



Research Paper

**OXYGEN SATURATION IMPROVEMENT AFTER
ADENOTONSILLECTOMY**

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Abstract

Enlarged adenoids and tonsils are known to be common cause of sleep disorders due to the narrowing of the nasopharyngeal airway and resultant degrees of apnoea and hypoapnoea. This invariably affects the oxygen saturation. This study therefore is to determine whether adenotonsillectomy improves the oxygen saturation in children with sleep breathing disorders from adenotonsillar hypertrophy. It is a prospective descriptive study of all children diagnosed with diagnosis of adenotonsillar hypertrophy and admitted for adenotonsillectomy within the period of 4months (December 2020 to March 2021). Using a Proforma, the biodata, clinical features, the tonsillar grade as well as the nasopharyngeal air column ratio were all collated.. The oxygen saturation was measured preoperatively on admission both awake and nocturnal, immediate post operatively and 48hrs post operatively as well as at 3wks follow up. The study comprised of 20 children with confirmed diagnosis of adenotonsillar hypertrophy that were eventually treated with adenotonsillectomy. Age ranged from 0-14years. Males were more than females; male: female ratio of 3.5:1. The mean SpO₂ both in the clinic and on admission was 97%. The commonest complaints seen in these patients were nasal discharge in 80%. Sleep apnoea was seen in 50% of the study population. In all the grades of tonsil in the subjects studied, there was an across the board increase in SpO₂ at both 48hrs and three weeks postoperative period. Adenotonsillectomy in children with obstructive symptoms following adenotonsillar hypertrophy appears to improve their oxygen saturation.

Key words: Oxygen saturation, adenoids, tonsils, adenotonsillectomy, sleep disorder.

INTRODUCTION

Sleep disordered breathing is said to comprise of various degrees of airway obstruction during sleep. It ranges from simple snoring to partial or complete obstruction of the upper airway known as obstructive sleep apnoea and Hypoapnoea. This is the commonest form of sleep breathing disorders. It can be seen in any age and is known to affect quality of life.^{1,2}

In children, adenotonsillar hypertrophy is said to be a major predisposing factor of obstructive sleep apnoea hypoapnoea syndrome (OSAHS).³ There are two postulations said to be responsible for this enlargement; repeated viral and bacterial infections of these lymphoid tissues seen commonly in repeated viral infections of the upper respiratory tract in these children.⁴ secondly is allergy, which can be commonly seen in these children and tends to stimulate the tissues resulting in their enlargement.⁵ The result of these enlargement is narrowing in the nasopharyngeal and oropharyngeal airway and subsequent result in OSA with possible decrease in oxygen saturation in these children.⁶ Obstructive adenotonsillar enlargement and OSA is seen more in ages 3-6years.^{4,7} In these children commonest presenting complaints was snoring and mouth breathing.^{8,9}

It is known that children with obstructive adenotonsillar enlargement have lower oxygen saturation than those without obstruction.⁸ Owing to this, adenotonsillectomy which is the treatment of choice for obstructive hypertrophy of these lymphoid tissues have been documented to improve OSAHS and therefore oxygen saturation in the children.^{10,11} Some others have found improvement in quality of life and sleep with adenotonsillectomy.^{12,13} In these children because they are often symptom free while awake, clinical assessment of OSAHS may not be able to distinguish it from simple snoring therefore sleep studies with the use of polysomnography may be needed.³ However there are very few if any sleep labs in our environment and polysomnography is not readily available and rarely affordable as well therefore, pulse oximetry has been adapted as an alternative tool for assessing both sleep breathing disorders(OA) and oxygen saturation in children. It has also been found reliable, available and effective.^{10,14,15} It is known that nocturnal pulse oximetry has a high positive predictive value of OSA.^{16,17,18} The limitation of possible false recording of desaturation in pulse oximetry is avoided by noting the pulse rate at the same reading and if there is no corresponding bradycardia, the reading is recorded as false.¹⁷ This therefore helps in

validating the results obtained from pulse oximetry. This study therefore aims at comparing the oxygen saturation profile in children with obstructive hypertrophy of tonsils and adenoids pre and post adenotonsillectomy.

