). Despite these symptoms, full recovery was observed in all patients (100%). Risk factors significantly associated with complications included a young age of <3 years (21.68%), low body weight <13 kg (18.88%), low BMI <14.5 kg/m² (17.48%), comorbidities (37.06%), and longer surgical duration >40 minutes (20.28%). ***Conclusion*:** This study showed that Adenotonsillectomy remains a safe and effective treatment for pediatric OSA, although perioperative and postoperative complications are not uncommon. Identifying risk factors such as comorbidities, young age, and low BMI can help optimize perioperative planning and postoperative care to improve outcomes.

Keywords: Obstructive Sleep Apnea, Adenotonsillectomy, Postoperative Complications, Risk Factors.

INTRODUCTION

Obstructive sleep apnea (OSA) is a chronic, sleep-related breathing disorder characterized by recurrent episodes of upper airway obstruction during sleep [1]. Its prevalence in adults ranges widely from 5.4% to 45.7% [2], whereas in children it is reported to be significantly lower, affecting approximately 1–5% [3]. Unlike adults, where obesity is a predominant contributing factor, pediatric OSA is most commonly caused by hypertrophy of lymphatic tissue, particularly the tonsils and adenoids [4, 5]. Consequently, the first-line treatment for OSA in children typically involves surgical removal of this hypertrophic tissue via adenotonsillectomy [6]. In cases where the tonsils are not enlarged and the adenoids are the primary cause of obstruction, adenoidectomy alone may be considered sufficient [7, 8].

The success rate of adenotonsillectomy in treating pediatric OSA varies considerably, ranging from 27.2% to 82.9% [6], yet it plays a critical role in preventing long-term complications such as hypertension and attention deficit hyperactivity disorder (ADHD) [9]. Although OSA is the most common indication for adenotonsillectomy in many countries, it is also recognized as a significant risk factor for postoperative complications, particularly oxygen desaturation. As a precaution, many institutions routinely recommend postoperative monitoring in a pediatric

intensive care unit (PICU) for children diagnosed with OSA [10].

Despite its therapeutic benefits, adenotonsillectomy carries inherent risks, including hemorrhage, dehydration, nausea, vomiting, pain, and the potential need for additional airway support following surgery [11–14]. In children undergoing adenotonsillectomy for OSA, the incidence of respiratory complications requiring medical intervention has been reported to range from 21% to 36% [12, 13]. Given the strong association between OSA and increased risk of respiratory complications, it is crucial to identify predisposing factors that may elevate this risk, thereby improving patient safety and optimizing care. There is broad consensus that children with severe OSA should be closely monitored in the postoperative period [15]. However, there remains considerable debate regarding the appropriate level of postoperative observation. While some experts support day-case surgery for children with OSA, others advocate for elective PICU admission or, at a minimum, more refined criteria for determining which patients require intensive postoperative care [16–19].

Therefore, this study aimed to assess the influence of OSA and associated risk factors on postoperative complications in children undergoing adenotonsillectomy.

METHODOLOGY & MATERIALS

This retrospective observational study was conducted in the Department of Otolaryngology–Head and Neck Surgery, Anwer Khan Modern Medical College Hospital, Dhaka, Bangladesh, from December 2022 to December 2024. In this study, we included 143 pediatric patients with obstructive sleep apnea (OSA) who underwent adenotonsillectomy within the study period at the otolaryngology department of our institution.

These are the following criteria to be eligible for enrollment as our study participants:

Inclusion Criteria

- Pediatric patients aged 0–14 years;
- Patients who underwent adenotonsillectomy during the study period;
- Patients with complete clinical records and consent obtained from parents/guardians.

Exclusion Criteria

- Patients with incomplete records;
- Patients with known systemic comorbidities that could influence postoperative recovery;
- Emergency surgical cases.

Data Collection

A written consent was taken after an explanation of the study procedure. Data were collected using a questionnaire. Variables recorded included demographic characteristics (age, gender, education level), operative time, intraoperative and postoperative complications, and recovery outcomes. Postoperative symptoms such as sore throat, stuffy nose, bad breath, bleeding, pain, sneezing, and cough were monitored on the first postoperative day. Operative duration was categorized into three time ranges (20–40 minutes, 40–50 minutes, and 50–75 minutes). Complications and recovery status were assessed both immediately postoperatively and during follow-up visits.

Statistical Analysis

All data were recorded systematically in a pre-formatted data collection form. Quantitative data was expressed as mean and standard deviation; qualitative data was expressed as frequency distribution and percentage. The data were analyzed using SPSS 22 (Statistical Package for Social Sciences) for Windows version 10.

