UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
Centro de Ciência da Saúde
Faculdade de Odontologia
Departamento de Odontopediatria e Ortodontia

Daniel Ibrahim Brito

PREVALÊNCIA DE MALOCLUSÕES E DESORDEM TEMPOROMANDIBULAR E SUA CORRELAÇÃO EM CRIANÇAS DE 6 A 12 ANOS DE IDADE

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2008

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Dissertação de Mestrado apresentada ao Programa de Pós-Graduação em Odontologia (Odontopediatria), Faculdade de Odontologia, Universidade Federal do Rio de Janeiro, como parte dos requisitos necessários à obtenção do título de Mestre em Odontologia (Odontopediatria).

Orientador:
Prof. Dr. Rogério Gleiser

Rio de Janeiro
2008

FOLHA DE APROVAÇÃO

DANIEL IBRAHIM BRITO

"PREVALÊNCIA DE MALOCLUSÕES E DESORDEM TEMPOROMANDIBULAR E SUA CORRELAÇÃO EM CRIANÇAS DE 6 A 12 ANOS DE IDADE"

Dissertação de Mestrado submetida ao Programa de Pós-Graduação em Odontologia(Odontopediatria), Faculdade de Odontologia, Universidade Federal do Rio de Janeiro-UFRJ, como parte dos requisitos necessários à obtenção do título de Mestre em Odontologia(Odontopediatria).

Rio de Janeiro, 08 de dezembro de 2008.

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Dedico este trabalho às mil e duzentas crianças que participaram dele,
pela sua boa vontade e alegria.

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O que for a profundeza do teu ser, assim será teu desejo.
O que for o teu desejo, assim será tua vontade.
O que for tua vontade, assim serão teus atos.
O que forem teus atos, assim será teu destino.

Brihadaranyaka Upanishad IV, 4.5

RESUMO

BRITO, Daniel Ibrahim. **Prevalência de maloclusões e desordem temporomandibular e sua correlação em crianças de 6 a 12 anos de idade.** Rio de Janeiro, 2007. Dissertação (Mestrado em Odontologia, área de concentração em Odontopediatria) Faculdade de Odontologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2007.

Maloclusões são apontadas como agentes causadores ou predisponentes para Desordens Temporomandibulares (DTM). Suas relações têm sido estudadas, mas os resultados são frágeis e pouco precisos. Este estudo objetivou testar associações específicas entre estas condições. Mil e duzentos escolares da rede pública de ensino de Juiz de Fora, MG, foram examinados por dois odontopediatras treinados e calibrados. Foram coletados dados referentes a sinais e sintomas de DTM (limitação de abertura bucal, dor à abertura passiva, deflexão, luxação, estalido e crepitação articulares, dor articular à palpação lateral e posterior, dor à palpação dos músculos masseter, temporais anterior, médio e posterior, e regiões mandibular posterior e submandibular) e fatores oclusais (relação molar, mordidas abertas anterior e posterior, mordidas cruzadas anterior e posterior, apinhamentos superior e inferior, sobremordida e sobressaliência). Como referência para o exame, foi adotado o Research Diagnostic Criteria (RDC/TMD) Axis I, e a Faces Pain Scale - Revised para quantificação da dor. Os fatores oclusais foram categorizados a partir do Index of Orthodontic Treatment Need (IOTN), grau 3. Responsáveis foram entrevistados para fornecer informações referentes à etnia, hábitos parafuncionais, bruxismo, dor de cabeça e fadiga ou dor mastigatória freqüentes, além de assinarem o Termo de Consentimento Livre e Esclarecido (TECLE). Análises descritivas e estatísticas em modelos de regressão logística uni e multivariados foram realizadas a fim de testar as hipóteses de associação. Altas prevalências foram encontradas tanto para maloclusões quanto para componentes de DTM, com diferenças entre sexos, idades e etnias. Algumas relações entre fatores oclusais e componentes de DTM foram observados, entretanto contribuições mais consistentes à DTM vieram da faixa etária, etnia, hábitos parafuncionais e bruxismo. Dor ou fadiga mastigatória e dor de cabeça mostraram-se também fortemente associados à DTM.

Palavras-chave: crianças, dentição mista, maloclusões, desordens temporomandibulares.

ABSTRACT

BRITO, Daniel Ibrahim. **Prevalência de maloclusões e desordem temporomandibular e sua correlação em crianças de 6 a 12 anos de idade.** Rio de Janeiro, 2007. Dissertação (Mestrado em Odontologia, área de concentração em Odontopediatria) Faculdade de Odontologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2007.

Malocclusions are pointed as causal or predisposing agents to Temporomandibular Disorders (TMD). Their relationship has been studied but results are fragile and lack accuracy. This study intended to test specific associations between these conditions. Twelve hundred schoolchildren from public schools of Juiz de Fora, MG, were examined by two trained and calibrated pediatric dentists. Data about TMD (mouth opening limitation, pain on passive opening, deflection, luxation, joint clicking and crepitus, joint pain on lateral and posterior palpation, and pain on palpation of the muscles masseter, anterior, medium and posterior temporal, and mandibular posterior and submandibular regions) and malocclusions (molar relationship, anterior and posterior openbite, anterior and posterior crossbite, upper and lower crowding, excessive overbite and overjet) were collected. The Research Diagnostic Criteria (RDC/TMD) Axis I was used as reference for examination, and the Faces Pain Scale – Revised to quantify pain. Occlusal traits were categorized according to the Index of Orthodontic Treatment Need (IOTN) grade 3. Parents were interviewed to report information on ethnics, frequent parafunctional habits, bruxism, headache and chewing pain or fatigue, besides providing the signed consent form. Descriptive and statistical analyses (uni and multivariated logistic regression models) were performed to test association hypothesis. High prevalence of malocclusions and TMD features were found, with differences on sex, age and ethnicity. Some relations between occlusal traits and TMD components were observed, although stronger and more consistent contributors to TMD were age, ethnicity, parafunctional habits and bruxism. Chewing pain or fatigue and headache has also shown to be strongly associated to TMD.

Keywords: children, mixed dentition, malocclusion, temporomandibular disorders.

LISTA DE FIGURAS

ARTIGO 1

Figure 1: Mean overbite and overjet *versus* Age ……..…… 11
Figure 2: Mean midline misalignment *versus* Age ……..…… 12
Figure 3: Percentages of midline misalignment (in millimeters) per molar relationship. The asymmetrical molar relationships (I + II, I + III, II + III) presented higher levels of misalignment ……. 12
Figure 4: Mean upper and lower crowding *versus* Age …….. 13

ARTIGO 2

Figure 1: The faces Pain Scale – Revised ……... 22
Figure 2: Percentage of TMD per age ……. 25
Figure 3: Percentage of reported traits per age …….. 25

ARTIGO 3

Figure 1: Percentages of significant traits, per dentition stage. Only statistically significant changes were included (p<.05) ……. 39
Figure 2: Percentages of significant traits, per ethnicity. Presented results are all statistically significant (p<.05) …….. 40

LISTA DE QUADROS E TABELAS

ARTIGO 1

Table 1: Prevalence of malocclusions in Brazilian children ……. 8
Table 2: Orthodontic treatment need in several populations, according to Lunn et al. …… 9
Table 3: Criteria for occlusal traits and treatment need evaluation …… 10
Table 4: Overall results and statistical significant differences ……... 11

ARTIGO 2

Table 1: Criteria for TMD signs and symptoms and interview traits …… 22
Table 2: Sample age, by sex (n=1200) ……... 23
Table 3: Percentages of TMD signs and symptoms by sex …… 24
Table 4: Logistic regression models for possible TMD contributing factors. TMD was considered if any of the examined signs or symptoms was present ……. 26
Table 5: Univariated logistic regression for possible TMD outcomes. TMD was considered if any of the examined signs or symptoms was present …… 27

