

# Long-Term Impact of Adenotonsillectomy on Quality of Life in Thai Children with Sleep-Disordered Breathing

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**Background:** Sleep disordered breathing (SDB) is a spectrum of disorders that is characterized by abnormal respiratory patterns during sleep, with symptoms that include snoring, mouth breathing, and pauses in breathing. No previous study has investigated the long-term impact of adenotonsillectomy on the quality of life in Thai children with SDB.

**Objective:** To investigate the long-term impact of adenotonsillectomy on the quality of life in Thai pediatric patients with SDB as measured by Obstructive Sleep Apnea-18 (OSA-18) questionnaire.

**Materials and Methods:** The present study was retrospectively conducted in Thai pediatric SDB that underwent adenotonsillectomy at Siriraj Hospital between January 1997 and December 2010. Caregivers of the present study children completed the OSA-18 questionnaire pre-operatively and at least 6-months post-operatively. Demographic and pre-operative polysomnography (PSG) data were also collected and analyzed. Pre-operative and post-operative OSA-18 total score and OSA-18 scores for all five domains were compared using paired t-test.

**Results:** Forty-nine children with SDB that underwent adenotonsillectomy were included. There were 30 boys (61.2%) and 19 girls (38.8%), with a mean age of 6.1±2.6 years (range 3.0 to 12.1). Pre-operative PSG was performed in 32 children (65.3%), with a mean apnea-hypopnea index of 12.6±12.4. Mean pre-operative and post-operative total OSA-18 score was 69.8±16.1 and 36.0±12.9, respectively. Mean duration from surgery to completion of the OSA-18 questionnaire after adenotonsillectomy was 12.5±4.6 months (range 6 to 28). Total OSA-18 score and the scores for all five OSA-18 domains were significantly improved after adenotonsillectomy ( $p < 0.001$  and  $< 0.001$ , respectively).

**Conclusion:** Long-term quality of life in Thai children with SDB was improved significantly after adenotonsillectomy, as evidenced by the significant improvement in OSA-18 total score and all OSA-18 domains. Based on these findings, the authors encourage adenotonsillectomy as the first-line treatment for SDB in Thai pediatric population.

**Keywords:** Long-term impact, Adenotonsillectomy, Quality of life, Thai children, Sleep-disordered breathing, SDB

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Sleep disordered breathing (SDB) is a spectrum of disorders characterized by abnormal respiratory

patterns during sleep. The symptoms include snoring, mouth breathing, and pauses in breathing. The severity of the disorder ranges from snoring to obstructive sleep apnea (OSA)<sup>(1)</sup>. OSA is diagnosed when SDB is accompanied by abnormal polysomnography (PSG) with obstructive events<sup>(1)</sup>. Although PSG is the gold standard for diagnosis of OSA, sleep laboratories with pediatric expertise remain limited. As such, PSG may not be available to diagnose pediatric OSA in some regions<sup>(2)</sup>. The prevalence of habitual snoring and OSA was reported to be 10% to 12% and 1% to 3%, respectively<sup>(3-5)</sup>. A study from Southern Thailand reported prevalence rates for habitual snoring and OSA of 8.5% and 0.69%, respectively<sup>(6)</sup>. In addition to nighttime symptoms, SDB also affects daytime behavior, including school

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performance, neurocognitive function, and quality of life<sup>(7-9)</sup>. Adenotonsillar hypertrophy is one of the primary causes of childhood SDB<sup>(10,11)</sup>. Accordingly, adenotonsillectomy is considered the first-line treatment for children with SDB<sup>(1,12-16)</sup>. The prevalence of SDB as an indication for adenotonsillectomy is increasing<sup>(17)</sup>.

Quality of life in children with OSA was described in reports from previous studies<sup>(18-21)</sup>. The OSA-18 is an 18 question disease-specific questionnaire-based tool that is used to measure the quality of life in children with clinical presentation of SDB<sup>(16,19-21)</sup>. Previous studies reported that pediatric OSA has significant adverse impact on patient quality of life<sup>(9,21,22)</sup>. Regarding surgical outcome, children with OSA experienced significant short-term and long-term improvement in quality of life after adenotonsillectomy, as measured by pre-operative to post-operative change in OSA-18 score<sup>(21,23-25)</sup>. However, no previous study has investigated the long-term impact of adenotonsillectomy on the quality of life in Thai children with SDB.

Accordingly, the aim of the present study was to investigate the long-term impact of adenotonsillectomy on the quality of life in Thai pediatric SDB as measured by OSA-18 questionnaire.

