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Débora do Canto Assaf

ALTERAÇÕES CRANIOFACIAIS, DISTÚRBIOS RESPIRATÓRIOS DO SONO E DESEMPENHO ESCOLAR EM CRIANÇAS E ADOLESCENTES DE SANTA MARIA, RS

Santa Maria, RS
2023

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Tese de Doutorado apresentada ao Programa de Pós-Graduação em Ciências Odontológicas da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para a obtenção do título de **Doutora em Ciências Odontológicas com ênfase em Ortodontia.**

Orientadora: Prof. Dra. Mariana Marquezan

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RESUMO

ALTERAÇÕES CRANIOFACIAIS, DISTÚRBIOS RESPIRATÓRIOS DO SONO E DESEMPENHO ESCOLAR EM CRIANÇAS E ADOLESCENTES DE SANTA MARIA, RS

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Esta tese é composta por dois artigos. O objetivo do artigo I é avaliar a associação entre más oclusões, distúrbio respiratório do sono e baixo rendimento escolar em crianças. O artigo II é identificar quais más oclusões e alterações na dimensão do palato estão associadas ao ronco em crianças. Este trabalho é um estudo transversal com uma amostra de 547 crianças em fase de dentição mista, entre 07 e 13 anos de idade, da cidade de Santa Maria -RS. Adotou-se o procedimento de amostragem aleatória por conglomerado em duplo estágio. A amostra foi avaliada e os dados foram obtidos através de questionários, exames odontológicos e fonoaudiológicos. No artigo I, foi realizado modelagem de equações estruturais (MEE) para testar os caminhos entre as medidas demográficas, socioeconômicas e de saúde bucal no desempenho escolar. O desempenho acadêmico foi medido pela percepção dos pais no desempenho acadêmico dos filhos, problema de aprendizado e reprovação na escola. Posteriormente, o modelo estrutural analisou a magnitude e a direção dos caminhos entre as variáveis observadas e latente. A qualidade do ajuste do modelo foi avaliada através de diferentes parâmetros: Root Mean Square Error of Approximation (RMSEA); Comparative Fit Index (CFI); Tucker-Lewis Index (TLI); e o Coefficient of Determination (CD). No artigo II, foi realizado uma análise descritiva para avaliar as características da amostra em geral e segundo a prevalência do ronco. Análise de regressão de Poisson não ajustada e ajustada com variância robusta foi realizada para avaliar a associação entre variáveis preditoras e a ocorrência de ronco. Uma análise secundária foi feita considerando a interação entre as medidas do palato (profundidade e largura) com a presença de diferentes más oclusões (mordida aberta anterior, sobressaliência acentuada e mordida cruzada posterior) para avaliar seu impacto combinado na ocorrência de ronco. Os resultados do artigo I foram: sexo masculino, maior idade, menor grau de escolaridade materna, distúrbios respiratórios do sono, modo respiratório oral ou oronasal apresentaram associação direta ao baixo desempenho escolar. Crianças que não receberam aleitamento materno exclusivo no peito nos primeiros 6 meses de vida apresentaram associação direta ao pior desempenho, além disso, a amamentação não exclusiva impactou indiretamente na desordem do sono via modo respiratório oral ou oronasal. No segundo, a prevalência de ronco foi de 25,1%. Crianças que não apresentavam mordida aberta anterior, mas apresentavam palato duro estreito, apresentaram maior chance de roncar. Independentemente da largura do palato duro, indivíduos com overjet acentuado apresentaram maior prevalência de ronco. Crianças com palato duro profundo e estreito associado à presença de mordida cruzada posterior também apresentou maior prevalência de ronco. Destacamos a importância do aleitamento materno exclusivo nos primeiros 6 meses de vida como fator importante na prevenção de distúrbios respiratórios do sono e problemas relacionados ao desempenho escolar, além de avaliar a dimensão do palato em crianças e não somente a presença de más oclusões, visto que uma dimensão alterada já pode predispor à presença de ronco infantil.

Palavras-Chave: Desempenho Escolar. Má Oclusão. Distúrbios do Sono. Ronco. Palato Duro.

ABSTRACT

CRANIOFACIAL CHANGES, SLEEP BREATHING DISORDERS AND SCHOOL PERFORMANCE IN CHILDREN AND ADOLESCENTS FROM SANTA MARIA, RS

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This thesis consists of two articles. The objective of article I is to evaluate the association between malocclusions, sleep-disordered breathing and poor school performance in children. Article II is to identify which malocclusions and alterations in the size of the palate are associated with snoring in children. This work is a cross-sectional study with a sample of 547 children in the mixed dentition phase, between 07 and 13 years old, from the city of Santa Maria -RS. A two-stage cluster random sampling procedure was adopted. The sample was evaluated and the data were obtained through questionnaires, dental and speech examinations. In Article I, Structural Equation Modeling (SEM) was performed to test the pathways between demographic, socioeconomic, and oral health measures in school performance. Academic performance was measured by parents' perception of the students' academic performance, learning problems and school failure. Subsequently, the structural model analyzed the magnitude and direction of the paths between the observed and latent variables. The model's goodness of fit was evaluated using different parameters: Root Mean Square Error of Approximation (RMSEA); Comparative Fit Index (CFI); Tucker-Lewis Index (TLI); and the Coefficient of Determination (CD). In article II, a descriptive analysis was performed to assess the characteristics of the sample in general and according to the prevalence of snoring. Unadjusted and adjusted Poisson regression analysis with robust variance was performed to assess the association between predictor variables and the occurrence of snoring. A secondary analysis was performed considering the interaction between palate measurements (depth and width) with the presence of different malocclusions (anterior open bite, accentuated overjet, and posterior crossbite) to assess their combined impact on the occurrence of snoring. The results of article I were: male gender, older age, lower level of maternal education, sleep-disordered breathing, oral or oronasal breathing mode were directly associated with poor school performance. Children who did not receive exclusive breastfeeding in the first 6 months of life showed a direct association with worse performance, in addition, non-exclusive breastfeeding indirectly impacted sleep disorder via oral or oronasal breathing mode. In the second, the prevalence of snoring was 25.1%. Children who did not have an anterior open bite, but had a narrow hard palate, were more likely to snore. Regardless of hard palate width, individuals with severe overjet had a higher prevalence of snoring. Children with a deep and narrow hard palate associated with the presence of posterior crossbite also had a higher prevalence of snoring. We highlight the importance of exclusive breastfeeding in the first 6 months of life as an important factor in the prevention of sleep-disordered breathing and problems related to school performance, in addition to assessing the size of the palate in children and not just the presence of malocclusions, since an altered dimension can already predispose to the presence of childhood snoring.

Keywords: School Performance. Malocclusion. Sleep Disorders. Snoring. Palate, Hard.

SUMÁRIO

1. INTRODUÇÃO GERAL

O sono é um processo biológico, natural e essencial para o organismo; a regulação e reparação de diversos processos sistêmicos se devem a ele (KIM et al., 2021).

Segundo a Classificação Internacional de Distúrbios do Sono (ICSD-3), da Associação Americana de Distúrbios do Sono (AASM, 2014), existem sete grandes grupos para classificar os distúrbios do sono: insônia, distúrbios respiratórios relacionados ao sono, distúrbios centrais de hipersonolência, distúrbios sono-vigília do ritmo circadiano, parassonias, distúrbios do movimento relacionados ao sono e outros distúrbios do sono (SATEIA, 2014).

Englobando os Distúrbios Respiratórios do Sono estão a Síndrome da Apneia Obstrutiva do Sono (SAOS) e a Síndrome de Resistência das vias aéreas (nas quais o ronco está presente) podendo acometer adultos e crianças.

Segundo a ICSD-3, em casos de SAOS infantil, os sinais e sintomas clínicos envolvem ronco, respiração difícil/obstruída, movimento toracoabdominal paradoxal, achatamento das conchas aéreas nasais e/ou consequências diurnas (sonolência ou hiperatividade) (SATEIA, 2014). O ronco ocorre quando, na inspiração, o fluxo de ar faz vibrar os tecidos da orofaringe gerando o som. O ronco é mais comum no sexo masculino e pode ocorrer em qualquer idade (AASM, 2014). Quando severo, pode ser um sinal de SAOS, independente da faixa etária (AASM, 2014). Em crianças, estudos apresentam alta prevalência de ronco, podendo chegar até 63% (URSCHITZ et al., 2003).

Os Distúrbios Respiratórios do Sono apresentam prevalência de 4 a 20% durante a infância (BONUK et al., 2011; LI et al., 2015) e compreendem etiologia multifatorial. Entre os fatores de risco estão hipertrofia adenotonsilar, hiperplasia de cornetos, cavidade nasal pequena e estreita, atresia maxilar, mordida cruzada posterior, retrognatismo mandibular, sobrepeso, respiração oral, hábitos de sucção não-nutritivas entre outros fatores (OPHOFF et al., 2018; ARENS et al., 2004).

Um estudo realizado na Itália (GALEOTTI, et al 2018) avaliou a prevalência de más oclusões em 139 crianças com diagnóstico de SAOS. Foram realizados exames a partir de oxímetro de pulso para obtenção do diagnóstico. As más oclusões associadas à SAOS foram mordida cruzada posterior, sobressaliência aumentada e sobremordida diminuída, assim como em outros estudos similares (CAZZOLLA et al., 2010; CARVALHO et al., 2014). Outros estudos observaram prevalência de 33,3% e 22,8% para distúrbios respiratórios do sono em crianças brasileiras e espanholas, respectivamente, nas quais

foram encontradas associações significativas para mordidas cruzadas posteriores, maxila estreita e mordidas abertas anteriores (AROUCHA et al., 2020; VÁZQUEZ-CASAS et al., 2020). Quanto aos hábitos bucais deletérios, verificou-se que crianças respiradoras bucais apresentam menor largura e maior profundidade na região mais posterior do palato enquanto hábitos prolongados de sucção não nutritiva apresentaram palato mais estreito e profundo na região anterior do palato (BERWIG et al., 2011).

Entretanto, um estudo realizado em uma população adulta (AL-MADANI et al, 2015), não encontrou evidências diretas quanto ao ronco estar associado às más oclusões, mas sim, observou associação entre ronco e morfologia do palato em forma de "V", ou seja, pacientes com palato mais profundo e atrésico, aumento da circunferência de pescoço, comprimento do arco superior diminuído e estreitamento na região de primeiros pré-molares superiores. Portanto, é interessante pensar que alterações na dimensão do palato pode ser um fator preditivo mais forte para distúrbios respiratórios do sono comparado às más oclusões que podem ainda não estar instaladas ou nem chegar a instalar-se no indivíduo.

Os distúrbios do sono em crianças estão fortemente relacionados com impacto neurocognitivo em geral (BOURKE et al, 2011), falha na aprendizagem, sonolência diurna, hiperatividade, agressividade e problemas relacionado ao humor como depressão e ansiedade (ARONEN et al, 2009; ROSEN et al, 2004) afetando a qualidade de vida dos pacientes (TAMASAS et al, 2019).

Um estudo realizado na Turquia, que avaliou 1650 crianças, encontrou prevalência de ronco em 38,9% da amostra, sendo mais prevalente no sexo masculino, além de crianças entre 7 a 8 anos apresentaram maiores índices de ronco quando comparadas às mais velhas (SAHIN et al, 2009). A prevalência de ronco tende a diminuir com a idade devido ao aumento da área transversal da faringe com o crescimento. Os fatores associados ao ronco encontrados neste estudo foram sintomas alérgicos, respiração bucal diurna, sintomas de apneia do sono, sono agitado, sonolência diurna excessiva, dores de cabeça matinais, hiperatividade e fumo passivo. O índice de massa corpórea (IMC) elevado também foi considerado como alto risco para aparecimento de ronco na infância (SAHIN et al, 2009).

Além do mencionado, Sahin e colaboradores (2009) encontraram associação significativa e independente entre baixo desempenho escolar com hiperatividade, enurese noturna, respiração oral diurna, ranger de dentes e baixa escolaridade dos pais na análise multivariada. Outros fatores como cefaleia e respiração bucal diurna, dificuldade de

respiração durante o sono, apneia do sono presenciada, hiperatividade e mau desempenho escolar também apresentaram associação significativa (SAHIN et al, 2009). Nesse estudo, dezoito crianças (1,5% da amostra) apresentaram sonolência diurna excessiva que incluía adormecer enquanto assistiam à televisão ou em locais públicos, durante as aulas na escola ou como passageiro de um carro, que foi significativamente maior em roncadores habituais. Outros fatores de risco para sonolência diurna excessiva incluíram respiração bucal diurna e menor duração do sono. Crianças com enurese noturna tiveram aproximadamente 4 vezes mais sonolência diurna excessiva (SAHIN et al, 2009).

O ronco definido como ocasional, frequente ou sempre presente apresentou prevalência de 63,7% em um estudo realizado em crianças alemãs. Crianças que roncavam apresentaram baixo desempenho acadêmico em matemática, ciências e ortografia (URSCHITZ et al., 2003). Crianças que roncam habitualmente têm pelo menos o dobro do risco de ter um desempenho ruim na escola, sendo essa associação mais forte com o aumento da frequência do ronco. Foi observado menor desempenho escolar no sexo masculino (exceto na disciplina de matemática), crianças maiores de nove anos tiveram índices de desempenho piores e baixa escolaridade materna e paterna também estão associados (URSCHITZ et al., 2003).

Além do impacto negativo na qualidade de vida e desempenho escolar de portadores de distúrbios respiratórios do sono, estudos de neuroimagem em adultos demonstram perda de células neurais e alterações nos níveis neuroquímicos de pacientes com SAOS não tratados. As regiões de perda relatadas foram: redução da matéria cinzenta no hipocampo (MORRELL et al., 2003), cerebelo, córtex frontal e parietal e giro cingulado anterior (MACEY et al., 2002; YAOUHI et al., 2009), alterações na substância branca frontal, reduções significativas no giro temporal médio direito e cerebelo esquerdo (regiões responsáveis pela regulação motora das vias aéreas superiores, bem como no processamento cognitivo) (AHI; KAMBA et al., 2001; MORRELL et al., 2010).

No que diz respeito às alterações cerebrais em crianças com SAOS, não foram observados no estudo de Halbower e colaboradores (2006) sinais de danos neuronais estruturais, mas apresentam metabólitos neurais reduzidos no hipocampo e no córtex frontal direito, prejuízos na memória, aprendizado e funções executivas.

Com base no forte impacto que os distúrbios respiratórios do sono e o ronco podem afetar o desempenho escolar e a qualidade de vida durante a infância e fase adulta, é importante que os fatores associados a esses distúrbios, incluindo os fatores oclusais, como más oclusões já instaladas e demais alterações craniofaciais, como por exemplo,

alterações na normalidade de dimensão de palato, sejam esclarecidos na literatura científica. A partir da identificação desses fatores, o profissional da saúde como cirurgiões-dentistas, fonoaudiólogos, pediatras, otorrinolaringologistas estarão aptos para realizar o diagnóstico e encaminhamentos necessários para o tratamento multiprofissional destes distúrbios.