ARTIGO 3

Table 1: Statistically significant relationships found in literature between TMD signs or symptoms and possible contributors or outcomes in children ……..37
Table 2: TMD signs and symptoms total prevalence and differences among mixed dentition stages (%) …… 40
Table 3: Significant relationships between TMD signs or symptoms and possible contributors at the univariated logistic regression models. Numbers are the expected value and p-value (in parenthesis). Only statistically significant results are shown …… 41
Table 4: Significant relationships between TMD signs or symptoms and parental reported outcomes at the univariated logistic regression models. Numbers are the expected value and p-value (in parenthesis). Only statistically significant results are shown …… 42

Table 5: Significant relationships between TMD signs or symptoms and possible contributors at the multivariated logistic regression models. To each TMD trait, all significant or close to significant contributor at the univariated models were included. Analyses were controlled for dentition stages when this was significant. Numbers are the expected value and p-value (in parenthesis) …….. 44

LISTA DE ABREVIATURAS

ATM	Articulação Temporomandibular
CNS	Conselho Nacional de Saúde
DHC	Dental Health Component
DTM	Desordem Temporomandibular
FO	Faculdade de Odontologia
IESC	Instituto de Estudos de Saúde Coletiva
IOTN	Index of Orthodontic Treatment Need
lb	libra
MG	Minas Gerais
OMS	Organização Mundial da Saúde
RDC/TMD	Research Diagnostic Criteria for Temporomandibular Disorders
SPSS	Statistical Package for Social Sciences
SUS	Sistema Único de Saúde
TECLE	Termo de Consentimento Livre e Esclarecido
TMD	Temporomandibular Disorders
TMJ	Temporomandibular Joint
UBS	Unidade Básica de Saúde
UFF	Universidade Federal Fluminense
UFJF	Universidade Federal de Juiz de Fora
UFRJ	Universidade Federal do Rio de Janeiro
UNIGRANRIO	Universidade do Grande Rio
WHO	World Health Organization

SUMÁRIO

1 INTRODUÇÃO 1
2 OBJETIVOS 3
2.1 OBJETIVO GERAL 3
2.2 OBJETIVOS ESPECÍFICOS 3
3 DELINEAMENTO DA PESQUISA 4
4 ARTIGOS SUBMETIDOS 6
4.1 ARTIGO 1 7
4.2 ARTIGO 2 19
4.3 ARTIGO 3 34
5 DISCUSSÃO 51
6 CONCLUSÃO 54
REFERÊNCIAS BIBLIOGRÁFICAS 55
ANEXOS 59

1 INTRODUÇÃO

Distúrbios relacionados às articulações temporomandibulares (ATM) e suas estruturas relacionadas, chamados genericamente Desordens Temporomandibulares (DTM), reúnem uma série de condições que resultam em limitação funcional, ruídos articulares, e sensibilidade muscular e/ou articular. Ainda genericamente, são agrupados em desordens articulares ou musculares (Ash, Ramfjord *et al.*, 2001).

Apesar de menos freqüentes que na população adulta, em que índices de prevalência chegam a 70% (Ash, Ramfjord *et al.*, 2001), as desordens temporomandibulares estão presentes também em crianças e adolescentes. Sua prevalência, entretanto, varia entre os diversos estudos, possivelmente por diferenças entre as populações estudadas, idade dos sujeitos, métodos utilizados ou técnica de diagnóstico (Deng, Fu *et al.*, 1995; Stockstill, Bowley *et al.*, 1998).

Para OKESON (Okeson, 2000), o sistema mastigatório funciona, em condições ideais, sem provocar qualquer tipo de transtorno ou desconforto. Ocasionalmente, esta função pode ser dificultada ou interrompida por um determinado evento, que geralmente é tolerado pelo sistema sem conseqüências, não gerando evidências clínicas. No entanto, se algum evento ultrapassa a tolerância fisiológica desse sistema, cria-se um distúrbio cuja resposta é refletida em diferentes sinais ou sintomas.

São raros os casos que exibem sinais ou sintomas moderados ou severos, implicando em tratamento funcional ainda na infância (Pilley, Mohlin *et al.*, 1992; Widmalm, Christiansen, Gunn *et al.*, 1995; Thilander, Rubio *et al.*, 2002; Bonjardim, Gaviao *et al.*, 2003). Por estarem relacionadas a diversas estruturas, as DTM têm etiologia multifatorial. Assim, assume-se que causas comuns podem não estar presentes com freqüência suficiente para o estabelecimento preciso de uma relação causa-efeito. Fatores traumáticos crônicos ou agudos, fatores psicológicos e maloclusão são descritos como prováveis causadores ou contribuintes das DTM (Ash, Ramfjord *et al.*, 2001). Entretanto, sua sugerida associação com problemas oclusais e a possibilidade de progressão do quadro com o aumento da idade tornam

a idéia de uma interceptação ortodôntica precoce desejável, assim que for possível predizer a longo prazo essa relação para cada paciente.

Diversos estudos têm sido realizados com esta intenção (artigo 3, Table 1), mas parece não haver, ainda, um consenso sobre o significado de seus achados. Apesar de várias populações terem sido estudadas, não é vasto o número de trabalhos desta natureza com indivíduos brasileiros na literatura consultada (Teixeira, Marcucci *et al.*, 1999; Garcia e Souza, 2001; Pereira e Conti, 2001; Conti, Freitas *et al.*, 2003; Castelo, Gaviao *et al.*, 2005; Delboni e Abrão, 2005; Bertoli, Antoniuk *et al.*, 2007), alguns relacionando hábitos parafuncionais ou tratamento ortodôntico a DTM, e não exatamente maloclusões.

Por sua vez, as maloclusões possuem a terceira maior prevalência entre as patologias bucais, perdendo apenas para a cárie e a doença periodontal. Encontram-se, portanto, na terceira posição da escala de prioridades quanto aos problemas odontológicos de saúde pública mundial (Oms, 1991). Estudos de prevalência têm sido realizados em crianças em fase de dentição mista, mas também é limitado o número de informações sobre condições oclusais específicas, com amostras brasileiras (Artigo 1, *Tables 1 - 2*), especialmente a respeito de avaliação da necessidade de tratamento.

Este trabalho objetiva, portanto, produzir dados que permitam entender melhor a implicação de maloclusões sobre DTM em indivíduos jovens, em fase de dentição mista, ao mesmo tempo em que fornecerá informações epidemiológicas de ambas.

2 OBJETIVOS

2.1 OBJETIVO GERAL

Avaliar a prevalência e a relação entre sinais e sintomas de DTM e problemas oclusais numa população de escolares de 6 a 12 anos de idade da cidade de Juiz de Fora, Minas Gerais, Brasil.

2.2 OBJETIVOS ESPECÍFICOS

2.2.1 Determinar a prevalência de determinados padrões oclusais nesta população – a saber: relação molar, trespasses vertical e horizontal, mordidas abertas e cruzadas anteriores, mordidas abertas e cruzadas posteriores, apinhamentos superior e inferior e alinhamento de linha média – relacionando-os com necessidade de tratamento ortodôntico.

2.2.2 Determinar a prevalência de sinais e sintomas de DTM nesta população – a saber: limitação de abertura bucal, desvio de abertura, luxação articular, dor articular em abertura passiva, estalido e crepitação articulares, dor articular à palpação lateral e posterior, dor nos músculos masseter, temporais anterior, médio e posterior e das regiões submandibular e mandibular posterior à palpação – e sua possível relação com idade, sexo, etnia, hábitos parafuncionais, bruxismo e dor de cabeça.

2.2.3 Identificar as associações existentes entre diferentes sinais e sintomas de DTM e fatores oclusais, incluindo maloclusões, nesta população.