## Materials and Methods

The present retrospective study was conducted at Siriraj Hospital, Thailand's largest university-based national tertiary care hospital. The protocol for the present study was approved by the Siriraj Institutional Review Board (SIRB), Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (COA no.153/2556).

The medical charts of pediatric patients aged younger than 15 years diagnosed with SDB that underwent adenotonsillectomy between January 1997 and December 2010 were reviewed. Caregivers of the included children completed the OSA-18 questionnaire pre-operatively and during a routine post-operative follow-up visit. The OSA-18 was used for post-operative evaluation because it is a well-accepted and widely used instrument for the evaluation of the quality of life in children with OSA, as previously described<sup>(16,19-21)</sup>. Only patients that met the above inclusion criteria and had OSA-18 scores pre-operatively and at least 6-months post-operatively were included. Patients having one or more of the following were excluded, 1) history of previous surgery for SDB, 2) craniofacial anomalies, 3) neuromuscular diseases, 4) genetic disorders,

5) cognitive disorders, or 6) mental retardation.

The OSA-18 questionnaire was introduced by Franco et al in 2000<sup>(19)</sup>. The OSA-18 survey is a quality of life questionnaire that was designed to be completed by the caregiver. The survey consists of 18 items that are divided into five domains that include sleep disturbance, physical symptoms, emotional distress, daytime function, and caregiver concerns. Each item is scored based on a 7-point ordinal scale, as follows 1) none of the time, 2) hardly any of the time, 3) a little of the time, 4) some of the time, 5) a good bit of the time, 6) most of the time, and 7) all of the time.

The OSA-18 is graded to produce a score for each item, a score for each of the five domains, and a total score. OSA-18 total score is the sum of the 18 individual item scores, with a total score that can range from 18 (no impact on quality of life) to 126 (major negative impact)<sup>(19)</sup>. Franco et al proposed that scores less than 60 suggest a small adverse impact, scores between 60 and 80 suggest a moderate adverse impact, and scores above 80 suggest a large adverse impact on the patient's quality of life<sup>(19)</sup>. In 2015, Kuptanon et al translated and validated a Thai language version of the OSA-18<sup>(26)</sup>. Thus, the Thai version of the OSA-18 was used to evaluate the quality of life of children with SDB in the present study.

Routine history taking and physical examination were performed on each patient. Daytime and nighttime symptoms suggestive of SDB, including snoring, pauses during breathing, mouth breathing, daytime sleepiness, and hyperactivity, were recorded. Ear, nose, and throat examination (including measurement of tonsillar size) was also performed. Adenoid size was assessed by either lateral skull film or flexible fiberoptic nasopharyngoscopy.

Obesity has been identified as one of the risk factors for childhood SDB<sup>(27,28)</sup>. Accordingly, the authors recorded patient weight and height measurements, with obesity being defined as weight for height equal to or greater than the median +3SD<sup>(29)</sup>.

According to the "Clinical Practice Guideline: PSG for Sleep-Disordered Breathing Prior to Tonsillectomy in Children" (the American Academy of Otolaryngology [AAO] guideline)<sup>(1)</sup>, adenotonsillectomy was to be discussed with caregivers if patient history and findings of physical examination were suggestive of SDB. Among the patients in the present study, adenotonsillectomy was performed if the caregiver was in agreement with the physician. However, PSG was performed in cases where there was discordance between clinical

**Table 1.** OSA-18 domains and total scores compared between the pre and postoperative groups

Domains	Preoperative OSA-18 score Mean±SD	Postoperative OSA-18 score Mean±SD	p-value
Sleep disturbance	16.6±4.5	6.8±3.2	<0.001
Physical symptoms	15.9±4.9	8.5±3.6	<0.001
Emotional distress	8.8±4.6	5.8±3.4	<0.001
Daytime function	9.1±3.8	5.8±2.5	<0.001
Caregiver concerns	19.7±4.7	9.0±4.3	<0.001
OSA-18 total score	69.9±15.8	36.0±12.9	<0.001

OSA-18=obstructive sleep apnea 18-item questionnaire; SD=standard deviation  
A p-value <0.05 indicates statistical significance

symptoms and physical examination or when the caregivers required an objective test to demonstrate OSA before the surgical intervention.

### Statistical analysis

Microsoft Excel spreadsheet software was used to manage the data (Microsoft Corporation, Redmond, WA, USA), and IBM SPSS Statistics software, version 19.0 was used for all statistical analyses (IBM Corp., Armonk, NY, USA). Demographic and comorbidity data were expressed as number and percentage. Pre-operative PSG data were presented as mean ± standard deviation (SD). Pre-operative and post-operative total OSA-18 and individual OSA-18 domain scores were compared using paired t-test, and are given as mean ± SD. A p-value of less than 0.05 was considered to be statistically significant.

