RESEARCH ARTICLE

A COMPARISON OF GROWTH OF CHILDREN WITH OBSTRUCTIVE SLEEP DISORDERED BREATHING POST ADENOIDECTOMY AND/OR TONSILLECTOMY AND THOSE ATTENDING A WELL-BABY CLINIC AT KENYATTA NATIONAL HOSPITAL

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ABSTRACT

Background: Adenotonsillar hypertrophy is the commonest cause of obstructive Sleep Disordered Breathing (oSDB) and adenoidectomy and or tonsillectomy (As+/-Ts) leads to an improvement of symptoms. Studies have been done to assess growth in the affected children post As+/-Ts with varying results. The constitution of the control group also varied.
Objective: To compare the growth of children with oSDB post As+/-Ts with that of a control group consisting of children attending the well-baby clinic.
Methods: One hundred and forty-six children (73 cases, 73 controls) aged between 2 years and 5 years were included in the study. The cases were children recruited from the Kenyatta National Hospital ENT clinic who had oSDB scores above 0.33 on the Sleep Related Breathing Questionnaire Pediatric Subscale (SRDB-PSQ). Controls were recruited from the well-baby clinic and had oSDB scores lower than 0.33 on the SRDB-PSQ questionnaire. Height (HAZ), weight (WAZ) and BMI Z scores were calculated from the weight and height measurements taken preoperatively or at first contact for the study group and controls respectively. Repeat measurements were taken after 3 months.
Results: Data from 62 cases (40 males and 22 females) and 63 controls (34 males and 29 females) was analyzed. Children with oSDB had statistically lower weight height and BMI Z scores when compared to controls (WAZ-0.76 vs 0.14p value<0.001, HAZ -0.54 vs-0.08 p value 0.04, BMI z score -0.67 vs 0.25, p value 0.001). Three months after surgery, there was no statistical difference in the Z scores of the study group and the controls. Both groups had an increase in their Z scores however the increase in the study group was significantly higher.
Conclusion: As+/-Ts improves the growth of children with oSDB to statistically similar levels of otherwise healthy children attending a well-baby clinic as early as 3 months post-operatively.

Key words: Adenoidectomy, Tonsillectomy, Obstructive sleep disordered breathing

INTRODUCTION

Obstructive Sleep-Disordered Breathing (oSDB) is a clinical diagnosis characterized by obstructive abnormalities of the respiratory pattern or the adequacy of oxygenation/ventilation during sleep, which include snoring, mouth breathing, and pauses in breathing. oSDB encompasses a spectrum of obstructive disorders that increases in severity from primary snoring to Obstructive Sleep Apnoea (OSA)[1]. The prevalence of oSDB varies between 4-13%[2,3]. The prevalence of OSA, the severest form of oSDB is between 1.2 -5.7%[1-3]. The commonest cause of oSDB in the paediatric age group is adenotonsillar hypertrophy[4,5] and adenotonsillectomy has been shown to lead to cure in 79-90% in children without comorbidities [6-8].

Obstructive sleep disordered breathing has been thought to lead to substantial morbidities in the cardiovascular, nervous and metabolic systems. Children with oSDB have higher levels of hypertension, pulmonary artery hypertension and neurocognitive disturbances[9,10]. oSDB has also been shown to negatively affect growth[11,12]. Studies done to assess the growth of these children have either had no control group or have had a control group of children with oSDB who were managed medically[13,14]. The studies with a control group that was considered otherwise healthy have had varied results[15,16].

This study sought to compare the growth of children with oSDB who underwent As+/-Ts, to otherwise healthy children on follow up at the well-baby clinic.

MATERIALS AND METHODS

The study was a prospective case controlled study done at the Kenyatta National Hospital. Ethical approval from the Kenyatta National Hospital / University of Nairobi Ethics and Research Committee was sought

and granted. The study period was from April 2018 to December 2018. The study population constituted children aged between 2 to 5 years. Seventy-three children scheduled for As+/-Ts for oSDB from the ENT clinic were recruited into the study as the study group. Seventy-three children attending the well-baby clinic were also recruited as controls. Exclusion criteria for the study group was As+/-Ts for any other indication other than oSDB, comorbid children or previous adenoid surgery. Exclusion criteria for the controls included children with comorbid conditions and those on nutritional supplements.