3 DELINEAMENTO DA PESQUISA

Este trabalho foi aprovado pelo Comitê de Ética do Instituto de Estudos em Saúde Coletiva (IESC/UFRJ) sob o processo 51/2007 (Anexo 1). Ele atende ao estabelecido na resolução n° 196/96 do Conselho Nacional de Saúde (CNS). Tratou-se de um estudo transversal e observacional (não experimental), em que uma amostra da população foi avaliada em um momento único do tempo, sem intervenção do pesquisador nos objetos estudados. Ele foi dividido em duas fases principais: a primeira envolveu exame dos sujeitos e entrevista com seus responsáveis. Foram coletados dados sobre a prevalência de maloclusões e sinais e sintomas de DTM em uma amostra de crianças em fase de dentição mista. A segunda analisou os dados em busca de correlações específicas entre as variáveis pesquisadas.

Para suficiente consistência no cruzamento de dados, um número de mil e duzentas crianças foi calculado, uma vez que baixas prevalências das variáveis eram esperadas, isoladamente. A julgar pelos números da Secretaria Municipal de Educação de Juiz de Fora, sabe-se que um número acima de 400 sujeitos escolhidos aleatoriamente é estatisticamente representativo desta população. Para ser incluída, a criança deveria: estar matriculada em escola da rede pública de ensino da cidade de Juiz de Fora, MG, ter entre 6 e 12 anos de idade, e ter assinado por seu responsável o Termo de Consentimento Livre e Esclarecido (TECLE) (Anexo 3). Dentre estas, seriam excluídas aquelas que tivessem recebido ou estivessem recebendo tratamento ortodôntico de qualquer natureza, ou manifestassem ao (à) examinador (a) o desejo de não participar do estudo. Também foram excluídas da segunda fase do estudo (cruzamento de dados) as crianças com problemas sistêmicos.

Foi sorteada uma amostra em clusters: um sorteio definiu as escolas participantes. Nestas, eram sorteadas as turmas a serem examinadas até que se completasse a amostra de 1220 sujeitos, sendo 20 para um estudo piloto realizado antes do início do estudo. Também antes do início do estudo, foram contatadas as autoridades das escolas cujos alunos participaram do estudo, para esclarecimentos e autorização. De acordo com a Secretaria Municipal de Educação de Juiz de Fora,

o diretor de cada escola teria autonomia para permitir ou não a realização do estudo, o que dispensou um documento de pacto entre a Prefeitura e o pesquisador. O estudo piloto avaliou e reavaliou crianças e responsáveis com a intenção de testar o exame e a entrevista, testar sua reprodutibilidade e concordância entre examinadores e dar base ao planejamento da coleta de dados, fornecendo informações como o tempo gasto com o exame e entrevista.

Nas escolas, ao apresentar-se a cada turma de crianças, o pesquisador dizia claramente que a participação não era obrigatória. Quem não desejasse, bastaria avisar ao professor. Aquelas dispostas a participar eram examinadas em um ambiente reservado da escola, geralmente uma sala de aula vazia, após escovação. O exame era realizado de acordo com os prontuários apresentados nos Anexos 4 e 6; detalhes técnicos são explicitados nos Artigos 1 e 2 desta dissertação. Os responsáveis deveriam concordar e assinar o Termo de Consentimento Livre e Esclarecido (TECLE) (Anexo 3). Uma entrevista era realizada, seguindo o exposto no Anexo 7.

Os dados coletados durante a fase de exame e entrevista foram posteriormente analisados estatisticamente. Testes de concordância inter e intra-examinadores utilizaram dados da fase piloto. Análises descritivas e de concordância entre variáveis sucederam o término da coleta. Algumas variáveis mostraram-se, no decorrer do estudo, inaplicáveis em crianças na idade objetivada. Como sua confiabilidade ficou comprometida, elas foram excluídas.

Um compromisso de acolhimento dos pacientes para tratamento dos problemas observados durante o estudo foi firmado com a Universidade Federal de Juiz de Fora (UFJF), através do Termo de colaboração (Anexo 2). Um pedido era feito e entregue ao responsável para que o dentista da Unidade Básica de Saúde (UBS) local encaminhasse formalmente o paciente para tratamento na UFJF.

O material produzido a partir dos dados coletados foi agrupado em três artigos, colocados no corpo da presente dissertação. Resumos executivos deste texto, com seus dados descritivos explicitados, serão entregues às Secretarias de Educação e de Saúde do município de Juiz de Fora, MG, e às diretorias das escolas envolvidas. Uma cópia integral ficará disponível na biblioteca da Universidade Federal de Juiz de Fora, além do arquivamento de praxe.

4 ARTIGOS SUBMETIDOS

Artigo 1:

Occlusion traits and orthodontic treatment need among 6- to 12-years-old Brazilian schoolchildren.

Brito, DI; Kuchler, EC, Gleiser, R.

(Submetido à Brazilian Oral Research – Anexo 9)

Artigo 2:

TMD prevalence and associated factors in Brazilian children.

Brito, DI; Kuchler, EC, Gleiser, R.

(Submetido à The Angle Orthodontist – Anexo 10)

Artigo 3:

Associations of TMD signs and symptoms and occlusal factors in children in mixed dentition

Brito, DI; Gleiser, R.

4.1 ARTIGO 1

Occlusion traits and orthodontic treatment need among 6- to 12-years-old Brazilian schoolchildren

Daniel Ibrahim Brito

Erika Calvano Kuchler

Rogério Gleiser

Abstract

The aim of this study was to evaluate occlusion traits in 6- to 12-years-old Brazilian schoolchildren and to classify the sample for orthodontic need according to the IOTN's dental health need grades. Twelve hundred children were randomly selected from state schools in the city of Juiz de Fora, Brazil. Two calibrated examiners observed occlusion traits: midline alignment, overbite, overjet, crowding, molar relationship, anterior and posterior crossbites and open bites. Ethnicity was included in some analysis. Some traits were categorized according to IOTN Dental Health Component. Of the examined children, 51.8% were boys; 46.2% were white, 37.2% mixed, 16.3% black and .3% other. Midline misalignment was found in 6.4% of the subjects; increased overbite in 19.1%; increased overjet in 31.1%; maxillary crowding 8.4% and mandibular in 14.1%; anterior cross bite in 14.2%; posterior cross bite in 15.2%; anterior open bite in 13.7% and posterior in .8%; 27.9% had Angle Class II or III malocclusions. There was an association of posterior crossbite to 6 mm or more anterior open bite. Statistically significant differences between males and females were found for increased overbite, anterior open bite, midline misalignment and crowding in the lower arch. Among ethnic groups, differences were found for crowding ($p<.05$). The number of treatment-needed traits did not change with age. In

a general comprehensive analysis, it was observed that 69.5% of the sample had from moderate need to treatment required.

Keywords: child, mixed dentition, malocclusion

Introduction

Some occlusal traits, defined as malocclusions, are considered to be a problem in public health. Their implications may vary from aesthetic impact to functional disorders, both with quality of life inference (1). According to the World Health Organization (WHO), they figure as third amongst dental problems, behind caries and periodontal disease and must receive periodical epidemiological evaluation. Such information is crucial for planning assistance programs (1).

Table 1: Prevalence of malocclusions in Brazilian children.