### Results

Forty-nine children with SDB that underwent adenotonsillectomy at the authors' center during the study period were enrolled. There were 30 boys (61.2%) and 19 girls (38.8%), with a mean age of 6.1±2.6 years (range 3.0 to 12.1). Obesity was found in 11 children (22.4%). Pre-operative PSG was performed in 32 children (65.3%), with a mean apnea-hypopnea index of 12.6±12.4. The mean pre-operative and post-operative total OSA-18 score was 69.8±16.1 and 36.0±12.9, respectively. The mean duration from surgery to completion of the OSA-18 questionnaire after adenotonsillectomy was 12.5±4.6 months (range 6 to 28). The total OSA-18 score was significantly improved after the adenotonsillectomy (p<0.001). Moreover, the scores for all five domains of the OSA-18 questionnaire were also significantly

improved after the surgery (p<0.001) (Table 1).

The impact of SDB on patient quality of life was evaluated pre-operatively and post-operatively. The pre-operative adverse impact of SDB on the quality of life in the 49 of the present study children was as follows, 14 children (28.6%) with small adverse impact, 21 children (42.9%) with moderate adverse impact, and 14 children (28.6%) with large adverse impact on their quality of life. The post-operative adverse impact of SDB on the quality of life was as follows, 46 children (93.9%) with small adverse impact, and three children (6.1%) with moderate adverse impact. No children with a large adverse impact on their quality of life was observed post-operatively.

### Discussion

The present study demonstrated that long-term quality of life was significantly improved in children with SDB after adenotonsillectomy. Importantly, total OSA-18 score and the scores for the five OSA-18 domains were all significantly improved post-operatively. The present study results were consistent with those of previous studies that demonstrated both short-term and long-term improvement after adenotonsillectomy<sup>(25,30-35)</sup>. A study from Thailand investigated the urine cysteinyl leukotriene levels and the quality of life in children with SDB, between before and after adenotonsillectomy<sup>(36)</sup>. That group concluded that adenotonsillectomy alleviated systemic inflammation and improved the patient's quality of life. However, they did not specify the mean length of time from surgery to completion of the post-operative OSA-18. As such, the present study differed from that study in terms of both long-term follow-up and evaluation of improvement in quality of life after adenotonsillectomy.

In terms of adverse impact of SDB on the quality of life, most children in the present study had moderate or large adverse impact on quality of life pre-operatively. However, after surgery, most patients in the present study (93.9%) had small adverse impact on quality of life, and no patients had large adverse impact on their quality of life. Therefore, the findings of the present study confirmed the effectiveness of adenotonsillectomy for improving the quality of life in Thai pediatric patients with SDB.

The present study has some mentionable limitations. First, only 65.3% of the present study patients underwent pre-operative PSG, which meant that SDB in the remaining patients was diagnosed clinically. As such, the results of the present study

may not be generalizable to patients with OSA, because OSA requires diagnosis that is based on both clinical and PSG data<sup>(37)</sup>. However, in contrast to that diagnostic requirement for OSA, according to the AAO guideline, patients are recommended to undergo adenotonsillectomy if they had a history and physical examination findings that were consistent with SDB, and they did not have a complex medical condition<sup>(1)</sup>. Second, there may have been some selection bias in the authors' study, given that patients without both pre-operative and at least 6-months post-operative OSA-18 data were excluded. Third, the authors' study population consisted, for the most part, of otherwise normal children who were candidates for adenotonsillectomy. As a result, the present study findings may not be generalizable to children with a complex medical condition. Future studies planned by the authors' team include investigation of post-operative outcomes after adenotonsillectomy using both subjective and objective measures, and investigation of patients with complex medical conditions after adenotonsillectomy that include craniofacial anomalies, Down syndrome, or morbid obesity.

## Conclusion

The long-term quality of life in Thai children with SDB was improved significantly after adenotonsillectomy, as evidenced by significant improvement in OSA-18 total score and all OSA-18 domains. Based on these findings, the authors encourage adenotonsillectomy as the first-line treatment for SDB in Thai pediatric population.

## What is already known on this topic?

Previous studies revealed significant improvement in short- and long-term quality of life in children with SDB who underwent adenotonsillectomy; however, no similar study has been conducted in Thai pediatric SDB.

## What this study adds?

Similar to the findings in other pediatric populations, significant improvement in OSA-18 total scores and all OSA-18 domains after adenotonsillectomy was also observed among Thai pediatric SDB.

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## Conflicts of interest

All authors declare no personal or professional conflicts of interest, and no financial support from the companies that produce or distribute the drugs, devices, or materials described in the present report.

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