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The Analysis Study of Adenotonsillectomy For Obstructive Sleep Apnea and Quality Of Life: A Systematic Review

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ABSTRACT
The recommended course of therapy for children with obstructive sleep apnea syndrome (OSAS) is adenotonsillectomy. We wanted to find out if adenoidectomy alone is a realistic and suitable treatment for kids with OSAS as it may be linked to much reduced rates of morbidity, death, and expense. This systematic review is to review the quality of life of adenotonsillectomy in patients with obstructive sleep apnea. This study demonstrated compliance with all requirements by means of a comparison with the standards established by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020. Thus, the specialists were able to guarantee that the research was as current as feasible. Publications released between 2014 and 2024 were considered for this search strategy. This was accomplished by utilizing a number of distinct online reference sites, including Pubmed, ScienceDirect, and SagePub. It was determined that reviews, previously published works, and partially completed works would not be included. In the PubMed database, the results of our search brought up 1.446 articles, whereas the results of our search on SCIENCE DIRECT brought up 2.514 articles, our search on SAGEPUB brought up 749 articles. The results of the search conducted for the last year of 2014 yielded a total 913 articles for PubMed, 1.321 articles for SCIENCE DIRECT and 749 articles for SAGEPUB. In the end, we compiled a total of 8 papers, 5 of which came from PubMed, 2 of which came from SCIENCE DIRECT and 1 of which came from SAGEPUB. We included eight research that met the criteria. In summary, the adenotonsillectomy in patients with obstructive sleep apnea has improved in behavior, symptoms, and quality of life were among the secondary outcomes.

Keywords: adenotonsillectomy, obstructive, sleep apnea

Introduction

The term "sleep-disordered breathing" (SDB) refers to a group of conditions that can range from frequent episodes of obstructed breathing during sleep to persistent snoring. Between 6% and 17% of kids are affected by the illness, and children from low-income or racially marginalized families are more likely to be affected. Untreated SDB may result in behavioral issues, excessive daytime drowsiness, impaired growth, neurodevelopment, and quality of life, as well as a higher risk of metabolic and cardiovascular disorders (Thomas et al., 2022).

In the US, 1.2% to 5.7% of children suffer from pediatric obstructive sleep apnea (OSA). Although adenotonsillectomy (AT) is the recommended first treatment for pediatric OSA, more

than 25% of children still experience persistent OSA following AT (Tauman et al., 2006).

Providing management advice might be challenging because to the dearth of published research examining the long-term effects of continuous OSA therapy in children. Research on primary OSA in children initially diagnosed with mild to moderate OSA and treated with AT has demonstrated modest behavioral and quality of life benefits, but there is inconsistent data regarding changes in attention and neurocognitive function (Venekamp et al., 2015).

The postoperative treatment of children undergoing AT for primary sleep disordered breathing (SDB) or OSA varies widely in practice. For these kids, routine clinical follow-up is not always provided, and when it is, it usually takes place over the phone or online without an in-person assessment. Furthermore, only few clinical circumstances may warrant the use of postoperative polysomnography (PSG). In the treatment of kids with chronic OSA, there is likewise no guideline for the best time to do postoperative PSG (Manickam et al., 2016).

Research Methods

Protocol

The author of this study ensured that it complied with the standards by adhering to Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. This is done to guarantee the accuracy of the results that are derived from the investigation. Thus, the specialists were able to guarantee that the research was as current as feasible. Publications released between 2014 and 2024 were considered for this search strategy. This was accomplished by utilizing a number of distinct online reference sites, including Pubmed, ScienceDirect, and SagePub. It was determined that reviews, previously published works, and partially completed works would not be included.

Criteria for Eligibility

In order to completse this literature evaluation, we looked at published research that discusses e quality of life of adenotonsillectomy in patients with obstructive sleep apnea. This is done to enhance the patient's therapy management and to offer an explanation. This paper's primary goal is to demonstrate the applicability of the issues that have been noted overall.

To be eligible to participate in the study, researchers had to meet the following requirements: 1) English must be used to write the paper. The manuscript must fulfill both of these conditions in order to be considered for publication. 2) A few of the examined studies were released after 2013 but prior to the time frame considered relevant by this systematic review. Editorials, submissions without a DOI, already published review articles, and entries that are nearly exact replicas of journal papers that have already been published are a few examples of research that are prohibited.