Reference	Subjects		Malocclusion (%)								
	Sample	Age (years)	Total	Open bite		Cross bite		Crowding	Increased Overjet	Increased Overbite	Midline misalignment
				Ant	Post	Ant	Post				
Frazão *et al.* (2002)	985	5	48.9	---	---	---	---	---	---	---	---
		12	71.3	---	---	---	---	---	---	---	---
Marques *et al.* (2005)	333	10 - 14	61.9	3.3	---	1.0	---	37.8	37.5	---	---
Pereira (2005)	39	12	---	43.6	23,1	5.1	15.4	58.9	23.1	35.9	41.1
Jahn (2005)	5779	12	37								
Suliano *et al.* (2007)	173	12	82.1	---	---	---	---	---	---	---	---
Brito *et al.* (2008)	407	9 - 12	80.8	7.8	6.1	10.1	19.2	45.5	29.7	10.8	---

During orthodontic services planning, it is also important to consider the real need of treatment, not only malocclusion prevalence. Indexes of treatment need were developed for such purpose (2). The most widely used is probably the Index of Orthodontic Treatment Need (IOTN) (3) which Dental Health Component (DHC) categorizes malocclusions into grades of need, from 1 (*none*) to 5 (*very great*). In

1993, Lunn *et al*. (4) suggested three levels based on IOTN: grades 1 and 2 (no treatment need); grade 3 (moderate need); and grades 4 and 5 (great need). Some studies have been realized in Brazilian populations to evaluate malocclusions prevalence (Table 1), and only a few defined treatment needs (Table 2).

Table 2: Orthodontic treatment need in several populations, according to Lunn et al. (4)

Reference	Country	Sample (n)	Age (years)	IOTN Dental Health Component (DHC)		
				none or little	moderate	great
				1 – 2	3	4 – 5
Miguel, 1998	Brazil	1 182	12	51.1 %	22.2 %	26.7 %
Wang *et al*., 1999	China	765	12	30.0 %	33.0 %	37.0 %
Üçüncü and Ertugay, 2001	Turkey	250	11 - 14	37.2 %	24.0 %	38.8 %
Mugonzibwa *et al*., 2004	Tanzania	346	6 - 11	40.7 %	37.6 %	21.7 %
Dias and Gleiser, 2006	Brazil	407	9 - 12	42.3 %	23.6 %	34.2 %

The aim of this study was therefore to describe occlusion traits among 6- to 12-years-old Brazilian schoolchildren and categorize some of the results according to malocclusions treatment need.

Materials and Method

This study was approved by an Institutional Review Board (IESC-UFRJ). Each child was asked about his/her intention to participate before the examination. A pilot version of the examination was tested in 20 children before the study started. Twelve hundred children were randomly selected to participate and this number was representative of the public schools' students from this population. The authors first selected the participating schools from a complete list obtained from the City Educational Department. In the schools, some groups were selected (clusters) until 1200 examinations were performed. Care was taken to obtain similar number of children by age. The guardian informed the examiner about previous orthodontic treatments (exclusion criterion), the child's ethnic group and signed the informed consent term.

Exams were performed by two trained and previously calibrated pediatric dentists (D.I.B., E.C.K.). Agreement among examiners was high (.937 to 1.0). Occlusion traits were observed and later categorized as in Table 3. IOTN DHC (3)

was used to evaluate the treatment need; in such cases, *Grade 3* (moderate need) was adopted as the borderline treatment need. Statistical analyses were performed using SPSS 13.0 for Windows (SPSS Inc.).

Table 3: Criteria for occlusal traits and treatment need evaluation.

Trait	Measurement	Treatment needed
Molar relationship (each side)	Relationship between permanent 1st molars or deciduous 2nd molars	Angle classes II or III or misalignment of deciduous 2nd molars' distal surface
Anterior cross bite	Palatine displacement of any anterior upper tooth in relation to the lower	When present
Posterior cross bite	Palatine displacement of any posterior upper tooth in relation to the lower	When present
Posterior open bite	Any fully erupted posterior tooth below the occlusal plan	When present
Crowding	Calculated by adding the distance (in mm) between the clinical contact points of the two adjacent teeth	3 or more mm*
Overjet	Horizontal relationship between upper and lower incisors' incisal edges	Increased overjet: 4 or more mm* Cross bite: 1 mm or more*
Overbite	Vertical relationship between upper and lower incisors' incisal edges	Increased overbite: 4 or more mm* Open bite: 3 or more mm*
Midline alignment	Relationship between upper and lower midlines	Misalignment of 3 or more mm*

* according to IOTN DHC grade 3 to 5 (3); measurement was performed with a millimeter ruler.

Results

The sample comprised a comparable number of boys (51.8%) and girls. Ethnical background could be divided into white (46.2%), mixed (37.2%), black (16.3%) and other (.3%). Similar amounts of children were taken for each age. Some children had missing or not fully erupted teeth and related measurements could not be performed. Overall results are shown in Table 4; 21.3% had Angle class II malocclusion and 6.6% had class III. Significant statistical differences were found between sexes. Lower crowding, increased overbite and midline misalignment were more common in boys, while anterior open bite was predominant in girls. Differences were also found among ethnical groups. Upper and lower crowding was more frequent in white children than other races.

Table 4: Overall results and statistically significant differences.

	Class II / III	Anterior crossbite	Posterior crossbite	Anterior open bite	Posterior open bite	Crowding		Increased Overjet	Increased Overbite	Midline misalignment	Any malocclusion
						Upper	Lower				
Total	27.9%	14.2%	15.2%	13.7%	0.8%	8.4%	14.1%	31.1%	19.1%	6.4%	69.5%
Males				11.7% [a]			15.8% [b]		20.7% [a]	7.6% [c]	
Females				15.8% [a]			12.2% [b]		17.2% [a]	4.9% [c]	
White						11.6% [d]	18.2% [e]				
Mixed						5.9% [d]	11.9% [e]				
Black						7.1% [d]	8.9% [e]				

a Pearson's R = .023; Spearman correlation = .024
b Fisher's exact test = .045
c Fisher's exact test = .034
d Pearson's R = .040; Spearman correlation = .027
e Pearson's R = .005; Spearman correlation = .004

Figure 1 shows the data found when overbite and overjet (means) were stratified by age (Figure 1). Both appear to increase until age 10 and then stabilize around 3.0 mm for overjet and 2.5 mm for overbite. Mean midline misalignment increases from age 6 (0.60 mm) to 9 (0.8 mm); a peak of 1.15 mm is observed by age 10, and by age 11 it returns to a lower level (mean 0.8 mm) as shown in Figure 2. The analysis of midline misalignment related to molar relationship allows to observe a tendence of severer misalignment in asymmetrical molar patterns (Figure 3).

Figure 1: Mean overbite and overjet *versus* Age.

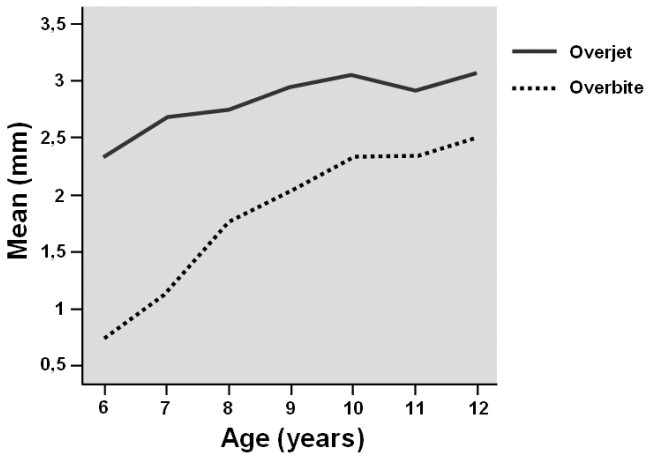


Figure 2: Mean midline misalignment *versus* Age.

