

UNIVERSIDADE FEDERAL DE MINAS GERAIS
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Bianca Spuri Tavares

**ERUPÇÃO DENTÁRIA EM BEBÊS, AMAMENTAÇÃO E FATORES
PERI E PÓS-NATAIS: *ANÁLISE DE CAMINHOS DE FATORES
DIRETOS E INDIRETOS***

Belo Horizonte
2025

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Tese apresentada ao Colegiado de Pós-Graduação em Odontologia da Faculdade de Odontologia da Universidade Federal de Minas Gerais, como requisito parcial à obtenção do grau de Doutor em Odontologia – área de concentração em Odontopediatria

Orientadora: Profa. Dra. Cristiane Baccin Bendo

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BIANCA SPURI TAVARES

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“O impossível acho, acontece com o viver. ”

Matt Haig, A Biblioteca da Meia-Noite (2021)

RESUMO

A erupção do primeiro dente decíduo e a duração do aleitamento materno são influenciadas por fatores biológicos, socioeconômicos e contextuais, incluindo condições ao nascimento e hospitalização neonatal. Há lacunas na literatura sobre como esses fatores se inter-relacionam, especialmente em bebês prematuros. Este estudo teve dois objetivos: 1) avaliar, por meio de um estudo de coorte, os fatores diretos e indiretos relacionados à idade da erupção do primeiro dente decíduo; e 2) analisar, de forma transversal, os fatores associados à duração do aleitamento materno, considerando a erupção dentária como possível determinante. Os estudos incluíram bebês prematuros e a termo, acompanhados mensalmente até a erupção do primeiro dente. Foram coletadas informações clínicas e contextuais, como idade gestacional, peso ao nascer, internação em unidade de terapia intensiva (UTI), escolaridade e renda materna, uso de chupeta, tipo de parto e idade materna. A erupção dentária foi avaliada clinicamente de forma mensal e a data da ocorrência foi confirmada pelos responsáveis. A duração do aleitamento foi aferida por questionário aplicado às mães. A análise estatística foi realizada com os softwares Mplus 8.6 e SPSS 26.0, utilizando modelos de caminho, além de análises descritivas e fatoriais. Participaram do estudo 91 bebês, sendo 43 prematuros e 48 a termo. Para os bebês nascidos a termo, a idade média de erupção do primeiro dente decíduo foi 7 meses ($\pm 1,27$). Para os nascidos prematuros, a idade cronológica média de erupção foi 11,37 meses ($\pm 2,51$) (idade corrigida: 8,95 meses $\pm 2,51$). No modelo longitudinal, baseado na idade cronológica, lactentes prematuros apresentaram maior risco de erupção dentária tardia em relação aqueles nascidos a termo ($\beta = 0,888$; $p < 0,001$). Mães com pior condição socioeconômica ($\beta = 0,297$; $p = 0,010$), que usaram medicamentos na gestação ($\beta = 0,337$; $p < 0,001$), realizaram ≤ 6 consultas pré-natais ($\beta = 0,198$; $p = 0,025$) e tiveram complicações no parto ($\beta = 0,214$; $p = 0,007$) apresentaram maior chance de partos prematuros. A idade gestacional influenciou significativamente a internação em UTI ($\beta = 0,829$; $p < 0,001$) e o peso ao nascer ($\beta = 0,935$; $p < 0,001$). Resultados semelhantes foram observados com a idade corrigida, variando apenas nos coeficientes β . Na análise transversal, crianças com menor idade gestacional tiveram erupção mais tardia do primeiro dente ($\beta = -0,612$; $p < 0,001$), e a erupção tardia esteve associada a maior duração do aleitamento materno ($\beta = 0,340$; $p < 0,001$). Bebês com menor idade gestacional apresentaram maior probabilidade de internação em UTI ($\beta = -0,838$; $p < 0,001$), e os que passaram por internação apresentaram menor duração de aleitamento ($\beta = -0,565$; $p < 0,001$). Conclui-se que, no estudo 1, bebês prematuros tiveram maior risco de atraso na erupção dentária em relação aos nascidos a termo, considerando tanto a idade cronológica quanto a corrigida. No estudo 2, a idade gestacional demonstrou associação direta com a erupção dentária e associação indireta com a duração do aleitamento materno, mediada por fatores maternos e neonatais.

Palavras-chave: erupção dentária; lactante; recém-nascido prematuro; estudo coorte; cronologia de erupção dentária; aleitamento materno; recém-nascido; erupção dentária.

ABSTRACT

Tooth Eruption in Infants, Breastfeeding, Perinatal and Postnatal Factors: Path Analysis of Direct and Indirect Effects

The eruption of the first primary tooth and the duration of breastfeeding are influenced by biological, socioeconomic, and contextual factors, including birth conditions and neonatal hospitalization. There are gaps in the literature regarding how these factors interrelate, especially in preterm infants. This study had two objectives: (1) to assess, through a cohort study, the direct and indirect factors related to the age at first primary tooth eruption; and (2) to analyze, through a cross-sectional study, the factors associated with the duration of breastfeeding, considering tooth eruption as a possible determinant. The studies included both preterm and full-term infants, followed monthly until the eruption of the first tooth. Clinical and contextual data were collected, including gestational age, birth weight, neonatal intensive care unit (NICU) admission, maternal education and income, pacifier use, type of delivery, and maternal age. Tooth eruption was assessed clinically on a monthly basis, and the date of eruption was confirmed by caregivers. Breastfeeding duration was assessed through a questionnaire administered to the mothers. Statistical analysis was conducted using Mplus 8.6 and SPSS 26.0 software, employing path models as well as descriptive and factorial analyses. A total of 91 infants participated in the study—43 preterm and 48 full-term. Among full-term infants, the mean age of first tooth eruption was 7 months (± 1.27). Among preterm infants, the mean chronological age at eruption was 11.37 months (± 2.51) (corrected age: 8.95 months ± 2.51). In the longitudinal model, based on chronological age, preterm infants had a higher risk of delayed tooth eruption compared to full-term infants ($\beta = 0.888$; $p < 0.001$). Mothers with poorer socioeconomic conditions ($\beta = 0.297$; $p = 0.010$), who used medication during pregnancy ($\beta = 0.337$; $p < 0.001$), had ≤ 6 prenatal visits ($\beta = 0.198$; $p = 0.025$), and experienced delivery complications ($\beta = 0.214$; $p = 0.007$) had a higher likelihood of preterm births. Gestational age significantly influenced NICU admission ($\beta = 0.829$; $p < 0.001$) and birth weight ($\beta = 0.935$; $p < 0.001$). Similar results were observed using corrected age, with variations only in the β coefficients. In the cross-sectional analysis, infants with lower gestational age experienced later eruption of the first tooth ($\beta = -0.612$; $p < 0.001$), and delayed eruption was associated with longer breastfeeding duration ($\beta = 0.340$; $p < 0.001$). Infants with lower gestational age were more likely to be admitted to the NICU ($\beta = -0.838$; $p < 0.001$), and those who were hospitalized had shorter breastfeeding duration ($\beta = -0.565$; $p < 0.001$). In conclusion, in Study 1, preterm infants had a higher risk of delayed tooth eruption compared to full-term infants, considering both chronological and corrected age. In Study 2, gestational age showed a direct association with tooth eruption and an indirect association with breastfeeding duration, mediated by maternal and neonatal factors.

Keywords: tooth eruption; infant; preterm newborn; cohort study; tooth eruption chronology; breastfeeding; newborn; dental eruption.

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LISTA DE ABREVIATURAS E SÍMBOLOS

ACP	Análise de Componentes Principais
CFI	<i>Comparative Fit Index</i> (Índice de Ajuste Comparativo)
IC	Intervalo de Confiança
KMO	<i>Kaiser-Meyer-Olkin</i> (medida de adequação de amostragem para análise fatorial)
OMS	Organização Mundial da Saúde
RMSEA	<i>Root Mean Square Error of Approximation</i> (Raiz Média do Erro Quadrático de Aproximação)
SPSS	<i>Statistical Package for the Social Sciences</i>
SRMR	<i>Standardized Root Mean Square Residual</i> (Raiz Média Residual Padronizada)
STROBE	<i>Strengthening the Reporting of Observational Studies in Epidemiology</i>
TLI	<i>Tucker-Lewis Index</i> (Índice de Tucker-Lewis)
UFMG	Universidade Federal de Minas Gerais
UTIN	Unidade de Terapia Intensiva Neonatal
UTI	Unidade de Terapia Intensiva
WLSMV	<i>Weighted Least Squares Mean and Variance adjusted</i> (Média Ponderada dos Mínimos Quadrados com Variância Ajustada)

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1 CONSIDERAÇÕES INICIAIS

O desenvolvimento orofacial inicial caracteriza-se por um período de crescimento alométrico acelerado e intensa especialização tecidual (Björk; Skieller, 1978). Durante os primeiros três anos de vida, o cérebro atinge aproximadamente 90% do seu crescimento e a face cerca de 65% do seu tamanho adulto, o que demonstra a rapidez e a relevância das mudanças estruturais nesse período (Madani; Berardi; Stoopler, 2014). Esse ritmo intenso de desenvolvimento impacta diretamente a formação e função da cavidade oral, exigindo atenção cuidadosa por parte de pediatras e odontopediatras que acompanham neonatos e bebês (Björk; Skieller, 1978; Madani; Berardi; Stoopler, 2014; Manlove *et al.*, 2020). O desenvolvimento oclusal, por sua vez, tem início no período pós-natal e se divide em fases: pré-dentária, dentição decídua, dentição mista e, por fim, dentição permanente (Manlove *et al.*, 2020). Entre o nascimento e os três anos de idade, ocorrem mudanças significativas na forma e na função da cavidade oral, evidenciando ainda mais a importância da atuação precoce e integrada dos profissionais da saúde infantil (Niranjan *et al.*, 2020).

O período pré-dentário é a fase que se estende do nascimento até o início da erupção dos primeiros dentes (Brands; Schroeder, 1996; Cahill; Marks, 1980; Marcos, 1995; Proffit; Frazier-Bowers, 2009; Suri; Gagari; Vastardis, 2004). Também conhecido como período da oclusão dos roletes gengivais, esse estágio se caracteriza por uma série de transformações fisiológicas que ocorrem nos seis primeiros meses de vida (Brands; Schroeder, 1996). Dentre elas, destacam-se o desenvolvimento das funções orais (como a sucção, a deglutição e, progressivamente, a mastigação), o amadurecimento neuromuscular da musculatura orofacial e o crescimento dos maxilares e das estruturas ósseas que servirão de suporte à futura dentição (Suri; Gagari; Vastardis, 2004).

O desenvolvimento da dentição decídua tem início ainda durante a gestação, por volta da quinta semana de vida intrauterina (Koussoulakou; Margaritis; Koussoulakos, 2009; Madani; Berardi; Stoopler, 2014). Antes de emergirem na cavidade oral, os dentes passam por um processo fisiológico complexo, dividido em etapas sucessivas (Koussoulakou; Margaritis; Koussoulakos, 2009). Inicialmente, ocorre o estágio de iniciação ou germinativo, quando se forma a lâmina dentária. Em seguida, no estágio de proliferação, há intensa multiplicação celular, dando origem ao botão dentário (Koussoulakou; Margaritis; Koussoulakos, 2009). No estágio de

morfodiferenciação, o dente começa a adquirir sua forma característica, enquanto no estágio de histodiferenciação ocorre a especialização celular, com a diferenciação dos ameloblastos (responsáveis pela formação do esmalte) e dos odontoblastos (que formam a dentina) (Koussoulakou; Margaritis; Koussoulakos, 2009). Após essa fase, inicia-se o estágio de aposição, marcado pela deposição da matriz de esmalte e dentina, seguido pela mineralização desses tecidos, o que culmina na formação completa da coroa dentária (Koussoulakou, Margaritis; Koussoulakos, 2009; Madani, Berardi; Stoopler, 2014).

A erupção dentária, por sua vez, é o processo pelo qual o dente atravessa os tecidos gengivais e se torna visível na cavidade oral (Koussoulakou; Margaritis; Koussoulakos, 2009). Esse evento ocorre somente após a mineralização da coroa estar concluída, embora o desenvolvimento da raiz continue por aproximadamente 18 meses após a erupção (Koussoulakou; Margaritis; Koussoulakos, 2009; Madani; Berardi; Stoopler, 2014). Trata-se de um processo altamente coordenado, que envolve uma série de movimentos eruptivos associados à remodelação óssea, mecanismo que compreende a formação e a reabsorção simultânea do tecido ósseo ao redor do germe dentário (Ackerman; Kean; Proffit, 2009). Somente após ultrapassar a gengiva e emergir na cavidade oral, a coroa dentária passa a integrar funcionalmente o sistema estomatognático (Ackerman; Kean; Proffit, 2009).

Estudos realizados em diferentes populações indicam que a erupção dos dentes decíduos geralmente se inicia entre os seis e dez meses de idade, sendo que a dentição decídua se completa, na maioria dos casos, até os 30 meses de vida (Folayan *et al.*, 2007; Haddad, 1997; Logan *et al.*, 1933). A cronologia da erupção dentária, parte integrante do crescimento e desenvolvimento somático da criança, pode ser influenciada por fatores genéticos e ambientais (Folayan *et al.*, 2007). Entre os fatores ambientais, destacam-se os fatores pré-natais, como deficiências nutricionais durante a gestação, que podem interferir tanto no desenvolvimento quanto no surgimento dos dentes decíduos (Delgado *et al.*, 1975; Infante; Owen, 1973; Hatton, 1955; SEOW *et al.*, 1988; Viscardi; Romberg; Abrams, 1994). Além disso, a cronologia da erupção pode apresentar variações entre diferentes populações, influenciada por aspectos como sexo, etnia e condições socioeconômicas (Al-Jasser; Bello, 2003; Enwonwu, 1973; Folayan *et al.*, 2007; Haddad; Correa, 2005; Holman; Yamaguchi, 2005; Moraes *et al.*, 2007).

Um fator neonatal importante que supostamente influencia na cronologia de erupção do dente decíduo em bebês é o nascimento prematuro (Haddad; Correa, 2005). Ele é definido como o nascimento antes de 37 semanas de vida intrauterina completas (WHO, 2015). A idade do bebê prematuro pode ser calculada de duas formas. Pode-se utilizar a idade cronológica e a idade corrigida (WHO, 2015). A idade cronológica refere-se à idade real dos bebês, calculada a partir da data de seu nascimento (WHO, 2015). O termo “idade corrigida” é utilizado no contexto de bebês prematuros e representa a idade ajustada, levando em consideração a época em que nasceram prematuramente, e reflete a idade que o bebê teria se tivesse nascido com 40 semanas (WHO, 2015).

A prematuridade continua sendo a principal causa de morte e complicações na infância (Machado *et al.*, 2014). Anualmente, nascem cerca de 20 milhões de bebês prematuros e com baixo peso (Machado *et al.*, 2014). Calcula-se que 40% desses bebês morrem antes de completar o primeiro ano de vida (Machado *et al.*, 2014). No Brasil, aproximadamente 11,1% dos nascimentos ocorrem de forma prematura, o que representa cerca de 300 mil bebês por ano, conforme dados recentes do Ministério da Saúde (Machado *et al.*, 2014). Entre os sobreviventes, são frequentes problemas de saúde como distúrbios respiratórios, alterações neurológicas, dificuldades de alimentação, déficits no crescimento, atraso no desenvolvimento neuropsicomotor e maior vulnerabilidade a infecções, com implicações que podem se estender até a vida adulta (Machado *et al.*, 2014).