O objetivo do primeiro artigo intitulado *"School performance, respiratory sleep disorders and malocclusion in children: an association cross-sectional study",* é avaliar a associação entre más oclusões, possíveis distúrbios respiratórios do sono e baixo desempenho escolar em crianças. Nossa hipótese conceitual é de que as más oclusões terão influência nos distúrbios respiratórios do sono infantil e consequentemente predispondo ao pior desempenho escolar. O Segundo artigo intitulado *"Snoring in children and its association with altered dimension of palate and malocclusion: a cross-sectional study",* visou identificar quais más oclusões (mordida aberta anterior, mordida cruzada posterior, overjet acentuado) e alterações na dimensão do palato duro (largura e profundidade) estão associadas ao ronco em crianças. A hipótese conceitual é que tanto as más oclusões como alterações na dimensão do palato estarão associadas a maior prevalência de ronco.

2. ARTIGO 1: SCHOOL PERFORMANCE, RESPIRATORY SLEEP DISORDERS AND MALOCCLUSION IN CHILDREN: AN ASSOCIATION CROSS-SECTIONAL STUDY. Este artigo será submetido ao periódico *Community Dentistry and Oral Epidemiology*, ISSN: 0301-5661. Fator de impacto = 2.489, Qualis CAPES A1. As normas para publicação estão descritas no Anexo B.

TITLE PAGE

SCHOOL PERFORMANCE, RESPIRATORY SLEEP DISORDERS AND MALOCCLUSION IN CHILDREN: AN ASSOCIATION CROSS-SECTIONAL STUDY

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SCHOOL PERFORMANCE, RESPIRATORY SLEEP DISORDERS AND MALOCCLUSION IN CHILDREN: AN ASSOCIATION CROSS-SECTIONAL STUDY

ABSTRACT

Objectives: The aim of this study was to evaluate the association between malocclusion, sleep-disordered breathing and poor school performance in children. **Methods:** This was a cross-sectional study with a sample of 547 children in the mixed dentition phase, between 07 and 13 years old, pupils at state schools in the city of Santa Maria -RS. A two-stage cluster random sampling procedure was adopted, with nine schools being randomly selected, according to the different administrative regions. The sample was evaluated and the data were obtained by applying questionnaires, and performing dental and speech examinations. Structural equation modeling (SEM) was used to test the pathways between demographic, socioeconomic, and oral health measures on school performance. The SEM was composed of the measurement model of latent variables and the structural model by associations between the variables. Academic performance was measured by three variables: parents' perception of the students' academic performance, learning problems, and school failure. Subsequently, the structural model analyzed the magnitude and direction of the paths between the variables observed and latent variables. **Results:** Male gender, older age (11-13 years), lower level of maternal education, sleep-disordered breathing, oral or oronasal breathing mode were directly associated with poor school performance. Children who did not receive exclusive breastfeeding in the first 6 months of life also showed a direct association with worse performance. In addition, non-exclusive breastfeeding indirectly impacted sleep disorder via oral or oronasal breathing mode. **Conclusion:** The initial hypothesis that malocclusions would play an important role in children's sleep quality was not proven in this study, however, we have shown the influence of sleep-disordered breathing on school performance. Moreover, we highlight the importance of exclusive breastfeeding in the first 6 months of life for the prevention of sleep-disordered breathing.

Keywords: School Performance, Malocclusion, Sleep Disorders.

INTRODUCTION

According to the International Classification of Sleep Disorders (ICSD 3), of the American Association of Sleep Medicine (AASM)[1], there are seven major groups into which sleep disorders are classified: Insomnia, Sleep-related breathing disorders, Central disorders of hypersomnolence, Disorders Circadian rhythm sleep-wake, Parasomnias, Sleep-related movement disorders and other sleep disorders[2].

Sleep-disordered breathing has a prevalence of 4 to 20% during childhood[3,4] and has a multifactorial etiology. The risk factors include adenotonsillar hypertrophy, turbinate hyperplasia, small and narrow nasal cavity, maxillary atresia, posterior crossbite, mandibular retrognathism, overweight, mouth breathing, non-nutritive sucking habits, among other factors[5,6]. Sleep disorders in children are strongly related to neurocognitive impact in general[7], learning failure, daytime sleepiness, hyperactivity, aggressiveness and mood-related problems such as depression and anxiety[8,9] affecting the quality of life of patients[10].

A study conducted in Italy[11] evaluated the prevalence of malocclusion in 139 children diagnosed with Obstructive Sleep Apnea Syndrome (OSAS). Pulse oximeter tests were performed to obtain the diagnosis. The types of malocclusion associated with OSAS were posterior crossbite, increased overjet and decreased overbite, as in other similar studies[12,13]. Other studies found a prevalence of 33.3% and 22.8% for sleep-disordered breathing in Brazilian and Spanish children, respectively, in which significant associations were found with posterior crossbite, narrow maxilla and anterior open bite cases[14,15]. As regards deleterious oral habits, mouth-breathing children were found to have a smaller width and greater depth in the posterior region of the palate, while in children with prolonged non-nutritive sucking habits, the anterior region of the palate was found to be narrower and deeper[16]

Whereas a study conducted in an adult population[17] did not find any direct evidence of snoring being associated with malocclusion; instead, an association was observed between snoring and a “V”-shaped palate morphology; that is, patients with a deeper palate and atresia, increased neck circumference, decreased maxillary arch length and narrowing in the maxillary a first premolar region. Therefore, it is interesting to think that alterations in the dimension of the palate may be a stronger predictive factor for sleep-disordered breathing when compared with malocclusion, which may not yet be or will perhaps never be installed in the individual.

A study conducted in Turkey, evaluated 1650 children, and found the prevalence of snoring in 38.9% of the sample. It was more prevalent in males, and in children between 7 and 8 years old who showed higher rates of snoring when compared with older children[18]. The prevalence of snoring tended to decrease with age due to the increase in the cross-sectional area of the pharynx with growth. Allergic symptoms, nocturnal enuresis, daytime mouth breathing, symptoms of sleep apnea, restless sleep, excessive daytime sleepiness, morning headaches, hyperactivity, sleep bruxism, high body mass index (BMI) and passive smoking are risk factors associated with snoring in childhood[18].

Snoring defined as being occasional, frequent or always present had a prevalence of 63.7% in a study conducted with German children[19]. Children who snored had poor academic performance in math, science and spelling[19]. Children who habitually snored had at least twice the risk of performing poorly in school, and this association was stronger with increasing snoring frequency. Lower school performance was observed among males (except in the subject of Mathematics); children over nine years of age had worse performance indices, and this was also associated with low maternal and paternal schooling[19].

In addition to the negative impact on the quality of life and school performance of individuals with sleep-disordered breathing, neuroimaging studies in adults have demonstrated the loss of neural cells and changes in neurochemical levels in patients with untreated OSAS. These losses were reported in the following regions: reduction of gray matter in the hippocampus[20], cerebellum, frontal and parietal cortex and anterior cingulate gyrus[21,22], alterations in the frontal white matter, significant reductions in the right middle temporal gyrus and left cerebellum (regions responsible for motor regulation of the upper airways, as well as in cognitive processing)[23,24].

With regard to brain alterations in children with OSAS, no signs of structural neuronal damage were observed in the study by Halbower et al [25], but the authors found reduced neural metabolites in the hippocampus and in the right frontal cortex, impairments in memory, learning and executive functions.

Based on the strong impact that sleep-disordered breathing and snoring can have on school performance and quality of life during childhood and adulthood, it is important for factors associated with these disorders, including occlusal and craniofacial changes, oral habits, functional alterations of the stomatognathic system to be clarified in the

scientific literature. Based on identification of these factors, health professionals such as dentists, speech therapists, pediatricians, otorhinolaryngologists will be able to make the diagnosis and necessary referrals for the multidisciplinary treatment of these disorders.

In the present study, orthodontists and a speech therapist performed multidisciplinary evaluations in school-aged with the purpose of contemplating and observing different aspects of the craniofacial complex. The conceptual hypothesis is that malocclusion will influence children's sleep-disordered breathing and consequently predispose them to worse school performance.

METHODS

Study Design

A cross-sectional study was conducted in the city of Santa Maria, Rio Grande do Sul, Brazil, in the year 2015. Two hundred and sixty-one thousand inhabitants were estimated, of which 30,216 (11.57%) were enrolled in elementary educational institutions (Demographic Census of the Brazilian Institute of Geography and Statistics, 2015). The research was submitted to and approved by the Research Ethics Committee of the Federal University of Santa Maria under protocol No. 08105512.0000.5346. The same database has been used in previous researches[26-28]. The participants' parents signed the Term of Free and Informed Consent (TFIC) (APPENDIX A).

Sample

Random sampling by double stage conglomerate was adopted. Ten thousand five hundred and sixty-nine pupils were enrolled in 26 elementary schools in the state network in 2014. Nine of these schools were drawn according to the different administrative regions and school size. From the lists of pupils enrolled in the nine selected schools, 1,559 children were invited to participate in the study, of which 948 consented and had the Term of Free and Informed Consent signed by their parents or guardians (response rate 60.8%). Of these 948 children, 547 were included in the sample. All children in the mixed dentition stage with erupted maxillary first molars were included in the study. Those with a history of previous or current orthodontic and/or speech therapy treatment, perceptible signs of syndromes and/or cognitive limitations were excluded from the sample. Sample losses were related to the following reasons: presence of deciduous or permanent dentition, not having permanent incisors to enable measurement of overbite

and overjet, children who missed classes on the assessment days and other missing data. Demographic and socioeconomic variables were collected from a semi-structured questionnaire answered by parents or guardians (APPENDIX B), which contained the following information: general health aspects, history of current or previous orthodontic and/or speech therapy treatment, gender (female or male), skin color (white or non-white), maternal and paternal schooling. Age was divided into three segments: 7 to 8 years, 9 to 10 and 11 to 13 years old. Maternal and paternal schooling was collected in completed years of study and later dichotomized into incomplete primary education (8 years).

Sleep-disordered Breathing

The questionnaire answered by parents or guardians (APPENDIX B) also included questions related to the child's sleep, such as: snoring, drooling on the pillow, restless sleep and open mouth while sleeping. When at least two of the four options mentioned were checked, we considered the condition “possible sleep-disordered breathing”. The questions were based on the validated “Sleep Disturbance Scale for Children” (SDSC) questionnaire[29].

School Performance

School performance was evaluated through questions answered by the child's parents or guardians and was divided into 3 groups of questions about: (1) problems with learning to read or write, (2) school year repeated and (3) guardian's perception of the child's school performance (APPENDIX B).

Dental Evaluation

The dental examination- using an evaluation form (APPENDIX C) - was performed by four previously trained and calibrated dentists (intra- and inter-examiner Kappa > 0.70), carried out at schools, in rooms provided by the school management, under natural bright light conditions, with the child and the professional sitting face to face. The dental evaluation included the period of dentition (primary, mixed or permanent), periods of mixed dentition (first transitional period, intertransitional period and second transitional period), occlusal changes: anterior open bite (present/absent), posterior crossbite unilateral or bilateral, anterior crossbite, overjet (mm), overbite (mm), Angle molar relationship (Classes I, II and III) and early tooth loss. For measurements in millimeters of overjet and overbite, the World Health Organization (WHO) probe

(Millennium - Golgran, São Caetano do Sul, SP, Brazil) was used. Measurements between 0.5 and 3.5mm were considered adequate; ≥ 4mm were considered increased. and decreased when ≤ 0mm.

Speech Language Evaluation

A single calibrated speech therapist (Kappa > 0.70) carried out speech assessment of the pupils using a form consisting of data extracted from the Orofacial Protocol with Scores (AMIOFE)[30] and data taken from the Myofunctional Orofacial Assessment Protocol (MBGR)[31] (APPENDIX D). The following factors were observed: breathing mode assessed by spontaneous observation of the patient, classified as nasal, buccal or oronasal according to AMIOFE[30]; tongue positioning was evaluated during rest and during speech evaluation, classified as normal (contained in the oral cavity) or altered (introduced to the dental arches with the following subclassifications: adaptation, dysfunction or excessive protrusion) according to the AMIOFE protocol.[30] The participant's speech was also evaluated during automatic speech, by asking the children to count from 1 to 20, count the days of the week, and say the letters of the alphabet. Then they were asked to describe the pictures on a clipboard, thus the children were classified as showing absence of speech distortion or presence of speech distortion, according to the MBGR protocol[31].

Statistical analysis

Analyses were performed using the STATA 14 program (StataCorp. 2014. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP). A descriptive analysis was performed to assess the distribution of the sample according to demographic, socioeconomic and behavioral variables and measures of oral health.

Structural equation modeling (SEM) was used to test the pathways between demographic, socioeconomic, and oral health measures on school performance. The SEM was composed of the measurement model of the latent variables and the structural model by the associations between the variables. The latent variable considered was academic performance, measured by three variables: 1) parents' or guardians' perception of the pupils' academic performance; 2) learning problem; and 3) failure in school. The latent variable construct was previously tested by confirmatory factor analysis (CFA). Subsequently, the structural model was used to analyze the magnitude and direction of the paths between the variables observed and latent variables.

The model quality of fit was evaluated using different parameters: Root Mean Square Error of Approximation (RMSEA); Comparative Fit Index (CFI); Tucker-Lewis Index (TLI); and the Coefficient of Determination (CD). The RMSEA value <0.05, CFI and TLI value> 0.90 and SRMR <0.10 indicate an adequate fit of the model (Kline, 2010)[32]. Modification indices (MI) were used to assess the quality of fit and determination of poor explanatory paths that were removed for the parsimonious model. The results are presented in standardized coefficient (β) format and at a significance level of 0.05.

RESULTS

Of the total number of pupils invited to participate in the study, 948 consented and had the Term of Free and Informed Consent signed by their parents or guardians (response rate 60.8%). Of the children who agreed to participate, 547 were included in the sample. Figure 1 shows the reasons for sample losses.

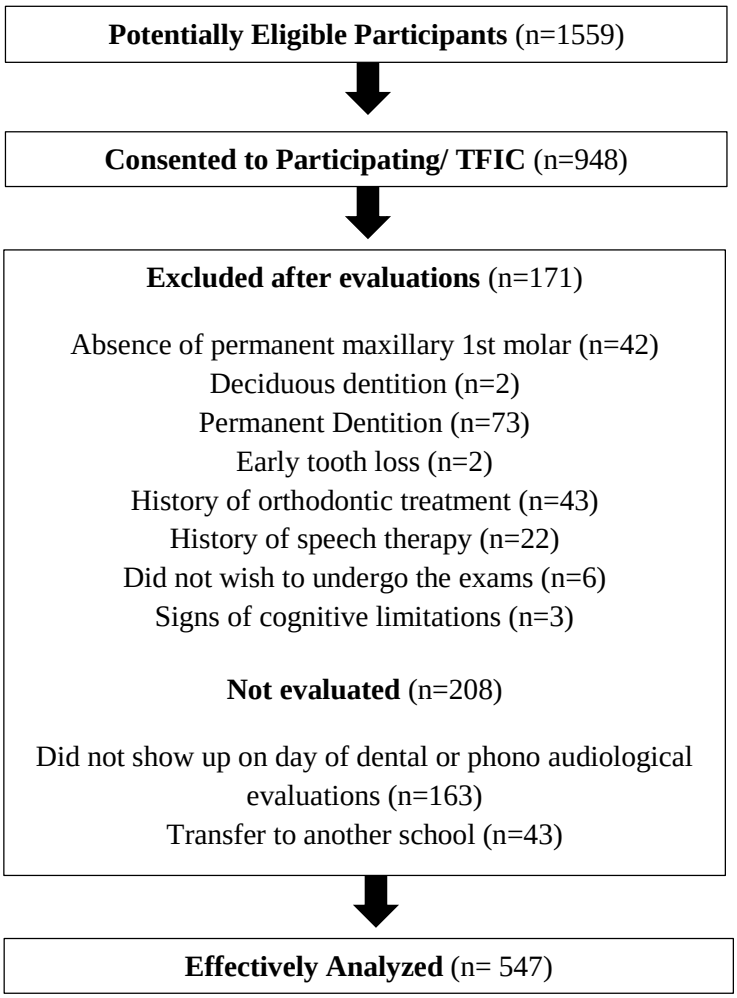

Figure 1. Flowchart - inclusion and exclusion criteria and sample losses.

