

**IMPACT OF ADENOTONSILLECTOMY ON QUALITY OF LIFE IN CHILDREN WITH
OBSTRUCTIVE ADENOTONSILLAR HYPERPLASIA**Dr. Ibrahim O. Musa^{1*}, Paul A. Onakoya², Josephine A.E Eziyi³ and Joseph O. Idugboe⁴¹Department of Otorhinolaryngology, General Hospital Ilorin, Nigeria.²Department of Otorhinolaryngology, University College Hospital, Ibadan, Nigeria.³Department of Otorhinolaryngology, OAUTHC, Ile-Ife, Nigeria.⁴Department of Otorhinolaryngology, Federal Medical Centre, Yenogoa, Nigeria.***Corresponding Author: Dr. Ibrahim O. Musa**

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ABSTRACT

Introduction: Obstructive sleep apnoea (OSA) caused by enlarged tonsils and adenoid is common in the paediatric population. It is characterized by episodic partial or complete obstruction of the upper airway during sleep. This study aims to determine the impact of adenotonsillectomy on quality of life (QoL) in children with obstructive adenotonsillar hyperplasia. **Participants and method:** This was a prospective and hospital-based study of 73 children with a clinical diagnosis of obstructive adenotonsillar hyperplasia. A validated Obstructive Sleep Apnoea (OSA-18) quality of life survey questionnaire was administered to all caregivers' of participants before, 1 week, and 6 weeks after adenoidectomy and/or tonsillectomy. Tonsillar enlargement was graded by the Brodsky assessment scale and a lateral soft tissue radiograph of the nasopharynx was done to determine the adenoid nasopharyngeal ratio (ANR) parameter as described by Fujioka et al. Analysis of the data collected was done using Statistical Package for Social Sciences (SPSS version 22) and the level of statistical significance was set at $P < 0.05$. **Results:** Seventy three children participated in this study with age range 1-12 years and mean age of 3.7 years \pm 2.84, with a male to female ratio of 2.2:1. There was a significant change in mean score of QoL from pre-surgery to 1 week (mean change=26.57, 95% CI=23.17-29.97, $P=0.001$) and from pre-surgery to 6 weeks post-surgery (mean change=34.72, 95% CI=30.0-37.38, $P=0.0001$) respectively. **Conclusion:** There were significant improvements in the QoL in children with obstructive adenotonsillar hyperplasia after adenotonsillectomy at least on short-term follow up with good caregivers' satisfaction.

KEYWORDS: Quality of life, Obstructive adenotonsillar hyperplasia, Adenotonsillectomy.**INTRODUCTION**

Generally, the greatest concern of any disease to physician, patients and caregivers refer to its physical consequences. However, the impact of a disease on the quality of life (QoL) of a patient, or his/her parent/guardian, should also be taken into account when choosing treatment approaches. The palatine tonsils, nasopharyngeal tonsils (adenoid), tubal and lingual tonsils are known as Waldeyer's ring and mucosa-associated lymphoid tissue (MALT) system. This aggregation of lymphoid tissue is found at the entrance of the upper aerodigestive tract. As such, the tonsils and adenoid are the body's first line of defence for protection of the lower airways and the gastrointestinal tract, as well as for development of antigenic memory by the host.^[1,2] The principal disturbances of the tonsils and adenoid are infection and hyperplasia.

In children, obstructive sleep apnoea (OSA) is a sleep-related breathing disorder (SDB) that is usually caused

by adenotonsillar hyperplasia and is characterized by upper-airway obstruction that disturbs sleep and normal respiratory gas exchange.^[3,4] For children with OSA that is caused by adenotonsillar hyperplasia, adenotonsillectomy is the treatment of choice.^[5] There are studies that showed evidence of improved disease-specific and global quality of life (QoL) in children after adenotonsillectomy.^[6-10]

Obstructive sleep apnoea is a common finding in children with a history of adenotonsillar hyperplasia. Findings showed that significant sleep disturbance symptoms included witnessed apnoeic episodes, excessively loud snoring, chronic mouth-breathing, frequent awakening during the night, hypersomnolence, secondary enuresis, night-mares, poor school performance, dysphasia, and hyponasal speech (rhinolalia clausa).^[1,2]