Search Strategy

We used "adenotonsillectomy", and "obstructive sleep apnea" out using the PubMed, Science Direct and SAGEPUB databases by inputting the words: (("adenotonsillectomies"[All Fields] OR "adenotonsillectomy"[All Fields]) AND ("obstructive sleep apnoea"[All Fields] OR "sleep apnea, obstructive"[MeSH Terms] OR ("sleep"[All Fields] AND "apnea"[All Fields] AND

"obstructive"[All Fields]) OR "obstructive sleep apnea"[All Fields] OR ("obstructive"[All Fields] AND "sleep"[All Fields] AND "apnea"[All Fields])) AND ((clinicalstudy[Filter] OR clinicaltrial[Filter] OR controlledclinicaltrial[Filter]) AND (2014:2024[pdat])) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

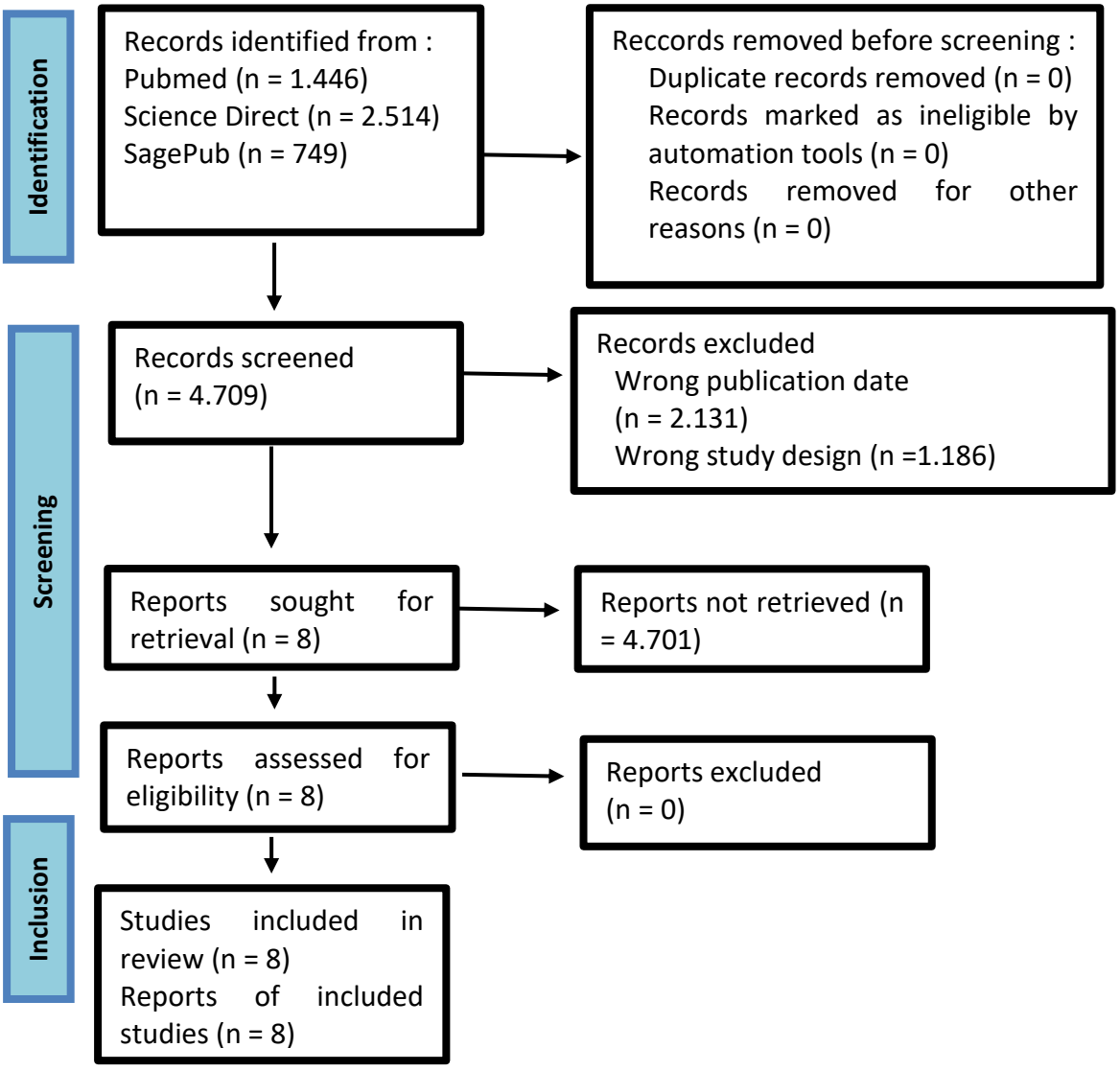

Figure 1. Prisma Flow Diagram

Only those papers that were able to satisfy all of the inclusion criteria were taken into

consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

Results and Discussion

In the PubMed database, the results of our search brought up 1.446 articles, whereas the results of our search on SCIENCE DIRECT brought up 2.514 articles, our search on SAGEPUB brought up 749 articles. The results of the search conducted for the last year of 2014 yielded a total 913 articles for PubMed, 1.321 articles for SCIENCE DIRECT and 749 articles for SAGEPUB. In the end, we compiled a total of 8 papers, 5 of which came from PubMed, 2 of which came from SCIENCE DIRECT and 1 of which came from SAGEPUB. We included eight research that met the criteria.

(Redline et al., 2023) showed that when compared to careful waiting, adenotonsillectomy did not substantially enhance executive function or attention in children with moderate SDB at one year of age. On a 12-month follow-up, children who received adenotonsillectomy, however, had better secondary outcomes, such as behavior, symptoms, and quality of life, as well as lower blood pressure and AHI.

(Garetz et al., 2015) showed that parent-rated general and OSAS-specific QoL measures and OSAS symptoms improved considerably more after adenotonsillectomy than during watchful waiting.

(Hartmann et al., 2021) showed that in children with mild OSA, there is a strong correlation between the frequency of slow, high-amplitude waves and behavioral functioning as well as quality of life. After around seven months of follow-up, early AT in children with mild-to-moderate OSA did not change the microstructure of nonrapid eye movement sleep as compared to watchful waiting.

(Taylor et al., 2016) showed that when children with OSAS were given cognitive tests without protracted desaturation, small and specific benefits of AT were seen. In comparison to data from the Childhood Adenotonsillectomy Trial, which indicates that surgery has greater

impacts on quality of life, behavior, and sleep, in may not be as effective in reversing the cognitive consequences of OSAS, or it may take longer for the benefits to materialize.

Table 1. The litelature include in this study

Redline et al, 2023[15]	USA	Randomized clinical trial	459 patients	In terms of executive function (BRIEF GEC T-scores: −3.1 for adenotonsillectomy vs. −1.9 for watchful waiting; difference, −0.96 [95% CI, −2.66 to 0.74]) and attention (GNG d-prime scores: 0.2 for adenotonsillectomy vs. 0.1 for watchful waiting; difference, 0.05 [95% CI, −0.18 to 0.27]), there were no statistically significant differences between the 2 groups at 12 months. Adenotonsillectomy resulted in greater improvements in behavioral issues, tiredness, symptoms, and quality of life than did watchful waiting. Less development of the AHI to more than 3 events/h and a larger 12-month reduction in systolic and diastolic blood pressure percentile levels were linked to adenotonsillectomy. Adenotonsillectomy-related major adverse events affected six children (2.7%).
Garetz et al,	USA	Randomize	453	Children randomized to

2015[16]		d controlled trial	patients	receive an adenotonsillectomy showed greater improvements in the majority of QoL and symptom severity measurements. These measurements included the Pediatric Quality of Life Inventory, which was completed by parents (effect size [ES]: 0.37), the 18-item Obstructive Sleep Apnea QoL instrument (ES: –0.93), the modified Epworth Sleepiness Scale score (ES: –0.42), and the Pediatric Sleep Questionnaire's Sleep-Related Breathing Scale (ES: –1.35). Obesity and baseline severity did not alter the effect, however race did in several symptom assessments. Reductions in the severity of OSAS were only partially responsible for the observed variations.
Hartmann et al, 2021[17]	Multiple country	Randomzied controlled trial	179 patients	Higher A1 phases per sleep hour was significantly linked to lower quality of life (OSA-18: ρ = 0.27, p = 0.022; PedsQL: ρ = −0.29, p = 0.015) and worse behavioral functioning (caregiver Behavior Rating Inventory of Executive Function

				(BRIEF) Global Executive Composite (GEC): ρ = 0.24, p = 0.042; caregiver Conners' Rating Scale Global Index: ρ = 0.25, p = 0.036). This association did not hold true for the entire sample. Changes in CAP parameters were similar in the eAT and WWSC arms at the 7-month follow-up. Variations in behavioral, cognitive, and quality-of-life performance assessments at follow-up were not significantly explained by CAP changes.
Taylor et al, 2016[18]	USA	Randomized controlled trial	227 patients	For both groups, the mean test results were within the average range. During the follow-up period, the eAT group's scores improved more significantly (P <.05) than those of the watchful waiting group. These changes had tiny effect sizes (Cohen's d, 0.20–0.24) and were only observed on tests of fine motor abilities, selective attention, and nonverbal thinking. Improvements in sleep measurements were linked to increases in test scores for the eAT group, providing more proof of the impact of AT on scores.
Katz et al,	USA	Randomize	464	Both the WWSC and eAT