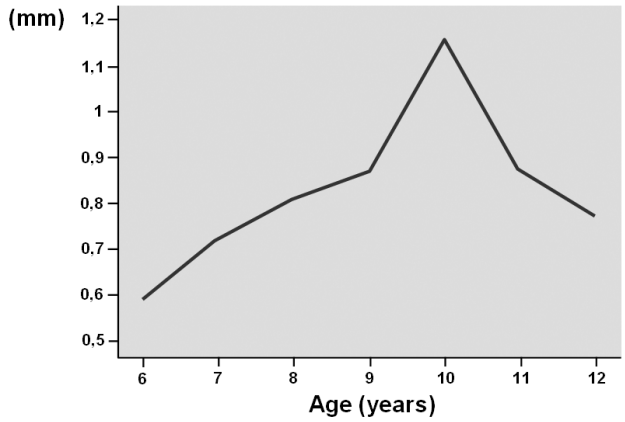


Figure 3: Percentages of midline misalignment (in millimeters) per molar relationship. The asymmetrical molar relationships (I + II, I + III, II + III) presented higher levels of misalignment.

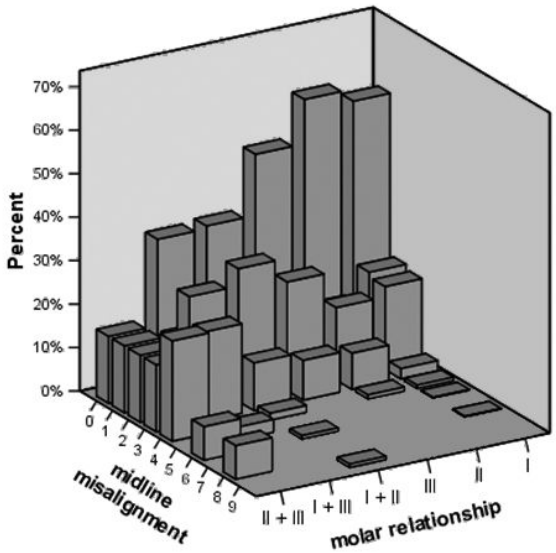
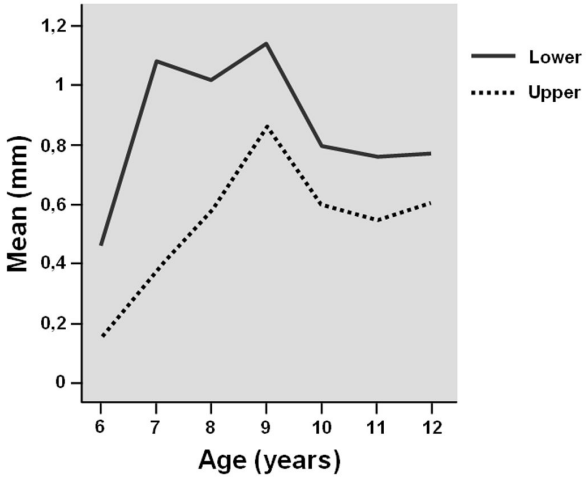


Figure 4 shows the cross tab of mean upper and lower crowding. They increased together as children reach 9 years (upper) and 7 years (lower), and then decreased and both stabilized at 10 years (means 0.6 and 0.8 mm).

Figure 4: Mean upper and lower crowding *versus* Age.



It was found an increased association of posterior crossbite with 6 mm or more anterior open bite (Pearson's R = .000; Spearman correlation = .000). After full categorization of all traits according to Table 3, they were added for comparison with age. This resulted in no significant associations. Age groups were also compared for presence of any of the defined treatment needs and mean number of treatment needed traits. No statistical differences were found. It was also observed that 69.5% of the sample presented from moderate need to treatment required (IOTN DHC grades 3 to 5).

Discussion

IOTN DHC grades 3 to 5 seem to be reliable to consider an orthodontic intervention needed, as this has been used by several other authors (4). Although in our study a high level of need was found (69.5%), we believe it could be even higher, as some traits like hypodontia, severe teeth displacements, diastemas and impeded eruption were not evaluated. Marques *et al.* (15) found 77.0% and Dias and Gleiser (14), 57.8% of orthodontic treatment need in other Brazilian samples. As traits' prevalence differ among populations, it is reasonable to presume that malocclusions prevalence also differ, as well as treatment need. Using the DHC, Alkhatib *et al.* (16) found treatment need in one third of London schoolchildren. Proffit *et al.* (17) stated that 57 – 59 per cent in different ethnic groups required some type of orthodontic treatment.

Correlation between malocclusions or orthodontic treatment need and socio-economical status has never been established. However, the authors believe, as children from lower income families have more caries and premature loss of teeth without space maintaining, they might present more malocclusion. The present study evaluated children from the public educational system, and they are expected to come from low income families, in most of the cases. Present results might not be extrapolated to the whole population of this city, although sample size was adequate.

Despite statistically significant differences were found between sexes and ethnical background, they are not much clinically unlike, with only small percentages of differences. Other results have been found in previous studies. Ciuffolo *et al*. (18) found increased overbite and overjet to be more frequent in boys, in a sample of Italian students. Drummond (19) found a higher percentage of malocclusions in boys in South Africa, as more treatment need in *coloured* children than in white, and less in black. Alkhatib (16) observed no significant differences among London boys and girls, as well as Frazão (5) in São Paulo, Brazil. In 2005, Jahn (8) found more severe malocclusions in boys, but no difference among ethnical groups, in 12-years-olds also from São Paulo.

Data about malocclusion progression is controversial. Frazão (5) found a higher prevalence in permanent dentition than in primary, suggesting increase with age. Jahn (8) showed more malocclusion in 5 years old when compared to ages of 12, 15 or 19. Similar to Ovsenik *et al.* (20) the present results showed no significant changes from younger subjects to 12-years-olds.

Proffit *et al.* (17) consider 3 mm as the limit for abnormal trespasses, while Brook and Shaw (3) assume 3.5 mm to barely normal overjet and overbite. It was observed a stabilization of vertical and horizontal trespasses by the age of 10. Further studies in older subjects might confirm the stability of those traits and therefore an average of nearly 3.0 mm overbite and 2.5 mm overjet in this population.

The decrease of both upper and lower anterior crowding by the age of 10 might be explained due to the *Lee Way space* availability (22) after the second primary molars exfoliation. Before this period, the anterior crowding increase is explained by the eruption of larger permanent teeth (incisors), which require more space in the arch (23).

Although this was a large sample study, conclusions must be considered in view of its cross-sectional design. The results of Figures 1, 2 and 3 relate possible age modifications that should be confirmed by longitudinal observation.

Overbite, overjet, midline misalignment and crowding were sometimes difficult to measure because anterior teeth were not totally erupted. This type of occurrence has led to significant data loss. The prevalence of Angle malocclusions Classes II (21.3%) and III (6.6%) could have been overestimated, as early primary teeth loss was not evaluated and some children might have arch length decreased due to early teeth migrations. Pereira (7) found 15.4% Class II and 7.7% Class III in another Brazilian sample.

The shown pattern of midline misalignment may be due to an asymmetrical mandibular growth, mentioned by other authors (21). The peak misalignment, around 1.2 mm observed by the age of 10, however, remains difficult to understand. An alternative explanation is a possible lack of accuracy when performing misalignment measurement in children due to high levels of crowding and, therefore, slight displacement of central incisors. Also, difficulty to acquire the best mandible positioning for measurement in these children was a note of the examiners. The positive relationship of midline misalignment to asymmetrical molar patterns was an expected outcome.

Conclusion

This paper stands out interesting occlusal development patterns of these children. High percentages of malocclusions and treatment need were found. Planning early interception treatment to the presented traits must be carefully considered.