The study group and controls recruited were subjected to the Sleep Related Breathing Disordered Questionnaire Pediatric Sleep Questionnaire (SRDB-PSQ) developed by Chervin *et al*[17]. Cases (study group) were children who met the criteria for severe oSDB i.e. a SRDB-PSQ score of 0.33 and above. All the cases recruited had a score of 0.33 and above, the control group children were also subjected to the questionnaire. Those with SRDB-PSQ scores below 0.33 proceeded with the study. There was only one child with a score above 0.33 who exited the study and was referred to the ENT clinic. The child was replaced by recruitment of another child in the well-baby clinic. The children who proceeded with the study had their weights and heights taken using a SECA weighing scale and a height stadiometer that were stationed at the well-baby clinic. The children in the study group had their heights and weights measured within 24 hours of admission and those in the control group had their heights and weights measured on first contact. Three months later the children in both groups were weighed and had their heights taken again. Their growth parameters were then converted to Z scores i.e. Weight for age Z score (WAZ), Height for age Z score (HAZ) and BMI for age Z score using the WHO anthro V3.2.2 software. Data analysis was conducted using IBM SPSS (version 21). The student T- test was used to assess the difference in WAZ, HAZ, and BMI Z score between the study group and the control group.

RESULTS

The total number of children recruited at the beginning of the study was 146, 73 in the case group (study group) and 73 in the control group. At 3 months, 11 children in the case group and 10 children in the control group had dropped out of the study. There were 62 children in the case group, 40 males and 22 females, and 63 children in the control group, 34 males and 29 females (Figure 1). The children who dropped out of the study were not included in the data analysis.

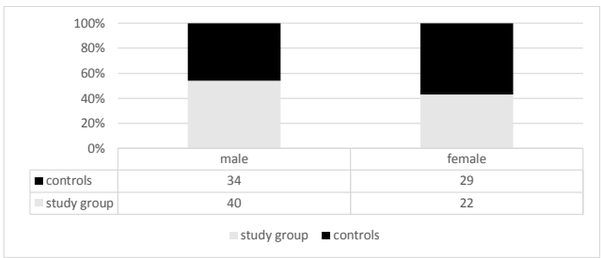


Figure 1: Distribution of male to females for the study group and controls

At the beginning of the study the weight height and BMI Z score for the cases were statistically lower than that of the controls (Table 1). Three months post operatively there was no statistical difference in the WAZ, HAZ, BMI Z Score (Table 2).

Table 1: Anthropometric values of study group and controls at the beginning of the study

	Study group Mean (SD)	Controls Mean (SD)	Difference (95% CI)	P- value*
Preoperative weight (kg)	13.74(2.43)	14.92(3.49)	1.18(0.12-2.23)	0.031
Preoperative WAZ score	-0.76(1.06)	0.16(1.32)	0.92(0.50-1.34)	<0.001
Preoperative height (cm)	96.24(7.64)	94.46(14.51)	-1.78(-5.84-2.27)	0.391
Preoperative HAZ score	-0.54(1.17)	-0.08(1.27)	0.46(0.03-0.89)	0.04
Preoperative BMI	14.77(1.62)	15.94(2.50)	1.17(0.44-1.91)	0.002
Preoperative BMI Z score	-0.67(1.29)	0.25(1.50)	0.92(0.43-1.41)	<0.001

*Two sample t-test

Table 2: Anthropometric values of the study group and controls at 3 months

	Study group	Controls	Difference (95% CI)	P-value*
	Mean (SD)	Mean (SD)		
Postoperative weight (kg)	15.30(2.50)	15.49(3.48)	0.19(-0.87-1.25)	0.723
Postoperative WAZ score	0.12(1.03)	0.48(1.25)	0.36(-0.04-0.76)	0.08
Postoperative height (cm)	98.71(7.47)	97.21(9.54)	-1.51(-4.52-1.51)	0.33
Postoperative HAZ score	0.11(1.18)	0.20(1.28)	0.09(-0.35-0.52)	0.688
Postoperative BMI	16.46(1.71)	16.41(2.23)	-0.04(-0.74-0.66)	0.909
Postoperative BMI Z score 0+	0.65(1.15)	0.56(1.38)	-0.08(-0.53-0.36)	0.714

*Two sample t-test

When the change in Z scores between the two groups was assessed for significance, the increase in WAZ, HAZ and BMI Z scores were statistically higher in the study group (Table 3).

