UNIVERSIDADE ESTADUAL DE CAMPINAS

Faculdade de Odontologia de Piracicaba

PATRÍCIA RAFAELA DOS SANTOS

ANÁLISE DOS FATORES MODULADORES ENVOLVIDOS NO DESENVOLVIMENTO OCLUSAL

ANALYSIS OF MODULATOR FACTORS INVOLVED IN OCCLUSAL DEVELOPMENT

Piracicaba

2023

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Tese apresentada à Faculdade de Odontologia de Piracicaba da Universidade Estadual de Campinas como parte dos requisitos exigidos para a obtenção do título de Doutora em Odontologia, na Área de Saúde Coletiva

Orientadora: Profa. Dra. Sílvia Amélia Scudeler Vedovello

ESTE EXEMPLAR CORRESPONDE À VERSÃO FINAL DA TESE DEFENDIDA PELA ALUNA PATRÍCIA RAFAELA DOS SANTOS E ORIENTADA PELA PROFA. DRA. SILVIA AMÉLIA SCUDELER VEDOVELLO.

Piracicaba

2023

Ficha catalográfica
Universidade Estadual de Campinas
Biblioteca da Faculdade de Odontologia de Piracicaba
Marilene Girello - CRB 8/6159

Sa59a

Santos, Patrícia Rafaela dos, 1990-
Análises dos fatores moduladores envolvidos no desenvolvimento oclusal / Patrícia Rafaela dos Santos. – Piracicaba, SP : [s.n.], 2023.

Orientador: Silvia Amélia Scudeler Vedovello.
Tese (doutorado) – Universidade Estadual de Campinas, Faculdade de Odontologia de Piracicaba.

1. Dentição mista. 2. Maloclusão. 3. Transtornos do sono-vigília. I. Vedovello, Silvia Amélia Scudeler, 1978-. II. Universidade Estadual de Campinas. Faculdade de Odontologia de Piracicaba. III. Título.

Informações Complementares

Título em outro idioma: Analysis of modulator factors involved in occlusal development
Palavras-chave em inglês: Dentition,
mixed Malocclusion
Sleep wake disorders
Área de concentração: Saúde Coletiva**Titulação:** Doutora em Odontologia **Banca examinadora:**
Silvia Amélia Scudeler Vedovello
[Orientador]Samuel Henrique Câmara de Bem
Heloísa Cristina Valdrighi
Karine Laura Cortellazzi
MendesVanessa Gallego Arias Pecorari **Data de defesa:** 13-12-2023
Programa de Pós-Graduação: Odontologia

Identificação e informações acadêmicas do(a) aluno(a)
- ORCID do autor: https://orcid.org/0000-0003-3894-2442
Currículo Lattes do autor: http://lattes.cnpq.br/1777195052061627

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Faculdade de Odontologia de Piracicaba

A Comissão Julgadora dos trabalhos de Defesa de Tese de Doutorado, em sessão pública realizada em 13 de dezembro de 2023, considerou a candidata PATRÍCIA RAFAELA DOS SANTOS aprovada.

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A Ata da defesa, assinada pelos membros da Comissão Examinadora, consta no SIGA/Sistema de Fluxo de Dissertação/Tese e na Secretaria do Programa da Unidade.

DEDICATÓRIA

Dedico esse trabalho a Deus, por me sustentar até aqui, ao meu marido Diogo Marques de Oliveira por me apoiar e a minha mãe Janice Franchini, por ser um exemplo de superação.

AGRADECIMENTOS

O presente trabalho foi realizado com apoio do CNPq, processo 141794/2018-6

O presente trabalho foi realizado com apoio da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) - Código de Financiamento 001

A Profa. Dra. Silvia Vedovello, pela orientação, carinho e amizade.

Ao Prof. Dr. Marcelo Meneghim por toda ajuda na elaboração do trabalho além de todo apoio e carinho.

À Faculdade de Odontologia de Piracicaba, na pessoa do seu Diretor, Prof. Dr. Flávio Aguiar

Á todas as escolas de ensino infantil da cidade de Araras-SP que permitiram a realização do estudo e a todas os voluntários.

A todas os meus amigos que participaram desse estudo de forma direta e indireta durante toda a jornada do doutorado em especial Diego Carneiro, Mariana Nabarrete, Ana Letícia Melo de Carvalho e Stéfany Gomes.

“Porque sou eu que conheço os planos que tenho para vocês', diz o Senhor, 'planos de fazê-los prosperar e não de causar dano, planos de dar a vocês esperança e um futuro. Então vocês clamarão a mim, virão orar a mim, e eu os ouvirei. Vocês me procurarão e me acharão quando me procurarem de todo o coração.”

Jeremias 29:11-13

RESUMO

O objetivo deste estudo foi avaliar os fatores moduladores envolvidos no desenvolvimento oclusal. Para isso, dois estudos foram realizados, o primeiro trata-se de um estudo longitudinal com 121 crianças com 5 anos de idade, em dois tempos (T0:baseline e T1: follow-up 3 anos), com o objetivo de avaliar a probabilidade de desenvolvimento de má oclusão na dentadura mista por meio de uma análise bayesiana, para isso foram coletadas informações das características clínicas má oclusão, seguindo os critérios da OMS (1987). Para a análise dos dados foram utilizados modelos bayesianos, para estimar os parâmetros, utilizando-se métodos de MCMC, foi usado o pacote RStan (STAN DEVELOPMENT TEAM, 2019) para o software R de estatística. Os resultados mostraram que as crianças que não apresentavam má oclusão em T0, tiveram uma probabilidade maior de apresentar em T1 (θ = 21,5%; IC95%:14,8% – 29,2%) do que de não apresentar (θ = 8,0%; IC95%:4,0% – 13,3%). Já no segundo estudo, teve como objetivo associar a má oclusão com distúrbios respiratórios do sono (DRS) em crianças, de forma transversal realizado com 212 crianças de 5 anos de idade na fase da dentadura decídua e em situação de vulnerabilidade social. O risco para os distúrbios respiratórios do sono (DRS) foi determinado pelo Pediatric Sleep Questionnaire (PSQ), para análise foram realizados modelos de regressão logística que foram ajustados e estimados os odds ratios brutos com os intervalos de 95% de confiança. Os resultados mostraram 20,8% das crianças apresentaram DRS, e que há maior chance de risco para DRS em crianças com mordida aberta anterior (OR=3,36; IC95%: 1,27-8,93). Conclui-se que fatores moduladores como o risco aos DRS estão associados a má oclusão de mordida aberta anterior e que e que crianças apresentam alta probabilidade de desenvolverem má oclusão na transição da dentadura decídua para a dentadura mista.

Palavras-Chave: Dentição mista; Transtornos do Sono-Vigília; Maloclusão.

ABSTRACT

The aim of this study was to assess modulating factors involved in occlusal development. Two studies were conducted for this purpose. The first was a longitudinal study involving 121 5-year-old children at two time points (T0: baseline and T1: follow-up at 3 years). The objective was to evaluate the probability of developing malocclusion in the mixed dentition through Bayesian analysis. Clinical information on malocclusion characteristics was collected following WHO criteria (1987). Bayesian models were used for data analysis, and parameter estimation employed Markov Chain Monte Carlo (MCMC) methods using the RStan package (STAN DEVELOPMENT TEAM, 2019) for the R statistical software. Results indicated that children without malocclusion at T0 had a higher probability of developing malocclusion at T1 (θ = 21.5%; 95% CI: 14.8% – 29.2%) compared to not developing it (θ = 8.0%; 95% CI: 4.0% – 13.3%). In the second study, the objective was to associate malocclusion with sleep-disordered breathing (SDB) in children, conducted cross-sectionally with 212 5-year-old children in the deciduous dentition phase and in a socially vulnerable situation. The risk for sleep-disordered breathing (SDB) was determined using the Pediatric Sleep Questionnaire (PSQ). Logistic regression models were used for analysis, adjusting and estimating crude odds ratios with 95% confidence intervals. Results showed that 20.8% of children exhibited SDB, and there is a higher risk for SDB in children with anterior open bite (OR=3.36; 95% CI: 1.27-8.93). In conclusion, modulating factors such as the risk of SDB are associated with anterior open bite malocclusion, and children have a high probability of developing malocclusion during the transition from deciduous to mixed dentition.