Diante desse cenário, estratégias eficazes de prevenção da prematuridade tornam-se essenciais, sendo o acompanhamento pré-natal uma das principais (WHO, 2016). Desde 2016, a Organização Mundial da Saúde recomendou que mulheres grávidas em todo o mundo fizessem um mínimo de oito consultas pré-natais, substituindo a recomendação anterior de quatro (WHO, 2016). O primeiro contato pré-natal deve ser antes das 12 semanas de gestação, e todas as mulheres devem fazer uma ultrassonografia antes das 24 semanas (O'Brien *et al.*, 2018). Essas consultas são essenciais para avaliar a saúde da gestante, fornecer boas orientações sobre como proceder durante o período gestacional, bem como orientar sobre o uso de medicamentos e suplementos vitamínicos que possam ser necessários (White Ribbon Alliance, 2019).

No entanto, mesmo com os cuidados recomendados durante a gestação, muitos bebês ainda nascem prematuros, o que costuma gerar uma série de

preocupações nos pais, sobretudo em relação ao desenvolvimento global da criança (Machado *et al.*, 2014). Entre os marcos desse desenvolvimento, a erupção do primeiro dente ocupa um lugar de destaque, tanto pela sua importância funcional quanto simbólica (Bolette *et al.*, 2016). Para os pais, especialmente daqueles de bebês prematuros, o atraso na erupção dentária pode ser motivo de grande ansiedade, por muitas vezes ser interpretado como um sinal de que algo não está evoluindo como o esperado (Bolette *et al.*, 2016). Essa inquietação mobiliza não apenas os familiares, mas também os profissionais de saúde responsáveis pelo acompanhamento da criança, como cirurgiões-dentistas e médicos pediatras (Bolette *et al.*, 2016). A presença do dente decíduo em boca é essencial para o equilíbrio da cavidade bucal, pois contribui para a manutenção do comprimento do arco dentário, permite a trituração adequada dos alimentos e favorece o equilíbrio esquelético-muscular (Bolette *et al.*, 2016). Assim, o irrompimento tardio do dente pode comprometer essas funções e impactar negativamente o desenvolvimento infantil (Monte-Santo *et al.*, 2018).

Além dessas preocupações iniciais com a erupção dentária, surge um aspecto ainda pouco explorado na literatura: a relação entre a erupção dos dentes e a amamentação (Bolette *et al.*, 2016). Normalmente os bebês visitam o dentista quando erupcionam os primeiros dentes, por volta dos seis meses de vida (Dodo *et al.*, 2023). Nessa fase, é comum que a mãe que decidiu amamentar questione sobre a continuação da amamentação além dos 6 meses (WHO, 2016; Dodo *et al.*, 2023). Um possível problema é a erupção dos dentes, pois algumas mães podem sentir desconforto ao amamentar (Dodo *et al.*, 2023). Sendo assim, tanto o contato com a gestante quanto o acompanhamento após o nascimento do bebê representam momentos propícios para que o dentista oriente e incentive a mãe a manter a amamentação além dos 6 meses (Antunes *et al.*, 2008). A Organização Mundial de Saúde (OMS) recomenda o aleitamento materno para um ótimo desenvolvimento neonatal e infantil. O aleitamento materno exclusivo, quando a criança recebe exclusivamente leite materno, direto da mama ou ordenhado, é recomendado por um período de seis meses (WHO, 2016). Após os seis meses, a OMS recomenda a manutenção do aleitamento materno até os dois anos de idade (WHO, 2016). A manutenção do aleitamento materno até os dois anos de idade é importante porque ele é rico em nutrientes, sendo assim promove uma complementação na dieta do bebê e oferece proteção imunológica (Salone; Vann; Dee, 2013). O leite materno reduz de

modo significativo os problemas de infecção tanto do trato gastrointestinal quanto do trato respiratório (Salone *et al.*, 2013). Além disso, os aspectos emocionais entre a mãe e o bebê durante a amamentação no seio são muito importantes, pois ela proporciona a integração mãe/filho (Silveira *et al.*, 2013). A amamentação supri a vontade de sucção, que envolve componentes emocionais, psicológicos e orgânicos, e caso a criança não seja amamentada, a necessidade de sucção pode não ser alcançada, causando uma insatisfação emocional, e assim a criança buscará substitutos como dedo, chupeta, ou objetos, adquirindo hábitos deletérios (Baldrighi *et al.*, 2001; Bastos, 2001; Zavaschi, 1991; Bittencourt *et al.*, 2001).

Outro aspecto importante é que o aleitamento materno auxilia no desenvolvimento craniofacial do bebê, através do movimento de ordenha que a criança faz ao amamentar, que promove uma boa relação entre as bases ósseas dos maxilares (Limeira *et al.*, 2014; Lopes-Freire *et al.*, 2015). Esse impacto positivo no crescimento orofacial reforça ainda mais a relevância de incentivar a amamentação, especialmente nos primeiros meses de vida, quando ocorrem importantes transformações estruturais (Lopes-Freire *et al.*, 2015).

Nesse contexto, a promoção do aleitamento materno exige não apenas o conhecimento técnico, mas também motivação, treinamento e a articulação de esforços entre diferentes profissionais, setores e o envolvimento ativo da família no apoio à amamentação (Antunes *et al.*, 2008). O cirurgião-dentista pode influenciar positivamente na promoção, proteção e apoio ao aleitamento materno (Antunes *et al.*, 2008). O incentivo da manutenção da amamentação deve considerar os aspectos emocionais, de cultura familiar, da rede social de apoio à mulher (Cohen *et al.*, 2018). Então, conhecer os fatores associados com a manutenção da amamentação é importante para tal abordagem (Cohen *et al.*, 2018). Para que o aleitamento materno seja praticado segundo as recomendações, é preciso que a sociedade em geral e a mulher, em particular, estejam conscientizadas da importância da amamentação (Cohen *et al.*, 2018). Existem benefícios para o bebê, para mãe, para a família e para a sociedade (Binns; Lee; Low, 2016).

Os principais benefícios do Aleitamento Materno para a criança a curto, médio e longo prazo inclui a redução da mortalidade na infância, tendo o potencial de evitar mortes de crianças por causas preveníveis como desnutrição (Antunes *et al.*, 2008). Outro fator é que pode evitar diarreia, por ser um alimento mais compatível com o organismo do bebê (Antunes *et al.*, 2008). A amamentação exclusiva nos

primeiros meses de vida diminui o risco de alergia à proteína do leite de vaca, dermatite atópica e outros tipos de alergias (Antunes *et al.*, 2008).

Além dos benefícios para o bebê, a amamentação tem vários benefícios para a mãe (Rollins *et al.*, 2016). Alguns exemplos desses benefícios é a recuperação mais rápida do peso pré-gestacional, a menor prevalência de câncer de ovário, endométrio e mama (Rollins *et al.*, 2016). Estima-se que o risco de apresentar câncer de mama na mulher que amamenta diminua 4,3% a cada 12 meses de lactação (Rollins *et al.*, 2016).

Os principais benefícios do Aleitamento Materno para a família e a sociedade a curto, médio e longo prazo é a economia com a alimentação do recém-nascido (Rollins *et al.*, 2016). A compra de leite acresce custos com mamadeiras, bicos e gás de cozinha, além de eventuais gastos decorrentes de doenças, que são mais comuns em crianças não amamentadas (Rollins *et al.*, 2016). Ocorre a redução da poluição ambiental, pois não produz lixo inorgânico resultante do consumo de bicos artificiais/mamadeiras e, menos poluentes do ar decorrentes do transporte de “substitutos” do leite materno (Rollins *et al.*, 2016).

Considerando a complexidade do desenvolvimento orofacial nos primeiros anos de vida e as intensas modificações que ocorrem na cavidade oral nesse período, torna-se fundamental compreender como a prematuridade pode influenciar o desenvolvimento infantil, incluindo a erupção dentária e o aleitamento materno (Rollins *et al.*, 2016). Evidências já estabelecem que o nascimento prematuro está associado a prejuízos no crescimento somático e neurológico (Machado *et al.*, 2014). No entanto, embora a erupção dentária e a amamentação sejam processos que ocorrem em paralelo no tempo, há escassez de estudos que analisem de forma integrada a possível relação entre esses eventos, especialmente quanto ao impacto da erupção sobre a duração ou continuidade da amamentação (Machado *et al.*, 2014). Frente a essas lacunas, este estudo propõe a hipótese de que bebês prematuros apresentam atraso na erupção dentária em comparação aos nascidos a termo, e que a própria erupção dentária pode representar um fator de risco para a interrupção precoce do aleitamento materno (Machado *et al.*, 2014).

2 OBJETIVO GERAL

Elaborar e construir dois modelos de caminhos para 1) avaliar os fatores diretos e indiretos relacionados à idade da erupção do primeiro dente decíduo em lactentes nascidos prematuros e a termo, por meio de estudo de coorte; e 2) avaliar os fatores diretos e indiretos associados à duração do aleitamento materno em lactentes nascidos prematuros e a termo, com ênfase na erupção dentária como possível determinante, em uma análise transversal.

2.1 Objetivos específicos

2.1.1 Artigo 1

- a)** Avaliar a relação de fatores maternos durante a gestação, como condição socioeconômica, atividade profissional, uso de medicação, número de consultas pré-natais, primiparidade e ocorrência de complicações no parto com a idade gestacional ao nascimento.
- b)** Avaliar a relação de complicações durante o parto e idade gestacional com a hospitalização do bebê;
- c)** Avaliar a relação da idade gestacional com peso ao nascer;
- d)** Avaliar a relação da idade gestacional, do peso ao nascer e de complicações durante o parto com a idade de erupção do primeiro dente decíduo, considerando tanto a idade cronológica quanto a idade corrigida;
- e)** Analisar e identificar relações diretas e indiretas entre as variáveis, estimando a direção das relações e a adequação do modelo de caminhos proposto, considerando tanto a idade cronológica quanto a idade corrigida.

2.1.2 Artigo 2

- a)** Avaliar a associação de fatores como idade da mãe, escolaridade materna, idade gestacional e peso ao nascimento, permanência na UTI e erupção do primeiro dente decíduo com o tempo de amamentação;
- b)** Avaliar a associação da idade gestacional com a erupção do primeiro dente;
- c)** Avaliar a associação da idade gestacional com o peso ao nascer;
- d)** Avaliar a associação da idade gestacional e peso ao nascer com a permanência na UTI;

- e) Analisar e identificar relações diretas e indiretas entre as variáveis, estimando a direção das relações e a adequação do modelo de caminhos proposto.

3 METODOLOGIA EXPANDIDA

Este estudo seguiu as diretrizes do checklist *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) para estudos de coorte e transversais (Malta *et al.*, 2010) (ANEXO A).

3.1 Comitê de Ética

O estudo foi aprovado pelo Comitê de Ética em Pesquisa com Seres Humanos da Universidade Federal de Minas Gerais (CAAE 66128117.4.0000.5149), número do Parecer: 2.395.617 (ANEXO B) e conduzido em conformidade com a Declaração de Helsinque.

3.2 Consentimento livre e esclarecido

Os pais ou responsáveis legais dos bebês assinaram voluntariamente o Termo de Consentimento Livre e Esclarecido, autorizando sua própria participação e a de seus filhos na pesquisa (APÊNDICE A).

3.3 Desenho do estudo

O **Estudo 1** teve delineamento de coorte prospectivo, enquanto o **Estudo 2** foi um estudo transversal aninhado à coorte.

3.4 Critérios de elegibilidade e recrutamento da amostra

Bebês de ambos os sexos, com idade mínima de quatro meses. Bebês com Síndrome de Down, Síndrome Congênita do Zika Vírus e/ou com qualquer dente decíduo já erupcionado foram excluídos.

Os bebês prematuros foram recrutados e acompanhados em um centro de referência multidisciplinar de um Hospital Universitário Federal (Universidade Federal de Minas Gerais - UFMG) em Belo Horizonte, Brasil. Neste centro de referência multidisciplinar, os bebês nascidos prematuros tem seu estado geral acompanhado mensalmente durante o primeiro ano de vida, o que permitiu que a coleta de dados fosse realizada na mesma frequência.

Os bebês nascidos a termo foram recrutados e acompanhados mensalmente em creches privadas de Belo Horizonte, Brasil.

3.5 Cálculo do tamanho da amostra

A amostra foi calculada adotando-se um intervalo de confiança de 95% (IC 95%) e um poder de 80%, considerando a média e o desvio-padrão da erupção dos primeiros dentes decíduos de recém-nascidos prematuros ($9,32 \pm 1,48$) e nascidos a termo ($7,97 \pm 2,62$) em estudo anterior (Khalifa *et al.*, 2014). O tamanho mínimo da amostra foi de 39 recém-nascidos em cada grupo, que aumentou em 10% para compensar possíveis perdas. Portanto, a amostra final foi estimada em 43 recém-nascidos prematuros e 43 recém-nascidos a termo.

3.6 Calibração dos examinadores

A coleta de dados foi realizada por dois examinadores calibrados (BST e JLS) e um auxiliar responsável pelas anotações. O treinamento e a calibração dos examinadores foram realizados na semana anterior ao início da coleta de dados, sob coordenação de um especialista em odontopediatria, considerado padrão-ouro.

Inicialmente, os examinadores receberam treinamento teórico e prático sobre os critérios diagnósticos utilizados no estudo, com foco na identificação de sinais clínicos de erupção dentária e ausência desses sinais. Em seguida, foi realizada a calibração intra e interexaminador, utilizando fotografias padronizadas da cavidade oral de bebês em diferentes estágios de erupção dentária.

A calibração ocorreu em duas etapas: primeiro, os dois examinadores realizaram individualmente a avaliação das imagens (teste intraexaminador), repetindo o procedimento após um intervalo de sete dias para verificação da consistência de suas análises. Posteriormente, os resultados de ambos foram comparados entre si para aferição da concordância interexaminadores.

A concordância intraexaminador, avaliada pelo teste Kappa, foi de 0,86 para o examinador BST e 0,85 para o examinador JLS, indicando concordância quase perfeita e moderada, respectivamente. A concordância interexaminadores entre os dois avaliadores apresentou índice Kappa de 0,87, representando concordância quase perfeita.

3.7 Variáveis

3.7.1 Variável Clínica

Os participantes do estudo foram avaliados mensalmente em consultas de rotina no hospital e em creches particulares. A criança deixou de ser acompanhada após a erupção dentária. (APÊNDICE B)

Exames clínicos bucais foram realizados mensalmente por meio de palpação e inspeção visual da cavidade oral para detectar a erupção do primeiro dente decíduo. Um dente foi considerado erupcionado quando qualquer parte de sua coroa atravessava a gengiva e era visível na cavidade oral. Os cuidadores também foram questionados sobre a data da erupção dentária na cavidade oral para garantir um controle aprimorado durante o monitoramento mensal dos bebês.

Durante os exames bucais, os avaliadores utilizaram equipamentos de proteção individual (EPIs), incluindo luvas, máscaras, aventais e protetores faciais, em conformidade com as normas de biossegurança. As avaliações foram realizadas em ambientes reservados e tranquilos, disponibilizados pelo hospital ou pela creche, com iluminação adequada para a observação clínica.

O bebê era posicionado no colo do responsável, geralmente um dos pais ou, quando em ambiente escolar, um professor da creche, que auxiliava na contenção segura durante o exame. Para a inspeção visual, utilizou-se gaze estéril com o objetivo de afastar suavemente os tecidos moles e possibilitar a observação das estruturas orais. Foram verificadas a presença ou ausência de sinais clínicos de erupção dentária, alterações na gengiva, e outros aspectos relacionados ao desenvolvimento bucal infantil, sem o uso de instrumentos cortantes ou invasivos.