2014[19]		d controlled trial	patients	intervention groups showed interval increases in the BMI z score (0.13 vs.0.31), although the effects of eAT were larger (P <.0001). Once the effects of baseline weight and AHI were taken into account, statistical modeling revealed that the BMI z score grew substantially higher in conjunction with eAT. Over the course of the 7-month period, a higher percentage of overweight children assigned to eAT than WWSC acquired obesity (52% vs. 21%; P <.05). The follow-up AHI, race, and gender did not substantially correlate with the change in BMI z score.
Fehrm et al, 2018[20]	Sweden	Randomized clinical trial	83 patients	The mean (SD) preoperative OAHI score was 23.8 (11.8) for APP and 23.8 (11.5) for ATE. Both the APP and ATE groups had a significant decrease in mean OAHI score after surgery (−21.7; 95% CI, −26.3 to −17.2; and −21.1; 95% CI, −24.5 to −17.7, respectively), but there was no significant difference between the groups (0.7; 95% CI, −4.8 to 6.1). Furthermore, no

				significant differences between the groups were seen regarding other polysomnography variables (eg, respiratory distress index: mean, 0.6; 95% CI, −5.0 to 6.3) or the OSA-18 questionnaire (eg, total symptom score: −0.5; 95% CI, −13 to 12). One patient from each group was readmitted owing to postoperative bleeding, but no other complications were seen.
Efune et al, 2024[21]	USA	Prospective cohort study	60 patients	Our sample's median (range) age was 4 years (1–16), and 27 (45%) of the participants were female. Among the youngsters in our cohort, 80% (n = 48) were of the Black and Hispanic races. Only 21 (35%) experienced clinically evident respiratory events, whereas thirty-nine (65%) had at least one episode of respiratory depression or airway blockage in the PACU as determined by the RVM. The following characteristics were linked by Poisson regression to an increase in episodes of respiratory depression and airway obstruction: two or more comorbidities (estimate 1.96; [1.11-3.46]), BMI Z-score 1-2 (estimate 2.04;

				[1.20-3.48]), and BMI Z-score less than -1 (estimate 3.91; [95%CI 1.49-10.23]).
Caetta et al, 2021[22]	USA	Prospective cohort study	560 patients	There were fifteen children (2.7% [95% CI 1.3, 4.0]) who experienced a respiratory problem during or after surgery. Nine patients experienced moderate problems such as stridor, croupy cough, laryngospasm, and desaturation; these did not extend the scheduled hospital or ambulatory stay. Based on their age, severe sleep study indices (AHI ≥ 24 or oxygen saturation nadir < 80%), or underlying medical condition, all six of the children with more severe complications—including prolonged desaturation, tachypnea, atelectasis, intercostal retraction, and obstructive apnea requiring continuous positive airway pressure—were planned admissions. 113 (68.5%) of the 165 children age ≥3 who had an AHI ≥10 but <24 and no medical comorbidities that were known to be predictive of postoperative problems were sent home the

				same day of surgery without experiencing any further respiratory sequelae.

(Katz et al., 2014) showed that even in children who were already overweight, eAT for OSAS causes a clinically significant increase in weight gain beyond expectations. Children who are overweight are more likely to become obese, which increases their chance of developing OSAS and other negative effects of obesity. Following eAT for OSAS, weight monitoring, dietary counseling, and physical activity promotion should be taken into consideration.

(Fehrm et al., 2018) showed that in this group of generally healthy children with severe OSA, the randomized clinical trial did not demonstrate that APP was more beneficial than ATE in terms of objective PSG variables and OSA-18 scores. According to this research, ATE should be the mainstay of care for children with severe OSA.

(Efune et al., 2024) showed that impaired breathing is more commonly detected by respiratory volume monitoring in the early postoperative phase following juvenile high-risk adenotonsillectomy than is clinically evident.

(Caetta et al., 2021) showed that according to this study, there is little chance of respiratory issues following an adenotonsillectomy. Children who are in good health and whose AHI is less than 24 years old may be eligible for ambulatory release.