Keywords: Mixed dentition; Sleep-Wake Disorders; Malocclusion.

SUMÁRIO

1. INTRODUÇÃO

As alterações oclusais podem acontecer nas diferentes fases do desenvolvimento oclusal e sua etiologia é de caráter multifatorial, podendo apresentar como etiologia causas genéticas e/ou ambientais (Silva Filho, Garib, Lara, 2013; Hartsfield, Jacob, Morford, 2017; Saito et al., 2017; Alkhadra, 2017; Al-Khalifa et al., 2017).As causas genéticas pertencem a um padrão herdado dos pais, como a tipologia facial, o padrão esquelético sagital da face,e as discrepâncias entre dente e osso, e alterações congênitas que originam alguns tipos de síndromes que geram anomalias crânio faciais, asanomalias dentárias de forma ou números, assim como alterações da cronologia de irrupção. Todas os fatores etiol[ogicos podem serobservados no desenvolvimento da dentição, podendo levar ás alterações oclusais. Esses tipos de alterações podem ser identificados ou previstos precocemente, entretanto são passíveis de poucas opções de tratamento preventivo ou interceptativo, uma vez que se trata de cunho biológico individualizado para cada pessoa (Almeida et al., 2000; Silva Filho, Santamaria Jr, Capelozza Filho, 2007; Schwartz et al., 2014; Lara et al ., 2013).

Já as causas ambientais são aquelas que interferem no desenvolvimento oclusal normal, e não pertencem ao curso biológico individual da pessoa posi, são caracterísitcas do estilo de vida. Dentre os fatores ambientais, podem ser citados os traumatismos e acidentes que envolvam a face, assim também como fatores nutricionais, perdas precoces de dentes decíduos, perda de dentes permanentes e os hábitos deletérios como sucção digital ou de objetos. A maioria das causas etiológicas ambientais está presentes na infância e participam das alterações de normalidade oclusal. A dentadura mista é umas das principais fases acometidas por esses fatores (Almeida et al., 2000; Silva Filho, Garib, Lara, 2013; Dimberg et al., 2015; Vedovello et al., 2016a; Amaral et al., 2017).

De forma complementar e num conceito mais atual, os fatores moduladores para o desenvolvimento das alterações oclusais, bem como seu agravamento, vão além dos fatores que envolvam especificamente o aspecto biológico do indivíduo. A influência do ambiente em que ele vive, assim como a

condição socioeconômica e vulnerabilidade social, devem ser investigadas (Meneghim et al., 2007; Silva Filho, Garib, Lara, 2013; Sardenberg et al., 2013; Normando, Barroso, Normando, 2015; Vedovello et al., 2016a; Vedovello et al., 2016b).

Neste contexto, a dentadura mista é a fase do desenvolvimento oclusal em que significativas alterações esqueléticas e dentárias acontecem concomitantemente. É considerada a fase ideal para a intervenção em alguns tipos de má oclusão em que a correção ortodôntica poderá ter impacto funcional e estético imediato (Silva Filho, Santamaria Jr, Capelozza Filho, 2007; Vedovello et al., 2016a; Boronat-Catalá et al., 2017 Al-Khalifa et al., 2017)Estudos mostram que apesar da etiologia das alterações oclusais serem de origem multifatorial, apresentam alguns fatores de risco, como, por exemplo, presença de hábitos de sucção não nutritiva, respiração bucal e padrão de crescimento vertical para mordida aberta anterior, entretanto ainda faltam evidências sobre sua etiologia (Silva Filho, Santamaria Jr, Capelozza Filho, 2007; Barros et al., 2015; Dimberg et al., 2015; Caprioglio e Fastuca, 2016).

Os estudos para dentadura mista são escassos. A maioria da literatura apresenta desfechos para a dentadura decídua e permanente (Kragt et al., 2016; Vedovello et al., 2016a; Caprioglio e Fastuca, 2016; Sun, Wong, McGrath, 2017). Revisões sistemáticas sugerem a realização de estudos longitudinais, pois os estudos apresentam falhas na forma de avaliação das características clínicas oclusais bem como amostras insuficientes, para que se possa avaliar as variáveis com o mínimo de viés possível (Sardenberg et al., 2013; Pisani et al., 2016; Kragt et al., 2016; Boronat-Catalá et al., 2017; Sun, Wong, McGrath, 2017).

Diante do exposto na literatura, a falta de estudos voltados à avaliação do desenvolvimento oclusal, bem como as implicações do impacto da saúde bucal de forma longitudinal, este estudo busca entender os fatores moduladores para o desenvolvimento, agravamento ou até mesmo a autocorreção das alterações oclusais, e estabelecidas as principiais associações desses fatores moduladores o diagnóstico precoce possa ser realizado de forma mais previsível, onde poderá

ser empregado medidas preventivas e interceptavas na fase de dentadura mista gerando assim limitação do dano e menor custo para estratégias de saúde individual e coletiva.

2. ARTIGOS

2.1 Trata-se do estudo **A longitudinal study of the probability of developing malocclusion in children using a Bayesian analysis,** submetido para a revista "*American Journal of Orthodontics and Dentofacial Orthopedics"* apresentado seguindo as normas da revista.

A longitudinal study of the probability of developing malocclusion in children using a Bayesian analysis.

Abstract

This study evaluated the probability of developing malocclusions in the mixed dentition using a Bayesian analysis. A longitudinal observational study was conducted with 121 children, assessed at baseline (T0) at five years/primary dentition and follow-up at three years/mixed dentition (T1), aged eight years. Information was collected based on the occlusal clinical conditions. Bayesian models were used to analyze the data and estimate the parameters. The parameter θ was used for the distributions, indicating the probability of presenting a given condition with an Credibility Index (ICr) of 95%. The results showed that children have a high probability of malocclusion in the primary and mixed dentition. There was a higher probability of developing an increased overjet in the mixed dentition, of 20.5% (ICr 95%: 13.6% - 28.4%) to 48.3% (ICr 95%: 39.1% - 57.7%). There was a higher probability of having a normal overbite in the primary dentition and a lower probability in the mixed dentition (ICr 95%: 9.2% - 21.3%). Children have a high probability of developing malocclusion from primary to mixed dentition. Bayesian analysis allows the estimate of a probabilistic model that can be used to assess the development of clinical malocclusion conditions.

Key words: Mixed dentition; Etiology; Malocclusion

Introduction

Malocclusions can be observed at different stages of occlusion development due to genetic and environmental etiological factors[1-3]. In this context, childhood is the most active occlusal and facial development stage, with changes in dentitions, facial growth, and dimensional alterations of the dental arches. Most interceptive orthodontic procedures are performed in this stage[5-8]. The prevalence of malocclusion in the primary dentition is considered high7,9, and the transition to permanent dentition should be monitored during the mixed dentition stage to determine the need and opportunity for orthodontic treatment. At this stage, preventive and interceptive orthodontics can minimize aesthetic, social, and psychological impacts, in addition to improving the quality of life of children[10-14].

The literature usually used frequency distribution and association analyses to present data on malocclusion in the child population and factors that can influence occlusal changes. No studies analyze occlusion using methods that consider the scenario in which malocclusion appears due to its multifactorial etiology, such as Bayesian analysis. Bayesian analysis facilitates decision-making by directly calculating the probability of various hypotheses or scenarios, considering the available information about that change. It also allows for more robust estimates in situations with little data, a difficulty found in the analysis of longitudinal data due to sample loss over time[7,9,15-19]. As far as we know, this is the first study to use a Bayesian analysis to determine the probability of developing malocclusion in childhood.

Considering the uncertainty in the development of malocclusion, from its establishment to even spontaneous self-correction, this analysis can contribute to decision-making for the early and preventive treatment of alterations. Using Bayesian analysis, this study longitudinally evaluated the probability of developing malocclusion during the transition from primary to mixed dentition.

