

# Sleep characteristics in oral breathers pre adenoidectomy and/or tonsillectomy

Características do sono de crianças respiradoras orais encaminhadas para realização de adenoidectomia e/ou amigdalectomia

Características del sueño de los niños respiradores orales encaminados para la realización de adenoidectomía y/o amigdalectomía

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## **Abstract**

**Introduction:** Oral breathing entails several changes in the life of children, one of them being changes in sleep quality, which may have an impact on child development. **Objective:** To understand the sleep characteristics of children diagnosed with oral breathing referred for adenoidectomy and/or tonsillectomy surgeries prescribed by the otorhinolaryngologist, based on information from the family and the children themselves. **Method:** An observational, analytical, cross-sectional and quantitative study was carried out

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### **Authors' contributions:**

TBG Study design and data collection; JPB Study design and article outline; MFB Critical review; APDL Methodology; GRC Advising; BLFA Critical review

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on 100 children of both sexes, with age range 5 and 12 years, divided into two groups: 50 children with oral breathing (EG) and 50 children without respiratory disorder (CG). The evaluation was based on the MBGR protocol, Mallampati score. After collection, the data were tabulated and analyzed statistically from the variables complaint, sleep quality and characteristics and Mallampati classification. **Results:** Parents and/or caregivers did not spontaneously report sleep-related information. When asked about sleep quality there was a predominance of symptoms for the EG. The main complaints related to sleep were snoring, sialorrhea, agitation, dry mouth, open mouth, fragmented sleep, with higher occurrence for the EG. Regarding the classification of Mallampati, there was a predominance of classes II and III for the EG and class I for the CG. **Conclusion:** Oral breathing children have a higher number of complaints reported by parents / guardians regarding sleep quality compared to nasal breathing children.

**Keywords:** Sleep; Mouth Breathing; Tonsillectomy; Adenoidectomy.

## Resumo

**Introdução:** A respiração oral acarreta diversas modificações na vida das crianças sendo uma delas as alterações na qualidade do sono, podendo ter impacto no desenvolvimento infantil. **Objetivo:** Compreender as características do sono de crianças com diagnóstico de respiração oral encaminhadas para a realização de cirurgias de adenoidectomia e/ou amigdalectomia prescritas pelo médico otorrinolaringologista, a partir das informações da família e das próprias crianças. **Método:** Estudo observacional, analítico, transversal e quantitativo, realizado com 100 crianças de ambos os sexos, com faixa etária entre cinco e 12 anos, divididas em dois grupos, sendo 50 crianças com respiração oral (GP) e 50 crianças sem diagnóstico de alteração respiratória (GC). A avaliação foi baseada no protocolo MBGR, classificação de Mallampati. Após a coleta, os dados foram tabulados e analisados estatisticamente a partir das variáveis queixa, qualidade e características do sono e classificação de Mallampati. **Resultados:** Os pais e/ou responsáveis não referiram espontaneamente informações relacionadas ao sono. Quando indagados sobre a qualidade do sono houve predomínio de sintomas para o GP. As principais queixas relacionadas ao sono foram ronco, sialorreia, agitação, boca seca, boca aberta, sono fragmentado, com maior ocorrência para o GP. Quanto à classificação de Mallampati houve predomínio dos graus II e III para o GP e grau I para o GC. **Conclusão:** Crianças respiradoras orais apresentam maior número de queixas referidas por pais/responsáveis em relação à qualidade do sono quando comparadas às crianças respiradoras nasais.

**Palavras-chave:** Sono; Respiração bucal; Tonsilectomia; Adenoidectomia.

## Resumen

**Introducción:** La respiración oral acarrea diversas modificaciones en la vida de los niños siendo una de ellas las alteraciones en la calidad del sueño pudiendo tener impacto en el desarrollo infantil. **Objetivo:** Comprender las características del sueño de niños con diagnóstico de respiración oral encaminhadas para la realización de cirurgías de adenoidectomía y/o amigdalectomía prescritas por el médico otorrinolaringólogo, a partir de las informaciones de la familia y de los propios niños. **Método:** estudio observacional, analítico, transversal y cuantitativo, realizado con 100 niños de ambos sexos, con rango de edad entre cinco y 12 años, divididos en dos grupos, siendo 50 niños con respiración oral (GE) y 50 niños sin diagnóstico de cambio respiratorio (GC). La evaluación se basó en el protocolo MBGR, la clasificación de Mallampati. Después de la recolección, los datos fueron tabulados y analizados estadísticamente de las variables queja, calidad y características del sueño y clasificación de Mallampati. **Resultados:** Los padres y/o tutores no mencionaron espontáneamente información relacionada con el sueño. Cuando se indagó sobre la calidad del sueño hubo predominio de síntomas para el GE. Las principales quejas relacionadas con el sueño fueron ronquidos, sialorreia, agitación, boca seca, boca abierta, sueño fragmentado, con mayor ocurrencia para el GE. En cuanto a la clasificación de Mallampati hubo predominio de las clases II y III para el GE y clase I para el GC. **Conclusión:** Los niños con respiración oral tienen un mayor número de quejas reportadas por los padres / tutores con respecto a la calidad del sueño en comparación con los niños con respiración nasal.