Para o artigo 1, a idade da erupção dentária foi considerada de duas formas: idade cronológica e idade corrigida. A "idade cronológica" refere-se à idade real dos bebês, calculada a partir da data de nascimento. O termo "idade corrigida" é usado no contexto de bebês prematuros. Representa a idade ajustada de recém-nascidos prematuros, levando em consideração a idade que o recém-nascido teria se tivesse nascido com 40 semanas (Harel-Gadassi *et al.*, 2018). Para as análises, foram consideradas a média das idades.

Para o artigo 2, a idade de erupção dentária foi dicotomizada pela mediana (≤ 8 meses ou > 8 meses).

3.7.2 Variáveis de Saúde da Criança

No grupo prematuro, dados sobre a saúde da criança foram coletados nos prontuários médicos. No grupo a termo, os mesmos dados foram coletados por meio de questionários para as mães, que foram orientadas a consultar a Caderneta de Saúde da Criança (APÊNDICE C).

Para o artigo 1, foram utilizados dados sobre intercorrências no parto (sim/não) e peso ao nascer (baixo peso ou peso normal). O componente de hospitalização do bebê foi mensurado pela presença ou ausência de cada bebê na UTI, presença ou ausência na incubadora, bem como a utilização, ou não de sonda endotraqueal por via orotraqueal.

Para o Artigo 2, o peso ao nascer da criança foi categorizado em extremo baixo peso (<1.000 gramas), muito baixo peso (≥ 1.000 até <1.500 gramas), baixo peso (≥ 1.500 até <2.500 gramas) ou peso normal (≥ 2.500 gramas) (Haddad; Correa, 2005). A idade gestacional foi mensurada em semanas de gestação. A utilização de UTI foi coletada como “sim” ou “não”. A duração da amamentação foi mensurada em meses.

3.7.3 Variáveis Sociodemográficas e Pré-natais

As mães responderam a um questionário sobre informações socioeconômicas e condições pré-natais (APÊNDICE D).

Para o artigo 1, foram utilizadas as seguintes informações: sexo da criança (masculino/feminino), trabalho materno durante a gestação (sim/não), uso de medicamentos durante a gestação (sim/não), consultas pré-natais (até 6 consultas/7 ou mais consultas) e se o bebê era ou não o primeiro filho (sim/não).

O componente socioeconômico foi medido utilizando a renda familiar e a escolaridade da mãe. A renda familiar foi coletada de acordo com o salário mínimo brasileiro, (Até 2 salários mínimos ou acima de 3 salários mínimos), salário mínimo é R\$ 1.412, que corresponde a US\$ 286. A escolaridade da mãe foi coletada de acordo com os níveis de escolaridade (Ensino fundamental I, Ensino médio, Faculdade/universidade).

Para o artigo 2, foi avaliada a variável idade da mãe de forma quantitativa. A escolaridade da mãe foi coletada de acordo com os níveis de escolaridade (Ensino fundamental I, Ensino fundamental II, Ensino médio, Faculdade/universidade).

3.8 Análise estatística

O programa IBM SPSS *Statistics* (IBM SPSS Statistics for Windows, version 26.0, IBM Corp. Released 2019, Armonk, NY, USA) foi utilizado para a realização de análises descritivas dos artigos 1 e 2, o teste de Little e a Análise de Componentes Principais (ACP) do artigo 1. O programa Mplus versão 8.6 (Muthen & Muthen) foi utilizado para as análises de caminhos dos artigos 1 e 2. A média ponderada dos mínimos quadrados e o método de estimativa ajustado pela variância (WLSMV) foram usados, uma vez que os modelos têm dados categóricos (LI, 2016). Os seguintes índices de qualidade de ajuste foram usados para avaliar os modelos: Índice de Ajuste Comparativo (CFI), Índice de Tucker-Lewis (TLI), Raiz Média Residual Padronizada (SRMR) e Raiz Média do Erro Quadrático de Aproximação (RMSEA). Os valores de CFI e TLI deveriam ter sido $> 0,90$. Os valores de SRMR e RMSEA deveriam ter sido $< 0,08$ (Kline, 2011).

Artigo 1

O teste de Little foi utilizado para determinar se os dados ausentes eram completamente aleatórios, permitindo a imputação dos dados. A ACP foi conduzida para construir modelos formativos para os seguintes componentes: status socioeconômico e hospitalização do bebê. A adequação dos componentes foi avaliada por Kaiser-Meyer-Olkin (KMO) $> 0,50$ e teste de esfericidade de Bartlett pelo valor de $p < 0,05$. A extração fatorial foi baseada na porcentagem de variância explicada $> 60\%$ e autovalor > 1 . Cargas fatoriais $> 0,40$ foram consideradas satisfatórias (Kline, 2011).

Inicialmente, dois modelos de caminhos foram construídos: um modelo usando a idade cronológica da erupção dentária e um modelo usando a idade corrigida da erupção dentária. Em seguida, coeficientes padronizados não significantes (β) com valor de $p < 0,40$ foram removidos para construir os dois modelos finais: a idade cronológica da erupção dentária e a idade corrigida da erupção dentária.

Artigo 2

A análise de caminhos foi realizada para avaliar as relações diretas e indiretas entre idade gestacional, erupção do primeiro dente e duração da amamentação. O modelo foi proposto com base em estudos anteriores (Birant *et al.*, 2023; Folayan; Sowole, 2013) (Figura 1). Caminhos não significativos com valor de $p > 0,40$ foram removidos (modelo final).

4 ARTIGOS

Este capítulo será apresentado em formato de dois artigos científicos e de acordo com as normas de publicação dos periódicos *Pediatric Dentistry*, Qualis A4, fator de impacto 1.874 e *Health Education & Behavior*, Qualis A3, fator de impacto 2.1. Estas normas encontram-se em anexo ao final deste documento (ANEXOS C e D).

ARTIGO 1

Direct and Indirect Factors Influencing the Age of the First Primary Tooth Eruption: Cohort Study Among Preterm and Term Infants with Path Model

Short Title: Primary tooth eruption in infants with Path Model

Abstract

Purpose: to test a path model of the direct and indirect birth-related risk factors influencing the age of first primary tooth eruption in infants. Methods: cohort study with 43 preterm and 48 full-term infants aged at least four months. Infants were monitored monthly to verify the chronology of eruption of the first primary tooth. Mothers responded to sociodemographic and health behavior questionnaire. Principal Component Analysis and path analysis were performed. Two models were constructed: chronological and corrected age of tooth eruption. Results: model using chronological age of tooth eruption demonstrated that preterm infants had an increased risk of having later tooth eruption compared to those born at term (standardized coefficient $[\beta]=0.888$; $p<0.001$). Indirect associations were found between socioeconomic and health conditions with the age of tooth eruption, mediated by gestational age. The same direct and indirect associations were also found for corrected age, with differences only in β values. Conclusions: preterm infants exhibited higher risk of delayed tooth eruption compared to full-term infants, considering both chronological and corrected age. Gestational age mediated the association between socioeconomic and health conditions with the age of tooth eruption.

keywords: Tooth, Deciduous, Infant, Premature Birth

1. Introduction

When the crown of the tooth passes through the gums and becomes part of the oral cavity, this process is called “eruption” ¹⁻². From its germinal state to the end of its formation cycle, teeth go through several stages of a physiological process involving a sequence of movements; eruption is just one of these stages¹. The development of the human deciduous dentition begins at the end of the fifth week of gestation¹⁻². Before eruption, the tooth completes crown formation and mineralization, while the root continues to develop for approximately 18 months after eruption¹⁻².

The ages at which primary teeth erupt are very important for children’s craniofacial growth and development¹. The eruption and maintenance of deciduous teeth in the oral cavity play a crucial role in ensuring proper alignment, spacing, and occlusion of permanent teeth¹.

Several factors have been associated with delayed eruption of primary teeth, such as malnutrition, endocrine disorders, genetic factors, congenital syndromes, and systemic conditions, in addition to perinatal factors such as prematurity and low birth weight (LBW)³⁻¹³. Studies show that there is a wide variation in the timing of primary tooth eruption, with the first tooth usually expected between 6 and 10 months of age¹⁶⁻¹⁷.

Prematurity, in particular, has gained attention in the literature as a factor associated with delayed tooth eruption. Most studies indicate a relationship between preterm birth, defined as occurring before 37 weeks of gestation, and alterations in the dental development timeline, generally analyzed using chronological age³⁻¹³. However, few studies¹¹ have accounted for ‘corrected age’, defined as the chronological age the infant would have reached had they been born at term (40 weeks of gestation)¹⁴. This gap highlights the need to investigate this group more thoroughly.

Path models are statistical strategies that allow for the simultaneous analysis of direct and indirect relationships among variables. These models are particularly useful for studying complex developmental processes like tooth eruption, which may be influenced by a range of interrelated factors, from socioeconomic conditions and maternal health during pregnancy, to gestational age, birth weight, and postnatal conditions. Unlike traditional analyses, path models enable researchers to visualize and test how these variables interact within a network of relationships, which is essential for understanding the trajectory of tooth eruption across different contexts¹⁶.

Although numerous studies have identified associations between factors such as pregnancy, gestational age, birth weight, and postnatal conditions with the age of deciduous tooth eruption, most have employed classical statistical methods, such as multivariate regression, or examined only a single outcome variable (tooth eruption)³⁻¹¹. As a result, they have not established multiple dependent relationships among variables or mapped direct and indirect pathways involving prenatal, birth, and postnatal factors and their association with tooth eruption timing.

In this study, a theoretical model was developed based on associations among socioeconomic status, conditions during pregnancy, gestational age, birth weight, hospitalization at birth, and tooth eruption; this model was tested using path analysis. Therefore, the aim of this study was to test a path model to investigate the direct and indirect birth-related factors influencing the age of eruption of the first primary tooth in infants. Additionally, the study aims to assess the role of prematurity as one of the key determinants of this trajectory, given its clinical relevance and prevalence.

2. Material and methods

The present study was reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE statement)¹⁵.

The infants' parents/caregivers voluntarily signed a consent form authorizing the participation of their children. This study was approved by the Human Research Ethics Committee of the 2017 (CAAE 66128117.4.0000.5149, Protocol number: 2.395.617) and was conducted in accordance with the Declaration of Helsinki.

2.1 Study design and eligibility criteria

This cohort study was carried out with a sample of both sexes and at least four months of age.

The exposed group was composed of infants who had been born preterm (before completing 37 weeks of gestational age). All preterm infants who were followed-up at a multidisciplinary reference center at a Federal University Hospital in Belo Horizonte, Brazil in 2017 were invited to participate. In this center, infants born preterm had their general condition monitored monthly during the first year of life, which allowed data collection to be carried out at the same frequency.

The non-exposed group was composed of infants who had been born at term. The infants of non-exposed group were monitored monthly in private daycare centers in Belo Horizonte, Brazil.

Infants with Down Syndrome, Congenital Zika Virus Syndrome, and/or with any erupted teeth were excluded from both the exposed and the non-exposed group.

2.2 Sample size calculation

The sample was calculated adopting a 95% confidence interval (95% CI) and a power of 80%, considering the mean and standard deviation of first primary tooth eruption of both preterm (9.32 ± 1.48) and full term (7.97 ± 2.62) infants by previous study.¹⁶ The minimal sample size was 39 infants in each group, which increased by 10% to compensate for possible losses. Therefore, the final sample was estimated at 43 premature infants and 43 term infants.

2.3 Calibration of the examiners

Two calibrated examiners carried out data collection. Examiner calibration was performed by analyzing photographs of the oral cavity of infants with signs of tooth eruption. The calibration was coordinated by a specialist in paediatric dentistry, considered the gold standard. The Kappa test was used to verify intra-examiner (Kappa=0.86 and Kappa=0.85) and inter-examiner agreement between the two examiners (Kappa=0.87).

2.4 Data Collection of Observable clinical variables

Study participants were assessed monthly in routine appointments at the hospital and in private daycare centers. The child was no longer monitored after the tooth erupted.

Mothers responded to a questionnaire to collect the following information: the child's sex (male/female), mother's work during pregnancy (yes/no), medication use during pregnancy (yes/no), prenatal consultations (up to 6 consultations/7 or more consultations) and whether or not the infant was the first child (yes/no).

For the preterm group, the data about the child's health were collected in the medical records: whether the birth had had any complications (yes/no) and birth weight

(extreme low birth weight <1,000 grams, very low birth weight $\geq 1,000$ to <1,500 grams, low birth weight $\geq 1,500$ to <2,500 g grams). For the term group, the same data were collected through questionnaires for the mothers, who were advised to consult the *Child Health Handbook*.

Oral clinical examinations were performed monthly through palpation and visual inspection of the oral cavity to detect the eruption of the first primary tooth. During oral examinations, personal protective equipment was used and the oral cavity was evaluated with the aid of sterile gauze. A tooth was considered erupted when any part of its crown passed through the gums and was visible in the oral cavity. Caregivers were additionally queried about the date of tooth eruption in the oral cavity to ensure enhanced control during the monthly monitoring of infants. The age of tooth eruption was considered in two forms: chronological age and corrected age. The "Chronological age" refers to the actual age of infants, calculated from the date of their birth. The term "corrected age" is used in the context of preterm infants. It represents the adjusted age of preterm infants, taking into account the time they were born prematurely, and reflects the age the infant would have been if he/she had been born at 40 weeks¹⁷.

2.5 Observable non-clinical variables

2.5.1 Socioeconomic component

The socioeconomic component was measured using the family's income and the mother's schooling. The family's income was collected according the Brazilian monthly minimum wage (R\$1,412), which corresponds to \$286 dollars. The mother's schooling was collected according the grades of education (elementary school, middle school, high school, college or university).

2.5.2 Infant's hospitalization component

Infant's hospitalization component was measured by the presence or the absence of each infant in the intensive care unit (ICU) and incubator, as well as the use, or not, of an endotracheal tube by the orotracheal route.

2.6 Statistical analysis

The Statistical Package for the Social Sciences (SPSS for Windows, version 26.0, IBM Inc, Armonk, NY, USA) was used for performing descriptive analyses, the Little's test, and the Principal Component Analysis (PCA). The Little's test was used to determine whether missing data were completely random, allowing data imputation. The PCA was conducted to build formative models for the following components: the socioeconomic status and the infant's hospitalization. The adequacy of the components was evaluated by Kaiser-Meyer-Olkin (KMO) >0.50 and Bartlett's test of sphericity $p < 0.05$. Factor extraction was based on the percentage of explained variance $>60\%$ and Eigenvalue > 1 . Factor loadings >0.40 were considered satisfactory¹⁸.

A Path Analysis was performed using Mplus version 8.6 (Muthen & Muthen). The weighted least squares mean and the variance-adjusted (WLSMV) estimation method were used, since the model has categorical data¹⁹. Initially, two models were built: a model using the chronological age of tooth eruption and a model using the corrected age of tooth eruption. Then, insignificant standardized coefficients (β) with p -value <0.40 were removed in order to build the two final models: the chronological age of tooth eruption and the corrected age of tooth eruption. The following goodness-of-fit indices were used to evaluate the models: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA). CFI and TLI values were to have been >0.90 . SRMR and RMSEA values were to have been <0.08 ¹⁸.