Metodology

This study was approved by the Ethics in Research with Human Committee (nº 31459420.5.0000.5418) and followed the Report of Observational Studies in Epidemiology (STROBE). Parents of children studying in public schools were invited to participate with their children voluntarily. Those who agreed signed the Informed Consent Form, and the children verbally consented to their participation.

This longitudinal observational study was developed to assess the probability of developing malocclusion in the transition from primary to mixed dentition during a 3-year follow-up. The study included 598 5-year-old children enrolled in public schools in a city in the interior of São Paulo, Brazil. The allocation of children between 5 years old across administrative areas within each municipal district was based on data from the Municipal Department of Education. The sample was stratified according to the administrative sectors within the district. In the initial phase, 14 schools were chosen using a simple randomization

procedure. Similarly, children were selected for inclusion in the sample during the second phase using another simple randomization procedure. Bayesian analyses do not include sample calculation.

During the initial assessment (T0), only children in primary dentition were included. Children with previous or current orthodontic or orthopedic treatment and with mental and/or physical disabilities that made oral examination impossible were excluded from the study.

All children initially assessed at T0 were contacted for follow-up when they had transitioned into mixed dentition (T1). Children who reported current or past orthodontic treatment, situations where parental or guardian authorization for examination was not obtained, non-responsive individuals, and those who could not be located through the Municipal Education Network. One hundred and twenty-one children were re-evaluated for the study at T1. The Flowchart shows the sample distribution (Figure 1).

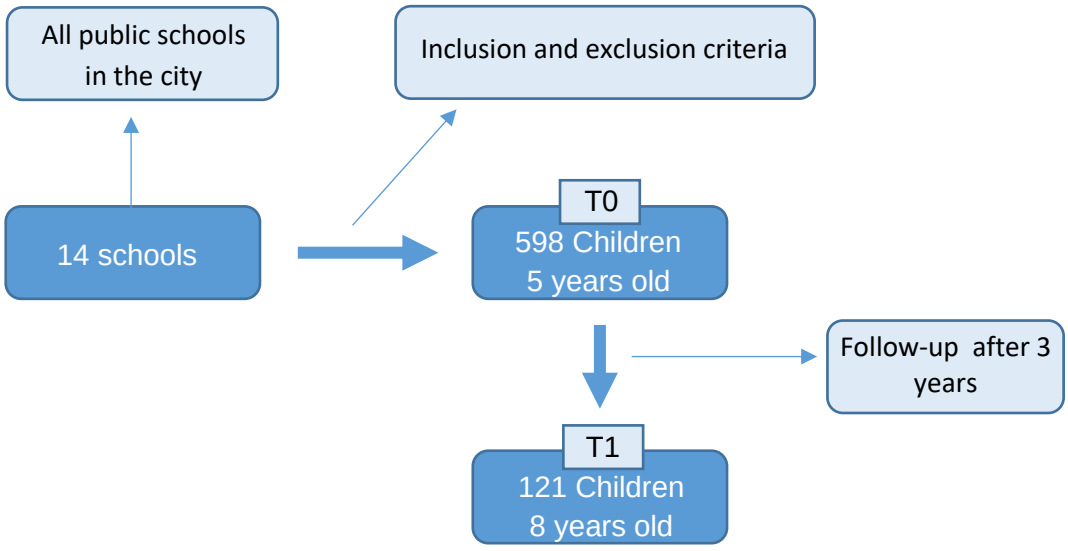

Figure 1. Sample selection flowchart

Assessment of dental occlusion included overjet, overbite, and posterior crossbite. The absence or presence of malocclusion was also assessed[20,21].

The overjet assessment considered the relationship between the upper and lower incisors in the horizontal direction, with no distance between the upper and lower incisors defined as normal overjet (0 mm). Increased overjet was recorded when the distance was >2 mm, and decreased overjet was recorded at <0 mm. The overbite assessment considered the relationship between the upper and lower incisors in the vertical direction. The normal overbite was defined when the upper incisors overlapped the lower incisors vertically by 2 mm. An anterior open bite was recorded without contact between the anterior teeth when the posterior teeth were occluded. The posterior crossbite considered the maxillary molars occluded in lingual relationship with the mandibular molars in centric occlusion. The abnormal relationship was considered posterior crossbite. Children were diagnosed with normal occlusion when all conditions were normal. When exhibiting at least one of the conditions mentioned above, they were classified as having malocclusion[20,22].

Calibration

A calibrated examiner performed clinical examinations and recorded the malocclusion. Before the survey, the calibration was performed on a group of 30 5-year-old children. Theoretical and clinical training and calibration exercises were organized for a total of 36 hours under the supervision of a reference examiner. After the reproducibility process, it was noted that the lowest agreement index measured among all evaluated occlusal conditions was a Kappa of 0.92 (with a confidence interval of 0.81 to 1.00), indicating Perfect Agreement, as per the classification proposed by Landis and Koch (1977)23.

Statistical analysis

Bayesian models were used to study the longitudinal behavior of the orthodontic variables overjet, overbite, crossbite, and malocclusion of 121 children in primary dentition (T0) and mixed dentition (T1). Bayes' theorem can be described as:

$$P(A|B) = \frac{P(B|A) \times P(A)}{P(B)}$$

P(A|B) (probability of A given B) represents the conditional probability that event A will happen, given that event B has occurred, just as P(B|A) represents the conditional probability that event B will happen, given that event A occurred. P(A) represents the probability of event A happening, and P(B) is used as a normalization constant to guarantee that the sum of the probabilities equals 1.

In the case of parameter estimation by Bayesian analysis, A is related to a parameter of the distribution, while B is related to the obtained data. The probability of a parameter assuming a specific value is calculated given that certain data were obtained (probability, also called posteriori). When looking for the parameter's value that maximizes this probability, it is possible to find an estimate for it. As this equation usually boils down to a complex integral, methods known as MCMC (Markov Chain Monte Carlo) obtain the parameters that maximize the probability to posteriori.

Then, information was used to priori models considering the Bernoulli distribution for binary variables (crossbite and malocclusion) and the categorical distribution (a generalization of the Bernoulli distribution) for categorical variables with more than two levels (overjet and overbite). To analyze the dichotomous variables, the Bernoulli distribution was also used.

The θ parameter was used for the Bernoulli and categorical distributions, indicating the probability of presenting a certain level. For example, a Bernoulli distribution with possible levels 0 = absence of malocclusion and 1 = presence of malocclusion may show θ = 0.5 if there is a 50% chance that a sampled individual will have a malocclusion. On the other hand, θ = 0.75 would indicate a 75% chance that an individual will have a malocclusion. The θ values, in turn, were sampled from a beta distribution, with parameters α = 1 and β = 1.

Models were also applied considering that there could be differences in the parameters of populations from different groups (in this case, individuals were grouped by the variables year, gender, income, and race).

To estimate the parameters, using methods of MCMC (Markov Chain Monte Carlo), the package was used RStan (STAN DEVELOPMENT TEAM, 2019) for statistical R software (R CORE TEAM, 2019). In all cases, four chains with 6,000 iterations each were used, so the first 1,000 were disregarded in the final analysis because it is a period in which the algorithm is still adjusting the estimate (warm-up), which may be very far from the real[18,19].

Resultados

Table 1 presents the sample distribution in T0 (primary dentition) and T1 (mixed dentition). Table 2 presents the frequency and estimate of the parameter θ (95% credibility interval) of the categorical variables (overjet, overbite, crossbite, and presence of malocclusion) in the T0 and T1. Children were more likely to develop increased overjet in T1. The probability increased from 20.5% (ICr 95%: 13.6% - 28.4%) to 48.3% (ICr 95%: 39.1% – 57.7%). The anterior open bite increased in T1 from 15.5% (ICr 95%: 9.6% – 22.4%) to 34.2% (ICr 95%: 26.1% – 42.7%), with a significantly higher probability of developing this malocclusion. Considering the three-year follow-up, there was no significant difference in the odds of crossbite and malocclusion. In T0 and T1, the probability of crossbite was low, 9.8% in the T0 and 13.8% in the T1, while the probability of malocclusion was high, 70.7% in the T0 and 82% in the T1.