DISCUSSION

Children with obstructive sleep apnea (OSA) have recurrent upper airway collapses and airflow cessations while they sleep. Loss of neuromuscular compensation and upper airway constriction are pathopahysiological factors of pediatric OSA. The primary cause of upper airway obstruction in children is thought to be hypertrophy of the tonsils and adenoids. As a result, adenotonsillectomy is frequently regarded as the initial course of treatment for juvenile OSA (Kaditis et al., 2016).

About 1% to 3% of children suffer from obstructive sleep apnea syndrome (OSAS), which has been linked to a higher risk of cardiovascular disease and other systemic morbidities. Children's behavioral problems have been linked to even milder kinds of sleep-disordered breathing. There is also evidence linking pediatric OSAS to a decline in health-related quality of life (QoL). Research (including a recent meta-analysis) showed that kids with OSAS had similar to kids with juvenile rheumatoid arthritis and poorer generic health-related QoL ratings than kids in the healthy group. More than half of the children assessed had moderate to significant impairment of disease-specific QoL (Garetz et al., 2015).

The AASM defines pediatric OSA PSG findings of 1 or more obstructive apnea, mixed apnea, or hypopnea per hour, OR a pattern of obstructive hypoventilation associated with (1) snoring, (2) flattened inspiratory nasal pressure waveforms, and/or (3) paradoxical thoracoabdominal motion. Despite the lack of guidelines, this definition is applicable to children with persistent or recurrent pediatric OSA (Sateia, 2014).

Over a 12-month period, behavior, symptom load, quality of life, blood pressure, and AHI

level were among the secondary outcomes that were improved by surgery. According to the latest research, children who snore regularly may still benefit from surgery even if their polysomnography AHI is low. The usefulness of the AHI for risk stratification in children who are usually healthy is called into question by the current findings and the literature from the past, which also supports the significance of symptoms as endpoints and predictors of treatment response (Redline et al., 2023).

The results of the large-scale, multisite, prospective, randomized controlled study by Garetz, et al, of AT for PSG-documented pediatric OSAS showed that children treated with surgical AT showed a significant and substantial improvement in key parent-reported measures of quality of life and symptoms, or "patient-centered outcomes," compared to children treated with WWSC. Improvements in PSG indicators of disease severity were linked to improvements in QoL and OSAS symptoms; however, the PSG indicators accounted for a very modest fraction of the observed improvements in QoL and symptoms (Garetz et al., 2015).

Children with moderate OSA (AHI > 10) have a strong correlation between a greater frequency of slow, high-amplitude rhythms, or so-called A1 phases, and poorer behavioral functioning, as well as a lower quality of life as reported by their caregivers at baseline, according to research by Hartmann et al. In children with mild OSA, there is a strong correlation between the frequency of slow, high-amplitude waves and both behavioral functioning and quality of life. When compared to watchful waiting, early AT has no effect on the microstructure of NREM sleep in children with mild-to-moderate OSA (Hartmann et al., 2021).

According to study of Taylor et al., children with OSAS who do not have prolonged desaturation and who have average general cognitive functioning may benefit somewhat from AT on cognitive test scores. The findings encourage further investigation into the neurological and cognitive impacts of AT for pediatric OSAS (Taylor et al., 2016).

When eAT was used for polysomnographically verified juvenile OSAS, a randomized controlled study by Katz et al. found that weight and BMI z score increased considerably more after 7 months of AT compared to WWSC. This study implies that the significant negative effects of OSAS on energy balance and metabolism are at least partially reversible upon therapy. When eAT was administered to otherwise healthy 5- to 9.9-year-old children with OSAS, weight and BMI z scores increased more than when WWSC was used. In particular, children with FTT, normal weight, and overweight showed increases in the BMI z score following AT. Interestingly, throughout the course of the trial, 51% of overweight children who were randomized to eAT developed obesity (Katz et al., 2014).

One of the risk factors for chronic OSA following surgery is severe OSA. The findings demonstrated that in terms of change in mean OAHI score, other respiratory PSG variables, and OSA-18 scores, APP was not superior than ATE in this research cohort. Out of the 47 patients, only one had severe OSA that persisted following ATE. According to this research, ATE should be the mainstay of care for kids with severe OSA (Fehrm et al., 2018).

Conclusion

In summary, the adenotonsillectomy in patients with obstructive sleep apnea has improved in behavior, symptoms, and quality of life were among the secondary outcomes.