3. Results

Ninety-one infants had participated this study: 48 infants born at term and 43 infants born preterm. The sample exhibited a statistical power of 100% when examining the comparison of mean chronological age at the first tooth eruption between term and preterm children. The power for the comparison based on corrected age stood at 99.6%. The minimum age of the infants at the first examination was four months and the maximum age was 17 months (mean=6.69 months; ± 2.24).

For the term-born infants, the observed gestational age ranged from a minimum of 37 weeks to a maximum of 41 weeks (mean=39.08 weeks; ± 0.94). The minimum birth weight was 2,300 grams and the maximum was 5,000 grams (mean=3,322.13

grams; ± 496.77). Twenty-five infants were male (52.1%). The mean age of the first tooth eruption was 7 months (± 1.272). Descriptive data are presented in Table 1.

For the preterm infants, the observed gestational age ranged from a minimum of 25 weeks to a maximum of 34 weeks (mean=30.07 weeks; ± 2.31). The minimum birth weight was 535 grams and the maximum was 2,815 grams (mean=1,384.42 grams; ± 482.24). Most infants were female ($n=22$; 51.2%). The mean chronological age of the first tooth eruption was 11.37 months (± 2.51). When considering corrected age, the mean was 8.95 months (± 2.51). Additional data are presented in Table 1.

The assumptions for the PCA were met by both components. For the socioeconomic status component, the KMO was equal to 0.500 and Bartlett's sphericity was <0.001 ; And for infant's hospitalization component, the KMO was equal to 0.737 and Bartlett's sphericity was <0.001 . One component was extracted for the socioeconomic status with 81.2% of the total explained variance and an Eigenvalue of 1.624 (Fig. A.1). One component was extracted for the infant's hospitalization with 84.7% of the total explained variance and an Eigenvalue of 2.542 (Fig. A.2).

Table 2 shows the initial and the final path model, with an adjustment of the data for the chronological age of tooth eruption. The final model demonstrated an almost perfect overall fit, suggesting its plausibility. According to the SEM (Fig. 1), preterm infants have an increased risk of presenting a delay in tooth eruption compared to those born at term ($\beta = -0.888$; $p < 0.001$). Mothers from a worse socioeconomic status ($\beta = 0.297$; $p = 0.010$), who had used medication during pregnancy ($\beta = 0.337$; $p < 0.001$), who had had ≤ 6 prenatal consultations ($\beta = 0.198$; $p = 0.025$), and who had had complications during their infants' birth ($\beta = 0.214$; $p = 0.007$) had had more preterm births. An indirect association was found between socioeconomic status and health conditions with chronological age of tooth eruption, which was mediated by the gestational age. Gestational age exerted a significant influence on infant's hospitalization ($\beta = 0.829$; $p < 0.001$) and birth weight ($\beta = 0.935$; $p < 0.001$).

Table 3 shows the initial and the final path model with an adjustment of the data for the corrected age of tooth eruption. The final model demonstrated an almost perfect overall fit, suggesting its plausibility. According to the SEM (Fig. 2), the same direct and indirect associations found for the chronological age were demonstrated for the corrected age, with differences only in β values.

4. Discussion

This study contributes by proposing a plausible model that explores the association between age and several direct and indirect risk factors related to later tooth eruption. These factors include conditions during pregnancy, gestational age, birth weight, hospitalization at birth, and socioeconomic status. The results revealed that preterm infants, when considering both chronological and corrected age, exhibited a higher risk of later tooth eruption compared to full-term infants. And mothers of preterm births tended to belong to a lower socioeconomic status, to utilize medications during pregnancy, to attend ≤ 6 prenatal medical visits, and to experience complications during birth.

Previous studies with traditional analyses also found that preterm infants are at greater risk of later tooth eruption compared to full-term infants³⁻¹³. However, the present study was the first to present a path model that provides a broader view of this subject. There was an association even when the comparison was made with the corrected age of the preterm infant, which was another novelty in relation to other studies³⁻¹³. The utilization of corrected age improves the capacity to correctly identify authentic delays, distinguishing them from perceived delays attributed to a child's gestational age at birth²⁰. Professionals must utilize corrected age instead of chronological age to make interpretations regarding the adequacy of a child's growth or developmental progress, thereby potentially influencing the delivery of care. It was found in one study that model fit was significantly improved using corrected postnatal age²¹. This result underscores the indirect impact of health conditions associated with preterm birth on later tooth eruption. Factors such as lower socioeconomic status, medication use during pregnancy, fewer prenatal medical visits (≤ 6), and birth complications predispose individuals to premature birth. Additionally, premature birth itself is a risk factor for delayed tooth eruption.

Even though low birth weight did not represent a risk factor to delayed tooth eruption in this study, the literature states that insufficient birth weight may reflect limitations in fetal development, including the formation of dental tissues and craniofacial bone structures³⁻¹³. Studies have indicated that low birth weight is related to systemic immaturity and increased vulnerability to metabolic and nutritional disturbances, which may interfere with the chronology of primary tooth eruption³⁻¹³. In the present study, gestational age significantly influenced both neonatal hospitalization

and birth weight, highlighting the interconnection among these variables. Therefore, birth weight should be considered a relevant marker for the early screening of risks to infant oral development.

Consulting a pediatric dentist is crucial to determine if the delay in tooth eruption is excessive and if it poses potential negative consequences for the child's oral development. Premature infants warrant special attention due to the potential for heightened oral changes compared to full-term infants, including the presence of Epstein pearls and mucocele²². Furthermore, preterm infants are more susceptible to present development enamel defects, particularly hypoplasia, which is characterized by a quantitative loss of tooth enamel²³. A previous systematic review indicated weak evidence regarding short-term changes in palatal morphology among preterm infants²⁴. The extent of this evidence is insufficient to ascertain whether such changes could affect the development of occlusion in these individuals²⁴. Despite regular consultations with pediatricians being common practice, the same cannot be said about evaluations with pediatric dentists. According to the Medical Expense Panel Research, 89.0% of infants and one-year-old children attend medical appointments annually, however, only 1.8% visit a dentist²⁵. Thus, with monitoring it is possible to take preventive and/or corrective measures in the infant's oral cavity, if necessary²⁶⁻²⁸. However, many parents may not understand the importance of early dental care for their children. Hence, it would be beneficial for pediatricians to understand the significance of referring infants to pediatric dentists, enabling them to effectively guide parents.

Socioeconomic and health factors associated with preterm births demonstrate the importance of good living conditions for the mother during pregnancy, and thus, for the infant's health as well. A higher socioeconomic condition can provide greater access to information related to health rights and access to quality medical clinics and hospitals, enabling necessary prenatal consultations. Since 2016, the World Health Organization²⁹ has recommended that pregnant women around the world have a minimum of eight prenatal visits (replacing the previous recommendation of four). The first prenatal contact should be before 12 weeks of gestation, and all women should have an ultrasound before 24 weeks³⁰. These consultations are essential to assess the health of the pregnant woman, provide good guidance on how to proceed during the gestational period, as well as guidance on the use of medications and vitamin supplements that may be necessary²⁹.

Furthermore, we found in the present study that mothers who had used medications during pregnancy had a higher likelihood of having premature births. According to reports of medication use by mothers during pregnancy, they had illnesses such as: Hypothyroidism, ovulation disorders related to progesterone deficiency, general pain, hypertension, malnutrition, depression, anxiety, infections, diabetes, cardiac arrhythmias, inflammation and human immunodeficiency virus (HIV). A higher socioeconomic condition also allows access to better nutrition, physical activities and well-being, which reduce the risk of diseases and consequently the need to use medication during pregnancy³¹. Complications during childbirth was another associated factor found in the present study and which was related to the health of the pregnant woman. Risks to maternal health, such as teenage pregnancy, infections, malnutrition and pre-eclampsia, are closely linked to premature births¹⁴. Furthermore, those results may be related to the health conditions of premature infants, who are more vulnerable to adverse conditions compared to full-term infants. That was another result of the present study: gestational age had a significant influence on the infant's hospitalization and birth weight. Quality prenatal care is critical in order to detect and manage complications, to ensure accurate dating of pregnancy through early ultrasounds and, if necessary, to delay delivery through approved treatments.

Pregnant women's health is a political-social issue. The Brazilian Ministry of Health determines at least six prenatal follow-up consultations, preferably one in the first trimester, two in the second and three in the third trimester of pregnancy¹⁶. Health policies are necessary to disseminate information related to the topic to pregnant women who do not understand the importance of good prenatal care¹⁴. However, a pregnant woman's health is still an individual issue. Because, even when she is aware of the information related to health, undergoing prenatal care is a choice that must be made by the pregnant woman herself. To facilitate the individual choice of pregnant women to seek prenatal care, such care must be readily available within the public health system³¹.

This study has some limitations. It is not population-based and only the eruption of the first primary tooth was evaluated. It is still necessary to carry out a population study and a cohort that monitors the birth of all teeth, despite knowing how difficult it would be to carry out a study of that magnitude.

This study revealed important findings for clinical practice and highlights the need for greater attention to the oral health of newborns, particularly those born

prematurely, as they may be at greater risk of oral development disorders. Alveolar bone formation is closely related to tooth development, and the eruption of primary lower incisors, typically the first tooth to emerge, is essential for the activation of functions such as chewing and speech³². A delayed tooth eruption may indicate developmental issues and often causes considerable anxiety in parents. Uncertainty about whether their child is developing normally can lead to increased emotional stress, especially in families already facing challenges related to prematurity. For many parents, absent or delayed tooth eruption may be perceived as a visible marker of abnormality, leading to frequent consultations with health care professionals³³. Therefore, pediatric dentists must be prepared to provide clear and evidence-based guidance. This highlights the importance of including anticipatory guidance on tooth eruption schedules as part of routine pediatric and neonatal dental care. Furthermore, the study reinforces the value of public maternal health policies that aim to improve access to quality prenatal care, particularly for mothers from lower socioeconomic backgrounds, as a means of preventing complications during pregnancy and childbirth. Finally, the results emphasize the relevance of using corrected age in epidemiological studies, since delayed tooth eruption has been observed in preterm newborns even after adjustment for corrected age.

5. Conclusion

The findings of this study allowed the identification of important direct and indirect factors associated with the tooth eruption. It was observed that the use of medication during pregnancy, fewer than six prenatal consultations, the presence of complications during delivery, and low socioeconomic status were significantly associated with a higher incidence of preterm births. Preterm birth, in turn, was associated with adverse neonatal outcomes, including higher rates of hospitalization in the first days of life and low birth weight. Furthermore, preterm infants exhibited a higher risk of delayed eruption of primary teeth compared to full-term infants, considering both chronological and corrected age. These results demonstrated the indirect association between socioeconomic and maternal health conditions with the timing of tooth eruption, mediated by gestational age.

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Figures' legends

Fig. 1. The path model with standardized coefficients (β) for the chronological age of tooth eruption

Fig. 2. The path model with standardized coefficients (β) for the corrected age of tooth eruption

Appendices

Fig. A.1. The structure and factor loadings of the formative model of the socioeconomic status

Fig. A.2. The structure and factor loadings of the formative model of the infant's hospitalization

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Table 1. Descriptive data of the studied groups (n= 91)

Variables	At term	Preterm
	N (%)	N (%)
Sex		
Female	25 (52.1)	22 (51.2)
Male	23 (47.9)	21 (48.8)
Birth weight		
Low weight	2 (4.2)	23 (53.5)
Normal weight	46 (95.8)	20 (46.6)
Stayed in the ICU		
Yes	0 (0)	39 (90.7)
No	48 (100)	4 (9.3)
Endotracheal tube use		
Yes	0 (0)	29 (67.4)
No	48 (100)	14 (32.6)
Stayed in the incubator		
Yes	1 (2.1)	39 (90.7)
No	47 (97.9)	4 (9.3)
Worked during pregnancy		
Yes	40 (83.3)	25 (58.1)
No	8 (16.7)	17 (39.5)
Medication during pregnancy[†]		
Yes	22 (54.8)	22 (54.8)
No	26 (54.2)	26 (54.2)
Prenatal consultations		
Up to 6 consultations	8 (16.7)	22 (51.2)
7 or more queries	39 (81.3)	21 (48.8)
Complication during pregnancy[‡]		
Yes	1 (2.1)	13 (30.2)
No	47 (97.9)	30 (69.8)
First child		
Yes	33 (68.8)	20 (46.5)
No	15 (31.3)	23 (53.5)
Mother's education		
Up to 11 years of studies	16 (33.3)	36 (83.7)
More than 11 years of studies	31 (64.6)	7 (16.3)
Income		
Up to 2 minimum wages	17 (35.4)	28 (65.1)
Above 3 minimum wages	31 (64.6)	11 (25.6)

Notes: ICU: intensive care unit

[†]Medication during pregnancy: hormones, vitamins and supplements, antibiotics, anti-inflammatories, corticosteroids, anti-diabetic drugs, antihypertensive and heart drugs, antidepressants, antiretroviral therapy drugs.

[‡]Complication during pregnancy: fetal distress, hemorrhage, eclampsia, pre-eclampsia, obstetric violence, infection.

Some variables exhibited a loss, resulting in the total less than 100%.

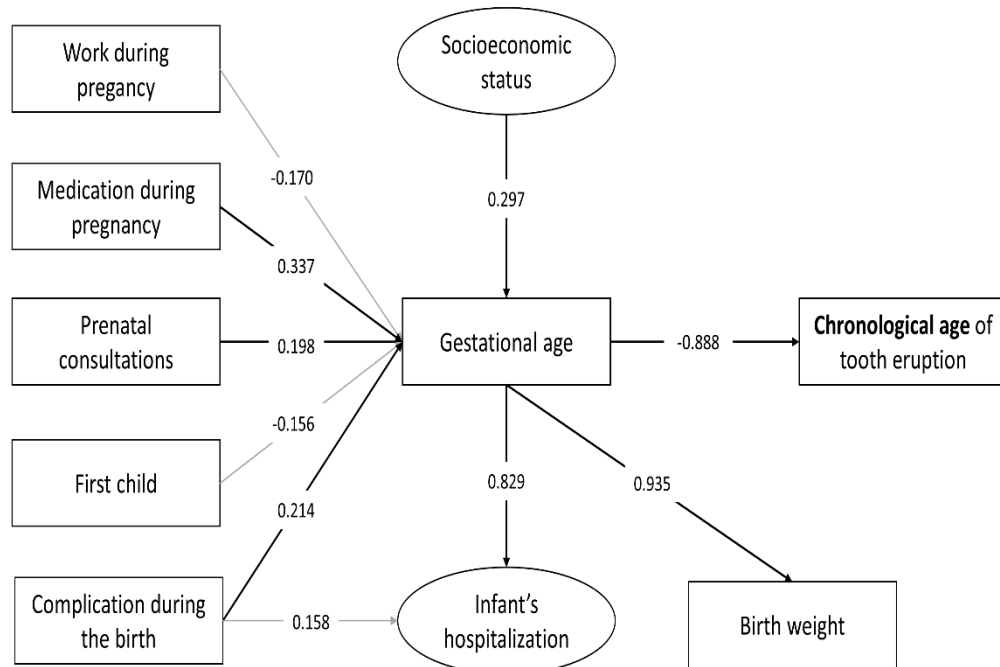
Table 2: Standardized Coefficients of Structural Equation Modeling (Chronological age of tooth eruption)