Table 3: Assessment of change in weight, height and BMI Z scores between the cases and controls

	Study group			Control			Difference (95%CI)	P-value*
	Mean			Mean				
	0 months	3 months	Change	0 months	3 months	Change		
Weight for age Z score	-0.76	0.12	0.88	0.14	0.46	0.32	0.56(0.42 - 0.67)	p <0.001
Height for age Z score	-0.54	0.11	0.65	-0.08	0.20	0.28	0.37(0.24 - 0.52)	p <0.001
BMI for age Z score	-0.67	0.65	1.32	0.25	0.55	0.30	1.02(0.77 - 1.21)	p <0.001
BMI	14.71	16.37	1.66	15.90	16.39	0.49	1.17(0.70 - 1.63)	<0.001

* T-test comparing mean change in controls to mean change in cases

On linear regression analysis, As+/Ts positively correlated to change in WAZ, HAZ and BMI Z score when adjusted for age and sex.

DISCUSSION

This study was a prospective case controlled study with a control arm constituting children attending well-baby clinic. This enabled comparison of growth of the affected children with unaffected children. At the beginning of the study, children with oSDB were found to have significantly lower weight height and BMI Z scores when compared to controls. This could be attributed to the fact that children with oSDB have been found to have lower growth hormone levels[18] and increased work of breathing[9] than children without oSDB. Three months later both the study group and controls had an increase in the Z scores hence the need to assess which group had a greater increase and if it was statistically significant. The study group had a greater increase in the Z scores and the change was statistically significant when compared to the controls. When the Z scores of the study group and controls were compared at three months, there was no statistical difference in the Z scores. This has been termed as the children in the study group having 'catch up' growth. This has been thought to be due to increased growth hormone production once the oSDB symptoms have been corrected[18]. There is also a reduction in the work of breathing[9].

Multiple studies done assessing the effect of As+/-Ts on growth of children have had varying results. The follow up period, whether or not there was a control group and the constitution of the control group also varied. This influences comparability of the studies. This study followed the children for 3 months and

found statistically significant increase in weight height and BMI Z scores in the study group when compared to the control group made up of otherwise healthy children. Selimoglu *et al*[11] found significant weight and height increase 6 months post adenotonsillectomy (weight Z score from -0.47 to -0.19 p value <0.005, height Z score from -0.27 to 0.20 p value <0.005). The study however only measured the control group at the beginning of the study. Nachalon *et al*[12] in Israel also found significant increase in weight and BMI Z scores 4 to 6 months after surgery (weight Z score from -1.29 to -0.19 p value <0.001, and BMI Z score from -0.45 to 0.36 p value 0.007), the height Z score increased but it was not statistically significant, (from -1.18 to -0.49 p value 0.223). The study however did not have a control group. Katz *et al*.[13] compared early adenotonsillectomy vs watchful waiting. There was a significantly faster increase in weight and BMI Z scores 7 months later in the adenotonsillectomy group when compared to the watchful waiting group. The height increase was however not statistically significant. Al Abdulla *et al*[15] in Bahrain however did not find a difference in BMI percentile scores between the study group and controls. The study assessed growth in children undergoing tonsillectomy but did not limit the inclusion criteria to those with only oSDB. The control group in the study also constituted children with other conditions other than oSDB or chronic recurrent tonsillitis attending their ENT clinic.

CONCLUSION

Clinicians should be aware, among others, of the negative effects of oSDB on growth of the affected children. As+/-Ts improves the growth of children with oSDB to statistically similar levels of otherwise healthy children as early as 3 months post-operatively.

Conflict of interest: This study was self-funded. There was no sponsorship or conflict of interest to declare

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