The majority of individuals were female (54.6%) and white (79.2%). The age in the sample ranged between 7 and 13 years and the mother's schooling of the major portion of the sample was greater than or equal to 8 years (67.3%). About 39.1% had some type of malocclusion, 63% had normal breathing (nasal) and 26.1% had untreated caries. As regards the variables related to school performance, most parents reported an excellent or good school performance of their children (81.5%), not having learning problems (77.5%) and that they had never failed any school subject (92.3%). (Table 1).

Relative to breastfeeding, 70.4% of the sample received exclusive breastfeeding in the first 6 months of life. Thirty-three percent of the sample had prolonged non-nutritive sucking habits such as a pacifier or a finger sucking beyond 3 years of age, and 38.7% of the sample had a possible sleep disorder reported by the guardian through the questionnaire that included questions related to the quality of child's sleep (Table 1).

Table 1. Sample distribution according to demographic, socioeconomic, behavioral and clinical characteristics (n = 547).

Variables	N*	%
Sex		
Girls	299	54.6
Boys	248	45.4
Age		
7-8 years	156	28.6
9-10 years	207	38.0
11-13 years	182	33.4
Skin color		
White	433	79.2
Non-white	114	20.8
Maternal education		
< 8 years of formal education	171	32.7
≥ 8 years of formal education	352	67.3
Self-perception of school performance		
Excellent or good	437	81.5
Fair or poor	99	18.5
Learning problems		
No	416	77.5
Yes	121	22.5
Failing a class		
No	501	92.3
Yes	42	7.7
Breastfeeding up to 6 months		
Exclusive	385	70.4
Not exclusive	182	29.6

Non-nutritive sucking habits		
No	366	67.0
Yes	180	33.0
Sleep disorder		
No	266	61.3
Yes	168	38.7
Breathing mode		
Normal	344	63
Oral or oronasal	202	37
Speech distortion		
No	461	84.4
Yes	85	15.6
Malocclusion		
Without	299	60.9
With	192	39.1
Untreated dental caries		
Without	404	73.9
With	143	26.1

*Values lower than 547 are due to missing data.

Table 2 shows the initial and final structural model fits. The SEM supported the hypothetical model (complete model) with the following values: CD = 0.13, CFI = 0.97, TLI = 0.95, RMSEA = 0.01. Subsequently, some variables were removed for construction of the parsimonious model, which also showed a good fit.

Table 2. Adjustment values of the initial and final structural model

Model Fit	Initial model	Final model
RMSEA (90% CI)	0.02 (0.01-0.04)	0.01 (0.01-0.02)
CFI	0.95	0.97
TLI	0.90	0.95
CD	0.13	0.19

RMSEA, Root Mean Square Error of Approximation; CI, Confidence interval; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; CD, coefficient of determination.

Figure 2 shows the significant direct and indirect paths of the final (parsimonious) model. All items confirmed the latent variable of school performance ($p < 0.05$). The factors that had direct impact on the worst school performance were male gender (β 0.11; $p<0.05$), older age (β 0.16; $p<0.05$) and lower maternal education (β -0.14; $p< 0.05$). Furthermore, children who were not exclusively breastfed up to 6 years of age (β 0.14; $p<0.01$) and who had sleep disorders (β 0.12; $p<0.05$) were also more likely to have worse school performance. The altered breathing mode (oral or oronasal) had a direct impact on the occurrence of sleep disorders (β 0.18; $p<0.05$) and on the occurrence of malocclusion

(β 0.15; p<0.05). The presence of non-nutritive sucking habits (β 0.19; p<0.05) and male gender (β 0.09; p<0.05) also had a direct impact on malocclusion. Relative to indirect effects, non-white skin color had an indirect impact on worse school performance via breathing mode and sleep disorders (β 0.19; p<0.05) and via maternal education. Moreover, non-exclusive breastfeeding (β 0.01; p<0.05) had indirect impact on sleep disorder via oral or oronasal breathing mode.

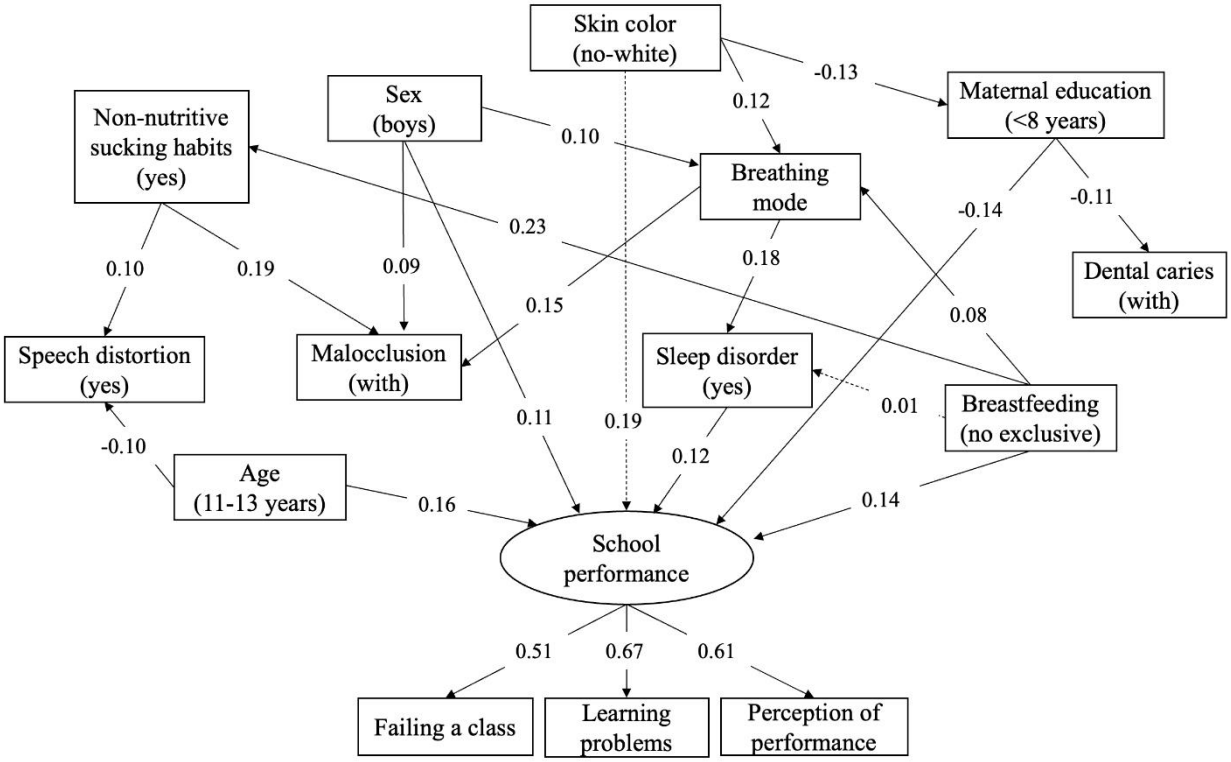

Figure 2. Significant associations among variables observed in the school performance of adolescents. Direct effects are represented through solid lines and indirect effects are indicated by dashed lines.

DISCUSSION

The present study showed a direct association between a possible sleep disorder and school performance, in line with several studies inspired by the scientific literature[18,19,25]. The clinical signs and symptoms related to the reported sleep symptoms, mainly related to OSAS, are explained by the brief respiratory stops repeated during the night, causing intermittent hypoxemia or oxyhemoglobin desaturation (reduction in hemoglobin oxygen levels), fragmenting the patient's sleep [33,34]. These nighttime events resulted in excessive daytime sleepiness and changes in mood and cognition. Jackson et al.[33] observed

alterations in the structure and metabolism of the brain of patients with OSAS in examinations using neuroimaging techniques, such as structural magnetic resonance imaging and proton magnetic resonance spectroscopy.

In the study by Sahin et al[18], daytime mouth breathing, difficulty with breathing during sleep, witnessed sleep apnea, and hyperactivity were associated with poor school performance. No significant association was determined with snoring in isolation, however, contrary to the study by Urishita and collaborators[19]. Moreover, there was no significant difference in mean sleep duration and school performance[18], children with good school performance did not sleep more than those with poor school performance. These findings suggested that the quality of sleep may be as or more important than the amount of sleep itself, corroborating the findings of other studies in the scientific literature[35,36].

Individuals of the male gender, low maternal education and older age (11 to 13 years) showed worse school performance in the sample evaluated. A North American cohort study followed the learning and cognitive performance of individuals from 4 to 22 years of age by means of brain magnetic resonance imaging[37]. The study observed a significant reduction of gray matter in some regions of the cerebral cortex in children who were below the poverty line and whose parents had low education levels[37].

As regards gender and age, there was no consensus in the scientific literature due to the high methodological variability for assessing school performance or cognitive performance. The study by Kohan et al.,[38] conducted in southern Brazil with children between 6 and 12 years of age, corroborated our findings regarding gender. Girls had higher scores related to neurocognitive performance, but not in relation to age, probably as a function of the type of cognitive test used in the aforementioned study[38]. Different approaches and cognitive tests can differentiate the performance between boys and girls at different ages, according to some studies conducted, in which the authors addressed motor, language, memory and logic tests, and showed results that varied consierably[39,40].

In the present study, a direct association was found between exclusive breastfeeding and school performance. This finding is in line with several studies in the scientific literature, including cohort studies and randomized clinical trials with large sample sizes[41-43]. Foroughi et al.[43] conducted a cohort study in the British population in which they followed-up 5362 individuals up to 43 years of age. A significant association

was found between exclusive breastfeeding from 4 months of age, different types of cognitive tests were used at different ages, such as reading, visual and memory tests, but the findings were only significant for females[43]. This finding was contrary to other studies that did not show differences between genders[41,42].

The physiological mechanism relative to breastfeeding interfering in cognitive aspects is attributed to the nutritional role of breast milk being beneficial for the development and strengthening of neural connections in the individual's CNS, since the development of the central nervous system undergoes critical phases during pre and postnatal periods [44,45]. In addition to cognitive aspects, nutrition can affect the child's physical growth[46,47], development of the individual's stomatognathic system, associated with the functions of speech, swallowing, breathing, chewing[48,49]. A recent systematic review[50] showed that exclusive breastfeeding was able to reduce the incidence of posterior crossbites, skeletal and dentoalveolar Class II in primary and mixed dentition. This also suggests that there seems to be a positive relationship between the duration of breastfeeding and reduced risk of malocclusion[50].

In this study, we noted the interesting highlight that the time of exclusive breastfeeding could exert an influence on the different interfaces in the formation of the individual. Exclusive breastfeeding in the first 6 months of life was directly associated with school performance, probably explained by the mechanisms mentioned in the paragraph above. Indirectly, exclusive breastfeeding was associated with the individual's breathing mode; when altered, these predisposed children to possible sleep-disordered breathing, which in turn contributed to failures in school learning. When breastfeeding was not exclusive, this was also associated with non-nutritive sucking habits, which are directly associated with malocclusion and speech distortion. This finding was in line with that of a previous study, in which breastfeeding was not directly related to malocclusion in school-aged children, unlike non-nutritive sucking habits[28]. The physiological mechanism related to the association of non-exclusive breastfeeding and the installation of non-nutritive oral habits is well known and understood in the literature. In the baby’s first months of life, there is greater development of its oral part linked to the feeling of satiety and pleasure. When this need is not fully met through breastfeeding, which requires more time and suctional effort, the child starts to seek other ways to meet this physiological need by resorting to pacifier and/or finger sucking, for example[51,52].

Relative to the indirect effects, non-white skin color had an indirect impact on worse school performance via breathing mode and sleep disorders (β 0.19; p<0.05) as well as via maternal education. The fact that non-white skin color is associated with worse school performance via lower maternal education may be a reflection of a less privileged social condition. A Cohort study with 30 years of follow-up[53], conducted in southern Brazil, demonstrated that high IQ (Intelligence Quotient) indices were associated with longer years of maternal and paternal education, higher family income and longer periods of breastfeeding. The socioeconomic condition of children is associated with several factors related to health, cognition and psycho-emotional effects with effects until adulthood[54]. Access to material and social resources or reactions to stress-inducing conditions both by children themselves and by their parents are some of the mechanisms that explain the association of socioeconomic status with children's well-being[54]. We believe that the worse socioeconomic condition can also explain the indirect route that led to non-white skin color being associated with low school performance through altered breathing mode and sleep disorders, since families with worse financial conditions have less access to treatments against respiratory and allergic diseases in children. The city where the study was conducted is located in the southernmost state of Brazil, where there are marked variations in temperature and humidity throughout the different seasons of the year, according to data from the Secretary of Agriculture of the State of Rio Grande do Sul[55]. Furthermore, it is a region with high rates of respiratory and allergic problems in the general population and especially in children[56].

Contrary to what we imagined, malocclusion did not act directly or indirectly on sleep disorders, and consequently, on school performance, corroborating the finding of the study by Al-Modani and collaborators[17], who did not find a direct relationship between malocclusion and snoring. However, the presence of altered breathing mode (oral or oronasal) directly impacted the occurrence of malocclusion (β 0.15; p<0.05) and the occurrence of sleep disorders (β 0.18; p<0.05). Previous studies have found an association between posterior crossbites and anterior open bites with OSAS in children[14,15]. However, association studies do not assess cause and effect. Furthermore, the majority of studies on sleep disorders do not include polysomnography, which is considered the gold standard test for diagnosing sleep disorders. Moreover, there are several types and degrees of severity of sleep disorders and occlusal changes, and it is a challenge to find studies with sufficient homogeneity for more robust evidence.

Faced with the clinical significance of understanding sleep-disordered breathing, especially obstructive sleep apnea syndrome, Canadian and Brazilian researchers[57] have recently discussed the importance of the subject and suggest the incorporation of Sleep Dentistry in dental schools, as the dental surgeon plays a key role in identifying these disorders.

The main limitation of this study was that it was based on parental reports, which is a subjective method and incorporates recall bias. However, a previous study demonstrated a significant association between habitual snoring reported by parents and objectively measured pathological snoring[58]. Furthermore, from a purely financial point of view, it would be unfeasible to carry out polysomnography exams in more than 500 children. Thus, precisely as a strong point of this study, we highlight the use of a representative sample of schoolchildren from Santa Maria. It is suggested that future longitudinal studies should be conducted on this topic in order to establish cause-effect relationships.

CONCLUSION

The initial hypothesis that malocclusion would play an important role in children's sleep quality was not proven in this study. Male children, aged between 11 and 13 years and with a lower level of maternal education had worse school performance. Non-exclusive breastfeeding up to 6 years of age and sleep disorders were also more likely to have worse school performance. Relative to indirect effects, non-white skin color indirectly impacted worse school performance via maternal education, breathing mode and sleep disorders.

We highlight the importance of exclusive breastfeeding in the first 6 months of life as an important factor in the prevention of sleep-disordered breathing and problems related to school performance.