Children with obstructive sleep apnoea has been shown to have an increased risk of developing systemic hypertension as well as right ventricular dysfunction due to elevated pulmonary arterial pressure.^[11] Children with obstructive sleep apnoea also have a higher risk of failure to thrive and impairment of growth development. Evidence suggested that growth hormone secretion is impaired and could affect growth.^[12] Early reports indicated 85-95% cure rates of OSA when adenotonsillectomy is done.^[13,14]

Quality of life (QoL) is a broad multi-dimensional concept that usually includes subjective evaluations of both positive and negative aspects of life.^[15] Health related quality of life (HRQOL) questions on perceived physical and mental health and function have become an important component of health surveillance and are generally considered valid indicators of service needs and intervention outcomes. Self-assessed health status also proved to be more powerful predictor of mortality and morbidity than many objective measures of health.^[15,16]

HRQOL measures make it possible to demonstrate scientifically the impact of health on quality of life, going well beyond the old paradigm that was limited to what can be seen under a microscope.^[16] There are several studies validating the OSA-18 survey health status instrument to assess children with obstructive adenotonsillar hyperplasia following adenotonsillectomy.^[6,7]

There are evidences that there is measurable deterioration in quality of life in children with obstructive adenotonsillar hyperplasia especially in domains of sleep disturbance, physical symptoms, daytime function, emotional disturbance, and parent/guardian concern about the child health status which may be reversible by adenotonsillectomy.^[6,7,8]

Third party respondent was a limitation as the questionnaire was answered by the parent or caregivers. There could be recall error and bias on the part of the parents/guardian (caregivers).

The symptoms of obstructive adenotonsillar hyperplasia are of concern to the primary caregivers. It is important to elicit the severity of symptoms by obtaining a thorough history from the patient's primary caregiver followed by thorough clinical examination.

The aim of the study is to determine the impact of adenotonsillectomy on quality of life in children with obstructive adenotonsillar hyperplasia

PARTICIPANTS AND METHOD

This was a prospective, longitudinal, and hospital based study. Consecutive patients of consenting caregivers/parents between the ages of 1-12 years with a clinical diagnosis of obstructive adenotonsillar

hyperplasia attending Otorhinolaryngology clinic of Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, were recruited between October 2013 and October 2015(2 years).

The participants were enrolled as they presented to the otorhinolaryngology clinic and were admitted to the Ear, Nose and Throat ward of OAUTHC, Ile- Ife. Ethical clearance was obtained from ethical committee of OAUTHC for this study (Appendix 1). Subject information sheet was given and explained to caregivers; and written informed consent was obtained from the parents/guardian of consecutive eligible participants, and this was followed by a detailed Ear, Nose and Throat, Head and Neck examination pre- and post-adenoidectomy and/or tonsillectomy.

Investigator-assisted OSA-18 questionnaire (Appendix 2) was administered to all eligible participants that fulfilled the inclusion criteria in order to assess the sleep disturbance, physical symptoms, emotional symptoms, daytime function, and caregiver concerns a day before surgery; one week and six weeks after the adenoidectomy and/or tonsillectomy. Maximum score was 126, score of 0-60 indicated small impact; 60-80 indicated moderate impact; more than 80 indicated severe impact.

Brodsky's assessment scale for tonsillar hyperplasia was used to grade the tonsil based on the following scale: 0 indicates that the tonsils do not impinge on the airway; 1+ indicates less than 25% airway obstruction; 2+ indicates 26% to 50% airway obstruction; 3+ indicates 51% to 75% airway obstruction; and 4+ indicates more than 75% airway obstruction.^[17]