This study received ethical approval from the Institutional Review Committee of Anwer Khan Modern Medical College Hospital in Dhaka, Bangladesh.

RESULTS

Table 1: Sociodemographic profile of our pediatric patients (N=143)

Demographic Characteristics	Number of Patients	Percentage (%)
Age group		
0–4 years	43	30.07
5–8 years	56	39.16
9-14 years	44	30.77
Mean weight (kg)	19.76 ± 8.22	
Mean BMI (kg/m^2)	15.67 ± 4.29	
Gender		
Male	81	56.64
Female	62	43.36
Education Level		
Toddler	38	26.57
Pre-School going	63	44.06

Demographic Characteristics	Number of Patients	Percentage (%)
School going	42	29.37
Comorbidity		
Obesity	16	11.19
Asthma	29	20.28
Rhinitis	42	29.37

Table 1 summarizes the demographic profile of the patients included in the study. The most common age group was 5–8 years, comprising 56 patients (39.16%), followed by 9–14 years with 44 patients (30.77%), and 0–4 years with 43 patients (30.07%). The study population had a mean body weight of 19.76 ± 8.22 kg and a mean body mass index (BMI) of 15.67 ± 4.29 kg/m². Regarding gender, males accounted for a slightly higher proportion (81; 56.64%) compared to females (62; 43.36%). Regarding education level, 63 patients (44.06%) were pre-school going, 42 (29.37%) were school going, and 38 (26.57%) were toddlers. Among comorbid conditions, rhinitis was the most prevalent, affecting 42 patients (29.37%), followed by asthma (20.28%) and obesity (11.19%).

Table 2: Distribution of study participants by blood group (N=143)

Blood Group	Number of Patients	Percentage (%)
O+	39	27.27
A+	42	29.37
B+	36	25.17
AB+	18	12.59
Others	8	5.59

Table 2 shows the distribution of blood groups among the study participants. The most common blood group was A+ (29.37%), followed closely by O+ (27.27%) and B+ (25.17%). AB+ was observed in 18 patients (12.59%), while other blood groups accounted for 8 patients (5.59%).

Table 3: Distribution of study subjects by time of operation (N=143)

Duration	Number of Patients	Percentage (%)
20–40 min	104	72.73
40–50 min	22	15.38
50–75 min	17	11.89

Table 3 shows the distribution of patients based on the time taken to complete their surgical procedures. The majority of patients (72.73%) underwent operations lasting between 20 and 40 minutes. A smaller proportion of surgeries lasted between 40 and 50 minutes (15.38%), while the remaining 17 patients (11.89%) had procedures lasting between 50 and 75 minutes.

Table 4: Distribution of complications and outcomes among patients (N=143)

Per-operative Complication	Number of Patients	Percentage (%)
Hemorrhage	32	22.38
Postoperative complications		
Sore Throat	112	78.32
Sneezing	42	29.37
Pain	38	26.57
Cough	29	20.28
Bleeding	22	15.38
Bad Breath	19	13.29
Stuffy Nose	12	8.39
Outcome		
Fully Recovered	143	100.00

This table presents the frequency and percentage of per-operative and postoperative complications observed in the study population. Hemorrhage was the primary per-operative complication, occurring in 32 patients (22.38%). Postoperatively, the most common symptom was sore throat, reported in 112 patients (78.32%), followed by sneezing in 42 patients (29.37%), pain in 38 (26.57%), and cough in 29 (20.28%). Other complications included bleeding (15.38%), bad breath (13.29%), and stuffy nose (8.39%). Despite these complications, all 143 patients

(100%) achieved full recovery during the follow-up period.

Table 5: Risk factors for postoperative complications in obstructive sleep apnea (OSA) patients (N=143)

Risk Factors	Number of Patients	Percentage (%)
Young age (< 3 y)	31	21.68
Low body weight (< 13 kg)	27	18.88
Low BMI (< 14.5 kg/m^2)	25	17.48
Comorbidities	53	37.06
Long surgical duration (> 40 min)	29	20.28

Table 5 shows the prevalence of various risk factors that may contribute to postoperative complications in children with OSA undergoing adenotonsillectomy. The most common risk factor observed was the presence of comorbidities, noted in 53 patients (37.06%). Young age (less than 3 years) was identified in 31 patients (21.68%), while 27 patients (18.88%) had low body weight (<13 kg), and 25 (17.48%) had a low body mass index (BMI <14.5 kg/m²). Additionally, prolonged surgical duration (>40 minutes) was documented in 29 patients (20.28%).