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TITLE PAGE

SNORING IN CHILDREN AND ITS ASSOCIATION WITH ALTERED DIMENSION OF PALATE AND MALOCCLUSION: A CROSS-SECTIONAL STUDY

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SNORING IN CHILDREN AND ITS ASSOCIATION WITH ALTERED DIMENSION OF PALATE AND MALOCCLUSION: A CROSS-SECTIONAL STUDY

ABSTRACT

Introduction: The aim of this study was to identify whether alterations in the dimension of the palate and cases of malocclusion were associated with snoring in children. **Methods:** A cross-sectional study with a sample of 547 children between 7 and 13 years of age was conducted in Santa Maria, Brazil. The data were obtained by means of questionnaires, dental and speech examinations. A descriptive analysis was performed to evaluate the sample characteristics and prevalence of snoring. Unadjusted and adjusted Poisson regression analyses with robust variance were performed to assess the association between predictor variables (demographic and socioeconomic characteristics, palate dimensions and malocclusion) and the occurrence of snoring (outcome). A secondary analysis was made considering the interaction between palate measurements (depth and width) with the presence of different types of malocclusion (anterior open bite, accentuated overjet and posterior crossbite) to evaluate their pooled impact on the occurrence of snoring. **Results:** The prevalence of snoring among these individuals was 25.1%. Children who had a narrow palate and did not have anterior open bite were more likely to snore. Independently of irregular palate width (narrow or raised), individuals with accentuated overjet showed a higher prevalence of snoring. A higher occurrence number of cases of snoring were found in patients with deep and narrow palate associated with the presence of posterior crossbite. **Conclusion:** A positive association was demonstrated between the presence of snoring in children with a narrower palate, accentuated overjet, posterior crossbite associated with smaller width and greater depth of the palate.

Keywords: Snoring. Malocclusion. Palate, Hard. Sleep Disorders.

INTRODUCTION AND LITERATURE REVIEW

According to the American Academy of Sleep Medicine (AASM)[1], snoring can be considered a normal and isolated symptom, however, in the pediatric context, it can be an indication of sleep-related breathing disorder. Sleep-disordered breathing in children is associated with several complications at the metabolic/hormonal[2], neurocognitive and behavioral levels, affecting the quality of life of these individuals and predisposing them to other pathologies in adulthood[3,4].

Studies have shown a prevalence of intermittent snoring in up to 20%, and regular snoring in 7% to 10% of children[3,5]. A study conducted in Turkey, in which 1650 children were evaluated, verified the presence of snoring in 38.9% of the sample, with higher prevalence in males, and in children between 7 and 8 years old when compared with older individuals[6]. The prevalence of snoring tended to decrease with age due to the increase in the cross-sectional area of the pharynx with growth. Allergic symptoms, nocturnal enuresis, daytime mouth breathing, symptoms of sleep apnea, restless sleep, excessive daytime sleepiness, morning headaches, hyperactivity, sleep bruxism, high body mass index (BMI) and passive smoking have been shown to be risk factors associated with snoring in childhood[6].

In 2005, a cohort study evaluated the presence of sleep-disordered breathing in over 800 children, by using a nocturnal oximeter – with cardiorespiratory recordings, airflow, respiratory effort and heart rate – or only based on the parents' reports[7]. Children with relatively mild sleep-disordered breathing, ranging from primary snoring to Obstructive Sleep Apnea Syndrome (OSAS), were significantly more likely to have externalizing behavioral problems, such as increased hyperactivity, emotional lability, opposition and aggressiveness[7]. However, another study identified more internalizing and less externalizing behavioral problems in children who snore compared with the control group. Not only were higher anxiety and depression scores observed in children who snore, but they also had cognitive problems and lower school performance. Both studies applied the “Child Behavior Checklist” questionnaire to assess behavioral problems[8].

Risk factors related to snoring and to sleep-disordered breathing may include physical obstructions in the airways – such as hypertrophy of tonsils, adenoids and turbinates – obesity, passive smoking, craniofacial abnormalities and types of malocclusion[9,10]. As regards malocclusion and craniofacial alterations, the following types of conditions are outstanding - maxillary atresia, mandibular retrognathism, posterior crossbite, increased

height of the lower third of the face, absence of labial sealing and accentuated gonial angle [9].

Previous clinical studies that evaluated the association between types of malocclusion and OSAS in children have found that posterior crossbite, increased overjet and decreased overbite were related to OSAS[12,13]. Studies that evaluated the association between sleep-disordered breathing in children have found significant association with conditions of posterior crossbite, narrow maxilla and anterior open bite [14,15]. As regards palate dimensions, a previous study found that in mouth-breathing children?/the posterior region of the palate had a smaller width and greater depth, while prolonged non-nutritive sucking habits were associated with children whose palates were narrower and deeper in the anterior region[16].

However, a study conducted in an adult population found no direct evidence that snoring was associated with types of malocclusion, but rather observed a significant association between snoring and the morphology of the "V" shaped palate; that is, patients with a deeper, atresic palate, increased neck circumference, decreased upper arch length and narrowing in the maxillary first premolar region were more likely to snore[17]. Therefore, it is interesting to think that alterations in the palate dimension may be a stronger predictive factor for sleep-disordered breathing when compared with malocclusion, which may not yet be installed or will never be installed in the individual.

Although previous evidence has linked sleep-disordered breathing to alterations in the dental arches, there is a lack of epidemiological surveys in the literature, with representative samples to verify the main predictors of childhood snoring. This would guide more effective treatments since the American Academy of Sleep Medicine and the American Academy of Sleep Dentistry recognize and indicate therapies with oral appliances for the treatment of snoring and sleep apnea in pediatric patients[18,19]. As snoring is a sleep disorder that can easily be verified by means of questionnaires in epidemiological surveys, this study sought to identify whether alterations in palate dimensions and malocclusion are associated with childhood snoring, in a representative sample from the city of Santa Maria, Brazil. The conceptual hypothesis was that children who snored would have a higher prevalence of malocclusion or dimensional alterations of the palate compared with children that did not snore.

METHODS

Study Design

A cross-sectional study was conducted in the city of Santa Maria, Rio Grande do Sul, Brazil, in the year 2015. There were an estimated number of two hundred and sixty-one thousand inhabitants, of whom 30,216 (11.57%) were enrolled in elementary educational institutions (Demographic Census of the Brazilian Institute of Geography and Statistics, 2015). The city of Santa Maria is located in the southernmost state of Brazil, where there are marked variations in temperature and humidity throughout the different seasons of the year, with average minimum temperatures around 9 degrees Celsius and average maximum temperatures around 30 degrees Celsius, according to data obtained from the Secretary of Agriculture of the State of Rio Grande do Sul[20]. The research protocol was approved by the Research Ethics Committee of the Federal University of Santa Maria (protocol No. 08105512.0000.5346) and the database used was the same as that used in previously published articles[21-23]. The participants' parents signed the Term of Free and Informed Consent Form (TFIC) (APPENDIX A).

Sample

Random sampling by double stage conglomerate was adopted. Ten thousand five hundred and sixty-nine pupils were enrolled in 26 elementary schools in the state network in 2014. Nine of these schools were drawn according to the different administrative regions and school size. From the lists of pupils enrolled in the nine schools selected, 1,559 children were invited to participate in the study, of whom 948 consented and had the Term of Free and Informed Consent signed by their parents or guardians (response rate 60.8%). Of these 948 children, 547 were included in the sample. All children in the mixed dentition stage, with erupted maxillary first molars, were included in the study. Those with a history of previous or current orthodontic and/or speech therapy treatment, perceptible signs of syndromes and/or cognitive limitations were excluded from the sample. Sample losses were related to the following reasons: presence of deciduous or permanent dentition, not having permanent incisors to enable measurement of overbite and overjet, children who missed classes on the assessment days and other missing data. Demographic and socioeconomic variables were collected from a semi-structured questionnaire answered by parents or guardians (APPENDIX B), which contained the following information: general health aspects, history of current or previous orthodontic

and/or speech therapy treatment, gender (female or male), skin color (white or non-white), maternal and paternal schooling. Age was divided into three segments: 7 to 8 years, 9 to 10 and 11 to 13 years old. Maternal and paternal schooling was collected in completed years of study and later dichotomized into incomplete primary education (8 years).

The questionnaire answered by parents or guardians included questions related to the child's sleep, such as the presence of snoring, drooling on the pillow, restless sleep and open mouth while sleeping. The questions were based on the validated questionnaire "Sleep Disturbance Scale for Children"[24] (SDSC) and the diagnosis relative to the presence of snoring in the child was made by the parents or guardians.

Dental Evaluation

The dental examination using an evaluation form (APPENDIX C) was performed by four previously trained and calibrated dentists (intra- and inter-examiner Kappa > 0.70), carried out in schools, in rooms provided by the school management, under bright light conditions, with the child and the professional sitting face to face. The dental evaluation included the period of dentition (primary, mixed or permanent), periods of mixed dentition (first transitional period, intertransitional period and second transitional period), occlusal changes: anterior open bite (present/absent), posterior crossbite unilateral or bilateral, anterior crossbite, overjet (mm), overbite (mm), Angle molar relationship (Classes I, II and III) and early tooth loss. For measurements in millimeters of overjet and overbite, the World Health Organization (WHO) probe (Millennium - Golgran, São Caetano do Sul, SP, Brazil) was used. Measurements between 0.5 and 3.5mm were considered adequate; ≥ 4mm were considered increased and decreased when ≤ 0mm.

Speech Language Evaluation

A single calibrated speech therapist (Kappa > 0.70) assessed the speech of the pupils, using a form consisting of data extracted from the Orofacial Protocol with Scores (AMIOFE)[25] (APPENDIX D). Based on this evaluation, the respiratory mode of the participants was verified by spontaneous observation of the patient, and classified as nasal, mouth or oronasal according to AMIOFE[25].

Quantitative Evaluation of the Hard Palate: width and depth.

The transverse dimensions (width) of the hard palate in the region of permanent first molars were obtained directly in the oral cavity, with the use of a digital pachymeter (Digimess®, Brazil), with a resolution of 0.01 mm and precision of 0.03 mm. The vertical dimension (depth) in the region of second premolar or deciduous second molar was measured with a Korkhaus (Dentaurum®, Germany) three-dimensional compass, which has been used in other previous studies[26,27]. This evaluation was performed in the schools, with the children positioned in a reclining chair. The examiner made use of a headlamp for correct visualization of the points of reference.

The points of reference in the region of the permanent first molars were the most apical portion of the gingival margin[22,28]. The width measurements corresponded to the transverse distance in millimeters between the points of reference of the teeth considered (second premolar width or deciduous second molar). The hard palate depth measurement corresponded to the vertical measurement in millimeters obtained from the median palate raphe up to the region that united the reference points of the second premolar teeth or deciduous second molars. The measurements were not taken in situations in which there were absence of one or both reference teeth, or if there were caries lesions or trauma that would change the perimeter of the dental arch.

Quantitative evaluation of the hard palate was made by the same previously calibrated speech therapist to obtain all the measurements established. For this purpose, 30 children were re-evaluated after an interval of one week, to obtain the intra-evaluator reproducibility by means of the Intraclass Correlation Coefficient: second premolar width or deciduous second molar (ICC = 0.96).

Statistical analysis

Data analyses were performed using the STATA 14 program (StataCorp. 2014. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP). A descriptive analysis was performed to evaluate the sample characteristics and according to the prevalence of snoring. Unadjusted and adjusted Poisson regression analyses with robust variance were performed to assess the association between predictor variables (demographic and socioeconomic characteristics, palate dimensions and malocclusions) and the occurrence of snoring. Exploratory variables that presented a $p<0.25$ in the unadjusted analysis were included in the adjusted model. Subsequently, a secondary analysis was made considering the interaction between palate measurements (depth and

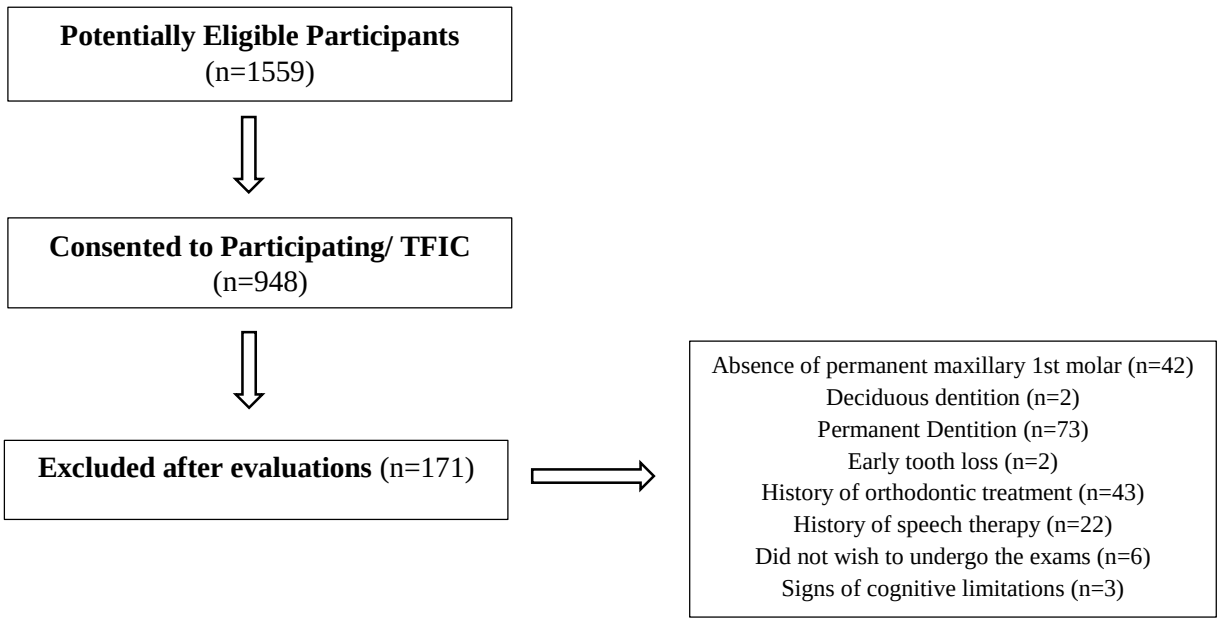
width) with the presence of different types of malocclusion (anterior open bite, accentuated overjet and posterior crossbite) to evaluate their pooled impact on the occurrence of snoring. The results are presented as a prevalence ratio (PR) and its respective 95% confidence interval (95% CI).

RESULTS

Of the total number of pupils invited to participate in the study, 948 consented to participating and had the Term of Free Informed Consent Form signed by their parents or guardians. Of the children who agreed to participate, 547 were included in the sample. Figure 1 show the reasons for sample losses.

Relative to the demographic and socioeconomic characteristics of the sample, the majority were girls (54.6%) and with white skin colour (79.2%). The age ranged from 7 to 13 years and the maternal education of the major portion of the sample was greater than or equal to 8 years of formal education (67.3%). The majority of participants had exclusive breastfeeding up to 6 months of age (70.4%) and did not have prolonged non-nutritive sucking habits (67.0%). With reference to oral health measurements, the majority of individuals had normal hard palate measurements and absence of malocclusion (Table 1).

Table 1 shows the characteristics of the sample according to the prevalence of snoring. Of the 547 pupils evaluated in the sample, 434 answered the question about snoring (about 80.0%). The prevalence of snoring among these individuals was 25.1%. Among individuals who snored, 32.2% had oral or oronasal breathing, 35.7% had a deep palate and 45.7% had a narrow palate width. Considering the types of malocclusion, approximately 32.6%, 35.0% and 33.9% of the adolescents who had anterior open bite, accentuated overjet and posterior crossbite. respectively, were snorers.