Lateral soft tissue radiograph of nasopharynx was used in assessing the adenoid-nasopharyngeal ratio (ANR) parameter as described by Fujioka et al: grade I (0.0 – 0.25), II (0.26 – 0.50), III (0.51 – 0.75), IV (0.76 – 1.0).^[18] The degree of obstruction of the nasopharyngeal airway was classified as showing either 'no obstruction' (grade I), or 'minimal' (grade II), or 'moderate' (grade III), or 'severe' (grade IV) obstruction.^[19] The adenoidal measurement was obtained by drawing a perpendicular line from the point of maximal adenoidal tissue (convexity) to the antero-inferior aspect of the sphenobasippital synchondrosis (Fig. 1). The nasopharyngeal measurement was drawn between the posterior border of the hard palate and the antero-inferior aspect of the sphenobasippital synchondrosis (Fig. 1).When the synchondrosis is not visible, the point was determined as site of crossing posterior inferior margin of lateral pterygoid plate and bony floor of nasopharynx using a transparent ruler and unit of measurement was in millimetre (mm), using Wolf radiologic viewing box by Scrip Hessco.

Adenoid nasopharyngeal ratio (ANR) = A / N
Where: A= adenoid size and N= nasopharyngeal depth

Inclusion criteria: Children with a clinical diagnosis of obstructive adenotonsillar hyperplasia and scheduled to have adenoidectomy and/or tonsillectomy, whose parents or caregivers consent to allow their children participate in the study.

Exclusion criteria: Children less than 1 year old or Children more than 12 years old; Children with nasal obstruction due to other causes like septal deviation, allergic rhinitis, nasal injury, and congenital nasal deformities and; Children of non-consenting parents or caregivers.

Data analysis and Presentation

Data were collated and presented in descriptive format, tables, and graphs where appropriate. The variables were severity of symptoms, age, gender, duration of symptoms and OSA-18 scores. Analysis was done using Statistical Package for Social Sciences software program (SPSS version 22). The mean and standard deviations was computed for all quantitative variables. Similarly, frequencies, percentages and cross tabulations were used to summarize qualitative variables. Paired sample T-test was used to analyze mean difference between continuous variables pre- and post-adenotonsillectomy and also used to compare mean changes in QoL pre- and post-surgery. One way analysis of variance test (ANOVA) was used to analyze the difference between three or more continuous variables. The level of significance was taken as 'p' value less than 0.05.

RESULTS

Seventy three children with obstructive adenotonsillar hyperplasia were enrolled for this study with age range 1-12 years, and mean age of 3.7 years \pm 2.84. Eighty children were initially recruited for the study; 7 children were lost to follow up and were thus excluded. The percentage dropout rates were 3 participants (3.4%) and 4 (5.2%) participants at 1 week and 6 weeks respectively. There were 50 males (68.5%) and 23 females (31.5%), giving a male: female ratio 2.2:1. Duration of symptoms was from 2-84 months with mean duration of 20.67 \pm 16.28 months.

Thirty nine (53.4%) of the parents/caregivers were government workers, and while 61 (83.5%) parents/caregivers had tertiary education (Table 1).

Snoring and mouth breathing were the most presenting symptoms while choking was the least experienced (Fig. 2). Grade III (43.8%) and II (28.8%) tonsillar hyperplasia were the most common (Table 2). The ANR ranged from 0.49 to 0.80 with a mean of 0.64 \pm 0.76.

Sixty seven (91.8%) children had grade 3 moderate nasopharyngeal obstruction while four (5.5%) children had grade 4 severe obstruction (Table 3).

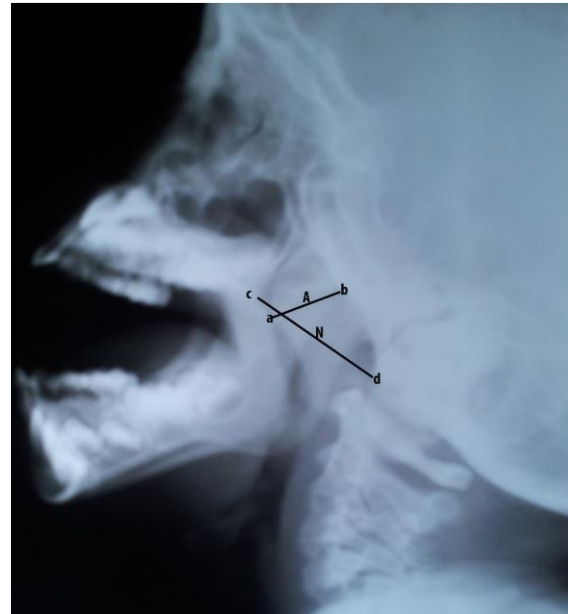


Fig.1: Lateral soft tissue radiograph of nasopharynx of one of the patients illustrating the measurements for calculation of Adenoid Nasopharyngeal ratio. The adenoidal measurements 'A' represent the distance from 'a' at the point of maximum convexity of adenoid shadow to line 'b'. The nasopharyngeal measurement 'N' is distance between 'c', the posterior border of the hard palate and 'd', the antero-inferior aspect sphenobasippital synchondrosis.^[19]

Table 1: Bio-data of parents/caregivers.