Table 1. Descriptive analysis of the sample at T0 and T1

Variable		T0		T1	
		n	%	n	%
Gender	**Male**	314	52,5	61	50,4
	Female	284	47,5	60	49,6
Race	**White**	443	74	79	65,2
	Non-White	155	26	42	34,8

Table 2. Frequency (percentage) and estimate of the θ parameter (credibility interval of 95%) of categorical variables (overjet, overbite, crossbite and malocclusion) in the Primary dentition (T0) and Mixed dentition (T1).

Variable	Level	Primary dentition		Mixed dentition	
		N (%)	θ (ICr95%)	N (%)	θ (ICr95%)
Overjet	No information	12 (9,9%)	–	0 (0,0%)	–
	Normal	73 (60,3%)	66,1% (57,2% – 74,5%)	47 (38,8%)	40,2% (31,1% – 49,4%)
	Increased	22 (18,2%)	20,5% (13,6% – 28,4%)	61 (50,4%)	48,3% (39,1% – 57,7%)
	Decreased	14 (11,6%)	13,4% (7,8% – 20,3%)	13 (10,7%)	11,6% (6,4% – 18,0%)
Overbite	No information	1 (0,8%)	–	0 (0,0%)	–
	Normal	68 (56,2%)	56,1% (47,4% – 64,8%)	70 (57,9%)	56,9% (48,0% – 65,6%)
	Increased	34 (28,1%)	28,4% (20,8% – 36,7%)	10 (8,3%)	8,9% (4,6% – 14,5%)
	Decreased	18 (14,9%)	15,5% (9,6% – 22,4%)	41 (33,9%)	34,2% (26,1% – 42,7%)
Crossbite	Present	11 (9,1%)	9,8% (5,2% – 15,5%)	16 (13,2%)	13,8% (8,3% – 20,2%)
	Absent	110 (90.9%)	90,2% (84,5% - 94,8%)	105 (86,8%)	98,6% (79,8% - 91,7%)
Malocclusion	Present	86 (71,1%)	70,7% (62,4% – 78,1%)	101 (83,5%)	82,9% (75,8% – 89,0%)
	Absent	35 (28,9%)	29,3 % (21,9% - 37,6%)	21 (16,5%)	17,1% (11% – 24,2%)

ICr = Credibility Index 95%

The information from Table 3 presents the percentages and estimates of the parameter θ denoting changes over time:

Overjet:

- The probability of a child having a normal overjet in T0 and an increased overjet in T1 is 30.5% (95% ICr: 22.5% – 39.0%).
- The probability of a child having a decreased overjet in T0 and a normal overjet in T1 is 4.2% (95% ICr: 1.4% - 8.5%).
- The probability of a child having an increased overjet in T0 and normal overjet in T1 is 5.9% (95% ICr: 2.4% – 10.9%).

Overbite:

- The probability of a child having a normal overbite in T0 and an anterior open bite in T1 is 14.7% (95% ICr: 9.2% – 21.3%).
- The probability of a child having a deep bite in T0 and a normal overbite in T1 is 14.7% (95% ICr: 9.2% – 21.3%).
- The probability of a child having a deep bite in T0 and normal overbite in T1 is 12.4% (95% Credibility Interval: 7.3% – 18.6%).
- The probability of a child having an anterior open bite in T0 and normal overbite in T1 is 9.3% (95% Credibility Interval: 5.0% – 14.8%).

Crossbite:

- The probability of a child not having a crossbite in T0 and T1 is 81.6% (95% Credibility Interval: 74.3% - 87.9%).
- The probability of a child not having a crossbite in T0 but presenting it in T1 is 8.0% (95% ICr: 3.9% - 13.4%).
- The probability of a child having a crossbite in T0 but not in T1 is 4.0% (95% ICr: 1.3% – 8.1%).

Malocclusion:

- The probability of a child not presenting malocclusion in T0 and developing it in T1 is 21.5% (95% ICr: 14.8% - 29.2%).

Table 3. Frequencies (percentages) and estimates of the θ parameter (95% credibility interval) of changes in the levels of categorical variables (overjet, overbite, crossbite, and malocclusion) between Primary dentition (T0) and Mixed dentition (T1)

Variable	Primary dentition	Mixed dentition	N (%)	θ (ICr95%)
Overjet	Normal	Normal	34 (31,2%)	29,6% (21,9% – 38,0%)
	Normal	Increased	35 (32,1%)	30,5% (22,5% – 39,0%)
	Normal	Decreased	4 (3,7%)	4,2% (1,4% – 8,5%)
	Increased	Normal	6 (5,5%)	5,9% (2,4% – 10,9%)
	Increased	Increased	14 (12,8%)	12,7% (7,3% – 19,3%)
	Increased	Decreased	2 (1,8%)	2,5% (0,5% – 6,0%)
	Decreased	Normal	4 (3,7%)	4,2% (1,4% – 8,6%)
	Decreased	Increased	4 (3,7%)	4,2% (1,4% – 8,6%)
	Decreased	Decreased	6 (5,5%)	5,9% (2,5% – 10,8%)
Overbite	Normal	Normal	43 (35,8%)	34,1% (26,1% – 42,5%)
	Normal	Increased	7 (5,8%)	6,2% (2,7% – 10,9%)
	Normal	Decreased	18 (15,0%)	14,7% (9,2% – 21,3%)
	Increased	Normal	15 (12,5%)	12,4% (7,3% – 18,6%)
	Increased	Increased	1 (0,8%)	1,6% (0,2% – 4,3%)
	Increased	Decreased	18 (15,0%)	14,7% (9,3% – 21,2%)
	Decreased	Normal	11 (9,2%)	9,3% (5,0% – 14,8%)
	Decreased	Increased	2 (1,7%)	2,3% (0,5% – 5,5%)
	Decreased	Decreased	5 (4,2%)	4,7% (1,7% – 8,8%)
Crossbite	Absent	Absent	101 (83,5%)	81,6% (74,3% – 87,9%)
	Absent	Present	9 (7,4%)	8,0% (3,9% – 13,4%)
	Present	Absent	4 (3,3%)	4,0% (1,3% – 8,1%)
	Present	Present	7 (5,8%)	6,4% (2,8% – 11,3%)
Malocclusion	Absent	Absent	9 (7,4%)	8,0% (4,0% – 13,3%)
	Absent	Present	26 (21,5%)	21,5% (14,8% – 29,2%)
	Present	Absent	11 (9,1%)	9,6% (5,1% – 15,4%)
	Present	Present	75 (62,0%)	60,8% (52,1% – 69,2%)

ICr = Credibility Index 95%

Discussion

The development of malocclusions is mainly assessed by cross-sectional studies of clinical conditions, which present the prevalence and association with characteristics in the population[9,16,17,24-26] without considering cause and effect. The longitudinal design contributes to the analysis of relative risk by assessing the relationship between an exposure factor and an outcome of interest (presence of malocclusion) by comparing the frequency of the outcome with data based on parameter estimates and confidence intervals[9,27,28].

In this sense, the present study explores the development of malocclusion through Bayesian analysis, commonly used in longitudinal study designs. This analytical approach is embedded in Bayes' Theorem and seeks to estimate unknown parameters within a probabilistic model[29,30]. The probability distribution allows for the incorporation of uncertainty before data examination, followed by establishing a subsequent probability distribution. Consequently, a more comprehensive analysis of the data can be achieved. The methodology of Bayesian analysis diverges from the conventional models used to describe the relationship between a binary dependent variable (i.e., presence or absence of malocclusion) and one or more independent explanatory variables, as the latter assumes a linear association with the occurrence of the given event.

As in any longitudinal study, the sample may lose segments. Initially, the Municipal Department of Education provided data concerning children within the specified age range, and the sample was stratified based on the administrative sectors of the district. In the second assessment, some children relocated to different schools due to their advancement to a new educational phase. This change affected our ability to contact them for follow-up assessments. Additionally, children undergoing orthodontic interventions were excluded from the study. The selection of statistical methodology was guided by the necessity to ensure adherence to the sample size standards previously established in the study design.