**Palabras clave:** Sueño; Respiración por la Boca; Tonsilectomía; Adenoidectomía.

## Introduction

Breathing is directly associated with craniofacial growth and development and the protection of the upper airways (UA).<sup>1</sup> Therefore, there may be several consequences when breathing functions incorrectly, mainly related to structural and functional changes in the stomatognathic system.<sup>2</sup> The main characteristics of oral breathers include lack of a lip seal, ogival or high palate, Angle Class II occlusion, unilateral or bilateral crossbite, open bite, night apnea, retained lower lip, retracted upper lip, generalized facial hypotony, altered stomatognathic functions, and postural and sleep changes.<sup>2,3</sup>

The etiology of oral breathing may be related to nasal obstruction such as rhinitis, septal deviation, hypertrophy of the palatine and/or pharyngeal tonsils with obstruction to the passage of air through the nasal tract, or non-obstructive origin without any organic obstruction as a result of habit.<sup>4</sup> When the etiology is due to organic changes, surgical procedures are usually necessary to solve them. Adenoidectomy and/or tonsillectomy are among the procedures most commonly performed in otorhinolaryngology and are highly common in oral breathing children. Currently, surgery is highly indicated because tonsillar hyperplasia causes frequent infections and leads to sleep disorders.<sup>5</sup>

A study conducted in a pediatric hospital revealed that adenotonsillectomy is the procedure most often performed by otorhinolaryngologists in the pediatric population. It's most common indications are for repetition tonsillitis, repetition UA infection, difficulty in feeding, cardiopulmonary changes resulting from respiratory obstruction, and sleep changes such as obstructive sleep apnea (OSA). Thus, this surgical mechanism is used to solve issues related to breathing/sleep resulting from obstructions.<sup>6</sup>

A study comparing nasal potency and otorhinolaryngological and orofacial characteristics in children observed reduced upper airway in children with signs and symptoms of rhinitis, reduced hard palate width, and changes in chewing, swallowing, and speech functions, especially in children with restless sleep.<sup>7</sup>

Changes in sleep quality may be associated with characteristic symptoms such as snoring, sialorrhea, dry mouth, restless and fragmented sleep, and nocturnal choking, and consequently they may generate daytime sleepiness, tiredness,

dark circles under the eyes, and school difficulties<sup>8</sup> such as memory and attention disorders.<sup>9</sup>

Studies have observed a close relationship between changes in sleep, oral breathing, and overweight. Therefore, all associated factors should be observed during clinical evaluation.<sup>10</sup>

Another study that described myofunctional orofacial findings and otorhinolaryngological, allergological, and orthodontic problems in children with oral breathing aged 0 to 12 years observed changes in the evaluations made by all professionals, thus emphasizing the importance of multidisciplinary treatment in improving the quality of life of children.<sup>11</sup>

Therefore, in light of a possible positive relationship between nasal obstruction, snoring, and apnea and the importance of sleep for child development, this study compared the characteristics of sleep in children diagnosed with oral breathing pre- and post-adenoidectomies and/or tonsillectomies prescribed by an otorhinolaryngologist.

## Methods

This is an observational, analytical, cross-sectional, quantitative study. This study conforms to all standards established by Resolution 466/2012 of the National Health Council on ethical aspects of research with human beings and was approved by the Ethics Committee of the Universidade Estadual do Centro-Oeste, under opinion number 1,332,668. Only the children whose parents or guardians signed the Informed Consent Form (ICF) participated in the study. The participants signed the Statement of Agreement, indicating their agreement to participate in the study.