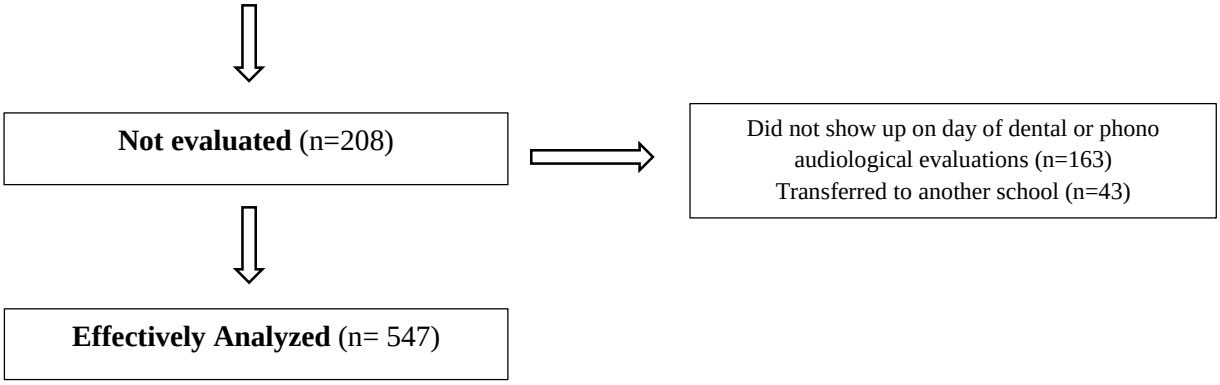


Figure 1. Flowchart - eligibility criteria and sample losses.

Table 1. Sample distribution according to demographic, socioeconomic, behavioral, and clinical characteristics, Santa Maria (n = 547).

Variables	Total sample	Snoring prevalence	
	N (%)	No	Yes
Sex			
Girls	299 (54.6)	174 (74.3)	60 (25.6)
Boys	248 (45.4)	151 (75.5)	49 (24.5)
Age			
7-8 years	156 (28.6)	93 (75.0)	31 (25.0)
9-10 years	207 (38.0)	125 (76.7)	38 (23.3)
11-13 years	182 (33.4)	107 (72.8)	40 (27.2)
Skin color			
White	433 (79.2)	251 (75.4)	82 (24.6)
No-white	114 (20.8)	74 (73.3)	27 (26.7)
Maternal education			
< 8 years of formal education	171 (32.7)	112 (77.2)	33 (22.8)
≥ 8 years of formal education	352 (67.3)	198 (74.2)	69 (25.8)
Breastfeeding up to 6 months			
Exclusive	385 (70.4)	229 (74.3)	79 (25.7)
Non exclusive	182 (29.6)	96 (76.2)	30 (23.8)
Non-nutritive sucking habits			
No	366 (67.0)	220 (78.0)	62 (22.0)
Yes	180 (33.0)	104 (68.9)	47 (31.1)
Breathing mode			
Normal	344 (63.0)	206 (79.5)	53 (20.5)
Oral or oronasal	202 (37.0)	118 (67.8)	56 (32.2)
Depth measurements of hard palate			
Normal	372 (91.4)	279 (75.6)	90 (24.4)
Deep	28 (6.9)	18 (64.3)	10 (35.7)
Shallow	7 (1.7)	3 (42.9)	4 (57.1)

Width measurements of hard palate			
Normal	456 (89.6)	274 (75.4)	89 (24.5)
Narrow	41 (8.1)	19 (54.3)	16 (45.7)
Raised	12 (2.3)	6 (85.7)	1 (14.3)
Anterior open bite			
Absent	461 (89.9)	269 (75.8)	86 (24.2)
Present	85 (10.1)	31 (67.4)	15 (32.6)
Accentuated overjet			
Absent	360 (72.0)	215 (79.6)	55 (20.4)
Present	140 (28.0)	78 (65.0)	42 (35.0)
Posterior crossbite			
Absent	478 (88.9)	283 (76.3)	88 (23.7)
Present	60 (11.2)	37 (66.1)	19 (33.9)

*Values lower than 547 are due to missing data.

Unadjusted and adjusted analyses of the association between hard palate measurements and occurrence of snoring are displayed in Table 2. In the unadjusted analysis, the presence of prolonged non-nutritive sucking habits (beyond 3 years old) and oral or oronasal breathing mode were related to a higher prevalence of snoring ($p<0.05$). Schoolchildren with a narrow palate and those who had accentuated overjet showed a 17% (PR 1.17; 95% CI 1.03-1.31) and 21% (PR 1.21; 95% CI 1.04-1.20) higher prevalence of snoring. In the adjusted model, only the presence of accentuated overjet was related to the occurrence of snoring (PR 0.08; 95% CI 1.00-1.17).

Table 2. Unadjusted and adjusted analysis of the association between hard palate measurements and occurrence of snoring

Variables	**Unadjusted**	**p-value**	**Adjusted**
	RP (95% CI)		**RP (95% CI)**
Sex			
Girls	1 (reference)		-
Boys	0.99 (0.92-1.05)	0.785	
Age			
7-8 years	1 (reference)		-
9-10 years	0.98 (0.91-1.06)	0.741	
11-13 years	1.01 (0.93-1.10)	0.680	
Skin colour			
White	1 (reference)		-
Non-white	1.01 (0.94-1.09)	0.672	
Maternal education			
< 8 years of formal education	1 (reference)		-
≥ 8 years of formal education	1.02 (0.95-1.09)	0.485	

Breastfeeding up to 6 months			
Exclusive	1 (reference)		-
Non exclusive	0.98 (0.91-1.30)	0.686	
Non-nutritive sucking habits			
No	1 (reference)		1 (reference)
Yes	1.07 (1.01-1.15)	0.040	1.05 (0.98-1.40)
Breathing mode			
Normal	1 (reference)		1 (reference)
Oral or oronasal	1.09 (1.02-1.17)	0.006	1.06 (0.98-1.14)
Depth measurements of hard palate			
Normal	1 (reference)		1 (reference)
Deep	1.09 (0.95-1.24)	0.208	1.07 (0.93-1.24)
Shallow	1.26 (0.99-1.59)	0.052	1.15 (0.87-1.51)
Width measurements of hard palate			
Normal	1 (reference)		1 (reference)
Narrow	1.17 (1.03-1.31)	0.010	1.09 (0.96-1.24)
Raised	0.91 (0.72-1.15)	0.565	0.90 (0.70-1.15)
Anterior open bite			
Absent	1 (reference)		1 (reference)
Present	1.06 (0.95-1.18)	0.238	1.00 (0.87-1.15)
Accentuated overjet			
Absent	1 (reference)		1 (reference)
Present	1.21 (1.04-1.20)	0.003	1.08 (1.00-1.17)*
Posterior crossbite			
Absent	1 (reference)		1 (reference)
Present	1.08 (0.90-1.95)	0.117	1.04 (0.93-1.16)

PR, prevalence ratio; CI, confidence interval; *p<0.05.

Table 3 shows the analysis of the hard palate measurements interacting with the anterior open bite on occurrence of snoring. Children who did not have anterior open bite but had a narrow hard palate were more likely to snore than their counterparts with normal measures (PR 1.24; 95% CI 1.08-1.42). There were no differences in the outcome of the interaction between this malocclusion and palate depth. Considering the interaction of hard palate measurements with accentuated overjet, our results showed that individuals with normal hard palate but with accentuated overjet are more likely to snore (PR 1.10; 95% CI 1.01-1.20). In addition, irrespective of irregular hard palate width (narrow or raised), individuals with accentuated overjet showed a higher prevalence of snoring compared with normal individuals (Table 4). Considering condition of posterior crossbite, a higher rate of occurrence of snoring was found in adolescents with the deep (PR 1.34; 95% CI; 1.11-1.61) and narrow (PR 1.18; 95% CI 1.01-1.40) hard palate associated with

the presence of posterior crossbite, in comparison with counterparts with normal palate and without this type of malocclusion (Table 5).

Table 3. Adjusted analysis of the hard palate measurements interacting with anterior open bite on the occurrence of snoring.

Interaction	**Snoring prevalence**	
	RP (95% CI)[+]	**p-value**
Anterior open bite (AOB)		
Hard palate depth x AOB		
Normal x Absent	1 (reference)	
Normal x Present	1.04 (0.92-1.18)	0.440
Deep x Absent	1.11 (0.95-1.29)	0.184
Deep x Present	0.97 (0.70-1.34)	0.873
Shallow x Absent	1.20 (0.89-1.63)	0.211
Shallow x Present	(empty)	-
Hard palate width x AOB		
Normal x Absent	1(reference)	
Normal x Present	1.10 (0.96-1.25)	0.134
Narrow x Absent	1.24 (1.08-1.42)	<0.01*
Narrow x Present	0.87 (0.74-1.03)	0.114
Raised x Absent	0.89 (0.70-1.13)	0.364
Raised x Present	(empty)	-

PR, prevalence ratio; CI, confidence interval; [+]Adjusted by non-nutritive sucking habits and breathing mode; *p<0.05.

Table 4. Adjusted analysis of the hard palate measurements interacting with accentuated overjet on the occurrence of snoring.

Interaction	**Snoring prevalence**	
	RP (95% CI) [+]	**p-value**
Accentuated overjet		
Hard palate depth x accentuated overjet		
Normal x Absent	1 (reference)	
Normal x Present	1.10 (1.01-1.20)	<0.05*
Deep x Absent	1.16 (0.98-1.37)	0.067
Deep x Present	1.03 (0.78-1.34)	0.823
Shallow x Absent	1.09 (0.69-1.72)	0.691
Shallow x Present	1.39 (0.99-1.96)	0.057
Hard palate width x accentuated overjet		
Normal x Absent	1(reference)	
Normal x Present	1.08 (0.99-1.17)	0.057
Narrow x Absent	1.05 (0.90-1.22)	0.512
Narrow x Present	1.35 (1.12-1.62)	<0.01*
Raised x Absent	0.99 (0.70-1.42)	0.999

Raised x Present	0.81 (0.75-0.87)	<0.01*

PR, prevalence ratio; CI, confidence interval; +Adjusted by non-nutritive sucking habits and breathing mode; *p<0.05.

Table 5. Adjusted analysis of the hard palate measurements interacting with posterior crossbite on the occurrence of snoring.

Interaction	**Snoring prevalence**	
	RP (95% CI)+	**p-value**
Posterior crossbite		
Hard palate depth x posterior crossbite		
Normal x Absent	1 (reference)	
Normal x Present	1.02 (0.92-1.15)	0.611
Deep x Absent	0.96 (0.82-1.13)	0.687
Deep x Present	1.34 (1.11-1.61)	<0.01*
Shallow x Absent	1.30 (0.97-1.93)	0.073
Shallow x Present	1.15 (0.68-1.93)	0.587
Hard palate width x posterior crossbite		
Normal x Absent	1 (reference)	
Normal x Present	1.03 (0.92-1/17)	0.531
Narrow x Absent	1.13 (0.97-1.32)	0.113
Narrow x Present	1.18 (1.01-1.40)	<0.05*
Raised x Absent	0.89 (0.70-1.12)	0.346
Raised x Present	(empty)	-

PR, prevalence ratio; CI, confidence interval; +Adjusted by non-nutritive sucking habits and breathing mode; *p<0.05.

DISCUSSION

In the present study, a prevalence of 25.1% of snoring was found in children from Santa Maria, Brazil. Previous studies in the literature showed prevalence data with wide variation ranging between 7 and 63.7%. Possibly this variability was due to the methods of evaluation and frequency considered for characterizing snoring, whether regular or intermittent[29,30]. In this study, no differences were found in the prevalence of snoring between genders, age or level of maternal education, unlike some studies that associated male gender, younger age and lower level of maternal education with snoring in children[31-33].

The conceptual hypothesis of this study was accepted, since a narrow palate, marked overjet, posterior crossbite associated with a smaller width and greater depth of the palate were associated with snoring in children.

Individuals with severe overjet had a higher prevalence of snoring irrespective of whether the palate was deeper or atresic. A recent study conducted in India[34] identified snoring in 76% of children aged 8 to 14 years, with Angle Class II malocclusion associated with mandibular retrognathia. In addition, 80% had a decrease in the lower airways and 42% in the upper airways, indicating that the retrognathic position of the mandible favored the reduction in passage of air thereby favoring snoring. Thus, mandibular advancement by means of orthopedic appliances in adolescents was capable of reducing snoring events and reducing the number of nocturnal awakenings related to respiratory effort evaluated by polysomnography[35].

In the present study, anterior open bite (AOB) malocclusion was not associated with snoring. A previous study observed that in children with AOB there was more extensive maxillary narrowing in the region of the canines and not in the posterior regions of the palate[16]. This could perhaps explain the lack of association between snoring and AOB.

Patients with posterior crossbite malocclusion and changes in palate measurements – narrow palate and deep palate – showed a greater predisposition to snoring. Although there are no previous studies evaluating the association between these predictive factors and snoring in children, a previous study in adults corroborated the finding that the decrease in palate width was associated with snoring[17]. Studies in children[16,36] also demonstrated the reduction in hard palate width in mouth breathers. The reduction in width of the hard palate has been associated with sleep disturbances[15,36], lower nasal airflow, signs and symptoms of rhinitis, and alterations in mastication, swallowing and speech functions[36]. In addition, children with OSAS showed a high prevalence of posterior crossbite and anterior open bite[37].

Although the causal relationship cannot be verified in cross-sectional studies[38] such as the present study, the cause-effect relationship between changes in palate size, posterior crossbite and respiratory disorders could be suggested in previous studies that performed rapid maxillary expansion (RME) for treatment of mouth breathing children with maxillary atresia, and improved not only their breathing pattern, but also their quality of both sleep and of life[39-41]. Significant improvements were also found in signs and symptoms such as tiredness upon awakening, mood, lip sealing, salivation during sleep, snoring and bruxism in children after RME[42].

According to an editorial entitled “Respiratory sleep disorders in children and role of the pediatric dentist” published in the European Journal of Pediatric Dentistry,

“Pediatric dentists have an important role in the diagnosis of sleep disorders related to breathing through the evaluation of predisposing skeletal factors, especially in the case of a small upper jaw and a small and/or retropositioned mandible”[19]. The clinical relevance of this study resides in the fact that the orthodontist can identify and treat the craniofacial alterations and types of malocclusion that may be interfering in the children's sleep quality, such as maxillary atresia and retrognathism[19], as well as enabling the orthodontist to refer them to other health professionals for comprehensive treatment of the child.

As a strength of this study, we highlight the use of a representative sample of children from the city of Santa Maria and the performance of exams by trained and calibrated examiners. However, as this was an epidemiological study involving the evaluation of over 500 children, the evaluation of sleep disorders using the gold standard - polysomnography, would be very costly; therefore, parents' reports were used for the diagnosis of snoring.

We suggest further studies should be conducted, focused on evaluation of the palate measurements and their association with snoring and/or sleep-disordered breathing in children since the malocclusion may not be installed, however, deviation from normality in the width and/or depth of the palate may predispose the individual to snoring or other types of sleep-disordered breathing. It is also suggested that longitudinal studies should be conducted for the purpose of establishing causal relationships.

CONCLUSION

A positive association was demonstrated between the presence of snoring in children with a narrower palate, accentuated overjet, and posterior crossbite, associated with smaller width and greater depth of the palate.