The initial assessment of the study examined five years of age children with primary dentition. The primary occlusion can improve or worsen when the individual transitions from primary to mixed dentition[9,27.] Consequently, the prior clinical question involves understanding the persistence of malocclusion during mixed dentition and its

severity. In this sense, we evaluate the longitudinal behavior of overjet, overbite, and transversal relationships.

When the analysis was performed on the occlusal conditions individually, the likelihood of a child exhibiting a normal overjet in the primary dentition and an increased overjet in the mixed dentition was significantly high. The maxilla has intramembranous ossification, and its most significant postnatal growth coincides with the mixed dentition period, which may explain the increase in overjet. This phenomenon could explain the observed increase in overjet. However, caution is essential as this characteristic is susceptible to change, especially considering that the most significant growth of the mandible is still pending and is expected to coincide with the growth spurt period. Consequently, there remains a possibility for the maxillary bones to maintain a proportional size. Consequently, the treatment for overjet can be initiated during stages of posterior occlusal development, such as the early permanent dentition stage. However, early intervention for mandibular deficiency may be warranted in severe cases[31-34].

The findings also demonstrated a likelihood of an anterior open bite occurring during the transition between primary and mixed dentition. However, the appropriate course of treatment should be determined when an open bite has the potential to rectify itself, primarily through eliminating detrimental oral habits. The potential for the alteration to persist into adulthood may present particular challenges of an orthodontic nature for correction, such as ensuring the stability of post-treatment relapse, which may reach a magnitude of 35%[35-40].

On the other hand, our results showed a high probability of children with a deep bite in the primary dentition having a normal overbite in the mixed dentition. The first bite elevation occurs with the eruption of the first permanent molars. The anterior vertical relationship is featured in the literature as a characteristic with much variability throughout occlusal development and should be observed with caution for the decision to treat. Faced with an overbite in the primary dentition, it is possible to monitor the transition in the other stages of occlusal development to choose the best moment to intervene[38-41].

Although the occurrence of posterior crossbite in children during the primary and mixed dentition stages is unlikely, there exists the potential for a higher incidence of posterior crossbite during the mixed dentition stage when there is a normal

transverse relationship in the primary dentition. Posterior crossbite is a transverse malocclusion that can significantly affect facial development, including asymmetrical growth of the bones and muscles and functional and aesthetic implications. Therefore, it is highly advised to initiate early treatment as soon as posterior crossbite is identified, regardless of the stage of occlusal development[42-45].

Considering our results, children will probably present malocclusion during the mixed dentition, mainly if these alterations have already manifested in the primary dentition[27,28,46]. The orthodontic intervention during the transitional period may fall into two opposite extremes if not accurately assessed: no intervention or overtreatment. Non-intervention occurs when the orthodontist believes that all occlusal development issues should be addressed exclusively during the permanent dentition phase. This approach significantly influences the development of the stomatognathic system and can lead to aesthetic and social impacts during childhood. On the other hand, overtreatment occurs when controllable changes can be treated in a shorter period, but the professional opt for prolonged treatment without optimizing the intervention time. This study proposes a strategic approach emphasizing the importance of decision-making to identify the ideal moment for intervention[32,41].

Finally, analyzing the aesthetic impact of the malocclusion or the worsening of the correction prognosis always justifies early intervention, precavendo impactos na qualidade de vida dos indivíduos em as fases futuras do desenvolvimento oclusal47. Consequently, understanding the likelihood of developing malocclusions has contributed to advancing our understanding of the progression of various occlusal characteristics. This knowledge stimulates improved planning and intervention strategies. In this sense, utilizing Bayesian analysis allowed the formulation of a probabilistic model that can effectively assess the evolution of clinical malocclusion conditions.

Conclusion

Considering the probabilistic model of Bayesian analysis, our results indicated that children with normal overjet in the primary dentition may show an increased overjet in the mixed dentition. Concerning overbite, children may present an anterior open bite during the transition between primary and mixed dentition and, on the other hand, self-correction of deep overbite in mixed dentition. Furthermore, they may present a

posterior crossbite during the mixed dentition when there is a normal transverse relationship in the primary dentition.

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2.2 Trata-se do estudo **Associação entre o risco para os distúrbios respiratórios do sono e a má oclusão em crianças em situação de vulnerabilidade social,** apresentado em formato de artigo seguindo as normas Vancouver.

Associação entre o risco para os distúrbios respiratórios do sono e a má oclusão em crianças.

RESUMO

O objetivo do estudo foi associar a má oclusão com distúrbios respiratórios do sono em crianças. Estudo observacional transversal realizado com 212 crianças de 5 anos de idade na fase da dentadura decídua. O risco para os distúrbios respiratórios do sono (DRS) foi determinado pelo Pediatric Sleep Questionnaire (PSQ). Foram avaliadas as relações oclusais de relação transversal, trespasse horizontal e trespasse vertical. O possível bruxismo do sono e em vigília, bem como a presença de hábitos bucais deletérios foram avaliados por meio de questionários enviados aos pais. Foram realizados modelos de regressão logística que foram ajustados e estimados os odds ratios brutos com os intervalos de 95% de confiança. As variáveis com $p<0,20$ nas análises individuais foram estudadas em um modelo de regressão logística múltiplo, permanecendo no modelo final apenas as variáveis que tiveram $p\leq0,05$. Os resultados mostraram 20,8% das crianças apresentaram DRS, e que há maior chance de risco para DRS em crianças com mordida aberta anterior (OR=3,36; IC95%: 1,27-8,93). Conclui-se que crianças que apresentam mordida aberta anterior tem mais chance de apresentar distúrbios respiratórios do sono.

INTRODUÇÃO

Os distúrbios respiratórios do sono (DRS) se referem ao colapso recorrente da via aérea respiratória que acontecem durante o sono. Em vigília existe uma proteção na via aérea que acontece por diversos mecanismos, que resultam no aumento da atividade muscular dos dilatadores faríngeos, entretanto, durante o sono, esses mecanismos não são suficientes, ocorrendo uma diminuição do espaço e, consequentemente, uma maior resistência ao fluxo respiratório (Palombini, 2010).

Os DRS apresentam associação com um maior risco para doenças cardiovasculares e metabólicas, e a identificação e tratamento dessa situação durante a infância é considerada a única forma de prevenção para a fase adulta (Palombini, 2010; Castilho et al., 2020).

A literatura aponta alguns possíveis fatores associados aos DRS, sendo eles genéticos como colapso ou obstruções das estruturas das vias aéreas respiratórias, falhas no sistema nervoso regulador da respiração, e ainda, fatores ambientais como

alergias, infecções, respiração bucal, má oclusão e bruxismo (Palombini, 2010, Ikävalko et al., 2012; Aroucha Lyra et al., 2020; Castilho et al., 2020)

Neste sentido, os DRS podem ser considerados um problema de importância crescente na pediatria, pois afetam a qualidade de vida das crianças (Castilho et al., 2020). Diante disso, o objetivo do estudo foi associar a má oclusão com distúrbios respiratórios do sono em crianças em situação de vulnerabilidade social.

METODOLOGIA

Este estudo foi aprovado pelo Comitê de Ética e Pesquisa (CAAE. 59292222.8.0000.5385). Foi realizado um estudo observacional transversal com 212 crianças de 5 anos de idade e em situação de vulnerabilidade social matriculadas em cinco escolas da zona leste do município de Araras (São Paulo, Brasil).

Foram incluídos no estudo as crianças com dentadura decídua completa, ausência de tratamento ortodôntico atual ou prévio, ausência de síndromes ou alterações que impediram a participação no estudo. O tamanho mínimo de 200 crianças foi calculado considerando um poder do teste de 80% e nível de significância de 5%.