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4.2 ARTIGO 2

TMD prevalence and associated factors in Brazilian children

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Erika Calvano Kuchler

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Abstract

Objective: To verify the prevalence of signs and symptoms of temporomandibular disorders (TMD) in 6 to 12-years-old Brazilian schoolchildren and to evaluate its relationship with age, gender, ethnicity, bruxism, chewing fatigue or pain, parafunctional habits and headache. Materials and Methods: A sample of 1200 subjects was randomly selected, while parents answered questions and gave signed consent. Signs and symptoms were evaluated by two calibrated professionals according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) and the Revised Faces Pain Scale. Data was first subjected to descriptive statistics and then was analyzed in both uni and multivariated logistic regression models. Results: TMD signs or symptoms were found in 34.8% of the sample, and headache was reported by 37.8% of parents, girls being more often affected by both (P<.05); girls also experienced more TMJ pain on posterior palpation and reported parafunctional habits. Age and parafunctional habits contributed to TMD (multiple logistic regression), which seems to decrease from 6 to 8 years, then increase and stabilize at 11. Bruxism was the only feature that decreased with age. Conclusion: Our results show high prevalence of TMD signs and symptoms and its association with reported parafunctional habits, headache, and TMJ pain or fatigue.

Keywords: Temporomandibular joint disorders; child; habits; headache

Introduction

Temporomandibular disorder (TMD) is a term that embraces different signs and symptoms related to the temporomandibular joint (TMJ) and associated structures malfunction. Although TMD etiology is not completely understood[1-4], some factors are believed to be involved, such as persistent oral habits[5], oral parafunction (including bruxism and nail biting)[2, 4, 6-12], psychological factors[12], malocclusions [13-17] and trauma[18]. Age, gender, ethnicity and headache are also possibly related to TMD development[15, 16, 19].

Mixed dentition is a period of intense facial development, with establishment of the occlusal features, which might influence the skull and mandible relationship. Studies report TMD in children to be as frequent as in adults[19, 20]. Deng, Fu and Hagg[21] reported a prevalence of 17.9% in a sample of 3 to 19-years-olds, while Sönmez *et al*. found 68.0% in the mixed dentition. The great variation between authors has been attributed to population differences, sample age, and various research techniques[21, 22]. Different methods have been used for TMD symptoms measurement in children. Some authors have used questionnaires[23], some adopted the Craniomandibular Index[24], some The Research Diagnostic Criteria (RDC/TMD)[25], and some even used combinations of methods. RDC/TMD has been proven to be a very reliable tool in TMD diagnosis[26].

With the aid of data from a Brazilian population, the aim of this study was to verify the prevalence of TMD signs and symptoms in 6- to 12-years-old children, using the RDC/TMD, and its possible relationship with age, gender, ethnicity, parafunctional habits, bruxism and headache.

Materials and Methods

This study was approved by an Institutional Review Board (IESC-UFRJ) and conducted in the city of Juiz de Fora, MG, Brazil. Each child was asked about his or her intention to participate before the examination; the parent signed the informed consent form and submitted to an interview. A pilot version was performed on 20 pairs of children and parents for inter and intra-examiner calibration prior to the study. The population was then clustered and randomly selected until 1200 examinations were performed, this being representative. Children with previous or undergoing orthodontic treatment were excluded.

Exams were performed by two trained and calibrated pediatric dentists, who identified mouth opening limitation, pain on passive mouth opening, opening deviation, luxation, TMJ click or crepitus (using a stethoscope), and TMJ and associated muscles pain or discomfort on palpation (inter-examiner Kappa = .761 to 1.0, mean .875; intra-examiner Kappa = .791 to 1.0, mean .895). The present criteria for TMD signs and symptoms were based on the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[27] with some simplifications (Table 1). As pain reports are especially difficult to quantify in such young children, the Revised Faces Pain Scale[28] (Figure 1) was adopted. First each child was shown the scale and informed that the first face feels no pain. Then the second face begins to feel pain, increasing to a very strong pain in the sixth face. At this point a placebo test[29] is performed by applying pressure to the patient's shoulder. He or she is asked to show a face that represents this feeling. If the report differs from the first face, the explanation is repeated once again.

Second, parents were interviewed to determine if they had observed TMJ pain or fatigue, parafunctional habits (including bruxism) or headache (Table 1). Age, sex, ethnicity, reported bruxism and parafunctional habits were analyzed in uni and multivariated regression models to be tested as possible contributors to TMD (any sign or symptom). Age was broken down into 3 categories: 6- and 7-year-olds (early mixed dentition stage); 8- and 9-year-olds (middle mixed dentition); and 10- to 12-year-olds (late mixed dentition) in order to maximize statistical power. Reported headache and TMD pain/fatigue were also included in univariated models as possible TMD outcomes.

Table 1: Criteria for TMD signs and symptoms and interview traits.

Part 1: Examination	
TMD sign/symptom	**Criteria**
Mouth opening limitation	Present when the child could not insert 3 own fingers in the full open mouth
Mouth opening deviation	Present when a deviation was observed with the mouth full open (≥ 4mm)*
Mouth opening luxation	Present when the mouth was locked in a open position
Pain on passive opening	Present if pain** was reported after a 1-lb opening force performed by examiner
TMJ click	Auscultated during mouth movements***
TMJ Crepitus	Auscultated during mouth movements***
TMJ pain on lateral palpation	Present if pain** was reported after a 1-lb pressure at each TMJ's lateral structures
TMJ pain on posterior palpation	Present if pain** was reported after a 1-lb pressure at each TMJ's posterior structures (possible when mouth is open)
Masseter pain on palpation	Present if pain** was reported after a 2-lbs pressure
Anterior, medium and posterior temporalis pain on palpation	Present if pain** was reported after a 2-lbs pressure
Submandibular region pain on palpation	Present if pain** was reported after a 1-lb pressure
Posterior mandibular region pain on palpation	Present if pain** was reported after a 1-lb pressure
Part 2: Parent interview	
Trait	**Criteria**
TMJ pain or fatigue	Parent was asked for TMJ pain or fatigue, sometimes revealed when chewing
Bruxism	Parent was asked for any listenable or observable bruxism
Parafunctional habits (nail/objects biting, finger/thumb sucking, pacifier)	If some habit was weekly observed
Headache	If child uses to complain once a week or more

* A ruler was used for the measurement.

** The Faces Pain Scale – Revised[28] – was used to quantify pain. A later categorization considered as *positive* all but the first face.

*** A stethoscope was used.

Figure 1: The faces Pain Scale - Revised[28].

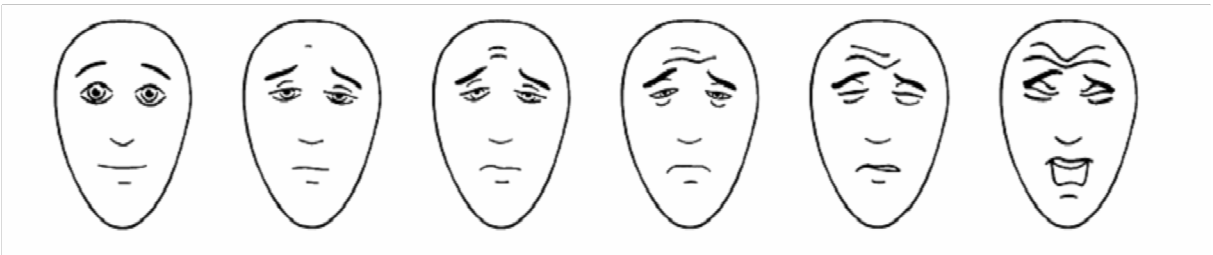


Table 2: Sample age, by sex (n=1200).

		Sex		Total (%)
		Male (%)	Female (%)	
Age	6-years-old	7.7	8.8	**16.4**
	7-years-old	6.3	6.2	**12.5**
	8-years-old	9.1	6.2	**15.4**
	9-years-old	7.4	6.9	**14.2**
	10-years-old	7.6	7.6	**15.1**
	11-years-old	8.9	7.1	**16.0**
	12-years-old	4.7	5.5	**10.3**
	Total	**51.7**	**48.3**	**100**

Results

Sample distribution by age and sex can be seen in Table 2. Male/female ratio was close to 1; sex distribution was similar with regard to age and ethnicity. Almost half (46.2%) the children were white, 37.3% were racially mixed, 16.2% were black and 0.3% were of other races (including Indians and Asians). Forty-eight per cent of the parents agreed to be interviewed.