Parent occupation	Frequency	Percentage (%)
Government employed	39	53.4
Private employed	10	13.6
Trader /artisan	18	24.7
Student	4	5.5
Housewife	1	1.4
Unemployed	1	1.4
Parent Education level		
No formal education	2	2.7
Primary	5	6.9
Secondary	5	6.9
Tertiary	61	83.5

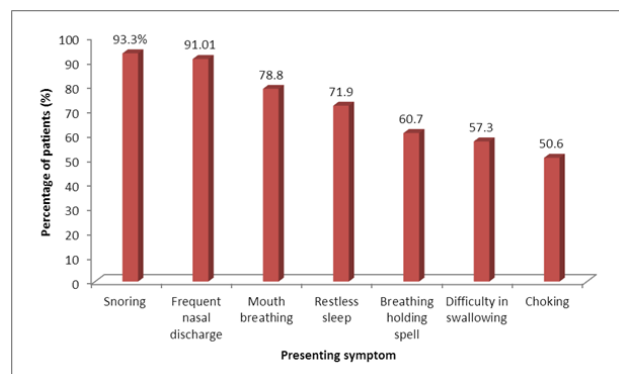


Fig. 2: Distribution of presenting obstructive symptoms.

Table 2: Distribution of tonsils enlargement by Brodsky grade.

Palatine tonsil	Frequency	Percentage (%)
0-25%(1+)	10	13.7
26-50%(2+)	21	28.8
51-75%(3+)	32	43.8
>75%(4+)	10	13.7
Total	73	100.0

Table 3: Distribution of ANR.

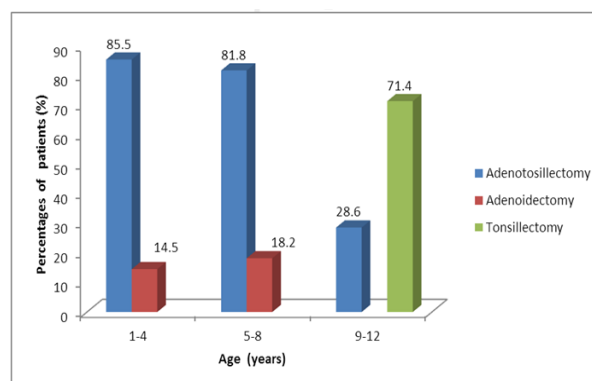
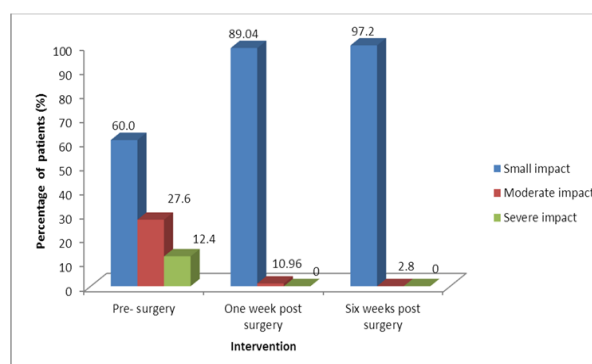
ANR grades	Frequency	Percentage (%)
Grade 1(0-0.25), no obstruction	None	None
Grade 2(0.26-0.50), mild obstruction	2	2.7
Grade 3(0.51-0.75), moderate obstruction	67	91.8
Grade 4(0.76-1.0), severe obstruction	4	5.5
Total	73	100.0