Future studies are required to provide simple screening tools that may be used to determine which patients are more likely to benefit from adenotonsillectomy as opposed to watching and waiting. Finding objective metrics that more accurately describe the physiological factors mediating the health consequences is also necessary.

REFERENCE

Caetta, A., Timashpolsky, A., Tominaga, S. M., D'Souza, N., & Goldstein, N. A. (2021). Postoperative respiratory complications after adenotonsillectomy in children with obstructive sleep apnea. *International Journal of Pediatric Otorhinolaryngology*, *148*, 110835.

Efune, P. N., Pinales, P., Park, J., Poppino, K. F., Mitchell, R. B., & Szmuk, P. (2024). Pediatric obstructive sleep apnea: A prospective observational study of respiratory events in the immediate recovery period after adenotonsillectomy. *Anaesthesia Critical Care & Pain Medicine*, 101385.

Fehrm, J., Nerfeldt, P., Sundman, J., & Friberg, D. (2018). Adenopharyngoplasty vs adenotonsillectomy in children with severe obstructive sleep apnea: a randomized clinical trial. *JAMA Otolaryngology–Head & Neck Surgery*, *144*(7), 580–586.

Garetz, S. L., Mitchell, R. B., Parker, P. D., Moore, R. H., Rosen, C. L., Giordani, B., Muzumdar, H., Paruthi, S., Elden, L., & Willging, P. (2015). Quality of life and obstructive sleep apnea symptoms after pediatric adenotonsillectomy. *Pediatrics*, *135*(2), e477–e486.

Hartmann, S., Bruni, O., Ferri, R., Redline, S., & Baumert, M. (2021). Cyclic alternating pattern in children with obstructive sleep apnea and its relationship with adenotonsillectomy, behavior, cognition, and quality of life. *Sleep*, *44*(1), zsaa145.

Kaditis, A. G., Alvarez, M. L. A., Boudewyns, A., Alexopoulos, E. I., Ersu, R., Joosten, K., Larramona, H., Miano, S., Narang, I., & Trang, H. (2016). Obstructive sleep disordered breathing in 2-to 18-year-old children: diagnosis and management. *European Respiratory Journal*, *47*(1), 69–94.

Katz, E. S., Moore, R. H., Rosen, C. L., Mitchell, R. B., Amin, R., Arens, R., Muzumdar, H., Chervin, R. D., Marcus, C. L., & Paruthi, S. (2014). Growth after adenotonsillectomy for obstructive sleep apnea: an RCT. *Pediatrics*, *134*(2), 282–289.

Manickam, P. V., Shott, S. R., Boss, E. F., Cohen, A. P., Meinzen-Derr, J. K., Amin, R. S., & Ishman, S. L. (2016). Systematic review of site of obstruction identification and non-CPAP treatment options for children with persistent pediatric obstructive sleep apnea. *The Laryngoscope*, *126*(2), 491–500.

Redline, S., Cook, K., Chervin, R. D., Ishman, S., Baldassari, C. M., Mitchell, R. B., Tapia, I. E., Amin, R., Hassan, F., & Ibrahim, S. (2023). Adenotonsillectomy for snoring and mild sleep apnea in children: a randomized clinical trial. *JAMA*, *330*(21), 2084–2095.

Sateia, M. J. (2014). International classification of sleep disorders. *Chest*, *146*(5), 1387–1394.

Tauman, R., Gulliver, T. E., Krishna, J., Montgomery-Downs, H. E., O'brien, L. M., Ivanenko, A., & Gozal, D. (2006). Persistence of obstructive sleep apnea syndrome in children after adenotonsillectomy. *The Journal of Pediatrics*, *149*(6), 803–808.

Taylor, H. G., Bowen, S. R., Beebe, D. W., Hodges, E., Amin, R., Arens, R., Chervin, R. D., Garetz, S. L., Katz, E. S., & Moore, R. H. (2016). Cognitive effects of adenotonsillectomy for obstructive sleep apnea. *Pediatrics*, *138*(2).

Thomas, S., Patel, S., Gummalla, P., Tablizo, M. A., & Kier, C. (2022). You cannot hit snooze on OSA: sequelae of pediatric obstructive sleep apnea. *Children*, *9*(2), 261.

Venekamp, R. P., Hearne, B. J., Chandrasekharan, D., Blackshaw, H., Lim, J., & Schilder, A. G. M. (2015). Tonsillectomy or adenotonsillectomy versus non-surgical management for obstructive sleep-disordered breathing in children. *Cochrane Database of Systematic Reviews*, *10*.