METHODOLOGY

It is a prospective descriptive study of all children diagnosed with diagnosis of adenotonsillar hypertrophy and admitted for adenotonsillectomy within the period of 4months (December 2020 to March 2021). Those with any other ailment or condition other than adenotonsillar hypertrophy were excluded. Informed consents were obtained from parents of the subjects and those that did not give such consents were excluded. Using a Proforma, the biodata, clinical features, the tonsillar grade as well as the nasopharyngeal air column ratio were all collated. The ANR (adenoidal nasopharyngeal ratio) was determined from the post nasal space x- ray while the tonsillar size was estimated using the Brodsky assessment. The oxygen saturation was measured preoperatively on admission both awake and nocturnal, immediate post operatively and 48hrs post operatively as well as at 3wks follow up. These were done using digital pulse oximeter placed on the index finger or the thumb of the child for a period of four hours each reading. The pulse rate and blood pressure were also monitored during these readings and documented. Any saturation below 95% which is taken as the baseline was noted as a desaturation. Permission was sought and obtained from the ethical committee of the hospital.

All data was analyzed using the SPSS V25 software at a 95% confidence interval and a p-value less than 0.05 was considered significant. The data was presented using descriptive statistics (mean, frequency, percentages) as appropriate. The comparison of mean variables was done using the One-way Analysis of Variance (ANOVA)

RESULTS

The study comprised of 20 children with confirmed diagnosis of adenotonsillar hypertrophy that were eventually treated with adenotonsillectomy. The age ranged from 0-14years with a mean age of 4.2+/- 3.2years. There were more males involved in the study -80% with a male: female of 3.5:1. Adenotonsillar hypertrophy was the commonest indication for the surgery (95%). The mean SpO₂ both in the clinic and on admission was 97%. Table1. The commonest complaints seen in these patients were nasal discharge in80%, mouth breathing both asleep and awake; 75% and 60%, poor performance in school in 65%. Sleep apnoea was seen in 50% of the study population.

Table2. Most of the subjects studied had grade 2 and grade 3 tonsillar sizes. Table 3.The ANR was higher for grade 3 tonsillar size but the difference was not significant statistically. Table4. In all the grades of tonsil in the subjects studied, there was an across the board increase in SpO2 at both 48hrs and three weeks postoperative period. Table5. In totality, the SpO2 preoperatively was 97.2% while the post- operative SpO2 showed a marginal increase with 98.3% however the 3 weeks SpO2 showed a significant increase to 100% with a p -value of 0.0001 which was statistically significant. Multiple comparisons of the preoperative SpO2, post -operative SpO2 and 3 weeks SpO2 showed a statistically significant difference in the p- values; 0.027 and 0.0001 respectively. Table6.

Table 1: Demographic Distribution

	Frequency (n=20)	Percentage (%)
Age Groups (years)		
<5	13	75.0
5 – 9	3	15.0
10 and above	2	10.0
Mean age ±SD	4.2 ±3.2	
Gender		
Male	14	80.0
Female	4	20.0
Diagnoses		
Obstructive adenotonsillar hypertrophy	17	95.0
Recurrent adenoidal hypertrophy	1	5.0
Duration of Complaint/Symptom		
≤2 years	15	85.0
> 2years	3	15.0
Vital signs		
	Mean	Standard deviation
SPO2 IN ADMISSION	97.2	1.5
SPO2 IN CLINIC	97.2	1.3
PULSE RATE ON ADMISSION	127.0	23.0

Table 2: Distribution of Symptoms

Symptoms	Yes	No
Sleep apnea	10(50.00)	10(50.00)
Mouth breath while awake	12(60.00)	8(40.00)
Mouth breathe while asleep	15(75.00)	5(25.00)
Nasal discharge	16(80.00)	4(20.00)
Feel often sleepy	5(25.00)	15(75.00)
Gets tired often	5(25.00)	15(75.00)
Doing well in school	13(65.00)	7(35.00)
Growing well	8(40.00)	12(60.00)
Irritability	1(5.00)	19(95.00)