O risco ao DRS foi avaliado por meio do questionário Pediatric Sleep Questionnaire (PSQ), validado para detectar os distúrbios respiratórios do sono como ronco, sonolência e problemas comportamentais. O PSQ foi respondido pelos pais e/ou responsáveis, em que apresentou 22 itens, com respostas binomiais (sim ou não) (Bruni e al., 1996; Charvin et al., 2000; Martins et al., 2022). Esse questionário apresenta 3 domínios: o de ronco com 9 itens, o de sonolência com 7 itens e o de comportamento com 6 itens com os seguintes questionamentos: Enquanto dorme, seu filho: 1) ronca mais da metade do tempo de sono? 2) sempre ronca? 3) ronca alto? 4) tem dificuldade para respirar ou luta para respirar? 5) tem respiração "pesada" ou alta? 6) você já viu seu filho parar de respirar durante a noite? Seu Filho: 7) tende a respirar pela boca durante o dia? 8) tem a boca seca ao acordar de manhã? 9) ocasionalmente faz xixi na cama? 10) acorda sentindo-se cansado pela manhã? 11)tem problema de sonolência durante o dia? 12) o professor já comentou que ele fica sonolento durante o dia? 13) é difícil acordá-lo de manhã? 14)ele acorda com dor de cabeça de manhã? 15) parou de crescer numa velocidade normal desde o nascimento? 16) está com sobrepeso? Meu filho frequentemente: 17) parece não

ouvir quando falamos com ele(a). 18) tem dificuldade organizando tarefas e atividades. 19) é facilmente distraído por estímulos estranhos. 20) tem os pés e as mãos inquietos ou se contorce ao sentar. 21) age como se estivesse “ligado na tomada”? 22) se intromete ou interrompe os outros. Valores de 8 ou mais respostas positivas é sugestivo de distúrbios respiratórios do sono. (Charvin et al.,2000; Martins et al., 2022).

A oclusão foi avaliada baseada nos critérios de Foster e Hamilton (1969). As variáveis analisadas foram trespasse horizontal, trespasse vertical e relação transversal (Foster e Hemilton, 1969).

O possível bruxismo do sono foi avaliado por um questionário adaptado do artigo (Winocur et al., 2011), que utilizou os critérios de diagnósticos da Academia Americana de Medicina do Sono (2005). O questionário refere-se a eventos ocorridos nos últimos 3 meses da seguinte forma: 1 - Você sabe ou já ouviu alguém dizer que seu filho range os dentes com frequência durante o sono? (sim/não); 2 - Você acha de que a dentição do seu filho está desgastada mais do que deveria ser? (sim/não); 3 - Você seu filho já relatou sentir algum dos seguintes sintomas ao acordar? (sim/não): (a) Sensação de fadiga, aperto ou dor no maxilar ao acordar? (b) Sentindo os dentes apertados ou que sua boca está dolorida ao acordar? (c) Dor nas temporas ao acordar? (d) Dificuldade em abrir bem a boca ao acordar? (e) Sentimento de tensão na articulação da mandíbula ao acordar e sentir como se tivesse que mover sua mandíbula para liberá-la? (f) Ouvir ou sentir um "clique" na articulação da mandíbula ao despertar que desaparece depois?

Os entrevistados foram classificados com possível bruxismo do sono se a resposta foi positiva para a questão 1 e/ou pergunta 2, além de pelo menos uma resposta positiva para um sintoma listado na questão 3 (Emidio et al., 2020). Já o bruxismo em vigília e os hábitos bucais deletérios foram identificados por perguntas diretas enviadas aos pais.

Análise estatística

Inicialmente foram realizadas análises descritivas dos dados com frequências absolutas e relativas. A seguir foram ajustados modelos de regressão logística entre cada variável independente individualmente e o desfecho (risco de distúrbios

respiratórios do sono). A partir desses modelos foram estimados os odds ratios brutos com os intervalos de 95% de confiança. As variáveis com p<0,20 nas análises individuais foram estudadas em um modelo de regressão logística múltiplo, permanecendo no modelo final apenas as variáveis que tiveram p≤0,05 no modelo múltiplo. A partir do modelo múltiplo foram estimados os odds ratios ajustados com os intervalos de 95% de confiança. As análises foram realizadas no programa R (R Foundation for Statistical Computing, Vienna, Austria), com nível de significância de 5%

RESULTADOS

Foram avaliadas 212 crianças com idade entre 5 anos de idade, sendo 52,8% meninos e 47,2% meninas. Na Tabela 1 é apresentada a análise descritiva das variáveis avaliadas. Observou-se que a maioria das crianças são de família com renda de até três salários-mínimos (91,5%). Em relação aos hábitos bucais deletérios, 44,8% usam chupeta, 74,5% apresentam possível bruxismo do sono e 43,4% apresentam bruxismo em vigília. Em relação à má oclusão pode-se observar que 18,8% apresentam mordida cruzada posterior, 14,2% trespasse horizontl aumentado e 13,7% trespasse horizontal diminuído. Observa-se ainda que 12,7% e 16,0% apresentam trespasse vertical aumentado e mordida aberta anterior, respectivamente. Quanto ao risco de distúrbios respiratórios do sono, a prevalência é de 20,8%.

Tabela 1. Análises descritiva das variáveis estudadas em escolares de 5 e 6 anos de idade (n=212).

Variável	Categoria	n (%)
Risco de distúrbios respiratórios do sono (desfecho)	Presença	44 (20,8%)
	Ausência	168 (79,2%)
Sociodemográfica		
Sexo	Feminino	100 (47,2%)
	Masculino	112 (52,8%)
Cor da pele	Branca	90 (42,5%)
	Preta	122 (57,6%)
Renda (Salários Mínimos)	Menos de um	53 (25,0%)
	Entre 1 e 3	141 (66,5%)
	Entre 4 e 6	16 (7,6%)
	Mais que 6	2 (0,9%)
Escolaridade da mãe	Não alfabetizado	5 (2,4%)
	1ª a 4ªSérie incompleta	15 (7,1%)
	5ª a 8ª Série incompleta	13 (6,1%)
	5ª a 8ª Série completa	10 (4,7%)
	2º Grau incompleto	23 (10,8%)
	2º Grau completo	93 (43,9%)
	Ensino Superior incompleto	12 (5,7%)
	Ensino Superior completo	34 (16,0%)
	Sem informação	7 (3,3%)
Escolaridade do pai	Não alfabetizado	24 (11,3%)
	1ª a 4ªSérie incompleta	18 (8,5%)
	1ª a 4ªSérie completa	5 (2,4%)
	5ª a 8ª Série incompleta	13 (6,1%)
	5ª a 8ª Série completa	14 (6,6%)
	2º Grau incompleto	18 (8,5%)
	2º Grau completo	79 (37,3%)
	Ensino Superior incompleto	15 (7,1%)
	Ensino Superior completo	19 (9,0%)
	Sem informação	7 (3,3%)
Hábitos bucais deletérios		
Sucção de chupeta	Sim	95 (44,8%)
	Não	117 (55,2%)
Sucção de dedo	Sim	16 (7,6%)
	Não	196 (92,4%)
Bruxismo do sono	Sim	158 (74,5%)

Variável	Categoria	n (%)
	Não	54 (25,5%)
Bruxismo em vigília	Sim	92 (43,4%)
	Não	120 (56,6%)
Má oclusão		
Relação transversal	Normal	151 (71,2%)
	Mordida cruzada posterior	61 (18,8%)
Trespasse horizontal (overjet)	Normal	153 (72,2%)
	Aumentado	30 (14,2%)
	Diminuído	29 (13,7%)
Trespasse vertical (overbite)	Normal	151 (71,2%)
	Sobremordida	27 (12,7%)
	Mordida aberta anterior	34 (16,0%)

*Evento de desfecho. Ref: Categoria de referência para as variáveis independentes. OR: Odds ratio. IC: Intervalo de confiança.

Os resultados das análises de associação com o risco de distúrbios respiratórios do sono nos escolares são apresentados na Tabela 2. Observa-se maior chance de risco de distúrbios respiratórios do sono nos escolares com mordida aberta anterior (OR=3,36; IC95%: 1,27-8,93). Pode-se observar que 29,4% dos escolares com mordida aberta anterior apresentam risco, enquanto entre os com trespasse vertical normal, apenas 1,5% apresentam risco.

Tabela 3. Análises das associações brutas e ajustadas com o risco de distúrbios respiratórios do sono, em escolares com 5 e 6 anos de idade (n=212).