Ways	Initial Model Standardized coefficients (p-value)	Final Model Standardized coefficients (p-value)	Confidence interval	Standard error
Gestational age ON				
Socioeconomic status	0.295 (0.011)	0.297 (0,010)	0.107-0.487	2.57
Work during pregnancy	-0.169 (0.066)	-0.170 (0.068)	-0.324- -0.017	-1.82
Medication during pregnancy	0.335 (<0,001)	0.337 (<0,001)	0.183-0.490	3.61
Prenatal consultations	0.197 (0.026)	0.198 (0.025)	0.053-0.343	2.25
Number of births	-0.155 (0.072)	-0.156 (0.070)	-0.298- -0.014	-1.81
Complication during the birth	0.225 (0.031)	0.214 (0.007)	0.084-0.345	2.70
Infant's hospitalization ON				
Gestational age	0.834 (<0.001)	0.829 (<0.001)	0.749-0.909	17.0
Complication during the birth	0.148 (0.073)	0.158 (0.080)	-0.009-0.307	1.75
Birth weight ON				
Gestational age	0.934 (<0.001)	0.935 (<0.001)	0.823-1.048	13.6
Chronological age of tooth eruption ON				
Gestational age	-1.305 (0.024)	-0.888 (<0.001)	-0.979- -0.797	-16.0
Birth weight	0.438 (0.448)	-	-	-
Complication during the birth	0.018 (0.854)	-	-	-
General Fit Indices				
CFI	0.999	1.000	-	-
TLI	0.998	1.000	-	-
SRMR	0.094	0.095	-	-
RMSEA (IC95%)	0.010 (0.000-0.096)	0,001 (0.001-0.093)	-	-

Table 3: Standardized Coefficients of Structural Equation Modeling (Corrected age of tooth eruption)

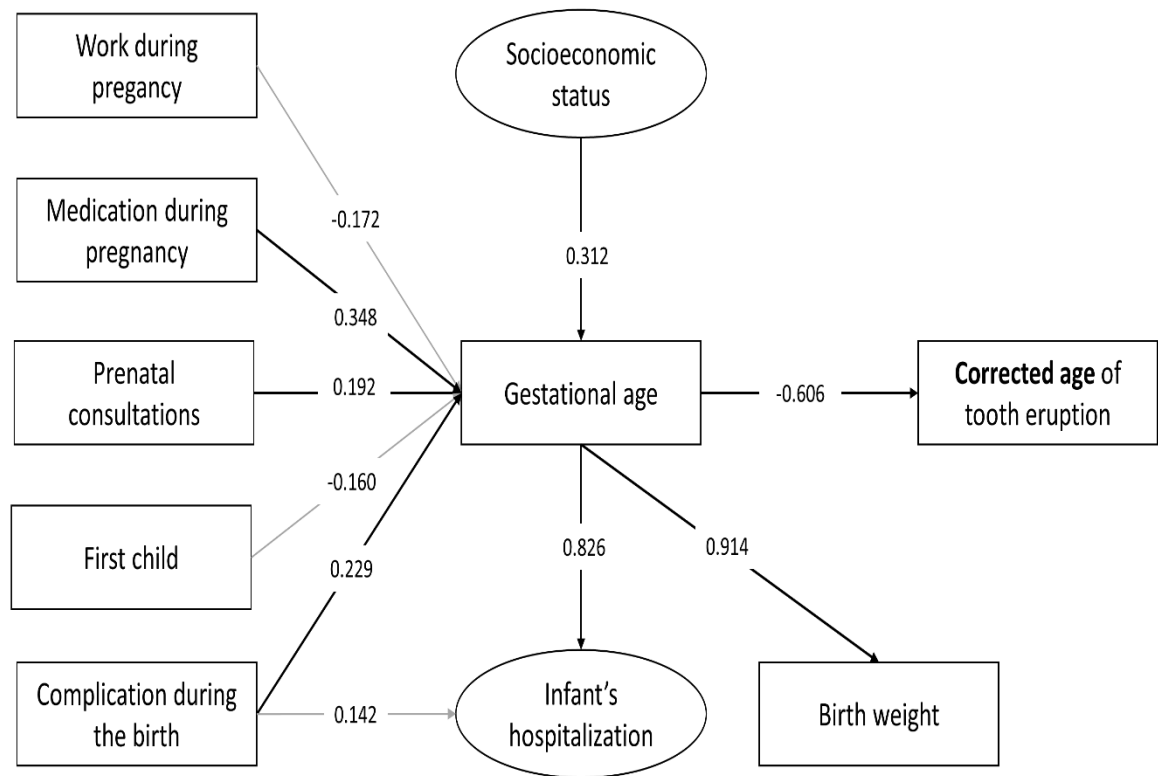
Ways	Initial Model Standardized coefficients (p-value)	Final Model Standardized coefficients (p-value)	Confidence interval	Standard error
Gestational age ON				
Socioeconomic status	0.309 (0.010)	0.312 (0.010)	0.113-0.512	2.57
Work during pregnancy	-0.170 (0.076)	-0.172 (0.075)	-0.332- -0.013	-1.78
Medication during pregnancy	0.345 (<0.001)	0.348 (<0.001)	0.188-0.508	3.58
Prenatal consultations	0.190 (0.040)	0.192 (0.040)	0.038-0.345	2.06
Number of births	-0.159 (0.064)	-0.160 (0.065)	-0.303- -0.018	-1.85
Complication during the birth	0.221 (0.031)	0.229 (0.013)	0.078-0.380	2.49
Infant's hospitalization ON				
Gestational age	0.832 (<0.001)	0.826 (<0.001)	0.743-0.909	16.42
Complication during the birth	0.148 (0.070)	0.142 (0.121)	-0.009-0.293	1.55
Birth weight ON				
Gestational age	0.935 (<0.001)	0.914 (<0.001)	0.811-1.017	14.56
Chronological age of tooth eruption ON				
Gestational age	-1.164 (0.092)	-0.606 (<0.001)	-0.785- -0.428	-5.58
Birth weight	0.599 (0.374)	-	-	-
Complication during the birth	-0.007 (0.949)	-	-	-
General Fit Indices				
CFI	1.000	1.000	-	-
TLI	1.000	1.000	-	-
SRMR	0.104	0.100	-	-
RMSEA (IC95%)	0.000 (0.000-0.094)	0.000 (0.000-0.089)	-	-

Fig. 1. The path model with standardized coefficients (β) for the chronological age of tooth eruption



Paths in bold: $p < 0.05$

Fig. 2. The path model with standardized coefficients (β) for the corrected age of tooth eruption



Paths in bold: $p < 0.05$

Fig. A.1. The structure and factor loadings of the formative model of the socioeconomic status

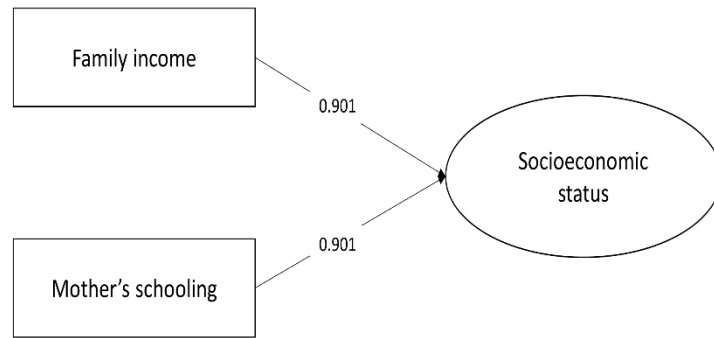
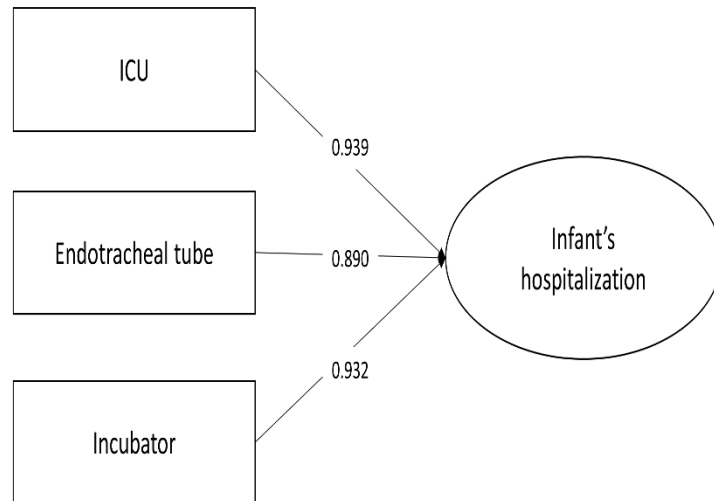


Fig. A.2. The structure and factor loadings of the formative model of the infant's hospitalization



ARTIGO 2

The Role of Teething in Breastfeeding Duration: A Path Analysis from a Cross-Sectional Study

Abstract

Understanding how the eruption of the first primary tooth could affect breastfeeding duration in a given population is essential for implementing strategies to encourage breastfeeding in services aimed at pregnant women. This study aimed to evaluate a trajectory model of factors associated with breastfeeding duration, with particular emphasis on the potential role of infant dentition as a determinant. Cross-sectional study with 91 infants of both sexes, aged six months or older, and their mothers. Breastfeeding duration, sociodemographic and behavioral factors were accessed by a questionnaire applied to mothers. The eruption of the first tooth was assessed clinically monthly by calibrated dentists. Child's birth data were collected by medical chart or Child Health Handbook. Path analysis was conducted using Mplus (version 8.6) to assess direct and indirect associations between variables. An indirect association was observed between gestational age and duration of breastfeeding, mediated through two distinct pathways: admission to the intensive care unit (ICU) and the timing of first tooth eruption. Lower gestational age was associated with a higher likelihood of ICU admission ($\beta = -0.838$; $p < 0.001$) and ICU admission was associated with a shorter duration of breastfeeding ($\beta = -0.565$; $p < 0.001$). Conversely, lower gestational age was also associated with a delayed eruption of the first primary tooth (after 8 months of age; $\beta = -0.612$; $p < 0.001$), which was associated with a longer duration of breastfeeding ($\beta = 0.340$; $p < 0.001$). These findings suggest that gestational age is associated with breastfeeding duration through two opposing indirect effects, mediated by different mechanisms.

Keywords: Tooth eruption. Infant. Preterm newborn. Tooth eruption chronology. Breastfeeding. Newborn. Dental eruption.

Introduction

The benefits of breastfeeding for both mother and infant are well-established in the literature. (Rollins et al., 2016) This process fosters a deep interaction between mother and child, with implications for the child's nutritional status, ability to defend against infections, physiology, and cognitive and emotional development. (Salone et al., 2013; Silveira et al., 2013) Furthermore, plays a significant role in the craniofacial development of the infant, as it involves the action of specific muscles, which, when activated, contribute to the proper development of craniofacial structures and the relationship between the maxilla and mandible. (Limeira et al., 2014; Lopes-Freire et al., 2015) The World Health Organization recommends breastfeeding until the age of two and exclusive breastfeeding for the first six months of life. However, various factors often interfere with the duration of breastfeeding. (WHO, 2015)

Mothers with lower breastfeeding rates tend to be young, of lower socioeconomic status and educational levels, single, overweight or obese before pregnancy, and more likely to report that their pregnancy was unplanned. (Ahluwalia et al., 2005; Forste et al., 2001; Hawkins et al., 2013) In addition to these factors, women's employment outside the home and improper positioning and latch are common reasons for the abandonment of breastfeeding. (Roe et al., 199; Odom et al., 2013) A factor associated with a longer duration of breastfeeding is the family environment, with the presence of a supportive partner is another significant factor. (Rollins et al., 2016) In hospitals, healthcare professionals have great potential to influence a mother's decision to breastfeed when they address the topic with pregnant women, discussing the positive aspects of breastfeeding and providing guidance on the practice. (McAllister et al., 2009) Finally, a mother's intention to breastfeed is a strong predictor of both initiation and duration, provided that the context is favorable. (DiGirolano et al., 2005) Thus, it is essential to foster this desire in future mothers through information related to the benefits of breastfeeding, as well as to seek solutions to the factors that hinder or prevent breastfeeding.

The promotion of breastfeeding involves motivation, training, and coordination of efforts among many people. The dentist can positively influence the promotion, protection, and support of breastfeeding. (Antunes et al., 2008) One potential challenge is tooth eruption, which can cause discomfort for some mothers. (Dodo et al., 2023) To best of our knowledge, there are no studies in the literature that examine

the influence of the eruption of the first tooth on the continuation or interruption of breastfeeding. Previous studies that explore this topic have evaluated the opposite way, that is, the influence of breastfeeding on the eruption of the first primary tooth. (Alnemer et al., 2017; Devraj et al., 2023; Shetty et al., 2023) However, understanding how the eruption of the first primary tooth could affect breastfeeding duration in a given population is essential for implementing strategies to encourage breastfeeding in services aimed at pregnant women.

In this study, a model was developed based on a theoretical framework of associations among sociodemographic characteristics of mothers, birth factors, eruption of the first primary tooth and breastfeeding (Figure 1). Therefore, the objective of this study was to evaluate path model and more specifically, (1) investigate the association of birth conditions such as gestational age, birth weight and use of intensive care unit (ICU) on time of breastfeeding (2) investigate the association of sociodemographic characteristics of mothers such as mothers' age and level of education on time of breastfeeding; and (3) investigate the association of eruption of the first primary tooth on time of breastfeeding.

Material and methods

The present study was reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE statement). (Malta et al., 2010)

The infants' parents/caregivers voluntarily signed a consent form authorizing the participation of their children. This study was approved by the Human Research Ethics Committee of the *Universidade Federal de Minas Gerais* (CAAE 66128117.4.0000.5149) and was conducted in accordance with the Declaration of Helsinki.

Study Design and Eligibility Criteria

This cross-sectional study was nested to a cohort study and was conducted with a sample of infants of both sexes and their mothers (Lopes-Silva et al., 2021; Tavares et al., 2024). The infants were at least 6 months old. Infants with Down Syndrome, Congenital Zika Virus Syndrome, and/or with any erupted teeth were excluded.

Mothers and infants were recruited from both public and private daycare centers, as well as from a multidisciplinary reference center at a Federal University

Hospital (*Universidade Federal de Minas Gerais - UFMG*) in Belo Horizonte, Brazil. At the hospital, the children evaluated were born prematurely (born before 37 weeks of gestational age), while the children at the daycare centers were born at term.

Variables and Data Collection

A questionnaire was administered to the mothers of the infants to assess breastfeeding duration (in months), mother's age (in years), and mother's education (elementary school, middle school, high school, college/University).

For infants who were recruited in the hospital, the data about the child's birth were collected in the medical records. For those recruited from daycare centers, the same data were collected through questionnaires for the mothers, who were asked to consult the Child Health Handbook. The child's birth variables were birth weight (extreme low birth weight <1,000 grams, very low birth weight $\geq 1,000$ to <1,500 grams, low birth weight $\geq 1,500$ to <2,500 grams, normal weight $\geq 2,500$), gestational age (in weeks) and whether the infant was in the ICU at birth (yes or no).

The eruption of the first tooth (≤ 8 months or > 8 months) was assessed clinically on a monthly basis through palpation and visual inspection of the oral cavity. Additionally, parents/caregivers were asked to report the date of tooth emergence to improve the accuracy of monthly monitoring. A tooth was classified as erupted once any portion of its crown had emerged through the gums and became visible in the oral cavity. Two calibrated examiners collected this data (Kappa ≥ 0.85).

Statistical Analysis

Descriptive statistics were performed by the Statistical Package for the Social Sciences (SPSS for Windows, version 25.0, IBM Inc, Armonk, NY, USA). Path analysis was conducted using the Mplus version 8.6 (Muthen & Muthen).