Table 3: Distribution of tonsillar size

Tonsillar Size	Frequency (n=20)	Percentage (%)
GRADE 1	3	15.00
GRADE 2	9	45.00
GRADE 3	6	30.00
GRADE 4	2	10.00
Total	20	100.00

Table 4: Association of Tonsillar size and ANR

Tonsillar Size	ANR	
	Average	Std Deviation
GRADE 1	0.87	0.10
GRADE 2	0.86	0.10
GRADE 3	0.95	0.08
GRADE 4	0.80	0.14
ANOVA (p-value)	0.337	

The difference is not statistically significant ($p > 0.05$)

Table 5: relationship of tonsillar size to SpO2

Tonsillar Grade	SPO2 IN CLINIC	SPO2 IN ADMISSION	48HRS POST SURG SPO2	3 WEEKS SPO2
GRADE 1	98 ±1.5	98±1.5	99±0	100±0
GRADE 2	97±1.3	97±1.4	98±3.1	100±0
GRADE 3	97±1.2	97±1.2	99±1.5	100±0
GRADE 4	98±0	97±2.8	99±1	100±1

All values are presented in mean ±standard deviation

Table 6: Comparison of SpO2

	Pre OP SpO2	Post OP SpO2	Three-weeks SpO2
Mean	97.2	98.3	100.0
Standard deviation	1.3	2.4	0.0
ANOVA (p-value)			0.0001*
Multiple Comparison			
Pre-OP SpO2 Vs Post OP SpO2			p=0.098
Pre-OP SpO2 Vs three weeks SpO2			p=0.027*
Post-OP SpO2 Vs three weeks SpO2			p=0.0001*

*statistically significant (p<0.05)

DISCUSSION

In this study, the mean age of the population studied was 4.2+/- 3.2 years and it was found that children in ages less than 5 were most affected similar to other works.⁸ This finding was not surprising since it is known to be the age when obstructive sleep apnoea(OSA) is seen more commonly.⁷ A male preponderance was also observed agreeing with some earlier work.⁹ adenotonsillar hypertrophy was the commonest cause of obstructive symptoms necessitating surgery as already documented.⁹while some researchers found snoring to be the commonest complaints in these children, nasal discharge was the commonest symptom followed closely by mouth breathing in the present study.^{8,9,19} It was also observed that a good number of these subjects had poor academic performance giving credence to some works that has found that adenotonsillar hypertrophy appears to affect the quality of life and learning in these children possible because of the resultant sleep breathing disorders and therefore adenotonsillectomy is thought to improve this.^{1,10,15}

The finding of grade 2 and 3 tonsillar size being more in the subjects with corresponding ANR of 0.86 and 0.95 was similar to the finding in an earlier work done in Ibadan however, the ANR in the present study were slightly higher in this present study.⁸

The tonsillar size when compared with the SpO₂ in the present study showed that while the grade 1 had very marginal increase in the SpO₂ post operatively, the other grades 2 to 4 had appreciable increment both in the 48 hours post- operative record and most in the 3 weeks SpO₂. While the mean oxygen saturation pre operatively found in other studies was lower than that recorded in the present study, the post-operative records were similar.^{8,10} The comparisons of both the preoperative and immediate post-operative oxygenation showed a statistical significant difference with the oxygenation after three weeks of surgery in these children. There therefore seem to be an improvement in the oxygen saturation of the children with obstructive hypertrophy of the adenoids and tonsils following adenotonsillectomy in agreement with other researchers.^{10,20}

CONCLUSION

The age less than 5 years were commonly affected with adenotonsillar hypertrophy and nasal discharge, mouth breathing and poor academic performance were the commonest complaints. Adenotonsillectomy was observed to have improved the SpO₂ in these children.

LIMITATION

The small size of the study population makes it difficult to extrapolate the findings to the general population.

Conflict of interest

None declared

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