Variável	Categoria	n (%)	Risco		OR bruto (IC95%)	p-valor	OR ajustado (IC95%)	p-valor
			Presença*	Ausência				
			n (%)	n (%)				
Socioeconômica								
Sexo	Feminino	100 (47,2%)	21 (21,0%)	79 (79,0%)	1,03 (0,53-2,00)	0,9337	-	-
	Masculino	112 (52,8%)	23 (20,5%)	89 (79,5%)	Ref			
Cor da pele	Branca	90 (42,5%)	20 (22,2%)	70 (77,8%)	1,17 (0,60-2,28)	0,6511	-	-
	Preta	122 (57,6%)	24 (19,7%)	98 (80,3%)	Ref			
Escolaridade da mãe	Até 8ª Série completa	43 (20,3%)	8 (18,6%)	35 (81,4%)	0,80 (0,34-1,88)	0,6081	-	-
	Do 2º grau até Superior completo	162 (76,4%)	36 (22,2%)	126 (77,8%)	Ref			
	Sem informação	7 (3,3%)	0 (0,0%)	7 (100,0%)	-			
Escolaridade do pai	Até 8ª Série completa	74 (34,9%)	12 (16,2%)	62 (83,8%)	0,60 (0,29-1,25)	0,1717	-	-
	Do 2º grau até Superior completo	131 (61,8%)	32 (24,4%)	99 (75,6%)	Ref			
	Sem informação	7 (3,3%)	0 (0,0%)	7 (100,0%)	-	-		
Hábitos bucais deletérios								
	Sim	95 (44,8%)	17 (17,9%)	78 (82,1%)	Ref		-	-

Variável	Categoria	n (%)	Risco		OR bruto (IC95%)	p-valor	OR ajustado (IC95%)	p-valor
			Presença*	Ausência				
			n (%)	n (%)				
Sucção de chupeta	Não	117 (55,2%)	27 (23,1%)	90 (76,9%)	1,38 (0,70-2,71)	0,3559		
Sucção de dedo	Sim	16 (7,6%)	6 (37,5%)	10 (62,5%)	2,50 (0,85-7,29)	0,0947	-	-
	Não	196 (92,4%)	38 (19,4%)	158 (80,6%)	Ref			
Bruxismo do sono	Sim	158 (74,5%)	31 (19,6%)	127 (80,9%)	0,77 (0,37-1,61)	0,4867	-	-
	Não	54 (25,5%)	13 (24,1%)	41 (75,9%)	Ref			
Bruxismo em vigília	Sim	92 (43,4%)	23 (25,0%)	69 (75,0%)	1,57 (0,81-3,06)	0,1839	-	-
	Não	120 (56,6%)	21 (17,5%)	99 (82,5%)	Ref			
Má oclusão								
Relação transversal	Normal	151 (71,2%)	32 (21,2%)	119 (78,8%)	Ref		-	-
	Mordida cruzada posterior	61 (18,8%)	12 (19,7%)	49 (80,3%)	0,91 (0,43-1,91)	0,8049	-	-
Trespasse horizontal (overjet)	Normal	153 (72,2%)	35 (22,9%)	118 (77,1%)	Ref			
	Aumentado	30 (14,2%)	5 (16,7%)	25 (83,3%)	0,67 (0,24-1,89)	0,4540		
	Diminuído	29 (13,7%)	4 (13,8%)	25 (86,2%)	0,54 (0,18-1,66)			
Trespasse vertical (overbite)	Normal	151 (71,2%)	28 (18,5%)	123 (81,5%)	Ref		Ref	
	Sobremordida	27 (12,7%)	6 (22,2%)	21 (77,8%)	1,26 (0,46-3,40)	0,6547	1,23 (0,44-3,44)	0,6902

Variável	Categoria	n (%)	Risco		OR bruto (IC95%)	p-valor	OR ajustado (IC95%)	p-valor
			Presença*	Ausência				
			n (%)	n (%)				
	Mordida aberta anterior	34 (16,0%)	10 (29,4%)	24 (70,6%)	1,83 (0,79-4,26)	0,1605	3,36 (1,27-8,93)	0,0150

*Evento de desfecho. Ref: Categoria de referência para as variáveis independentes. OR: Odds ratio. IC: Intervalo de confiança

DISCUSSÃO

O presente estudo avaliou a associação da a má oclusão, presença de hábitos bucais deletérios e possível bruxismo do sono e em vigília com o risco para o desenvolvimento de distúrbios respiratórios do sono a partir disso observamos que movo estudos são sugeridos a fim de determinar também a relação de causa e efeito entre essas variáveis, traçar diagnósticos mais precisos e auxiliar na escolha de tratamento (Carvalho et al., 2014; Aroucha Lyra et al., 2020; Shirke et al., 2023).

A prevalência dos riscos aos DRS foi de 20,8%, sendo considerada uma alta prevalência na população infantil, mesmo que observado uma taxa de variação na prevalência dos estudos devido ao perfil da amostra estudada, todos corroboram com a presença alta desses distúrbios na infância (Castronovo et al., 2003; Sakamoto et al., 2017; Guo et al., 2020; Hansen et al., 2022; Shirke et al., 2023; Li et al., 2023).

Os DRS possuem alta prevalência na população e podem influenciar negativamente o desenvolvimento e bem-estar das crianças, com isso, são necessários mais estudos nessa população, pois, é a única fase que permite estratégias preventivas das alterações decorrentes dos distúrbios respiratórios do sono na fase adulta (Kim & Guilleminault., 2011; Carvalho et al., 2014; Hansen et al., 2022; Li et al., 2023).

Considerando que, este estudo associou o risco para problemas respiratórios do sono com aspectos clínicos e comportamentais das crianças na dentadura decídua, observou-se que crianças com alterações clínicas de má oclusão apresentam mais chances ao risco dos distúrbios respiratórios do sono.

A mordida aberta anterior esteve associada com os DRS (Carvalho et al., 2014; Pacheco et al., 2015; Aroucha Lyra et al., 2020; Shirke et al., 2023). A falta de trespasse vertical positivo proporciona na criança a ausência do ponto resistência para o posicionamento da língua em determinadas funções do

sistema estomatognático como movimentos durante a fala e deglutição, e ainda, proporciona alterações do padrão respiratório normal, nesse caso, para padrão respiratório predominantemente bucal, esse cenário converge para piora na qualidade de vida da criança (Shirke et al., 2023; Li et al., 2023).

Embora a polissonografia seja o padrão ouro para a avaliação dos DRS, o questionário Pediatric Sleep Questionnaire (PSQ) utilizado nesse estudo se apresenta como uma opção viável de baixo custo para ser aplicado em grandes populações infantis e de vulnerabilidade social como nesse estudo, tendo validade e confiabilidade do seu uso para populações brasileiras (Martins et al., 2022).

A vulnerabilidade social foi uma característica da amostra estudada como baixa renda e baixa escolaridade dos pais, sendo fatores que podem estar associados com alterações da saúde bucal e com o impacto na qualidade de vida relacionada a saúde bucal das crianças. Com isso, estratégias de saúde pública em saúde bucal são altamente desejadas para essa população, incluindo diagnóstico e prevenção dos DRS (Santos et al., 2020; Shirke et al., 2023; Li et al., 2023).

Não é possível afirmar nesse estudo a relação entre causa e efeito dos fatores estudados com o desfecho, e a literatura de apresenta de forma escassa, para isso, é necessário que estudos de acompanhamento longitudinal sejam realizados e são altamente sugeridos para estudos futuros. Entretanto, as implicações clínicas para os achados desses estudos apontam a necessidade de diagnóstico precoce dos DRS, bem como, tratamento das alterações oclusais de mordida aberta anterior de forma precoce.

CONCLUSÃO

Conclui-se que crianças que apresentam mordida aberta anterior tem mais chance de apresentar distúrbios respiratórios do sono.

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3. DISCUSSÃO

Devido ao caráter multifatorial e para que seja possível contemplar um amplo conhecimento da má oclusão e seus impactos na vida das crianças são necessários estudos com diferentes desenhos metodológicos, nos estudos de frequentistas podemos observar fatores que estão associados à essa alteração em um recorte transversal ou longitudinal, apontado variáveis correspondentes aos fatores etiológicos e até mesmo análises mais profundas como de causa e efeito, entretanto, não foi possível observar na literatura atual estudos investigando a probabilidade do desenvolvimento da má oclusão (Góis et al., 2012; Shamshoian et al., 2022).