Age group 1-4 years had highest number of patients while age group 9-12 had the least (Fig. 3). Forty four (60.7%) participants had score between 0-60 (small impact), 20 participants (27.6%) had score between 61-80 (moderate impact), and 9 participants (12.4%) had score between 81-126 (severe impact) before the surgery while 65 participants (89.04%) and 71 participants (97.2%) had scores between 0-60 at 1 week and 6 weeks after surgery respectively while 2 participants (2.8%) had score between 60-80 after surgery, and these are the children with Downs' syndrome and craniofacial anomalies. The lower the score the lesser the negative impact of obstructive adenotonsillar hyperplasia on QoL before surgery, whereas after surgery the lower the score the higher the positive impact of adenotonsillectomy on QoL (Fig. 4). There was significant difference in quality of life from pre-surgery to 1 week post-surgery and 6 weeks post-surgery ($f=371.48$, $P=0.0001$) (Table 4).

Table 4: Comparison of mean score of quality of life using One-way analysis of variance and pair-t-test.

Intervention	Mean	95% CI	Standard deviation	f-test	p-value
Pre-surgery	54.72	50.81-58.43	18.83	371.48	0.0001
One week post surgery	27.49	25.48-29.5	9.68		
Six week post surgery	4.66	4.28-5.04	1.81		
Mean change Variables				t-test	
Pre-surgery to 1 week post-surgery	26.57	23.17-29.97	15.63	15.54	0.0001
1 week post-surgery to 6 weeks post-surgery	6.721	5.399-8.512	7.55	8.643	0.0001
Pre-surgery to 6 weeks post-surgery	34.72	30.0-37.38	17.98	18.325	0.0001

Participants served as their own control as QoL changes were compared in individual participants before and after surgery. Change mean scores were converted into a measure of impact to facilitate interpretation of result. Before the surgery the impact were small for all domains and the survey as a whole. After surgery, however, the impact were large for all domains and overall survey score. This indicated that there were large improvements in QoL from before surgery to one week and six weeks after surgery respectively (Fig. 5).

**Figure 3: Distribution of type of surgery among age group.****Fig. 4: QOL from pre-surgery to post-surgery.**

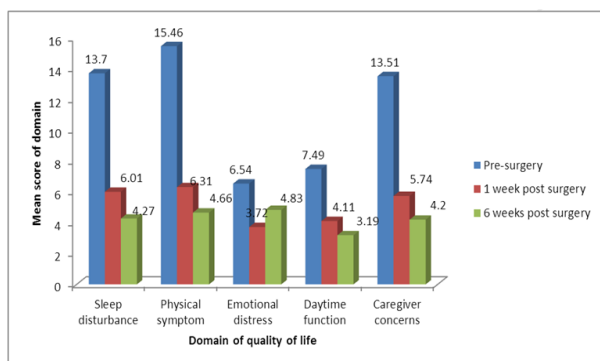


Fig. 5: Comparison of mean score of domain quality of life.

DISCUSSION

This study involved 73 children with obstructive adenotonsillar hyperplasia who had adenoidectomy and/or tonsillectomy. More than 530,000 adenotonsillectomies are performed in United States annually^[20] but the actual number of adenoidectomy and/or tonsillectomy performed in Nigeria is generally unknown. Though, inferences from data available from some health centres in Nigeria shows that lower adenotonsillectomies are being performed compared to USA. This could be due to socioeconomic factor which has been associated with poor health seeking behaviour in our environment.

Thirty nine (53.4%) parents/caregivers were government employed while 18 (24.7%) are traders/artisan, and 61 (83.5%) of the parents/guardian had tertiary education. This could be responsible for greater awareness of the disease condition amongst this group. However, design of this study was not sensitive enough to actually detect socioeconomic status amongst these groups. In addition, it may be by chance or due to allergic hyperplasia of the nasopharyngeal and palatine tonsils from infant formulae (cow's milk) which is a common practice among working class mother. The cow's milk allergy which is due to intolerance to a protein found in it and most sufferers are formula-fed, however, breastfed children can also acquire cow's milk allergy if their mothers consume milk products.^[21]

Low socioeconomic class parents/caregivers may not present their children to the hospital as they have to pay out of pocket for health care in our environment as compared to the working class who are probably richer and have access to National Health Insurance Scheme (NHIS). However, this is at variance with report from America where sleep-disordered breathing was said to be common amongst children of parents/caregivers of low socioeconomic class.^[22] This group of socioeconomic class may not translate to the same in our environment.