Path analysis was performed to evaluate the direct and indirect relationships between gestational age, eruption of the first tooth and breastfeeding duration. The model was proposed based on previous studies. (Birant et al., 2023; Folayan & Sowole, 2013) (Figure 1) The analysis was performed using the weighted least squares mean and variance-adjusted (WLSMV) estimation method, which is suitable for categorical data. (Li, 2016) The following goodness-of-fit indices used to evaluate the measurement models and global model: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), standardized root mean residual (SRMR), and root mean square

error of approximation (RMSEA). CFI and TLI values should be > 0.90 , whereas SRMR and RMSEA values should be < 0.08 . (Kline, 2011) Nonsignificant paths with p-value > 0.40 were removed (final model).

A Path Analysis was performed using Mplus version 8.6 (Muthen & Muthen). The weighted least squares mean and variance-adjusted estimation method (WLSMV) were used since the model has categorical data. (Li, 2016) Initially, a model was constructed: using gestational age and breastfeeding. Then, insignificant standardized coefficients (β) with p-value < 0.40 were removed to construct a final model. The following goodness-of-fit indices were used to evaluate the models: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA). The CFI and TLI values should have been > 0.90 . The SRMR and RMSEA values should have been < 0.08 (Kline, 2011).

Results

A total of 91 mothers and their children participated of this study. Most mothers (42.9%) were between 25 and 34 years of age and had completed middle school (48.4%). In addition, the mean gestational age was 35.01 ($\pm 4,767$) years and the mean breastfeeding time was 7.52 ($\pm 8,141$) months. Regarding the children, 48.4% had birth weight below the normal weight. 42.9% required ICU and 51,6% had the eruption of the first deciduous tooth by 8 months of age. (Table 1). The power of the sample was calculated based on the comparison between time of breastfeeding and eruption of the first tooth, with a 99.19% confidence interval.

The table 2 shows the initial and final structural model with the adjustment of the data. The final model demonstrated an adequate overall fit, suggesting its plausibility. An indirect association was observed between gestational age and breastfeeding duration, mediated through two distinct pathways: admission to the intensive care unit (ICU) and the timing of first tooth eruption. Children whose mothers had a lower gestational age were more likely to need ICU ($\beta = -0.838$; $p < 0.001$) and ICU admission, in turn, was associated with a shorter duration of breastfeeding ($\beta = -0.565$; $p < 0.001$). Conversely, children whose mothers had a lower gestational age had a delay eruption of the first primary tooth (after 8 months of age; $\beta = -0.612$; $p < 0.001$), which was in turn associated with a longer duration of breastfeeding ($\beta = 0.340$;

$p < 0.001$). Additionally, mothers who had a higher gestational age were more likely to have their children born with normal weight ($\beta = 0.929$; $p < 0.001$) and children whose mothers were over 34 years old had a longer breastfeeding time ($\beta = 0.235$; $p = 0.002$) (Table 2; Figure 2).

Discussion

The gestational period is one of the key determinants of a newborn's health and survival. One of the challenges that can arise is preterm birth, defined as delivery before 37 completed weeks of gestation. (Ramokolo et al., 2023) Postnatally, breastfeeding stands out as a critical factor for infant health and development¹. Considering the importance of both gestation and breastfeeding, the present study identified an indirect association between gestational age and the duration of breastfeeding, mediated through two distinct pathways: admission to the ICU and the timing of first tooth eruption. These findings suggest that gestational age is associated breastfeeding duration through two opposing indirect effects, each mediated by a different mechanism. Notably, the pathway “gestational age – tooth eruption – breastfeeding” represents the most novel finding of this study.

To date, no studies have been identified in the literature that investigate the impact of the eruption of the first primary tooth on the continuation or cessation of breastfeeding. However, the results of the present study suggest that the timing of the eruption of the first primary tooth may directly influence the duration of breastfeeding. It was observed that infants with later tooth eruption were breastfed for longer periods than those with earlier eruption. This finding supports the hypothesis that tooth eruption may act as a deterrent to continued breastfeeding, either due to maternal discomfort or changes in infant behavior, such as irritability, excessive drooling, and biting during feeding. (Lopes-Silva et al., 2021; Ramos-Jorge et al., 2011) Understanding how the eruption of the first primary tooth may interfere with breastfeeding duration in each population is essential for developing effective strategies to promote breastfeeding within prenatal care services. This result highlights the need for a renewed focus on pediatric dentistry within the breastfeeding context. Guidance on the effects of dental eruption and strategies to manage associated discomfort should be incorporated into breastfeeding promotion initiatives, particularly for preterm infants. It is essential that

dental professionals engage early and actively in multidisciplinary care teams, providing support to mothers facing challenges triggered by early dentition.

It is important to highlight that no association was observed between ICU admission and delayed tooth eruption. This suggests that, although both factors (ICU admission and tooth eruption) are linked to prematurity, they are associated breastfeeding in independent ways. In fact, the ICU admission was primarily associated with shorter duration of breastfeeding. However, preterm infants who were not admitted to the ICU were breastfed for longer periods than those who were hospitalized, suggesting that the environment and challenges imposed by hospitalization, such as mother-infant separation, difficulties in milk expression, or delays in initiating direct breastfeeding, are significant barriers to sustaining breastfeeding, more so than prematurity itself.

As expected, preterm infants had higher rates of ICU admission, which inherently poses significant obstacles to direct breastfeeding. Various factors may lead to preterm birth, such as infections, inflammation, placental problems, and maternal lifestyle. (Ramokolo et al., 2023) Consequently, premature infants are often physiologically unprepared to function independently outside the womb, necessitating NICU admission. NICUs provide a controlled environment where healthcare professionals address common preterm conditions, including pulmonary immaturity, thermoregulation difficulties, immature immune systems, and feeding problems. Preterm infants frequently lack the strength or coordination required for effective sucking and swallowing, thus requiring tube or intravenous feeding until they can nurse directly.

This situation can be distressing for families, especially mothers. After ICU discharge, mothers assume primary responsibility for infant nutrition. Initially, they may need to rely on breast pumps until the infant is developmentally ready to latch, a process that can be time-consuming and emotionally taxing. This often leads to self-doubt regarding milk supply and may result in early supplementation with formula to preempt potential issues, (Briere et al., 2014) thereby shortening breastfeeding duration for infants who required intensive neonatal care. (Abugov et al., 2021; Briere et al., 2014)

Early preparation for breastfeeding through prenatal consultations appears to be an effective strategy to promote breastfeeding persistence. Providing information and support enables mothers to make informed decisions for their high-risk infants.

(Friedman et al., 2004) NICU professionals are in an ideal position to guide families, equipping them to address breastfeeding challenges after discharge. (Briere et al., 2014) Key challenges to sustained breastfeeding in NICUs include inadequate facilities for parental presence and high rates of bottle and formula feeding. Supportive environments foster practices like the kangaroo care method (skin-to-skin contact), which is widely recognized for its positive impact on breastfeeding. (Kostandy et al., 2019; Lode-Kolz et al., 2023) As discharge approaches, continued lactation support and education on maintaining milk supply become essential. Wooldridge and Hall (2003) showed that mothers who provided exclusive breast milk feeding during the first week post-discharge were more likely to sustain breastfeeding.

Another notable finding was that higher gestational age was associated with normal birth weight, likely due to greater physiological development, including oral strength required for effective milk extraction. Additionally, maternal age was positively associated with breastfeeding duration. Children of mothers aged over 34 had significantly longer breastfeeding periods. This may be attributed to greater emotional maturity and life experience, enabling these mothers to better manage the postpartum period and breastfeeding challenges. (Edwards et al., 2021) The transition to motherhood often entails a gap between expectations and reality, marked by exhaustion, loss of autonomy, and feeding difficulties. Coping with this period requires preparation and continuous support. Ensuring that breastfeeding is a positive experience for both mother and infant is critical. Although it can be demanding, access to clear, evidence-based information empowers mothers to make informed decisions, reducing feelings of judgment or societal pressure. Thus, healthcare professionals must adopt a sensitive, respectful, and collaborative approach in breastfeeding support.

These findings, while offering novel insights, particularly regarding the relationship between tooth eruption and breastfeeding duration, also open new avenues for future research. Understanding additional variables that may influence this dynamic, such as maternal return to work or anatomical challenges like ankyloglossia, could further enhance the support provided to breastfeeding mothers. The current results underscore the importance of a multidisciplinary approach and the need for integrated care protocols that consider the complex interplay between neonatal health, developmental milestones, and maternal well-being.

This multidisciplinary approach should involve pediatricians, pediatric dentists, nurses, and lactation consultants, focusing on sustaining breastfeeding even after tooth eruption. Health professionals must be trained to provide sensitive, specific guidance for mothers of preterm infants, addressing issues such as milk extraction, formula use, and breastfeeding management during dental eruption. Furthermore, promoting maternal bonding and agency through kangaroo care and parental involvement in neonatal units is essential. Maternal factors such as age and psychosocial context should also be considered in breastfeeding promotion strategies. Collectively, these components can contribute to more effective, empathetic, and family-centered public health policies and care practices.

Conclusions

The findings of this study reinforce the complexity of breastfeeding in the context of prematurity and neonatal hospitalization, showing that multiple factors, such as gestational age, ICU needs, tooth eruption, and maternal age, can significantly influence breastfeeding duration.

The Author(s) declare(s) that there is no conflict of interest

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Table 1: Descriptive analyses of the variables.

Variables	N (%)
Intensive Care Unit	
No	52 (57.1)
Yes	39 (42.9)
Mother's age	
≤ 24 years old	20 (22.0)
25-34 years old	39 (42.9)
> 34 years old	32 (35.2)
Mother's education	
Elementary school	39 (42.9)
Middle school	44 (48.4)
High school	05 (5.5)
College/University	03 (3.3)
Birth weight of the child	
Extremely low birth weight	12 (13.2)
Very low birth weight	11 (12.1)
Low birth weight	21 (23.1)
Normal weight	47 (51.6)
Gestational age*	35.01 (4.767)
Time of breastfeeding*	7.52 (8.141)
Eruption of the first tooth	9.07 (2.932)
≤ 8 months old	47.0 (51.6)
> 8 months old	44.0 (48.4)

*mean (standard deviation)

Table 2: Standardized coefficients of structural equation modeling

Ways	Initial Model Standardized coefficients (p-value)	Final Model Standardized coefficients (p-value)	Confidence interval	Standard error
Breastfeeding ON				
Eruption of the first tooth	0.207 (0.232)	0.340 (<0.001)	0.182-0.499	0.10
Gestational age	-0.482 (0.652)	-	-	-
Intensive Care Unit	-0.720 (0.002)	-0.565 (<0.001)	-0.713- -0.416	0.09
Mother's age	0.236 (0.002)	0.235 (0.002)	0.111-0.359	0.08
Mother's education	-0.148 (0.155)	-0.147 (0.154)	-0.318-0.023	0.10
Birth weight of the child	0.274 (0.828)	-		
Eruption of the first tooth ON				
Gestational age	-0.599 (<0.001)	-0.612 (<0.001)	-0.838- -0.385	0.14
Intensive Care Unit ON				
Gestational age	-0.701 (0.009)	-0.838 (<0.001)	0.880-0.796	0.03
Birth weight of the child	-0.152 (0.601)	-	-	-
Birth weight of the child ON				
Gestational age	0.929 (<0.001)	0.929 (<0.001)	0.894-0.965	0.02
General Fit Indices				
CFI	0.986	0.991	-	-
TLI	0.964	0.982	-	-
SRMR	0.215	0.218	-	-
RMSEA (IC95%)	0.069 (0.000-0.158)	0.049 (0.000-0.135)	-	-

CFI: comparative fit index; RMSEA: root mean square error of approximation; SRMR: standardized root mean square residual; TLI: Tucker-Lewis Index.

Fig. 1. Predetermined theoretical framework model

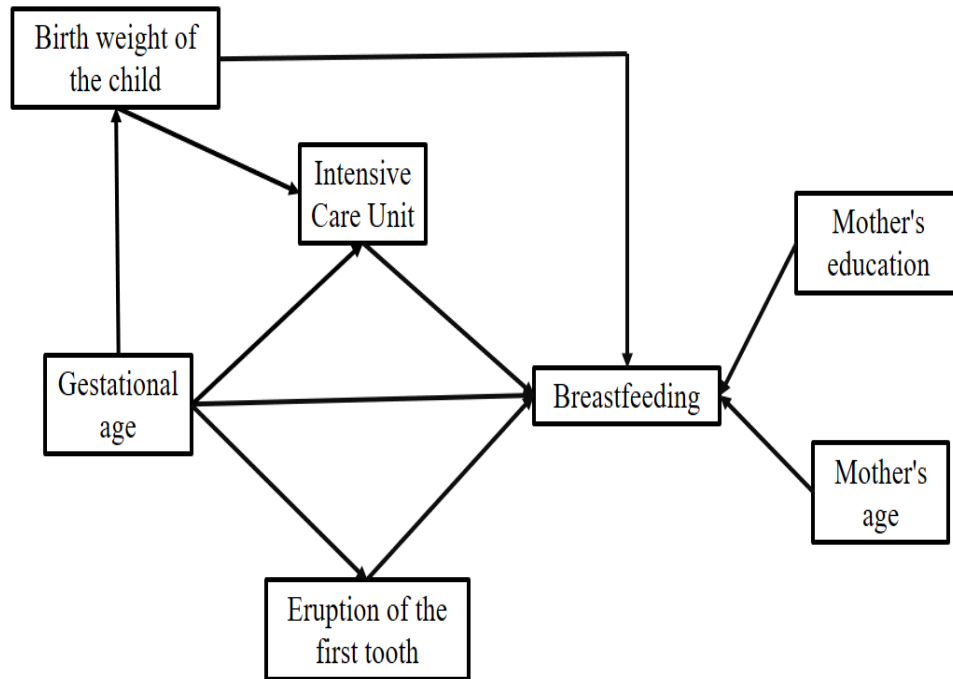
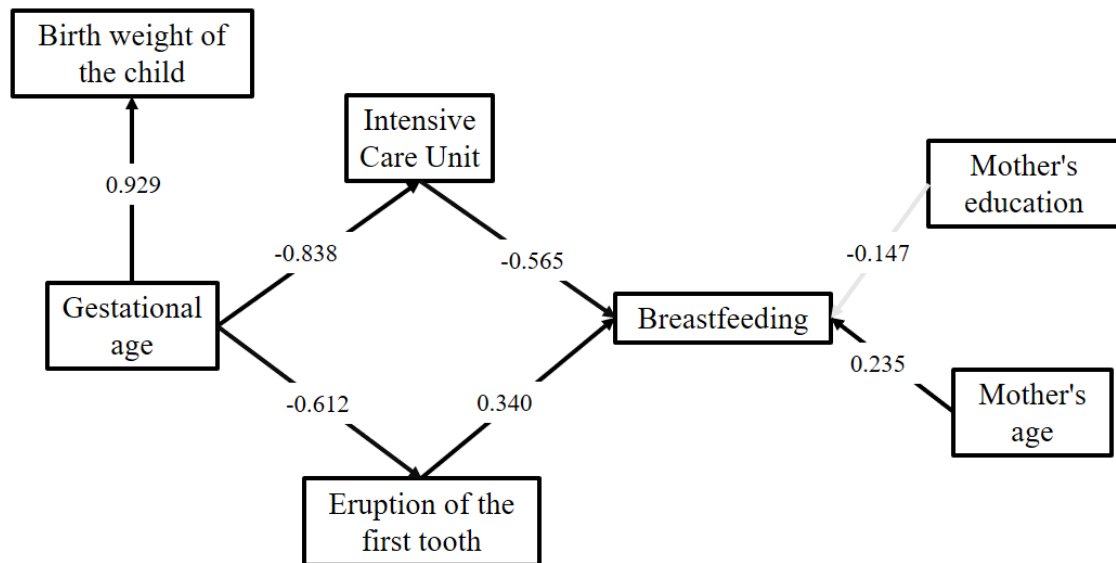


Fig. 2. Structural equation modeling with standardized coefficients. Paths in bold: $p < 0.05$.