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4. DISCUSSÃO GERAL

Os achados do artigo I rejeitam a hipótese inicial de que as más oclusões desempenhariam um papel importante na qualidade do sono das crianças e afetariam o desempenho escolar. Entretanto, o aleitamento materno exclusivo nos primeiros 6 meses de vida mostrou-se agindo de forma direta no desempenho escolar e também indiretamente via prevenção de distúrbios respiratórios do sono.

O presente estudo mostrou associação direta entre possível distúrbio do sono e performance escolar, estando de acordo com diversos estudos descritos na literatura científica (HALBOWER et al., 2006; SAHIN et al., 2009; URSCHITZ et al., 2003). A explicação para os sinais e sintomas clínicos relacionados aos distúrbios respiratórios do sono, principalmente referentes ao da SAOS, é explicado pelas breves paradas respiratórias repetidas durante a noite, causando hipoxemia intermitente ou dessaturação de oxihemoglobina (reduções nos níveis de oxigênio da hemoglobina) fragmentando o sono do paciente (JACKSON et al, 2011). Esses eventos noturnos resultam em sonolência diurna excessiva e alterações no humor e na cognição. Pacientes não tratados apresentam risco aumentado para hipertensão, diabetes e acidente vascular cerebral (SALMAM et al, 2020). Jackson e colaboradores (2011) observaram alterações significativas na estrutura e no metabolismo do cérebro de pacientes com SAOS usando técnicas de neuroimagem, como ressonância magnética estrutural e espectroscopia de ressonância magnética de prótons.

No estudo de Sahin e colaboradores (2009), respiração bucal diurna, dificuldade de respiração durante o sono, apneia do sono presenciada e hiperatividade apresentaram associação ao baixo desempenho escolar, embora nenhuma associação significativa foi determinada com o ronco de forma isolada, ao contrário do estudo de Urschitz e colaboradores (2003). Além disso não houve diferença significativa na duração média do sono e desempenho escolar (SAHIN et al., 2009), crianças com bom desempenho escolar não dormiram mais do que aquelas com baixo desempenho escolar. Estes achados nos sugerem que a qualidade do sono possa ser tão ou mais importante do que a quantidade do sono em si, corroborando com outros estudos da literatura científica (KOHYAMA et al., 2021; MATSUI et al., 2021).

No presente estudo, foi encontrado associação direta entre aleitamento materno exclusivo e performance escolar. Este achado está de acordo com diversos estudos na literatura científica, incluindo estudos de coorte e ensaios clínicos randomizados com alta

amostragem (KRAMER et al, 2008; CEZAR et al, 2005; FOROUSHANI et al, 2010). Foroushani e colaboradores realizaram um estudo de coorte na população britânica no qual acompanharam 5362 indivíduos até os 43 anos de idade. Foram encontradas associação significativa entre aleitamento exclusivo no peito e desempenho congnitivo, avaliados em diferentes idades, como testes de leitura, visuais e de memória. Porém, os achados foram somente significativos para o sexo feminino (FOROUSHANI et al, 2010), ao contrário de outros estudos os quais não apresentaram diferenças entre os sexos (KRAMER et al, 2008; CEZAR et al, 2005).

O mecanismo fisiológico acerca do aleitamento materno interferir em aspectos cognitivos se dá pelo papel nutricional do leite materno para o desenvolvimento e fortalecimento das conexões neurais no SNC do indivíduo, visto que o desenvolvimento do sistema nervoso central possui períodos críticos durante o pré e pós-natal (DOYLE et al, 1992; BARKER et al, 1994). Além de aspectos cognitivos, a nutrição pode afetar o crescimento físico da criança (GRUMMER-STRAWN, 1993; OSKI, 1993) e o desenvolvimento do sistema estomatognático do indivíduo, associado às funções de fala, deglutição, respiração, mastigação (BURR et al, 2020; DI FILIPPO et al, 2022). Uma revisão sistemática recente (ABATE et al, 2020) mostrou que a amamentação exclusiva foi capaz de reduzir a incidência de mordidas cruzadas posteriores, Classe II esquelética e dentoalveolar na dentição decídua e mista. E ainda sugere que parece existir uma relação positiva entre tempo de amamentação e redução do risco de má oclusão (ABATE et al, 2020).

Percebemos, neste trabalho, o destaque interessante que o tempo de amamentação exclusiva pôde exercer em diferentes interfaces na formação do indivíduo. O aleitamento materno exclusivo nos 6 primeiros meses de vida apresentou associação direta com o desempenho escolar, provavelmente explicado pelos mecanismos citados no parágrafo acima. Indiretamente, o aleitamento exclusivo teve associação com o modo respiratório do indivíduo que, quando alterado, predispôs as crianças a possíveis distúrbios respiratórios do sono e estes, por sua vez, contribuem para falhas no aprendizado escolar. O aleitamento materno, quando não exclusivo, também se mostrou associado aos hábitos de sucção não nutritiva, que estão diretamente associados à má oclusão e distorção de fala. O mecanismo fisiológico relacionado a associação de aleitamento materno não exclusivo e instalação de hábitos orais não nutritivos já é bastante conhecido e entendido na literatura. O bebê, nos primeiros meses de vida, tem maior desenvolvimento da parte oral ligada à sensação de saciedade e prazer. Quando essa necessidade não é totalmente

suprida através da amamentação no peito, que exige maior tempo e esforço de sucção, a criança passa a buscar outras formas de suprir essa necessidade fisiológica através de sucção de chupeta e/ou dedo por exemplo (BATISTA et al, 2018; ZIMMERMAN et al, 2018).

Ao contrário do que imaginávamos, a má oclusão não agiu de forma direta ou indireta nos distúrbios do sono e consequentemente na performance escolar corroborando com o estudo de Al-Madani e colaboradores (2015) que não encontraram relação direta das más oclusões e ronco. Entretanto, a presença de modo respiratório alterado (oral ou oronasal) impactou diretamente na ocorrência de má oclusão (β 0.15; $p<0,05$) e na ocorrência de desordens no sono (β 0.18; $p<0,05$). Estudos prévios verificaram associação entre mordidas cruzadas posteriores e mordidas abertas anteriores com SAOS infantil (AROUCHA et al., 2020; VÁZQUEZ-CASAS et al., 2020). Entretanto, estudos de associação não avaliam causa-efeito. Além disso, a maioria dos estudos sobre distúrbios do sono não contemplarem a polissonografia, que é considerado o exame padrão ouro para diagnóstico de distúrbios do sono. Além do mais, existem diversos tipos e graus de severidades de distúrbios do sono e alterações oclusais, sendo um desafio encontrar estudos com homogeneidade suficiente para evidências mais robustas.

Diante da significância clínica sobre o entendimento dos distúrbios respiratórios doo sono, principalmente a síndrome da apneia obstrutiva do sono, pesquisadores canadenses e brasileiros (BABILONI et al, 2020) recentemente discutiram a importância do assunto e sugerem a incorporação da Odontologia do Sono nas faculdades de odontologia, pois o cirurgião dentista tem papel fundamental na identificação destes distúrbios.

A principal limitação deste estudo é que ele foi baseado em relatos dos pais, que é um método subjetivo e incorpora um viés de memória. No entanto, estudo prévio demonstrou associação significativa entre ronco habitual relatado pelos pais e o ronco patológico medido objetivamente (LU et al, 2003). Ademais, seria inviável a realização de exames de polissonografia em mais de 500 crianças sob o ponto de vista financeiro. E, justamente, como ponto forte desse trabalho, destacamos a utilização de uma amostra representativa dos escolares de Santa Maria. Sugere-se a realização de estudos longitudinais futuros acerca dessa temática a fim de estabelecer as relações de causa-efeito.

Quanto ao segundo artigo, 25,1% da amostra estudada apresentou ronco segundo relato dos pais. Crianças sem mordida aberta anterior (MAA) e com palato mais estreito

apresentaram maior prevalência de ronco, assim como overjet acentuado, mordida cruzada posterior associada a menor largura e maior profundidade do palato nas regiões de primeiro molar permanente ou segundo pré-molar/segundo molar decíduo.

Estudos demonstram uma prevalência bastante variável na literatura científica variando de 7 a 63,7% dependendo da frequência do ronco avaliado e do método de avaliação (GISLASSON et al, 1995; URSCHITZ et al., 2003). Não encontramos diferenças entre gênero, idade ou nível de educação materna entre crianças que roncavam e não roncavam, diferentemente de alguns estudos que associaram o sexo masculino, menor idade e menor grau de educação materna com ronco infantil (KUEHNI et al, 2008; SAHIN et al, 2009; ZHANG et al., 2019).

Quanto às alterações craniofaciais, indivíduos com overjet acentuado apresentaram maior prevalência de ronco independentemente de o palato ser mais profundo ou atrésico. Um estudo recente realizado na Índia (BALRAJ et al, 2021) identificou ronco em 76% das crianças de 8 a 14 anos de idade com má oclusão de Classe II de Angle associada a retrognatismo mandibular. Além disso, 80% apresentaram diminuição das vias aéreas inferiores e 42% das vias aéreas superiores, indicando que a posição retrognata da mandíbula favorece à diminuição da passagem do ar favorecendo ao ronco. Desta forma, o avanço mandibular através de aparelhos ortopédico em adolescentes diminuiu os eventos de ronco e reduziu o número de despertares noturnos relacionados ao esforço respiratório avaliado via polissonografia (SCHÜTZ et al, 2011).

A má oclusão de MAA não foi associada ao ronco na amostra estudada. Um estudo anterior observou que crianças com MAA apresentam maior estreitamento maxilar na região de caninos e não em regiões posteriores do palato (BERWIG et al, 2011). Talvez isso possa explicar a falta de associação entre ronco e MAA.

Mordida cruzada posterior (MCP) e alterações nas dimensões da largura e profundidade do palato (palato mais estreito e mais profundo, respectivamente) comparadas aos valores de normalidade (BERWIG et al, 2021), apresentaram maior prevalência de ronco. Os estudos a seguir corroboram com nossos achados. A diminuição da largura do palato apresentou associação com ronco em adultos (AL-MADANI et al, 2015). Crianças com menor largura maxilar a nível de primeiros molares superiores apresentaram maiores índices de distúrbios respiratórios do sono (VÁZQUEZ-CASAS et al, 2020). Assim como, crianças com SAOS, diagnosticadas por polissonografia, apresentaram alta prevalência de mordida cruzada posterior e mordida aberta anterior (CAPRIOGLIO et al., 1999). Estudos de Berwig (2011), Milanesi (2019), Trevisan

(2015) e seus colaboradores também demonstraram redução da largura de palato duro em adultos e crianças respiradores orais. A redução da largura do palato duro foi associada a sono agitado, menor fluxo de ar nasal, sinais e sintomas de rinite, e alterações nas funções de mastigação, deglutição e fala (MILANESI et al, 2019).

A relação causa-efeito entre alterações da dimensão do palato, MCP e distúrbios respiratórios pode ser sugerida em estudos com tratamento ortodôntico interceptativo. Crianças respiradoras orais com atresia maxilar submetidas a expansão rápida da maxila (ERM) apresentaram melhora no padrão respiratório, qualidade do sono e qualidade de vida após tratamento com disjuntores maxilares (IZUKA et al, 2015; CAMACHO et al., 2017; ASHOK et al, 2014). Melhorias significativas também foram encontradas em sinais e sintomas como cansaço ao acordar, humor, selamento labial, salivação durante o sono, ronco e bruxismo em crianças após a ERM (GIANNASI et al., 2015).

O presente estudo avaliou somente a presença de ronco. Sabe-se que o ronco pode ser sintoma de algum tipo de distúrbio respiratório do sono como por exemplo a Síndrome de Resistência das Vias Aéreas Superiores (SRVAS) ou Síndrome da Apneia Obstrutiva do Sono, distúrbios mais complexos que afetam a qualidade de vida do indivíduo. Deste modo, é importante a identificação do ronco infantil afim de verificar suas possíveis causas e consequências na vida do indivíduo. O ortodontista e odontopediatra são profissionais aptos para identificar e tratar alterações craniofaciais como retrognatismo mandibular, mordida cruzada posterior e atresia maxilar que possam estar atuando como fatores causais do ronco.

Como limitação deste estudo, pode-se citar que ele foi baseado no relato dos pais, podendo haver viés de memória. Novos estudos com padrão ouro de diagnóstico para distúrbios do sono utilizando a polissonografia ou dispositivos portáteis para medição de saturação de oxigênio são sugeridos para sedimentar o entendimento entre ronco, alterações na dimensão de palato e más oclusões. Assim como estudos longitudinais são sugeridos para estabelecer causalidade.

5. CONSIDERAÇÕES FINAIS

A partir dos resultados do artigo I, observamos as seguintes associações: crianças do sexo masculino, idade entre 11 a 13 anos e menor grau de educação materna apresentaram pior desempenho escolar. Amamentação não exclusiva até os 6 meses de idade e desordens do sono também predispuseram ao pior desempenho escolar. Em relação aos efeitos indiretos, a cor da pele não-branca impactou indiretamente no pior desempenho escolar via modo respiratório e desordens no sono.

No artigo II, foi observada associação positiva entre a presença de ronco em crianças com palato mais estreito, overjet acentuado, mordida cruzada posterior associada a menor largura e maior profundidade do palato nas regiões de primeiro molar permanente ou segundo pré-molar/segundo molar decíduo.