This study also demonstrated that adenoidectomy ± tonsillectomy was slightly more among males (68.5%) than females (31.5%) with a male to female ratio of 2.2:1. This was comparable with what that had been

reported in similar studies.^[6,7,8] However, another study demonstrated that both sexes are equally affected in the pubertal age group.^[23] The mean age of children in this study was 3.7 years ± 2.84. This is smaller than what was reported by Ahmed et al, who reported age range of 0-18 years with a mean age of 5.44 years (+3.39 SD) and a median age of 5 years.^[24] This finding could be because they included older children in their study.

The most common symptom was snoring (93.3%), this was followed by frequent nasal discharge (91.01%) and mouth breathing (78.8%) whereas the least presenting symptom was choking (50.6%). This study corroborated what was reported earlier by De Serres et al; where 100% snored, and 91.8% had restless sleep.^[6] Fifty four participants (74.0%) were between the ages of 1-4 years which coincided with the period of most frequent upper respiratory tract infection and the period of maximum enlargement of nasopharyngeal and palatine tonsils as a result of increased immunologic activity. This finding was comparable to what was reported by Orji and Ezeanolue, they reported 63% of their patients to be less than 4 years.^[25]

Majority of the participants, 67 (91.8%) had grade III (moderate nasopharyngeal obstruction) whereas 4 (5.5%) had grade IV (severe nasopharyngeal obstruction) and these findings were similar to 54.1% and 17.7% for grade III and IV respectively reported by Farhad et al.^[26] However, in another study grade IV (severe nasopharyngeal obstruction) was found to be the commonest.^[27]

The impact of obstructive adenotonsillar hyperplasia on QoL was small before surgery and there was significant improvement from pre-surgery to one week and six weeks after surgery respectively ($f= 371.48$, $P=0.0001$) (Table 4). This agreed with report from other studies that showed significant improvements in QoL following adenoidectomy ± tonsillectomy for children with SDB.^[6-10] Similarly, Kitcher et al^[28] found significant improvement in QoL on long term follow-up (up to 9months) in children with SDB after adenotonsillectomy. Another study also showed significant improvement in QoL on long term.^[29] On the contrary, Flanary et al found no significant difference between short- and long-term QoL scores.^[30]

A meta-analysis study by Cristina et al found that significant improvements in QoL occurred after adenotonsillectomy in children with SDB on short time follow up (ranged from 21-90 days, average of 35.7 days) and postulated that the more the time elapses after surgery for patients evaluation, the more difficult it will be to dissect out improvement in QoL due to the surgical procedure from other medical, social, and developmental factors.^[31] On the contrary, the design of this study allowed short time follow up to 6 weeks.

Comparison of the mean change score from pre-surgery to 1 week and 6 weeks post-surgery were significant ($P=0.0001$). This study shows significant improvement in QoL which was seen in 89.04% at 1 week and 97.2% at 6 weeks post-operatively (Fig. 4). After surgery, there was significant improvement on score averages for all domains, suggesting the success of surgery in improving the quality of life of the patients. The improvement was greater in items related to physical symptom, caregivers concern and sleeps disturbance. Emotional distress showed a low score, and this agreed with the reports of Stewart *et al.*,^[32] however, it was at variance with the report by Renata *et al.*^[33] which showed high score for emotional distress.

Again, Cristina *et al* found that the greatest improvement in QoL after surgical intervention were evident in the domains of sleep disturbance, physical suffering, and caregiver concerns.^[31] The drastic improvement in health status after adenoidectomy and/or tonsillectomy support the effectiveness of this procedure in treating obstructive adenotonsillar hyperplasia in children. However, Constantin *et al*, reported that OSA-18 showed poor sensitivity and low negative predictive value to detect moderate to severe obstructive sleep apnoea.^[34]

Children with Down's syndrome and craniofacial anomaly (2.8%) associated with enlarged palatine and nasopharyngeal tonsils had mild improvement on scores. This could be as a result of contracted nasopharyngeal and oropharyngeal air way, and global hypotonia seen in Down's syndrome resulting in persistent collapsibility of pharyngeal soft tissue.^[35] This finding is similar to what was found in another study where 6% mild improvement in patients with craniofacial anomalies and Down's syndrome was reported.^[6]

The findings from this study will help the parents or guardian to know more about the impact of adenotonsillectomy on QoL in children with obstructive adenotonsillar hyperplasia, and it will also assist them in making appropriate decision concerning the benefit of the procedure for their children especially in an environment where there are relatively scarce resources.