The inclusion criteria of the study group were: age between 5 and 12 years, having been diagnosed with oral breathing by an otorhinolaryngologist, having been indicated for adenoidectomy and/or tonsillectomy, and having respiratory complaints for at least one year. The inclusion criteria of the control group were: age between 5 and 12 years, no complaint/diagnosis of palatal and/or pharyngeal tonsil hypertrophy, and no complaint of any respiratory difficulties (self-reference of the child and the parents). The exclusion criteria for both groups were: diagnosis and (or) self-reference of the guardians for neurological, syndromic, psychiatric, metabolic, and/or endocrinological changes,

previous head and neck surgeries, and previous speech treatment.

The sample comprised 100 participants of both sexes aged between 5 and 12 years. The children were divided into two groups: 50 children from the study group (SG) diagnosed with oral breathing, indicated for adenoidectomy and/or tonsillectomy surgeries, and on the waiting list; and 50 children from the control group (CG), without diagnosis of oral breathing and (or) any complaints of respiratory changes. Convenience sampling was used, where the children of the SG group were part of the network of contacts of the researchers (family, friends, acquaintances, etc.) and were evaluated on the day of the medical consultation prior to surgery, and the children of the CG were evaluated at the Clinic-School of Speech Therapy of the Universidade Estadual do Centro-Oeste.

In the SG group, 62% of the children were boys, and the children in the group had a mean age of 7.9 years. In the CG group, 50% of the children were boys, and the group had a mean age of 8.3 years. No statistical difference was found in the two groups by sex or age.

The medical history and evaluation of the children followed the MBGR<sup>12</sup> protocol, which is divided into two stages. In the first, the clinical history of the participants is collected, and in the second an orofacial myofunctional examination is performed that includes observation of body posture, extra- and intraoral morphological analysis, evaluation of mobility, tonicity, and orofacial sensitivity, and evaluation of stomatognathic functions.

In this study, we sought to investigate the quality of sleep through the general and initial complaint in the evaluation and sleep complaints reported by parents during the interview, and from this we considered the following aspects: Restlessness, fragmentation of sleep, snoring, sialorrhea, resonance, apnea, water intake at night, open mouth when sleeping, dry mouth when waking up, pain in the face when waking up, posture, and other changes mentioned by the guardians during the medical history. An altered sleep pattern was identified when the parents reported one or more of these

symptoms during medical history and an adequate sleep pattern in the absence of these symptoms.

Intraoral evaluation was performed according to the Mallampati classification,<sup>13</sup> which associates the size of the tongue to that of the pharynx on a scale of four classes from I to IV. The researchers had to agree on the evaluation, and the supervisor of the study was a PhD specialist in orofacial motricity with 30 years of experience in this type of evaluation.

The data obtained were tabulated and quantitatively analyzed using a significance level of 0.05 (5%) and a confidence interval of 95%. Analysis of variance (ANOVA) and a test of the equality of two proportions were applied to analyze the complaint, quality and characteristics of sleep, and Mallampati classification.

## Results

No difference was found in the medical history data between the groups for spontaneously reported sleep-related complaints (Table 1).

The guardians were later questioned about the quality of sleep of their children, and their sleep pattern was classified as altered when one or more symptoms were reported, and adequate in the absence of symptoms. There was a difference between the groups, with the parents of the children in the SG group offering more complaints related to the quality of sleep (Table 1).

With regard to the characteristics of sleep (Table 1), the SG group showed more changes in sleep pattern except for restlessness, which was more common in the CG group. There were statistically significant differences between the groups in all crossings.

When comparing the groups, the Mallampati classification (Table 2) showed a predominance of Class I in the CG group. Conversely, Classes II and III were more predominant in the SG group. Only Class IV showed no statistical difference between the groups, with a low occurrence in both groups ( $p = 0.153$ ).

**Table 1.** Comparison between groups of sleep complaints, sleep, and sleep characteristics.

	Control		Study		p*	
	n	%	n	%		
<b>Sleep complaint</b>						
No	31	62.0%	28	56.0%	0.542	
Yes	19	38.0%	22	44.0%		
<b>Sleep</b>						
Altered	29	58.0%	49	98.0%	0.001	
Adequate	21	42.0%	1	2.0%		
<b>Sleep Characteristics</b>						
Snoring	No	32	64%	5	10%	0.001
	Yes	18	36%	45	90%	
Sialorrhoea	No	35	70%	17	34%	0.001
	Yes	15	30%	33	66%	
Restlessness	No	18	36%	34	68%	0.001
	Yes	32	64%	16	32%	
Dry Mouth	No	45	90%	17	34%	0.001
	Yes	5	10%	33	66%	
Open mouth	No	37	74%	6	12%	0.001
	Yes	13	26%	44	88%	
Fragmentado	No	43	86%	21	42%	0.001
	Yes	7	14%	29	58%	

Legend: \*Equality of Two Proportions Test (p-value < 0.001); n = number of subjects; % = percentage.