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APÊNDICE A – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

UNIVERSIDADE FEDERAL DE SANTA MARIA – UFSM
CENTRO DE CIÊNCIAS DA SAÚDE - CCS
PROGRAMA DE PÓS GRADUAÇÃO EM DISTÚRBIOS DA COMUNICAÇÃO HUMANA
PROJETO: "Caracterização e Avaliação Integradas dos distúrbios da Motricidade Orafacial e da Postura Corporal-Fase 2"

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

As informações contidas neste documento têm por objetivo esclarecer detalhadamente os objetivos e procedimentos desta pesquisa e obter por escrito autorização para participação na mesma, com livre arbítrio e sem coação.
O projeto é executado por alunos de graduação em fonoaudiologia e fisioterapia, bem como mestrandos e doutorandos do Programa de Pós-Graduação em Distúrbios da Comunicação Humana, do Centro de Ciências da Saúde, da Universidade Federal de Santa Maria, sob orientação da Profª. Drª. Ana Maria Toniolo da Silva (Curso de Fonoaudiologia), e Profª. Drª. Eliane Corrêa (Curso de Fisioterapia).
Objetivo: avaliar os diversos aspectos relacionados à motricidade orofacial e à postura corporal para verificar se existe algum problema que dificulte a respiração, deglutição, mastigação e fala e agilizar o tratamento de tais alterações.
Justificativa: as alterações relacionadas à motricidade orofacial e à postura corporal, geralmente causam problemas que aumentam, quando em conjunto. Assim, a importância da realização desta pesquisa está em obter informações precisas e objetivas acerca destas alterações, para melhor direcionar o processo terapêutico.
Esta pesquisa não implica prejuízoe/ou risco aos participantes, pelo contrário, traz benefícios, uma vez que propõem sem custos avaliação fonoaudiológica, fisioterapêutica, otorrinolaringológica e odontológica, a fim de detectar os sujeitos com alterações de motricidade orofacial e/ou de postura corporal, encaminhando-as para as intervenções necessárias. Os eventuais riscos que podem ocorrer referem-se ao deslocamento até os locais de avaliação (universidade e clínicas particulares) ou naquelas avaliações em que seja necessário o uso de adesivos na pele, no que se refere a sua retirada.
Procedimentos: Após consentimento para participação no estudo, será realizada triagem fonoaudiológica para selecionar os sujeitos que se enquadram nos critérios do estudo. Em seguida, os participantes **poderão** realizar avaliação fonoaudiológica, fisioterapêutica, otorrinolaringológica, odontológica com moldagem do palato, cefalométrica,antropométrica, fotográfica, eletromiográfica e baropodométrica, entre outros. Previamente às avaliações, será realizada uma breve entrevista com o paciente e/ou responsável para obtenção de informações sobre possíveis queixas que irão direcionar e complementar as avaliações. **Cabe destacar, que as avaliações serão selecionadas de acordo com o objetivo da pesquisa, sendo que alguns sujeitos não realizarão todas as avaliações citadas.**
Nestas avaliações serão realizados os seguintes procedimentos:
1. Avaliação fonoaudiológica: Avaliação das estruturas e funções do rosto (lábios, língua, bochechas, céu da boca e as funções de respiração, mastigação,deglutição, sucção e fala).
2. Avaliação fisioterapêutica: Resposta de questionário com perguntas sobre os seus hábitos de vida. O modo de respirar será avaliado com um aparelho no qual se deve puxar e soltar o ar em um tubo de borracha, e com outro aparelho em que apenas irão soprar. Também será analisada a diferença entre a inspiração e expiração, com o uso de uma fita métrica. Haverá ainda, uma avaliação da postura corporal, na qual os pacientes serão fotografados nas posições de frente, perfil e costas. As fotos serão analisadas em um programa de computador.
3. Avaliação otorrinolaringológica: Será realizada pelo médico por meio do exame de nasofibrofaringoscopia composto por cabo flexível e fino colocado no nariz do paciente após aplicação de um anestésico tópico, para visualização da garganta e do nariz. Esta avaliação não traz nenhum risco ao paciente, sendo que se causar algum desconforto mediante manifestação de vontade de não se submeter ao exame, o mesmo não será realizado.
4. Avaliação odontológica e moldagem do palato (céu da boca): Será realizada por um dentista que verificará o período da dentição, o estado de conservação dos dentes e possíveis alterações na dentição. Também será realizada a moldagem do palato (céu da boca) e dos dentes superiores com alginato (uma massinha com sabor de tuti-fruti que endurece na boca em poucos segundos). Depois de retirado o molde da boca, o mesmo será passado para o gesso. O molde de palato eventualmente causa desconforto em algumas crianças que se assustam como procedimento. Caso isso ocorra, a moldagem
não será realizada.
5. Avaliação cefalométrica e tomográfica: será realizada em um centro de radiografia e documentação ortodôntica. Esta avaliação não dói, não é invasiva, não causa nenhum prejuízo ao paciente e possibilita a realização medidas de algumas dimensões da cabeça, através de uma radiografia. Nestes exames poderão ser utilizados meios de contraste.
6. Avaliação antropométrica: serão marcados alguns pontos no rosto do paciente com lápis ou delineador de maquiagem e realizadas medidas a partir destas marcações. O instrumento utilizado para medir é um paquímetro, um aparelho de metal, não invasivo, que terá suas hastes levemente encostadas na pele da criança. Essa avaliação é indolor e não causa desconforto. Eventualmente o sujeito poderá ser avaliado pelo método de antropometria computadorizado, onde o único instrumento a encostar na pele do paciente será o delineador para marcação dos pontos da face.
7. Avaliação fotográfica: serão tiradas fotos do rosto (dentro e fora da boca) para complementar a avaliação odontológica e cefalométrica.
8. Avaliação eletromiográfica: este exame é um procedimento que não dói, não é invasivo, feito com eletrodos (adesivos) colados na superfície da pele. Não causa nenhum prejuízo ou dano ao indivíduo e verifica a atividade dos músculos, sua "força". Durante realização do exame, o paciente permanecerá na posição sentada confortável e com os olhos abertos.Para este exame será feita a limpeza da pele do local avaliado com álcool etílico 70%. O único desconforto que os participantes poderão sentir é em função da retirada de eletrodos da pele, pois estes possuem adesivos que colam, porém tal retirada será feita com cuidado a fim de minimizar qualquer sensação desagradável. A duração desta avaliação é de cerca de uma hora e trinta minutos, sendo o exame mais demorado do projeto.
9. Avaliação baropodométrica: o exame da descarga de peso é feito de pés descalços em cima de uma plataforma computadorizada e também não trás riscos ou desconforto.

As avaliações acima poderão ser acompanhadas pelo responsável, quando for menor de idade, sendo que o exame poderá ser suspenso a qualquer momento, caso ocorra a vontade de interromper os testes por algum motivo, não sendo obrigado a concluir os testes se não o desejar. As avaliações serão realizadas nas dependências das escolas (no caso decrianças) e no Laboratório de Motricidade Oral, do Serviço de Atendimento Fonoaudiológico (SAF) da UFSM. Após esta primeira etapa, serão oferecidas ao participante e responsáveis as informações sobre os resultados das avaliações e quais as condutas sugeridas para o caso, que poderão ser: encaminhamento para terapia fonoaudiológica e/ ou fisioterapia; avaliação médica ou a outros profissionais, quando houver necessidade.
Será mantida a confidencialidade das informações referentes à identidade dos pacientes. Os
dados coletados serão armazenados em banco de dados no laboratório de motricidade orofacial por 10 anos, sob responsabilidade das coordenadoras do projeto, e ao término deste período os mesmos serão incinerados. Como se trata de um serviço de clínica-escola dentro de uma Universidade, os dados levantados a partir deste projeto serão analisados com objetivo científico e poderão ser desenvolvidas pesquisas que serão publicadas em revistas da área,com objetivo de informar a população e pesquisadores com relação aos dados coletados. Para tanto, estes dados farão parte de um banco de dados.

Declaração dos participantes

• Fui informado detalhadamente por LUANA CRISTINA BERWIG sobre os objetivos, condições, natureza, procedimentos e duração do estudo. As vantagens e desvantagens me foram explicadas de forma detalhada.
• Tive tempo suficiente para fazer perguntas e essas me foram respondidas de forma completa e detalhada. Além disso, posso, a qualquer momento, solicitar novos esclarecimentos.
• Li e compreendi a folha de informação, havendo recebido uma cópia da mesma.
• Estou ciente de que posso a qualquer tempo reverter minha decisão de permitir a (minha/ e meu filho) participação no estudo, sem precisar apresentar razões e sem por isso incorrer em qualquer sanção.
• Tenho conhecimento de que todos os dados pessoais serão mantidos em total confidencialidade, ou seja, em nenhuma hipótese serão citados nomes, na divulgação de resultados deste estudo.

Assim sendo, eu _____,
RG nº _____, abaixo assinado, responsável por
_____ (nome do aluno), declaro que, após a leitura e esclarecimento deste documento, concordo na participação nesta pesquisa, livre de qualquer forma de constrangimento e coação.

_____
Responsável

_____
Pesquisador responsável

Santa Maria, _____/_____/_____ .

Declaração dos participantes menores de idade

( )CONCORDO **( ) NÃO CONCORDO**

Se você tiver alguma consideração ou dúvida sobre a ética da pesquisa, entre em contato: Comitê de Ética em Pesquisa - CEP-UFSM, Av. Roraima, 1000 - Prédio da Reitoria – 7º andar – Campus Universitário – 97105-900 – Santa Maria-RS - tel.: (55) 32209362 - email: comiteeticapesquisa@mail.ufsm.br
Os telefones de contato para quaisquer esclarecimentos são (55) 3220 9239 (Serviço de Atendimento Fonoaudiológico) ou 3220 8541 (Departamento de Fonoaudiologia da UFSM), com as professoras responsáveis citadas anteriormente.

Observação: O Termo de Consentimento Informado, baseado no item IV das Diretrizes e Normas Regulamentadoras Para a Pesquisa em Saúde, do Conselho Nacional de Saúde (resolução 196/96), será assinado em duas vias, de igual teor, ficando uma via em poder do participante da pesquisa ou do seu representante legal e outra com o(s) pesquisador(es) responsável(eis).

APÊNDICE B – QUESTIONÁRIO AOS PAIS OU RESPONSÁVEIS

Agradecemos por participar desta pesquisa! Estas perguntas SÃO MUITO IMPORTANTES para melhor conhecer a saúde de seu filho. Por favor, tente responder todas as perguntas! Qualquer dúvida, entre em contato comigo pelo telefone: Luana – 9949 1938.

1) Nome da criança: _____

2) Data de nascimento da criança: _____/_____/_____

2) Telefones para contato:_____

3) Sexo: ( ) Feminino ( ) Masculino

4) Você considera seu filho(a) da raça:
( ) branca ( ) negra ( ) mulato ( )outro (oriental, índio), qual?_____

5) Seu filho (a) mamou no peito (seio materno)? ( ) Não ( )Sim, até quando? _____ (informar anos e/ou meses)

6) Seu filho (a) usou chupeta? ( ) Não ( )Sim, até quando? _____ (informar anos e/ou meses)

7) Seu filho (a) chupou dedo? ( ) Não ( ) Sim, até quando?_____ (informar anos e/ou meses)

8) Seu filho (a) começou a caminhar sozinho sem apoio quando? _____ (informar anos e/ou meses)

9) Possui problema neurológico (convulsões), síndrome ou má formação na face? ( ) Não ( ) Sim, especifique:_____

10) Realizou ou realiza tratamento fonoaudiológico? ( ) Não ( ) Sim, por quê? _____
_____

11) Realizou ou realiza tratamento ortodôntico, fazendo uso de aparelho dentário móvel ou fixo? ( )Não ( )Sim

12) Quanto ao sono de seu filho(a), marque se é verificado: ( ) ronco ( ) baba no travesseiro
( ) acorda para ingerir água ( ) agitação ( ) boca aberta enquanto dorme

13) Quanto a respiração do seu filho (a), quando acordado (a), esta ocorre: ( ) pelo nariz ( ) pela boca

14) Seu filho (a), possui alguma dificuldade na fala? ( ) Não ( )Sim, qual?_____

15) Em relação aos problemas respiratórios do seu filho (a), marque os que ele (a) possui com frequência: ( ) asma ( ) resfriados frequentes (mais de 6 episódios/ano) ( ) problemas de garganta ( ) mau hálito ( ) bronquite ( ) pneumonia ( ) rinite ( ) sinusite ( ) obstrução nasal ( ) coceira no nariz ( )nariz escorrendo ( ) espirros.

16) Seu filho (a):
- Fala outra língua? ( ) Não ( )Sim
- Apresenta dores de ouvido frequentes (otites)? ( ) sim ( ) não
- Apresenta dificuldades para escutar? ( ) não ( ) sim Usa aparelho para ouvir? ( ) não ( ) sim
- Apresenta dificuldades para enxergar? ( ) não ( ) sim Usa óculos? ( ) não ( ) sim
- Apresenta alguma dificuldade para falar? ( ) não ( ) sim. Descreva: _____
- Apresenta dificuldade para compreender a fala? ( ) não ( ) sim. Descreva: _____
_____
- Apresenta ou apresentou doença grave (por ex. epilepsia, tumor, meningite, pneumonia) ou psiquiátricas (depressão, transtorno de déficit de atenção e hiperatividade, psicoses)? ( ) não ( ) sim,
Qual / quais? _____ Faz tratamento? ( ) sim ( ) não

17) Com que idade a criança entrou na escola? _____

18) A criança tem ou teve problemas para aprender a ler e escrever? ( ) não ( ) sim Qual? _____

19) A criança repetiu alguma série? ( ) não ( ) sim Qual(is)?_____

20) Como você classifica o rendimento (ou desempenho) escolar de seu filho?
Regular ( ) Bom ( ) Muito bom ( ) Ótimo ( )

21) Outras Informações que achar importante sobre seu(sua) filho(a): _____
_____
_____
_____

22) No mês passado, quanto receberam em Reais, juntas, todas as pessoas que moram na sua casa? (incluindo salários, bolsa família, pensão, aposentadoria e outros rendimentos)_____

23) Quantos cômodos tem a casa (exceto banheiro)? _____

24) Quantas pessoas, incluindo o Sr(a), moram na casa?_____

Qual a escolaridade da mãe (ou a responsável)
( ) Analfabeto
( )1ª a 4ª séries incompletas – última série que frequentou:
( ) 1ª a 4ª séries completas (primário ou ensino fundamental I)
( ) 5ª a 8ª séries incompletas – última série que frequentou:
( ) 5ª a 8ª séries completas (ginasial ou ensino fundamental II)
( ) 1º ao 3º anos incompletos – último ano que frequentou:
( ) 1º ao 3º anos completos (colegial, científico ou ensino médio)/curso técnico, qual?
( ) Ensino superior incompleto – quantos anos frequentou:
( ) Ensino superior completo
Qual a escolaridade do pai (ou responsável)
( ) Analfabeto/
( )1ª a 4ª séries incompletas – última série que frequentou:
( ) 1ª a 4ª séries completas (primário ou ensino fundamental I)
( ) 5ª a 8ª séries incompletas – última série que frequentou:
( ) 5ª a 8ª séries completas (ginasial ou ensino fundamental II)
( ) 1º ao 3º anos incompletos – último ano que frequentou:
( ) 1º ao 3º anos completos (colegial, científico ou ensino médio)/curso técnico, qual?
( ) Ensino superior incompleto – quantos anos frequentou:
( ) Ensino superior completo
Qual a Profissão da mãe? Ocupação?
Qual a Profissão do pai? Ocupação?
Tem irmãos? ( ) sim Quantos: ___ ( ) não.
Quais e quantos desses itens sua família possui? TV em cores: _____ Vídeos-cassetes/DVD: _____ Rádios: _____ Banheiros: _____ Carros: _____ Empregados mensalista: _____ Máquina de lavar: _____ Freezer (separado ou 2ª porta da geladeira):

APÊNDICE C – FICHA DE AVALIAÇÃO MIOFUNCIONAL

Ficha de Avaliação Miofuncional

Nome:_____
Data: ____/____/____ Idade: _____ Escola: _____ Turma:____

AVALIAÇÃO QUANTITATIVA DO PALATO EM BOCA COM PAQUÍMETRO

LARGURA CANINA	
LARGURA 1OS PRÉ-MOLARES	
LARGURA 2OS PRÉ-MOLAR	
LARGURA 1OS MOLAR	

AVALIAÇÃO QUANTITATIVA DO PALATO EM BOCA COM COMPASSO

PROFUNDIDADE CANINA	
LARGURA CANINA	
PROFUNDIDADE 2OS PRÉ-MOLAR	
LARGURA 2OS PRÉ-MOLAR	

DIMA:_____ DIMALP:_____

APARÊNCIA E CONDIÇÃO POSTURAL/POSIÇÃO

Condição Postural dos Lábios		**Escores**
Oclusão normal dos lábios	Normal	(3)
Oclusão dos lábios com tensão	Atividade aumentada dos lábios e Mm. Mentual	(2)
Ausência de oclusão labial	Disfunção leve (entreabertos)	(2)
	Disfunção severa (totalmente abertos)	(1)
Postura vertical da mandíbula		
Postural normal	Mantém espaço funcional livre	(3)
Oclusão dos dentes	Sem espaço funcional livre	(2)
Boca aberta	Disfunção leve	(2)
Excessiva abertura de boca	Disfunção severa	(1)