Prevalence of TMD signs and symptoms is shown by sex in Table 3. TMJ crepitus was the most frequent sign (31.4%) and posterior mandibular region pain the most frequent symptom (22.8%) observed during examination. Frequent headache was reported by 37.8% of parents. If the presence of any sign or symptom is considered as TMD, then 34.8% of the sample presented TMD, most being mild in character. No children presented TMJ luxation. Some statistically significant ($P<.05$) differences were found between sexes. Girls had more TMJ pain on posterior palpation, reported parafunctional habits and headache, and overall TMD (presence of any examined sign or symptom). Despite the statistical relevance, nearly all findings were more prevalent in girls.

The logistic regression models (Table 4) revealed age and parafunctional habits as contributing factors for the presence of TMD. Sex was not significant at the multivariated level, although it had significance at the univariated analyses. Reported headache and TMJ pain or fatigue were both significantly related to TMD (Table 5). Figure 2 shows the percentage of TMD across ages, by sex. The pattern is very

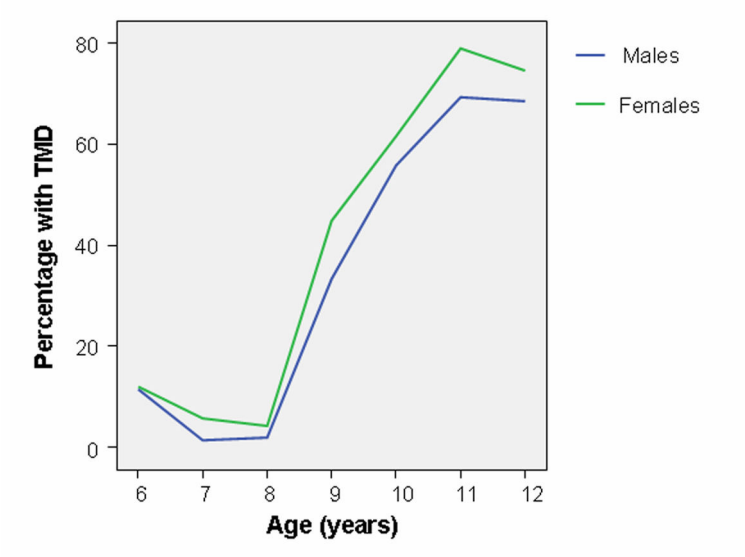
similar among males and females. It decreases from 6 to 8 years, then increases and stabilizes at 11. Figure 3 exhibits percentages of the traits reported by parents according children's age. Parafunctional habits, headache and TMJ pain/fatigue decrease from 6 to 7 years, then increase in an irregular pattern. Bruxism was the only trait that decreased with age.

Table 3: Percentages of TMD signs and symptoms by sex.

Examined TMD sign/symptom	**Sex**		**Total (%)**
	Male (%)	**Female (%)**	
Mouth opening limitation	1.1	.7	.9
Mouth opening deviation	.8	.9	.8
Mouth opening luxation	0	0	0
Pain on passive opening	13.0	12.0	12.5
TMJ Click	16.6	15.8	16.2
TMJ Crepitus	30.7	32.2	31.4
TMJ pain on lateral palpation	10.2	12.3	11.2
TMJ pain on posterior palpation*	**17.1***	**21.7***	**19.3**
Masseter pain on palpation	12.4	15.1	13.7
Anterior temporal pain on palpation	8.9	11.0	9.9
Medium temporal pain on palpation	4.5	5.2	4.9
Posterior temporal pain on palpation	4.7	5.7	5.2
Submandibular region pain on palpation	11.6	13.7	12.6
Posterior mandibular region pain on palpation	21.6	24.0	22.8
Traits reported by parents			
TMJ pain or fatigue	12.8	18.2	15.6
Bruxism	27.3	29.0	28.8
Parafunctional habits*	**53.8***	**67.9***	**61.2**
Headache*	**32.1***	**43.0***	**37.8**
Overall TMD (any examined sign or symptom)*	**31.8**	**37.9**	**34.8**

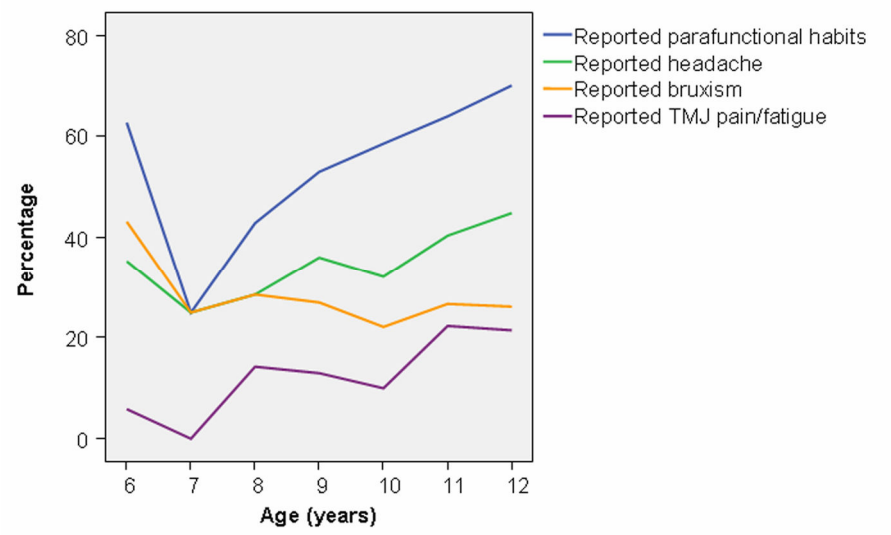
* $p < .05$

Figure 2: Percentage of TMD per age.



The presence of any TMD sign or symptom increases from 8 to 11 years and then seems to stabilize.

Figure 3: Percentage of reported traits per age.



Reported parafunctional habits, headache and TMD pain or fatigue decreased from 6 to 7 years-olds and then increased. Bruxism seems to decrease as subjects are older.

Discussion

Studies on TMJ prevalence in young subjects have been described as hard to perform, mainly because of lack of child cooperation or lack of ability to give valid responses[30]. Although a placebo test was used, we perceived more firm responses from children 7 or older in distinguishing between feeling pressure and the various

levels of tenderness. Tuerlings and Limme[29] found the 6-year-olds patients to be "sufficiently cooperative, but Nilner and Lassing[30] also considered 7-year-olds as the standard for better cooperation. Other factors besides subjects' cooperation are felt to be potential confounders. To Thilander et al.[16] the reported prevalence varies greatly among different studies, probably because of the difference in the number and age of the subjects examined, methods used, and diagnostic criteria. Sometimes parafunctions are included as subjective symptoms and sometimes as clinical signs.

Table 4: Logistic regression models for possible TMD contributing factors. TMD was considered if any of the examined signs or symptoms was present.

Factor		Univariated logistic regression *		Multivariated logistic regression * †	
		p-value	Expected	p-value	Expected
Dentition (age) **	Early mixed (6-7-years-olds)	**<.001**	**1**	**<.001**	**1**
	Middle mixed (8-9-years-olds)	**<.001**	**2.848**	**.016**	**2.252**
	Late mixed (10-12-years-olds)	**<.001**	**23.695**	**<.001**	**4.396**
Sex	Male		**1**		1
	Female	**.027**	**1.308**	.606	1.107
Ethnicity	White	.904	1	---	---
	Mixed	.988	1.003	---	---
	Black	.677	.911	---	---
Bruxism	Not reported		1		---
	Reported	.964	1.009	---	---
Parafunctional habits	Not reported		**1**		**1**
	Reported	**.010**	**1.623**	**.022**	**1.572**

* 95% confidence interval.