DISCUSSION

Obstructive sleep apnea (OSA) affects approximately 1–5% of the pediatric population, with most cases attributed to hypertrophic adenoids and/or tonsils rather than obesity, which is more commonly implicated in adults [20–22]. Consequently, adenotonsillectomy or adenoidectomy remains the standard treatment in children with OSA [22, 23]. Although frequently performed even as a day-case procedure in many healthcare systems, these surgeries are not without risk [22]. Children with OSA are particularly prone to respiratory complications postoperatively, often attributed to increased secretions and postoperative edema in the adenoidal and tonsillar regions [24, 25]. Our study demonstrated that children diagnosed with OSA presented with significantly different baseline and clinical characteristics compared to those undergoing adenotonsillectomy for other indications. Specifically, they had lower body weight and BMI, which may reflect growth failure or earlier recognition of symptoms due to disease severity. While some studies have linked higher BMI in children with OSA to obesity-related pathogenesis [4-20], our findings align with research indicating that affected children often present at a younger age with lower weight and BMI, which may reflect underlying nutritional deficits or earlier recognition of symptoms due to greater severity [26].

Children with OSA more frequently required combined tonsillectomy and adenoidectomy, resulting in longer operative times. Although some literature supports adenoidectomy alone for managing pediatric OSA [7, 8], others advocate for routine adenotonsillectomy to ensure adequate airway clearance, particularly in moderate to severe cases [4, 5].

In the present study, per-operatively, hemorrhage was the most common complication, occurring in 32 patients (22.38%). Postoperatively, sore throat was reported by 112 patients (78.32%), followed by sneezing in 42 (29.37%), pain in 38 (26.57%), and cough in 29 (20.28%). Other complications included bleeding (15.38%), bad breath (13.29%), and nasal congestion (8.39%).

A detailed analysis revealed that, in addition to OSA, younger age (particularly <3 years), low body weight, syndromic diagnoses, and longer surgery duration were all significant risk factors for perioperative and postoperative complications. Notably, younger children were more likely to experience complications during or shortly after surgery, with fewer issues arising during the overnight observation period. These findings mirror those of Rosen *et al*., who first noted that younger, medically complex children with OSA are at heightened risk of complications following adenotonsillectomy [12].

Previous studies have identified similar risk factors: age under 2 years or 3 years, obesity, underweight status, asthma, and systemic comorbidities, including neuromuscular conditions, craniofacial anomalies, cardiac abnormalities, and chromosomal disorders, have all been linked to higher rates of postoperative respiratory complications [12-30]. Both underweight and obese children appear particularly vulnerable, and in the obese children group, adenotonsillectomy may not always resolve OSA symptoms completely [7-18].

In our study, the most frequently observed risk factor was the presence of comorbid conditions such as rhinitis, asthma, or obesity, identified in 53 patients (37.06%). Among these, rhinitis was the only comorbidity significantly associated with respiratory complications. This may be explained by the increased airway secretions and edema associated with rhinitis, which, when combined with the respiratory-depressant effects of anesthesia and opioids, can increase airway resistance and raise the likelihood of perioperative respiratory events in children with severe OSA [31–34].

Despite these complications, the present study reported that all 143 patients (100%) fully recovered during the follow-up period. Literature shows a wide variability in adenotonsillectomy success rates for

pediatric OSA, ranging from 21% to 84% [6–37]. These outcomes suggest that while adenotonsillectomy is effective in many cases, it may not be curative for all children with OSA, especially those with multiple risk factors or underlying comorbidities.

Overall, our findings show that children with OSA are at a heightened risk of postoperative complications following adenotonsillectomy, particularly when compounded by young age, low body weight, or associated comorbid conditions. Therefore, a thorough preoperative assessment and vigilant postoperative monitoring, especially in high-risk patients, are critical for ensuring safety and improving outcomes.

Limitations of the Study

Our study was a single-center study, so it does not represent the whole community. We took a small sample size due to the short study period. After evaluating those patients, we did not follow up with them for the long term and did not know other possible interference that may happen in the long term with these patients.

CONCLUSION AND RECOMMENDATIONS

This study highlights the significance of obstructive sleep apnea (OSA) and associated risk factors in influencing postoperative complications following adenotonsillectomy in children. While the procedure was generally safe and effective, evidenced by a 100% recovery rate and several postoperative complications such as sore throat, sneezing, pain, and bleeding, were frequently observed. Importantly, specific risk factors including young age, low body weight, low BMI, comorbidities, and prolonged surgical duration were identified as potentially contributing to increased postoperative morbidity. These findings underscore the need for preoperative assessment and perioperative management strategies to minimize complications in pediatric OSA cases undergoing adenotonsillectomy.

Further study with a prospective and longitudinal study design, including a larger sample size, needs to be done to validate the findings of our study.

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