Aparência de bochechas		
Normal		(3)
Volume aumentado ou flácida/arqueadas	Leve	(2)
	Severa	(1)
Posição da língua		
Contida na cavidade oral	Normal	(3)
Interposta aos arcos dentários	Adaptação ou disfunção	(2)
	Protruída em excesso	(1)
Aparência do palato duro		
Largura adequada	Normal	(3)
Largura diminuída (estreito)	Leve	(2)
	Severo	(1)

Profundidade palato duro (MBGR): ( )adequada ( )aumentada (alto) - ( ) Leve ( ) Severo

Forma do lábio superior

( ) Normal *(1º arco do cupido)* ( )Asa de gaivota *(1º e 2º arco do cupido)*

Forma do lábio inferior

( ) Normal ( ) Eversão discreta ( ) Eversão acentuada

Comprimento do lábio superior

( ) Cobre ⅔ dos incisivos ( ) Cobre mais que ⅔ ( ) Cobre menos que ⅔

Mucosa externa dos lábios

( ) Normal ( ) Com saliva ( ) Ressecada ( ) Ferida

FUNÇÕES

Respiração		**Escore**
Respiração nasal	Normal	(3)
Respiração oronasal	Leve (ON)	(2)
	Severa (O)	(1)

Possibilidade de uso nasal: ( ) 2 min ou mais ( ) entre 1 e 2 min ( ) menos que 1 min
( ) resfriado ou em crise de rinite ( ) necessário reavaliar ( ) modo respiratório gera dúvida

Fala: automática – contagem de 1 a 20, dias da semana, meses do ano, alfabeto (MBGR)				
Omissão	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):
Substituição	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):
Distorção	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):

Fala: Nomeação de figuras da prancha (MBGR)				
Omissão	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):
Substituição	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):
Distorção	( ) ausente	( ) assistemática	( ) sistemática	Fone(s):

Em caso de distorção: [ ] interdental anterior [ ] interdental lateral [ ] ausência ou pouca vibração do ápice
[ ] vibração múltipla do ápice [ ] elevação do dorso [ ] rebaixamento do dorso [ ] outras:

Frênulo: extensão: (0) adequada (1) longa (1) curta
fixação na língua: (0) parte média (1) entre à parte média e o ápice (2) no ápice
fixação no assoalho: (0) entre as carúnculas (1) na crista alveolar
outras características: (0) não há (1) submerso (1) espesso (1) com fibrose
( ) Normal ( ) Anteriorizado ( ) Curto ( ) Curto e anteriorizado ( ) Anquiloglossia

CONDUTA: ( ) Fonoterapia ( ) Av ORL ( ) Tratamento da oclusão é prioridade ( ) Orientação aos pais

APÊNDICE D – FICHA DE AVALIAÇÃO ODONTOLÓGICA

Ficha de avaliação oclusal

Nome: _____ Turma:_____
Escola:_____ Data: ___/___/_____
Avaliador: _____

Período da dentição:
☐ Mista ☐ 1º período transitório ☐ Período intertransitório ☐ 2º período transitório

Avaliação sagital:
☐ Classe I
☐ Classe II ☐ Divisão 1 ☐ Subdivisão D
☐ Divisão 2 ☐ Subdivisão E
☐ Classe III ☐ Subdivisão D
☐ Subdivisão E
Overjet: _____mm ☐ acentuado (mais que 4 mm)
(medir nos incisivos) ☐ mordida cruzada anterior (dentes:_____) ☐ com desvio funcional

Avaliação vertical:
Overbite: _____mm ☐ Mordida aberta
☐ Mordida profunda (mais que 4mm)

Avaliação transversal:
Em MIH
☐ Normal
☐ Mordida cruzada posterior ☐ L ☐ Bilateral
☐ V ☐ Unilateral ☐ Direita
☐ Esquerda

Em RC
☐ Normal
☐ Presença de desvio funcional
☐ Mordida cruzada posterior ☐ Bilateral
☐ Unilateral ☐ Direita
☐ Esquerda

Avaliação intra-arcos:

Diastemas	Superior	Inferior
	☐ Presentes	☐ Presentes
	☐ Ausentes	☐ Ausentes
	☐ não se pode avaliar	☐ não se pode avaliar

Apinhamentos	Superior	Inferior
	☐ Presentes	☐ Presentes
	☐ Ausentes	☐ Ausentes
	☐ não se pode avaliar	☐ não se pode avaliar

Perdas dentárias:

Decíduos		Permanentes	

Observações (cáries, freios, IPV e ISG): _____
_____
_____
_____
_____

ANEXO A – PARECER CONSUBSTANCIADO DO CEP

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: CARACTERIZAÇÃO E AVALIAÇÃO INTEGRADAS DOS DISTÚRBIOS DA MOTRICIDADE OROFACIAL E DA POSTURA CORPORAL - FASE 2

Pesquisador: ANA MARIA TONIOLO DA SILVA

Área Temática:

Versão: 4

CAAE: 08105512.0.0000.5346

Instituição Proponente: Universidade Federal de Santa Maria/ Pró-Reitoria de Pós-Graduação e

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 937.461

Data da Relatoria: 10/03/2015

Apresentação do Projeto:

O proponente apresenta emenda ao projeto intitulado "Caracterização e avaliação integradas dos distúrbios da motricidade orofacial e da postura corporal - fase 2a".

A justificativa para a emenda é a que segue: "A emissão deste documento foi necessária tendo em vista a inclusão de um pequeno aspecto metodológico nas avaliações já previstas e a atualização do grupo de participantes, pois alguns deixaram de participar do projeto e outros necessitam ser incluídos. O Termo de Consentimento Livre e Esclarecido precisou ser atualizado, a fim de contemplar o aspecto metodológico incluído."

Pelo que foi apresentado, entende-se que a emenda pode ser aprovada.

Objetivo da Pesquisa:

.

Avaliação dos Riscos e Benefícios:

.

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar
Bairro: Camobi **CEP:** 97.105-970
UF: RS **Município:** SANTA MARIA
Telefone: (55)3220-9362 **E-mail:** cep.ufsm@gmail.com

Comentários e Considerações sobre a Pesquisa:

.

Considerações sobre os Termos de apresentação obrigatória:

Foram apresentados de modo suficiente.

Recomendações:

Veja no site do CEP - http://w3.ufsm.br/nucleodecomites/index.php/cep - na aba "orientações gerais", modelos e orientações para apresentação dos documentos. Acompanhe as orientações disponíveis, evite pendências e agilize a tramitação do seu projeto.

Conclusões ou Pendências e Lista de Inadequações:

.

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

Considerações Finais a critério do CEP:

SANTA MARIA, 23 de Janeiro de 2015

Assinado por:
CLAUDEMIR DE QUADROS
(Coordenador)

ANEXO B - NORMAS PARA PUBLICAÇÃO NO PERIÓDICO *COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY*

Author Guidelines

Community Dentistry & Oral Epidemiology now offers Free Format submission for a simplified and streamlined submission process; More details here

Content of Author Guidelines: 1. General, 2. Ethical Guidelines, 3. Submission of Manuscripts, 4. Manuscript Format and Structure, 5. After Acceptance

Useful Websites: Submission Site, Articles published in *Community Dentistry and Oral Epidemiology*, Author Services, Wiley Blackwell's Ethical Guidelines, Guidelines for Figures

1. GENERAL

The aim of *Community Dentistry and Oral Epidemiology* is to serve as a forum for scientifically based information in community dentistry, with the intention of continually expanding the knowledge base in the field. The scope is therefore broad, ranging from original studies in epidemiology, behavioural sciences related to dentistry, and health services research, through to methodological reports in program planning, implementation and evaluation. Reports dealing with people of any age group are welcome.

The journal encourages manuscripts which present methodologically detailed scientific research findings from original data collection or analysis of existing databases. Preference is given to new findings. Confirmation of previous findings can be of value, but the journal seeks to avoid needless repetition. It also encourages thoughtful, provocative commentaries on subjects ranging from research methods to public policies. Purely descriptive reports are not encouraged, and neither are behavioural science reports with only marginal application to dentistry.

Knowledge in any field advances only when research findings and policies are held up to critical scrutiny. To be consistent with that view, the journal encourages scientific debate on a wide range of topics. Responses to research findings and views expressed in the journal are always welcome, whether in the form of a manuscript or a commentary. Prompt publication will be sought for these submissions. Book reviews and short reports from international conferences are also welcome, and publication of conference proceedings can be arranged with the publisher.

Please read the instructions below carefully for details on the submission of manuscripts, and the journal's requirements and standards, as well as information on the procedure after acceptance of a manuscript for publication in *Community Dentistry and Oral Epidemiology*.

Authors are encouraged to visit **Wiley Blackwell Author Services** for further information on the preparation and submission of articles and figures.

2. GUIDELINES FOR RESEARCH REPORTING

Community Dentistry and Oral Epidemiology adheres to the ethical guidelines below for publication and research.

2.1. Authorship and Acknowledgements

Authorship: Authors submitting a manuscript do so on the understanding that the manuscript has been read and approved by all authors, and that all authors agree to the submission of the manuscript to the Journal.

Community Dentistry and Oral Epidemiology adheres to the definition of authorship set up by the International Committee of Medical Journal Editors (ICMJE). According to the ICMJE criteria, authorship should be based on (1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content and (3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3.

It is a requirement that all authors have been credited as appropriate upon submission of the manuscript. Contributors who do not qualify as authors should instead be mentioned under Acknowledgments.

Acknowledgements: Under *acknowledgements*, please specify contributors to the article other than the authors accredited, along with all sources of financial support for the research.

2.2. Ethical Approvals

In all reports of original studies with humans, authors should specifically state the nature of the ethical review and clearance for the study protocol. Informed consent must be obtained from human participants in research studies. Some reports, such as those dealing with institutionalized children or mentally disabled persons, may need additional details of ethical clearance.

Research participants: research involving human participants will be published only if such research has been conducted in full accordance with ethical principles, including the World Medical Association **Declaration of Helsinki** (version 2008) and the additional requirements (if any) of the country where the research has been carried out.

Manuscripts must be accompanied by a statement that the research was undertaken with the understanding and written consent of each participant and according to the above mentioned principles.

All studies should include an explicit statement in the Methods section identifying the review and ethics committee approval for each study, if applicable. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used. Take care to use the term “participant” instead of “subject” when reporting on your study.

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Clinical trials should be reported using the CONSORT guidelines available at **http://www.consort-statement.org**. A **CONSORT checklist** should also be included in the submission material.
Community Dentistry and Oral Epidemiology encourages authors submitting manuscripts reporting from a clinical trial to register the trials in any of the following free, public clinical trials registries: **www.clinicaltrials.gov**, **http://clinicaltrials.ifpma.org/clinicaltrials**, **http://isrctn.org/**. The clinical trial registration number and name of the trial register will then be published with the manuscript.

2.4. Observational and Other Studies

Reports on observational studies such as cohort, case-control and cross-sectional studies should be consistent with guidelines such as STROBE. Meta-analysis for systematic reviews should be reported consistent with guidelines such as QUOROM or MOOSE. These guidelines can be accessed at **www.equator-network.org**. Authors of analytical studies are strongly encouraged to submit a Directed Acyclic Graph as a supplementary file for the reviewers and editors. This serves to outline the rationale for their modelling approach and to ensure that authors consider carefully the analyses that they conduct.

Studies with a health economics focus should be consistent with the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement and the CHEERS checklist; see the article at the following link: **https://www.bmj.com/content/346/bmj.f1049**.

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If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to log into Author Services, where, via the Wiley Author Licensing Service (WALS), they will be able to complete the licence agreement on behalf of all authors on the paper.

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3. SUBMISSION OF MANUSCRIPTS

New submissions should be made via the Research Exchange submission portal: **https://wiley.atyponrex.com/journal/CDOE**. Should your manuscript proceed to the revision stage, you will be directed to make your revisions via the same submission portal. You may check the status of your submission at anytime by logging on to submission.wiley.com and clicking the "My Submissions" button. For technical help with the submission system, please review our **FAQs** or contact **submissionhelp@wiley.com**.

Community Dentistry and Oral Epidemiology requires the submitting/corresponding author (only) to provide an ORCID iD when submitting their manuscript. If the author does not have an ORCID iD, an easy-to-use application to obtain one is available through the journal's ScholarOne system. Complete instructions for submitting a manuscript are available online and below. Further assistance can be obtained from the Managing Editor, Michelle Martire: **cdoejournal@wiley.com**

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Data Sharing and Data Availability

Community Dentistry and Oral Epidemiology expects that data supporting the results in the paper will be archived in an appropriate public repository. Authors are required to provide a **data availability statement** to describe the availability or the absence of shared data. When data have been shared, authors are required to include in their data availability statement a link to the repository they have used, and to cite the data they have shared. Whenever possible the scripts and other artefacts used to generate the analyses presented in the paper should also be publicly archived. If sharing data compromises ethical standards or legal requirements, then authors are not expected to share it.

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3.2. Manuscript Files Accepted

Manuscripts should be uploaded as Word (.doc or .docx) or Rich Text Format (.rtf) files (not write-protected), along with separate Figure files. For the latter, GIF, JPEG, PICT or Bitmap files are acceptable for submission, but only high-resolution TIF or EPS files are suitable for printing. Tables should be done in Word rather than in Excel. The files will be automatically converted to HTML and a PDF document on upload, and those will be used for the review process. The text file must contain the entire manuscript, including the title page, abstract,

text, references, tables, and figure legends, but no embedded figures. Figure tags should be included in the file. Manuscripts should be formatted as described in the Author Guidelines below.

3.3. Suggest Two Reviewers

Community Dentistry and Oral Epidemiology attempts to keep the review process as short as possible to enable rapid publication of new scientific data. In order to facilitate this process, please suggest the names and current email addresses of two potential international reviewers whom you consider capable of reviewing your manuscript. Whether these are used is up to the Editor, but it is helpful to have the suggestions.

3.4. Suspension of Submission Mid-way in the Submission Process

You may suspend a submission at any phase before clicking the 'Submit' button and save it to submit later. The manuscript can then be located under 'Unsubmitted Manuscripts' and you can click on 'Continue Submission' to continue your submission when you choose to.

3.5. E-mail Confirmation of Submission

After submission, you will receive an email to confirm receipt of your manuscript. If you do not receive the confirmation email within 10 days, please check your email address carefully in the system. If the email address is correct, please contact your IT department. The error may be caused by some sort of spam filtering on your email server. Also, the emails should get through to you if your IT department adds our email server (uranus.scholarone.com) to their whitelist.

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All manuscripts (except some commentaries and conference proceedings) are submitted to an initial review by the Editor or Associate Editors. Manuscripts which are not considered relevant to oral epidemiology or the practice of community dentistry or are not of interest to the readership of *Community Dentistry and Oral Epidemiology* will be rejected without review. Manuscripts presenting innovative, hypothesis-driven research with methodologically detailed scientific findings are favoured to move forward to peer review. All manuscripts accepted for peer review will be submitted to at least 2 reviewers for peer review, and comments from the reviewers and the editor will be returned to the corresponding author.

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3.9. Conflict of Interest

Community Dentistry & Oral Epidemiology requires that sources of institutional, private and corporate financial support for the work within the manuscript must be fully acknowledged, and any potential grant holders should be listed. Acknowledgements should be brief and should include information concerning conflict of interest and sources of funding. It should not include thanks to anonymous referees and editors.

3.10. Editorial Board Submissions

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