CONCLUSION

This study confirmed that there was significant improvement in QoL in children with obstructive adenotonsillar hyperplasia after adenoidectomy and/or tonsillectomy on short-term follow up with good parental/guardian satisfaction. There was significant improvement in all domains of QOL especially during 6 weeks post-operative period.

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CONFLICT OF INTERESTS

The authors declare that there was no conflict of interests that could influence this work.

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APPENDIX 2

Obstructive Sleep Apnea Quality of Life Survey (OSA-18) Questionnaire

Ethical Reference Number: ERC/2013/11/14

Pre –adenoidectomy/adenotonsillectomy

You are invited to participate in a study titled: Impact of Adenotonsillectomy on Quality of Life in Children with obstructive adenotonsillar hyperplasia. Kindly answer the following questions to the best of your ability. There is no right or wrong answer.

Hospital no	
Study number	
Age of patient	
Sex	
Parents/caregivers occupation	
Date	

Highest level of education attained by the parent/caregiver (tick one below)

None () primary () Secondary () tertiary ()

Duration of symptoms in months.....

Parent/caregivers phone number

Circle the appropriate response to each question.	None of the time	Hardly any of the time	A little of the time	Some of the time	A good bit of the time	Most of the time	All of the time
Sleep Disturbance							
During the past 4 weeks, how often has your child had...							
...loud snoring?	1	2	3	4	5	6	7
...breath holding spells or pauses at night?	1	2	3	4	5	6	7
...choking or made gasping sounds while asleep?	1	2	3	4	5	6	7
...restless sleep or frequent awakenings from sleep?	1	2	3	4	5	6	7
Physical Symptoms							
During the past 4 weeks, how often has your child had...							
...mouth breathing because of nasal obstruction?	1	2	3	4	5	6	7
...frequent colds or upper respiratory infections?	1	2	3	4	5	6	7
...nasal discharge or a runny nose?	1	2	3	4	5	6	7
...difficulty in swallowing food?	1	2	3	4	5	6	7
Emotional Distress							
During the past 4 weeks, how often has your child had...							
...mood swings or temper tantrums?	1	2	3	4	5	6	7
...aggressive or hyperactive behaviour?	1	2	3	4	5	6	7
...discipline problems?	1	2	3	4	5	6	7
Daytime Function							
During the past 4 weeks, how often has your child had...							
...excessive daytime sleepiness?	1	2	3	4	5	6	7
...a poor attention span or concentration?	1	2	3	4	5	6	7
...difficulty getting up in the morning?	1	2	3	4	5	6	7
Caregiver Concerns							
During the past 4 weeks, how often have the problems described above...							
...caused you to worry about your child's general health?	1	2	3	4	5	6	7
...created concern that your child is not	1	2	3	4	5	6	7

getting enough air?							
...interfered with your ability to perform daily activities?	1	2	3	4	5	6	7
...made you frustrated?	1	2	3	4	5	6	7

TOTAL SCORE=

MAXIMUM SCORE= 126

0-60 small impact on health related quality of life

60-80 moderate impact

80+ severe impact

Physical Examination Grading Scale

Weight (kg)..... Height (m)..... Body Mass Index (BMI).....

Quiet respiration:
Mouth closed (0)
Mouth open (1)

Oropharynx Examination

Tonsils:	
1+ endophytic tonsils, anterior and posterior pillars visible	1
2+ tonsils extend to tonsillar pillars	2
3+ tonsils extend beyond tonsillar pillars, approximating uvula	3
4+ tonsils apposing each other, obliterating visualization of uvula	4
Other tonsillar asymmetry	4