**Table 2.** Comparison between groups by Mallampati classification

Mallampati	Control		Study		p*
	n	%	n	%	
Class I	34	68.0	7	14.0	0.001
Class II	10	20.0	26	52.0	0.001
Class III	6	12.0	15	30.0	0.027
Class IV	0	0.0	2	4.0	0.153

Legend: \*Equality of Two Proportions Test (p-value < 0.001); n = number of subjects; % = percentage.

## Discussion

No statistically significant difference was observed between the groups regarding sleep-related complaints. This might be due to the high number of parents/guardians of both groups (control/study) who did not spontaneously report complaints related to children's sleep because their main complaint concerned respiratory difficulties.

Another study of sleep-related problems reported by parents and children found a lack of knowledge of sleep-related problems and the risks they pose, especially regarding the identification of what can be and cannot be considered part of the normal sleep process.<sup>14</sup> This can be seen in inconsistencies in the reports of parents and children that reveal a lack of parental knowledge of what hap-

pens with their children during the night. Therefore, paying more attention and having a closer follow-up of sleep-related problems is fundamental, and parents and professionals need to know more about the characteristics and risks of disorders that may impair the quality of life of children, for the sooner they are detected, the sooner the search to solve the problem will start.<sup>15</sup>

Another study found a high prevalence of sleep problems, especially in preschool age, as well as the presence of habits, such as falling asleep late, that can also negatively influence the quality of sleep.<sup>15</sup> This finding confirms the importance of studying this age group, as in the present study, because respiratory changes in this age group can underlie the changes already observed in schoolchildren, promoting further sleep changes.

As found in this study, oral breathing children have more sleep-related changes, such as snoring, sialorrhea, dry mouth, open mouth, and fragmented sleep. Another study that compared the quality of sleep between oral and nasal breathing children also showed a higher prevalence of sleep changes in children with respiratory changes (SG).<sup>8</sup>

Patients diagnosed with Obstructive Sleep Apnea Syndrome (OSAS), which has characteristics such as: altered positioning of the tongue dorsum, soft palate posture and suprahyoid muscle tone, with modification of the oropharyngeal space. Thus, the difficulties in the quality of sleep are also related to changes in the stomatognathic system, such as respiratory disorders, because changes in the muscles of the upper airways occur in both.<sup>16</sup>

The otorhinolaryngological diagnosis most commonly found in patients with sleep-disordered breathing has been reported to be palatine and pharyngeal tonsil hypertrophy, associated or not with allergic rhinitis, with 42% of children with OSAS being oral breathers.<sup>6</sup> Although some studies indicate tonsillectomy for the treatment of OSAS, the effectiveness of this procedure depends on several factors, such as the anatomy of the patient, Body Mass Index, neck circumference, and tongue size.<sup>14</sup> A review aimed at determining whether Obstructive Sleep Apnea (OSA) is correlated with changes in oral language found that its late diagnosis and treatment may cause considerable changes in verbal acquisition, since the period in which the acquisition of speech sounds, tonsil hypertrophy, and OSA occurs coincide.<sup>17</sup>

The present study found a predominance of Mallampati Classes II and III in the SG group. A study of nasal and oral breathing children observed hypertrophy of the palatal tonsils and Class III and IV obstructions according to the Mallampati classification,<sup>18</sup> unlike the present study, which found a higher concentration of children with Class II and III obstruction.

These results indicate the need for interdisciplinary studies of this subject, since these data corroborate the literature on the possible relationship between oral breathing, sleep disorders, and consequent changes in child development.<sup>19</sup>

Although the present study makes some contributions to the understanding of the relationship between oral breathing, adenoid hypertrophy and nasopharyngeal tonsil, and sleep changes, further studies using larger samples and comparing other

causal aspects of respiratory changes, such as rhinitis, turbinate hypertrophy, and septal deviation, are necessary.

## Conclusion

Oral breathing children have a higher number of complaints reported by parents/guardians regarding the quality of sleep, such as snoring, sialorrhea, fragmented sleep, dry mouth and open mouth during sleep, and daytime sleepiness than do nasal breathing children.

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