5 CONSIDERAÇÕES FINAIS

As evidências apresentadas nesta tese revelam a complexa interação entre condições pré-natais, perinatais e pós-natais na saúde bucal e nutricional do recém-nascido, com ênfase nos bebês prematuros. O atraso na erupção dentária, especialmente entre prematuros, foi associado a fatores como idade gestacional, hospitalização neonatal, uso de medicamentos durante a gestação, menor número de consultas pré-natais e baixo nível socioeconômico. A utilização da idade corrigida demonstrou-se essencial para diferenciar atrasos reais de aparentes na erupção dentária, propondo uma nova abordagem para avaliação do desenvolvimento infantil em estudos epidemiológicos. Dessa forma, os achados reforçam a necessidade de integrar a odontopediatria de forma mais ativa nas práticas de cuidado infantil, desde os primeiros meses de vida.

Complementarmente, este trabalho evidenciou que a erupção dentária tardia, comum entre prematuros, está diretamente associada à maior duração da amamentação, possivelmente por adiar os desconfortos maternos que ocorrem com a dentição. Por outro lado, a internação em UTIN, frequentemente necessária em prematuros, representa uma barreira inicial à amamentação, impactando negativamente sua continuidade. Dessa forma, torna-se evidente a importância de estratégias de apoio à lactação durante e após a hospitalização neonatal, bem como o envolvimento precoce de equipes multiprofissionais, incluindo odontopediatras, pediatras e consultores em amamentação. Assim, os achados desta tese sustentam a urgência de políticas públicas que promovam cuidado materno-infantil integral, sensível às particularidades dos prematuros, e reforçam a relevância de práticas clínicas coordenadas e centradas na família.

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ANEXO A – Checklist STROBE

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

ANEXO B - STROBE Checklist and Additional GROESBE Items.

Item	Item No.	STROBE Recommendations	GROESBE Items
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract. (b) Provide in the abstract an informative and balanced summary of what was done and what was found.	
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported.	
Objectives	3	State specific objectives, including any prespecified hypotheses.	
Methods			
Study design	4	Present key elements of study design early in the paper.	Provide a full description of the study design.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	Describe the setting, locations, and dates of data collection.
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up. <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls. <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	Describe the source population, eligibility criteria, and methods of selection of participants. For incidence studies, describe methods of follow-up.

Item	Item No.	STROBE Recommendations	GROESBE Items
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Outcomes—Describe the diagnostic criteria for each oral condition. 7a. Describe the diagnostic criteria and case definition for untreated dental caries. 7b. Describe the diagnostic criteria and case definition for severe periodontitis. 7c. Describe the diagnostic criteria and case definition for edentulism.
Data sources/measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.	Give sources of data and details of methods of assessment (examination protocol, reliability assessment, and summary indices) for each oral condition.
Bias	9	Describe any efforts to address potential sources of bias.	
Study size	10	Explain how the study size was arrived at.	Explain how the sample size was determined.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding. (b) Describe any methods used to examine subgroups and interactions.	12a. Describe how prevalence and incidence were estimated.

Item	Item No.	STROBE Recommendations	GROESBE Items
		(c) Explain how missing data were addressed.	12c. Clearly describe how missing data were handled.
		(d) Cohort study—If applicable, explain how loss to follow-up was addressed. Case-control study—If applicable, explain how matching of cases and controls was addressed. Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy.	
		(e) Describe any sensitivity analyses.	
Results			
Participants	13	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram.	Report the number of participants at each stage of the study and reasons for nonparticipation at each stage.
Descriptive data	14	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. (b) Indicate number of participants with missing data for each variable of interest. (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount).	For incidence studies, report details of follow-up time.
Outcome data	15	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time.	Report the number of existing and/or new cases of the condition.

Item	Item No.	STROBE Recommendations	GROESBE Items
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure.	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures.	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized. (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.	
Other analysis	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses.	
Discussion			
Key results	18	Summarise key results with reference to study objectives.	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	

Item	Item No.	STROBE Recommendations	GROESBE Items
Generalisability	21	Discuss the generalisability (external validity) of the study results.	
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.	

GROESBE, Guidelines for Reporting Oral Epidemiologic Studies to Inform Burden Estimation; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

**ANEXO C – Comitê de Ética em Pesquisa com Seres Humanos da Universidade
Federal de Minas Gerais (CAAE 66128117.4.0000.5149)**



**FEDERAL UNIVERSITY OF MINAS GERAIS
RESEARCH ETHICS COMMITTEE - COEP**

Project: CAAE – 66128117.4.0000.5149

**Interested (a): Prof. Cristiane Baccin Bendo Neves
Dept. Pediatric Dentistry and Orthodontics
Faculty of Dentistry - UFMG**

DECISION

The Research Ethics Committee of UFMG - COEP approved, on July 4, 2017, the research project entitled "Chronology, signs and symptoms of eruption of primary lower incisors in preterm and low birth weight children" as well as:

- Informed Consent Form.

The final or partial reports must be sent to COEP one year after the beginning of the project through the Platform Brazil.


Profa. Dra. Vivian Resende
Coordenadora do COEP-UFMG

ANEXO D - Lista de verificação de envio de manuscrito AAPD

Submission Documents

- ☐ Submit manuscript in .doc or .docx format.
- ☐ Manuscript is double spaced.
- ☐ Used basic fonts such as Arial, Courier, Helvetica no smaller than 11 points.
- ☐ Two versions of the manuscript are to be uploaded, one version containing all the author information and one version without any information identifying the authors or their institutions (blinded).
- ☐ Tables appear at the end of the main document, while photos, photomicrographs and graphs are to be submitted as separate files (.jpg or .tif format only).
- ☐ IRB approval, informed consent (verbal or written), HIPAA compliance (if from the United States), and/or animal care committee must be included with the submission.
- ☐ IRB approval letters must be in English, on official IRB letterhead, and over an official signature of the IRB approval agent.

Short Title

- ☐ A brief but comprehensive phrase summarizing the paper.

Keywords

- ☐ Five words that appear in the title/abstract, and searchable in PubMed.

Abstract

- ☐ The Abstract is brief, providing the reader with a concise but complete summary of the paper.
- ☐ Date range of study should be given.
- ☐ Number of patients/animals (including age and gender, if appropriate) should be given.
- ☐ Various groups, including controls, described.
- ☐ Procedures performed should be described.
- ☐ Specifics of evaluation should parallel the results portion of the abstract.
- ☐ Abstract results parallel abstract methods.
- ☐ Abstract results contain quantitative data along with statistical significance.
- ☐ Abstract conclusions can be drawn from the results of the study.

Introduction

- ☐ Provides context for the article.
- ☐ Provides objective of the study.
- ☐ Provides a clear purpose/hypothesis.
- ☐ Does not exceed two or three paragraphs.

Methods

- ☐ As appropriate, includes a detailed description of the study design or type of analysis.
- ☐ As appropriate, includes dates and period of study.
- ☐ As appropriate, includes condition, factors, or disease studied.
- ☐ As appropriate, includes details of sample (e.g., study participants and the setting from which they were drawn).
- ☐ As appropriate, includes method of random sequence generation in detail (coin flip, random table, etc.)
- ☐ As appropriate, includes method of allocation concealment in detail (opaque envelopes, sequential numbered drug containers, etc.)
- ☐ As appropriate, includes a description of treatment providers.
- ☐ As appropriate, includes whether providers and participants were blinded.
- ☐ As appropriate, includes inclusion and exclusion criteria.
- ☐ As appropriate, includes intervention(s), if any.
- ☐ As appropriate, includes outcome measures.
- ☐ As appropriate, includes method of blinding of outcome assessors.
- ☐ As appropriate, includes method of standardization and calibration of outcome assessors, including kappa statistics.
- ☐ As appropriate, includes statistical analysis.

Results

- ☐ Clearly mirrors methods; used subtitles if needed. Check for consistency in data in text, tables, and figures.
- ☐ Report the results of the statistical analysis for all variables collected and analyzed, not just for those which exhibited statistical or near statistical significance.
- ☐ Text and Tables must stand alone.

Discussion

- ☐ State pertinent new findings, but do not repeat results.
- ☐ How did your results differ from other relevant literature?
- ☐ Do not cite tables or figures in the discussion. These should be introduced in the methods and results sections.
- ☐ Do not cite new results not previously reported in the Results. All results the author wishes to discuss must have first been presented in the Results section of the manuscript.
- ☐ Describe limitations of your study in the paragraph just before your Conclusions. Include itemization of limitations of any incomplete data.
- ☐ Describe the type of future studies needed, if appropriate.

Conclusions

- ☐ Synthesis of key points.
- ☐ List and number using Arabic numerals.
- ☐ Conclusions should be supported by data.
- ☐ Numbered succinct statements.

References

- ☐ Call out references in order they appear in text.
- ☐ Adhere to AAPD guidelines.
- ☐ Verify accuracy of your references.
- ☐ Archive each and all references in WebCite®.

Tables

- ☐ Adhere to AAPD Maximum requirements according to Type of Manuscript.
- ☐ Include title for each table.
- ☐ Numbers correspond to numbers in text.
- ☐ Define abbreviations below each table.

Figures

- ☐ Adhere to AAPD Maximum requirements according to Type of Manuscript.
- ☐ Image resolution, after cropping to the area of interest, should be a minimum 300-600 dpi.
- ☐ Figures should be submitted individually as .jpg or .tif files.
- ☐ Figures should be numbered in Arabic numerals in the order of the first citation in the text.
- ☐ Legends for each figure must be printed on a separate page.
- ☐ Figure legends should clearly define findings on each figure, with labels mentioned in the caption if they are used in the figure.
- ☐ If based on individual subject, caption should include subject age and gender.

NOTE: Authors desiring to have more Figures or Tables MUST agree with the electronic publication of their manuscript, and must select this preference. Each separate chart, graph or photograph will be counted as a separate figure. Figures grouped together will be counted as their individual parts. See examples on page 2.

ANEXO E - Lista de verificação de envio de manuscrito - *Health Education & Behavior*

The Manuscript

Style and format:

- All manuscripts should be prepared in accordance with the style and format requirements of the *Publication Manual of the American Psychological Association* (6th edition).
- The manuscript, including captions, footnotes, tables, and references, must be double-spaced with 1-inch margins in a 12-point font. The elements of a manuscript should include: abstract, body of text, references, and tables, figures or other graphic images.

Title: The title should stand alone as the first page of the manuscript. **(Note: Author information and any acknowledgements should not be included with the title. These are to be uploaded as a separate Title Page and Acknowledgements document. See above for details.)**

Abstract: Write an informative abstract of up to 250 words, followed by no more than 6 keywords. The abstract should be a standalone narrative of the work. It should not be structured in explicitly defined sections, e.g., Background, Aims, Methods, Results, Conclusions. Rather, it must follow a logical narrative. It must address these questions:

1. What is the problem addressed?
2. What does this report add to the literature?
3. What are the implications for public health research and/or practice?

Avoid citing references, abbreviations, and detailed statistics (e.g., p-values, means). State clearly the methodology employed (e.g., qualitative and quantitative), the sample size (if relevant) and the analysis (e.g., conversation analysis, structural equation modeling).

The abstract and the keywords should be easy to discover through search engines.

Body of text:

1. Introduction
2. Methods
3. results
4. discussion (including limitations and strengths and implications for theory, policy, and/or practice)

References:

- All references should be prepared in accordance with the format and style requirements of the *Publication Manual of the American Psychological Association* (most recent edition).
- References to unpublished material are discouraged.
- Footnotes to the text should be avoided.

- For further information on how to format citations and references, please consult the APA Style tutorial at: https://us.sagepub.com/sites/default/files/apa_style_november_2019.pdf

Tables and figures:

- A total of five tables and figures are permitted with the submitted manuscript.
 - All tables, figures, and graphic images should be cited sequentially in text, serially numbered, and accompanied by explanatory captions, and constructed in accordance with the style and format requirements of the *Publication Manual of the American Psychological Association* (most recent edition).
- Do not include tables and figures within the body of the manuscript; tables and figures can be included at the end of the document immediately following the reference list or uploaded in separate document files. Tables should be editable.
- All figures, illustrations, graphics, and photographs should be supplied with the highest quality original electronic format. All files should follow the Sage artwork guidelines contained at the [Sage Manuscript Submission Guidelines](#).

Human Participants and Institutional Review Board:

- All studies involving data collection with human participants must document that approval was received from an appropriate institutional review board.
- It must be stated in writing, anonymized in the Methods section or named in the cover letter, that the study protocol was approved by a review committee on the protection of human participants or its equivalent.

Language and other requirements:

- Manuscripts must be submitted in English.
- Authors should refrain from using the term subjects when describing or referring to human research participants. Alternative terms such as respondents, research participants, or some other more specific designation (e.g., youth, females, patients, or residents) should be used.
- Each manuscript reporting empirical research that is submitted is expected to include implications for theory, policy, and/or practice in the discussion section.

Reporting standards: *Health Education & Behavior* has adopted guidelines for reporting standards that have been developed in recent years and promulgated by several groups. Manuscripts reporting the results of an intervention that has been evaluated should provide a detailed description of the intervention in the methods section. *Health Education & Behavior* strongly encourages authors to utilize the checklist and guide that have been provided by Hoffmann et al. (2014) for reporting descriptions of interventions.

Reports of randomized controlled trials should adhere to the Consolidated Standards of Reporting Trials (CONSORT) Statement (Rennie, 2001) and reports of evaluations with nonrandomized designs should adhere to the requirements of the Transparent Reporting of Evaluation with Nonrandomized Designs (TREND) (Des Jarlais, Lyles, Crepaz, & the TREND Group, 2004). *Health Education & Behavior* also expects

manuscripts reporting the results of systematic reviews and meta-analytic reports to adhere to the requirements for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)(Moher, Liberati, Tetzlaff, & Altman, 2009). Submitting author are also encouraged to adhere to the NIH OBSSR guidelines on conducting mixed methods research when reporting such studies (OBSSR NIH Best Practices for Mixed Methods Research).

Appendices and supplemental material: Appendices should not be included in the manuscript. However, appendices containing questionnaires and instruments, intervention materials, supplemental data analyses, or other materials or information that are proposed by the authors(s) and deemed to be valuable by the editor may be made available for public access via links to a section for such material at the *Health Education & Behavior* website. Extensive appendices and supplemental material intended for online-only display should be clearly marked with “online supp” in the file name.

Revised Manuscripts

Revised manuscripts should follow the formatting requirements described above. Changes to revised and resubmitted manuscripts should be noted within the document with tracked changes in MS Word or by other means (e.g., use of bold font or color-highlighted text).

In addition to a copy of your manuscript with tracked changes or other marks, authors must submit a clean copy of the manuscript with no editing marks and all tracked changes accepted. This clean copy will be used for production if your revised manuscript is accepted for publication.

A separate point-by-point “Response to Reviewers” should be included when transmitting a revised submission. When submitting the revised manuscript, authors will be able to respond to the comments made by reviewer(s). This response can be entered into the space provided or uploaded as a separate document. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the reviewer(s).