O desenvolvimento oclusal na infância é observado com grande variabilidade de sua apresentação clínica, as características de normalidade em cada fase do desenvolvimento oclusal e as alterações oclusais podem ocorrer bem como pode se autocorrigir, com isso, esse estudo analisou a probabilidade dos eventos ocorrerem na fase de transição da dentadura decídua e mista, observando que é alta a probabilidade das crianças desenvolverem má oclusão na dentadura decídua e mista, e que também é alta a probabilidade de uma criança desenvolver má oclusão na dentadura mista mesmo não apresentando na dentadura decídua (Góis et al., 2012; Alkhadra et al., 2017; Amaral et al., 2017).

A característica de má oclusão que apresentou mais probabilidade de as crianças apresentarem na dentadura mista foi a mordida aberta anterior, essa é uma característica instável pois ao mesmo tempo que pode ocorrer, ela também apresenta potencial de autocorreção. Na infância ela pode ser facilmente tratada, por isso, ao identificar essa alteração é necessário tratamento preventivo ou interceptativo o quanto antes (Lentini-Oliveira et al., 2014; Nascimento et al., 2016; Tanny et al., 2028).

Já na fase adulta, o tratamento da mordida aberta anterior é desafiador, e pode inclusive envolver tratamento cirúrgicos, mesmo assim, a literatura aponta grande instabilidade nas correções durante essa fase (Lentini-Oliveira et al., 2014; Nascimento et al., 2016; Tanny et al., 2028).

Nesse sentido, observou-se que as alterações de mordida aberta anterior estivem associado ao risco para o desenvolvimento de distúrbios respiratórios do sono, sendo essa uma alteração respiratória importante e impede a qualidade do sono e que quando perpetuada na fase adulta pode inclusive aumentar riscos de doenças cardiovasculares (Kim et al., 2011; Pacheco et al., 2015; Guo et al., 2020).

Com isso, identificar e tratar a mordida aberta anterior em crianças de forma precoce é altamente desejado para que ocorra a melhora na qualidade de vida das crianças.

4. CONCLUSÃO

Conclui-se que fatores moduladores como o risco aos DRS estão associados a má oclusão de mordida aberta anterior e que e que crianças apresentam alta probabilidade de desenvolverem má oclusão na transição da dentadura decídua para a dentadura mista.

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ANEXOS

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PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: ANÁLISE DOS FATORES MODULADORES ENVOLVIDOS NO DESENVOLVIMENTO OCLUSAL: ESTUDO LONGITUDINAL.
Pesquisador: PATRICIA RAFAELA DOS SANTOS
Área Temática:
Versão: 3
CAAE: 31459420.5.0000.5418
Instituição Proponente: Faculdade de Odontologia de Piracicaba - Unicamp
Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 4.031.001

Apresentação do Projeto:
Transcrição editada do conteúdo do registro do protocolo e dos arquivos anexados à Plataforma Brasil
A EQUIPE DE PESQUISA inclui PATRÍCIA RAFAELA DOS SANTOS (Cirurgiã Dentista, Doutoranda na área de Saúde Coletiva do PPG em Odontologia da FOP-UNICAMP, Pesquisadora responsável, Orientanda), Marcelo de Castro Meneghim (Cirurgião Dentista, Docente da área de Odontologia Preventiva e Saúde Pública da FOP-UNICAMP, Pesquisador participante, Orientador) e SILVIA AMÉLIA SCUDELER VEDOVELLO (Cirurgiã Dentista, Docente da Faculdade de Odontologia da Fundação Herminio Ometto, Pesquisadora participante), o que é confirmado na declaração dos pesquisadores e na PB.
Pendência 1 (atendida em 14/05/20)- Os dados dos pesquisadores foram ajustados na contracapa do projeto.
Delineamento da pesquisa: Trata-se de estudo epidemiológico observacional, longitudinal, que envolverá 121 indivíduos que participaram de dois estudos anteriores desenvolvidos pela Faculdade de Odontologia do Centro Universitário da Fundação Herminio Ometto na cidade de Araras – SP, em 2014 e 2017. O objetivo deste estudo será avaliar, o desenvolvimento oclusal na fase de dentadura mista e o tipo de impacto dos fatores moduladores clínicos e ambientais. Os

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Anexo 3 - Parecer de aprovação pela revista *American Journal of Orthodontics and Dentofacial Orthopedics*

Ms. Ref. No.: AJODO-D-23-00742R4
Title: A longitudinal study of the probability of developing malocclusion in children using a Bayesian analysis.
American Journal of Orthodontics & Dentofacial Orthopedics

Dear Professor Meneghim,

Thank you for revising and resubmitting your manuscript to the AJO-DO. I am now satisfied that all necessary changes have been made and I am pleased to accept your research for publication. Congratulations.

We have tentatively scheduled your article for publication in mid- to late 2024. When we approach the publication date, we will send your article to the production department where it will be prepared for publication. The production department will notify you when the proof is available. Once you approve the proof, the article will published in the In Press section of our website until its formal publication date.

Thank you for submitting your article to the AJO-DO. I look forward to its publication.

With kind regards,

Jae Hyun Park
Deputy Editor-in-Chief
American Journal of Orthodontics and Dentofacial Orthopedics
Manuscript submission: www.editorialmanager.com/ajodo
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Anexo 4 - Parecer Comitê de Ética Capitulo 2

CENTRO UNIVERSITÁRIO DA FUNDAÇÃO HERMÍNIO OMETTO - FHO

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: ASSOCIAÇÃO ENTRE A QUALIDADE DE VIDA RELACIONADA À SAÚDE BUCAL E O CAPITAL SOCIAL EM PRÉ-ESCOLARES

Pesquisador: SILVIA AMÉLIA SCUDELER VEDOVELLO

Área Temática:

Versão: 1

CAAE: 59291622.8.0000.5385

Instituição Proponente: Centro Universitário Hermínio Ometto/ UNIARARAS

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 5.461.955

Apresentação do Projeto:

Este estudo terá como objetivo explorar os caminhos pelos quais o capital social individual e comunitário podeminfluenciar a cárie dentária
e a má oclusão e a qualidade de vida relacionada á saúde bucal (OHRQoL)em pré-escolares. Estudo observacional transversal será
realizado com crianças matriculadas em escolas públicas da zona leste da cidade de Araras (São Paulo, Brasil), de ambos os sexos e na fase de
dentaduradecídua.A pesquisa incluirá a avaliação de dados não clínicos (aspectos socioeconômicos, OHRQoL e capital social) e dados(cárie
dentária e má oclusão). A OHRQoL será avaliada usando a versão brasileira da Early Childhood Oral Health Impact Scale (ECOHIS). O
capital social incluirá características individuais e contextuais. As variáveis clínicas de cárie dentária e má oclusão serão avaliadas pelos critérios
da Organização Mundial da Saúde (OMS).

Objetivo da Pesquisa:

Hipótese:

O estudo parte da hipótese que um alto capital social individual e comunitário impacta diretamente em menor prevalência de cárie dentária e

Endereço: Avenida Dr. Maximiliano Baruto, 500
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UF: SP **Município:** ARARAS
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Anexo 5 - Relatório de similaridade emitido pelo software Turnitin.

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de Marcelo De Castro Meneghin

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2	Caio André da Silva EMÍDIO, Luiz Felipe Nogueira SANTOS, Diego Patrik Alves CARNEIRO, Patrícia Rafaela dos SANTOS et al. "Behavioral and clinical aspects associated with probable sleep bruxism in early childhood", Revista de Odontologia da UNESP, 2020 Publicação	1%
3	Melissa Picinato-Pirola, Amanda Lima e Lira, Giovanna Régis Viana, Thaynara Lemos Batista Santos, Camila de Castro Corrêa. "Hábitos de sono e autoavaliação miofuncional orofacial de crianças com risco	1%