Note: Health Education & Behavior adheres to a rigorous double-anonymized reviewing policy in which the identity of both the author(s) and reviewer(s) are always concealed from both parties. The response to reviewers should be a anonymized document, and should not contain author names, contact information, or any other identifying information.

Memoriams

Brief writings in memory of distinguished persons in the field are by invitation only. We do not accept unsolicited contributions; however, we welcome suggestions.

Pre-Publication Proofs and Post-Publication Reprints

Proofs of manuscripts accepted for publication will be supplied to the corresponding author prior to publication. The corresponding author has the responsibility to check the accuracy of typesetting and copyediting, including references, and to return corrected proofs within the specified time allotted. Authors may be charged for excessive alterations to the proofs. The corresponding author will receive a PDF containing a copy of the article as it appears in the issue in which it will be published, and is to be used in accordance with the specified instructions. Corresponding authors are responsible for distributing the PDF with any other coauthors of the manuscript.

Copyright

Since a U.S. Copyright Law became effective in January 1978, the transfer of copyright from author to publisher, heretofore implicit in the submission of a manuscript, must now be explicitly transferred to enable the publisher to ensure maximum dissemination of the author's work. A copy of the agreement executed and signed by each author is required with each manuscript submission. The agreement can be found on the website. (If the article is a "work for hire," the agreement must be signed by the employer.) No manuscript can be considered accepted unless a signed copyright transfer agreement is executed and submitted. It is the author's responsibility to obtain written permission and pay any and all fees for the use of any quotation(s) over 300 words from previously published material; non-original photographs, figures, or tables or any portion thereof, exclusive of data; and quotes of any length from newspapers, magazines, poems, songs, and anything broadcast over radio or television. Without a copy of written permission on file with the publisher, the quotation(s) cannot be used. Original photographs require signed releases from those photographed.

Authorship

Manuscripts should only be submitted for consideration once consent is given by all contributing authors. Those submitting manuscripts should carefully check that all those whose work contributed to the paper are acknowledged as contributing authors.

The list of authors should include all those who can legitimately claim authorship. This is all those who:

1. Made a substantial contribution to the concept and design, acquisition of data or analysis and interpretation of data,
2. Drafted the article or revised it critically for important intellectual content,
3. Approved the version to be published.

Authors should meet the conditions of all of the points above. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

When a large, multicenter group has conducted the work, the authors should identify the individuals who accept direct responsibility for the manuscript. These individuals should fully meet the criteria for authorship.

Acquisition of funding, collection of data, or general supervision of the research group alone does not constitute justification for authorship, although all contributors who do not meet the criteria for authorship should be listed in the Acknowledgments section.

Please refer to the [International Committee of Medical Journal Editors \(ICMJE\) authorship guidelines](#) for more information on authorship.

Please note that AI chatbots, for example ChatGPT, should not be listed as authors. For more [information see the policy on Use of ChatGPT and generative AI tools](#).

Disclosures

Health Education & Behavior requires all authors to acknowledge their funding in a consistent fashion under a separate heading. Please visit the [Funding Acknowledgements](#) page on the Sage Journal Author Gateway to confirm the format of the acknowledgment text in the event of funding, or state that: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. It is the policy of *Health Education & Behavior* to require a declaration of conflicting interests from all authors enabling a statement to be carried within the paginated pages of all published articles.

Please ensure that a “Declaration of Conflicting Interests” statement is included at the end of your manuscript, after any acknowledgements and prior to the references. If no conflict exists, please state that “The Author(s) declare(s) that there is no conflict of interest”.

Research Ethics, Use of Human Subjects, and Informed Consent

Research reported in the journal should comply with ethical principles that are contained in the American Psychological Association Ethical Guidelines for Research With Human Subjects, the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects (Williams, 2008), and the Unified Code of Ethics for the Health Education Profession (Capwell, Smith, Shirreffs, & Olsen, 2000).

Medical research involving human subjects must be conducted according to the [World Medical Association Declaration of Helsinki](#).

Submitted manuscripts should conform to the [ICMJE Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals](#), and all manuscripts reporting animal and/or human studies must state in the methods section that the relevant Ethics Committee or Institutional Review Board provided (or waived) approval. Please ensure that you have provided the full name and institution of the review committee, in addition to the approval number.

For research articles, authors are also required to state in the methods section whether participants provided informed consent and whether the consent was written or verbal.

ORCID

As part of our commitment to ensuring an ethical, transparent and fair peer review process Sage is a supporting member of ORCID, the Open Researcher and Contributor ID. ORCID provides a unique and persistent digital identifier that distinguishes researchers from every other researcher, even those who share the same name, and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between researchers and their professional activities, ensuring that their work is recognized.

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Authors seeking assistance with English language editing, translation, or figure and manuscript formatting to fit the journal's specifications should consider using Sage Language Services. Visit [Sage Language Services](#) on our Journal Author Gateway for further information

APÊNDICE A - Termo de Consentimento Livre e Esclarecido

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Convidamos o Sr. (a) a participar da pesquisa “Cronologia, sinais e sintomas da erupção dos dentes decíduos: comparação entre bebês nascidos prematuros e a termo”, que tem como objetivo observar quando os dentes de leite nascem na boca e quais são os sintomas (febre, dor de barriga etc) que estão associados com esse nascimento. Esta pesquisa será realizada com crianças da creche “Obras sociais da Pampulha”, e está sob responsabilidade da pesquisadora Bianca Spuri Tavares, aluna de doutorado, e orientação da professora Cristiane Baccin Bendo Neves do departamento de Saúde Bucal da Criança e do Adolescente da Faculdade de Odontologia da UFMG. As crianças serão acompanhadas mensalmente na creche que frequentam.

A pesquisa será realizada através questionários às mães/responsáveis, exame bucal dos bebês, e coleta de dados da caderneta de saúde da criança para verificar medidas como peso e altura ao nascer. Quando os dentes começarem a nascer, a criança terá somente os dentes fotografados. As fotografias não mostrarão o rosto da criança, somente os dentes e os sinais (como inchaço e vermelhidão) serão fotografados. As fotografias serão para fazer um acompanhamento das alterações e poderão ser usadas somente para ciência, como artigos científicos, sem a identificação do bebê. Os exames da boca serão realizados nos bebês com auxílio de espelho clínico e abaixadores de madeira para língua. Este exame será feito utilizando todo o equipamento de proteção (luvas para procedimentos, óculos, gorro, máscara e avental) e com material descartável e/ou esterilizado. O bebê poderá chorar durante o exame, o que é considerado normal para a idade do seu filho.

Os dados analisados nesta pesquisa contribuirão para o diagnóstico e possíveis tratamentos referentes aos sintomas do nascimento dos dentes do seu filho, além de orientar dentistas, mães e familiares sobre o que fazer quando essas alterações estão presentes.

Os riscos da pesquisa são considerados mínimos, e podem ser a vergonha em responder às perguntas, assim como o cansaço para preencher o questionário. Para diminuir esses riscos, os questionários não serão identificados com o seu nome, nem o nome da sua criança, e serão curtos e rápidos. Sua participação será voluntária, sem envolver nenhum custo ou remuneração. E caso haja vontade, você pode desistir em qualquer momento, sem que haja prejuízo ou danos a você ou seu filho(a). A identificação dos participantes da pesquisa será mantida sob caráter confidencial, assim como informações relacionadas à privacidade dos participantes. As informações serão utilizadas exclusivamente para estudo e pesquisa.

Esse documento será obtido em duas vias, uma que ficará aos cuidados da pesquisadora e outra em sua posse. Em caso de dúvidas pode entrar em contato comigo pelo telefone (35) 98817-7306 ou e-mail biancaspuri@hotmail.com, ou em caso de dúvidas sobre as questões éticas dessa pesquisa, entrar em contato com o Comitê de Ética em Pesquisa da Universidade Federal de Minas Gerais (COEP-UFMG) pelo telefone: (31) 3409-4592 ou e-mail coep@prpq.ufmg.br.

COEP-UFMG – Comissão de Ética em Pesquisa da UFMG. Av. Antônio Carlos, 6627. Unidade Administrativa II – 2º andar – Sala 2005. Campus Pampulha. Belo Horizonte, MG – Brasil. CEP: 31270-901. E-mail: coep@prpq.ufmg.br. Tel:34094592

Assinatura do pesquisador

Por este documento, eu, _____, autorizo a avaliação clínica do menor _____, nascido em ____/____/____, pelo qual sou responsável. Fui informado (a) que receberei um questionário para responder. Dou minha permissão para que estes dados sejam utilizados para fins de pesquisa e ensino.

Belo Horizonte, ____ de _____ de ____.

Assinatura da mãe ou responsável

APÊNDICE B – Ficha de avaliação da cronologia de erupção



Faculdade de Odontologia

Nome da criança: _____

Data do exame: ___/___/___ Idade da criança: _____ nº exame: _____

CRONOLOGIA DE ERUPÇÃO

Assinalar a idade em que o dente irrompeu em boca. 0- Não irrompido 1- Até 1/3 de coroa irrompida 2- De 1/3 até 1/2 coroa irrompida 3- 1/2 coroa irrompida até coroa completamente irrompida 4 – Coroa completamente irrompida

[illegible]

APÊNDICE C – Caderneta de saúde da criança



Faculdade de Odontologia

Data: ____/____/____

CADERNETA DE SAÚDE DA CRIANÇA

Nome: _____

Sexo: () Masculino () Feminino

Data do parto: ____/____/____ Número de semanas: _____

Peso ao nascimento: _____ Estatura ao nascimento: _____

Seu filho apresenta algum problema de saúde? Se sim, qual? _____

Seu filho já foi internado? _____

Classificação: AIG () PIG () GIG ()

UTI: () Sim () Não Quanto tempo: _____

Uso de tubo endotraqueal: () Sim () Não Quanto tempo? _____

Incubadora: () Sim () Não Quanto tempo? _____

Uso de sonda nasal: () Sim () Não Quanto tempo? _____

Má formação craniofacial: () Sim () Não

Doença óssea metabólica: () Sim () Não

Teve infecções? () Sim () Não Quais? _____

Medicação regular do bebê: _____

Dosagem de fósforo sérico mais baixa: Id.Cron. _____ Id. Cor. _____

Dosagem de Fosfatase alcalina mais alta : Id.Cron. _____ Id. Cor. _____

Data de introdução da dieta enteral: ____/____/____ Qualidade () LM () FI

Tempo de nutrição parenteral: _____

Outras intercorrências: _____

Seu filho recebeu aleitamento materno? _____

Por quanto tempo? _____

APÊNDICE D - Questionário socioeconômico

Faculdade de Odontologia

Pedimos às mães ou responsáveis que respondam ao questionário abaixo. Não há resposta certa ou errada; sintam-se à vontade para responder da maneira que quiserem. Agradecemos sua participação.

I - Identificação

1- Quem responde o questionário: () Mãe () Pai ()

Outros: _____

2- Nome da criança:

3- Menino () Menina ()

4- Dia em que seu filho nasceu: ____/____/____

5- Nome da mãe: _____

6- Dia em que a mãe nasceu: ____/____/____

7- Idade da mãe: _____

8- Endereço: _____

Bairro: _____

Cidade: _____ Estado: _____

CEP: _____

9- Telefone: () _____ / () _____

10-E- mail: _____

II – Educação Materna e Paterna

11-Até que série a mãe estudou?

() 1ª a 4ª séries () 5ª a 8ª séries () Ensino médio

() Ensino Superior () Nunca foi a escola () Não sabe

12-Até que série o pai estudou?

- () 1ª a 4ª séries () 5ª a 8ª séries () Ensino médio
() Ensino Superior () Nunca foi a escola () Não sabe

III – Tamanho da família e renda

13-Quantas pessoas moram na sua casa? _____

14-Qual a renda mensal familiar? _____

- () Até 1 salário mínimo () 1 a 2 salários mínimos
() 3 a 4 salários mínimos () 5 a 6 salários mínimos
() acima de 7 salários mínimos () Não sabe

15-Você ou algum membro da família recebe algum tipo de auxílio do governo?
(Ex: bolsa família, bolsa escola,...).

- () Sim. Valor: R\$_____ Qual?_____ () Não

IV – Habitação/ Saneamento

16-Quanto cômodos tem a casa em que você mora?_____.

17-Há tratamento da água para beber?

- () Filtrada () Mineral () Fervida () Coada () Sem tratamento
() Não sabe

18-Como é o sanitário em sua casa?

- () Interno () Externo () Com descarga () Sem descarga
() Não tem sanitário

19-Coleta do lixo:

- () Coletado pela prefeitura () Enterrado () Queimado () Terreno baldio () Rio/ Córrego

20- A rua em que mora é asfaltada?

- () Sim () Não

21- Você possui algum desses aparelhos em casa?

() Fogão a gás. Nº _____	() Geladeira. Nº _____	() Rádio. Nº _____	() Televisão. Nº _____	() Microcomputador. Nº _____
------------------------------	----------------------------	------------------------	----------------------------	----------------------------------

() Celular. Nº ____	() Forno Micro-ondas. Nº ____	() Máquina de lavar roupas. Nº ____	() Máquina de lavar louças. Nº ____	() Aparelho de som. Nº ____
-------------------------	--------------------------------------	---	--	---------------------------------

22-Você possui algum desses veículos?

() Carro. Nº ____ () Motocicleta. Nº ____ () Bicicleta. Nº ____

V – Saúde materna

23- A gravidez foi planejada? () Sim () Não

24-Quantas consultas de pré-natal foram realizadas? _____.

25- Recebeu orientações de higiene bucal durante esse período?

() Sim () Não () Não realizou pré-natal

26- Este é seu primeiro filho?

() Sim () Não

27- Com qual idade você teve o primeiro filho? _____.

28- Você considera ter tido uma alimentação saudável durante a gravidez?

() Sim () Não

29-Qual tipo de trabalho exerceu durante a gravidez?

30-Durante a gravidez fez ingestão de álcool, drogas ou tabaco?

() Álcool () Tabaco () Drogas () Não ingeriu.

31- Durante a gravidez teve alguma doença?

() Sífilis () HIV () Tuberculose () Dengue () Chikungunya
() Zika () Toxoplasmose () Outra _____ () Não teve

32- Se teve Sífilis, o seu filho nasceu com sífilis congênita?

() Sim () Não

33- Possui alguma das doenças abaixo?

() Hipertensão arterial () Cardiopatia () Diabetes () Anemia

() Outra _____ () Não possui comprometimento sistêmico

34-Fez uso de algum medicamento durante a gestação?

() Sim. Qual:_____ () Não

VI– Aleitamento

35-Como foi o parto? () Normal () Cesariana () Não sabe

36-Foi utilizado o fórceps durante o parto? () Sim () Não

37-Houve traumas/complicações durante o nascimento?

38-Você recebeu instruções sobre a amamentação do bebê?

() Sim () Não

39- Seu filho(a) amamenta no seio?

() Sim. Até qual idade?_____ () Não

40- Seu filho(a) usa mamadeira? () Sim () Não

41-O que você coloca na mamadeira?

42-Qual a frequência de amamentação do seu filho(a)?_____

43- Seu filho(a) tem dificuldades em se alimentar? () Sim () Não

44-Seu filho(a) faz uso de chupeta? () Sim () Não

45-Seu filho(a) usa mordedores de borracha? () Sim () Não

46-Você já fez higienização bucal do seu filho(a)? () Sim () Não

Observações da mãe ou responsável:_____

_____.

Observações do pesquisador:_____