† Included the variables significant at univariated model.

** Age was categorized in order to gain statistical power to the present analysis.

Researching children offers peculiar difficulties. For example, facial or head pain due to trauma, mainly from sports, was a common finding. Examiners had to carefully differentiate such pain from muscular pain on palpation, by asking if the subject had any recent accidents. Protrusive and laterotrusive movements, as well as lateral pterygoid area palpation, were present on the examination form at the beginning of the study. However, during the pilot study, it became clear that the

movements would not permit accurate measurement, especially in the youngest subjects, so these variables were excluded from the final exam form.

Table 5: Univariated logistic regression for possible TMD outcomes. TMD was considered if any of the examined signs or symptoms was present.

Factor		Univariated logistic regression*	
		p-value	**Expected**
Headache	Not reported		**1**
	Reported	**.003**	**1.824**
TMJ pain or fatigue	Not reported		**1**
	Reported	**<.001**	**20.767**

* 95% confidence interval.

Defining subjective symptoms and clinical signs qualitatively is also a problem in this research field[16]. Differences in degrees of signs and symptoms are difficult to estimate; studies in the same population may present different results, depending on methodological registration criteria. Lack of standardization in measuring TMD symptoms in children led us to search for the best way to quantify any type of pain in these subjects. The work of Stinson et al.[31] indicates that the Faces Pain Scale–Revised[28] is possibly the most accurate tool for children as young as the present. Using a placebo like in the study of Tuerling and Limme[29] has improved even more the reliability of the examination, as it helped to exclude unreliable responses. Also, observing the children's body language kept us from under or overestimating the pain measurement. Under painful stimulation, one usually shows body signs that may range from an eye blink to dodging the examinator's finger pressure or crying. During our data collection, children occasionally reported no pain even when exhibiting those signs. On the other hand, sometimes a high pain score was given when no body signs of pain were shown at all. Both situations should be carefully considered: we repeated the placebo test and restarted the examination. If this still did not work, the subject was excluded.

For so many reasons, the present results might be different from others. Deng, Fu and Hagg[21] reported a lower overall value for TMD in Chinese 3- to 19-year-olds (17.9%). In Danish 7- to 13-year-olds, Sonnesen, Bakke and Solow[17] found 26.0%,

which is closer to the 34.8% found in our study, although their patients had severe malocclusion. According to Sonmez et al.[19], 68.0% of Turkish children in the mixed dentition presented TMD signs or symptoms. The large sample of Colombian 5- to 17-year-olds, mostly in mixed dentition, of Thilander et al.[16], presented 25.0% of subjects with TMD. A possible explanation to that difference is the methodological differences between studies.

Regarding deviation on maximum mouth opening, Tuerlings and Limme[29], who called it “deflection”, reported 19.9% among 6- to 12-year-old Belgians. This prevalence is far greater than what we found (0.8%), which must be related to our adoption of a 4-mm cut point. As the expected prevalence of mouth opening luxation was very low (0.4%[16]), it is acceptable that none of our subjects presented this sign. Similar studies have not reported percentages of pain on passive mouth opening. We considered this sometimes hard to perform because the exfoliating incisors caused discomfort to the child when opening pressure was applied. This required the examiner to explain to each subject the difference between pain from the exfoliating anterior teeth and pain in the TMJ region.

TMJ click is also a variable that exhibits very different results, depending on the study. Muhtarougullari et al.[32] found a range of 6.8% to 65% in diverse child samples and attributed such a range to the examination methods: “Different techniques for recording joint sounds reveal different findings”. Studies in which a stethoscope is used show more TMJ sounds[33]. In the study of Sonnesen et al.[17] the authors found 2.9% had directly audible clicking, while 16.3% were observed when auscultated through a stethoscope, a result almost identical to that of the present study (16.2%). Keeling et al.[33], who used finger pressure laterally over the TMJ area, reported 8.9% clicking. They also noted 1.0% crepitus, both much below our results (31.4%). Tuerlings and Limme[29] found 9.6% clicking and 25.7% crepitus (which they call “popping”) by using a stethoscope. Some studies do not differentiate TMJ sounds into clicking and crepitus, but lump them together. However, now that it is accepted that they have different etiology and implications[34], we dealt with them distinctly. As reported in several previous studies, the presence of sounds was influenced by age, being more frequent in older subjects[29, 30], as well as in girls[29]. This has been attributed to hormonal changes during the pubertal peak, which occurs earlier in

girls[33]. Tuerlings and Limme[29] found that the global tenderness score also increased with age. In the children of our study, all traits increased with age, although statistical significance was not always achieved, except for bruxism. Interestingly, Keeling *et al.*[33], who examined one of the largest samples in the literature, found no association between joint sounds or muscle sensibility with age, ethnicity, or gender. According to Figure 2, there are many possible factors leading to the increase in TMD from childhood to adolescence, such as permanent dentition establishment, occlusal vertical dimension increase, hormonal changes, and enhanced emotional stress and tension. Nevertheless, the present data is not adequate to control such features and disclose this position.

Also controversial is the role of parafunctional habits in TMD. According to Glaros et al.[35] prolonged light clenching can induce signs and symptoms of TMD in healthy subjects. Thilander et al.[16] found that dental wear, which indicates frequent grinding or clenching, was associated with TMJ pain and muscle tenderness, and Sari and Sonmez[9] stated that finger or thumb sucking and nail biting are related to TMD, also during the mixed dentition. On the other hand, Castelo et al.[36] did not find relationship between TMD symptoms and bruxism, nail biting or nonnutritive sucking habits during the primary dentition. Our findings support a positive relationship between parafunctional habits and TMD, but having combined the different parafunctional sucking and biting habits, we were still unable to determine their role in causing the disorder. Reported bruxism had no statistical significance with regard to TMD, but the accuracy of the reports could not be verified. As in the study of Sonnesen et al. [17], this is the only trait that seems to decrease with age. Such decrease could be due to morphological changes in occlusion. It is known that during this period more solid relationships are achieved through intercuspal contacts of posterior teeth and that mandibular movements are better guided by the establishment of incisal and canine guidance, and curves of Wilson and Spee.

Headache was considered and analyzed in our study not as a TMD contributing factor but as an outcome, and positive results were found. Thilander et al.[16] found an association with muscle pain but stated “whether muscle pain gives rise to headache or vice versa is an open question”. Also, the prevalence found in this study (37.8%) was higher than that (27.5%) reported by Muhtarogullari et al.[32] in

Turkish children. As both were obtained through parental interview and considered when present weekly, such difference might be due to population differences.

Conclusion

Children in the mixed dentition presented a high prevalence of overall TMD signs and symptoms, headache, and parafunctional habits, none influenced by ethnicity. All analyzed traits, except for bruxism, increased with age. Age and parafunctional habits were significantly related as TMD contributing factors. Reported headache and TMJ pain or fatigue were strongly associated outcomes.

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4.3 ARTIGO 3

Associations of TMD signs and symptoms and occlusal factors in children in mixed dentition

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Rogério Gleiser

Abstract

Aims: To verify the association of occlusal factors and some parental reported traits to Temporomandibular Disorders (TMD), in children in mixed dentition. Methods: Cross-sectional data was obtained from twelve hundred 6- to 12-years-old randomly selected schoolchildren (mean 9.08 ± 1.98 years; 51.8% boys). Each child was examined for molar relationship, midline deviation, excessive overbite and overjet, upper and lower crowding, anterior and posterior open and cross bites; as TMD signs/symptoms, we evaluated mouth opening limitation and deflection, luxation, temporomandibular joint and masticatory muscles pain on palpation, joint sounds and pain on passive mouth opening according to RDC/TMD axis I. The Revised Faces Pain Scale was used to determine pain. Parents answered to questions on child's pain or fatigue of masticatory muscles, bruxism, headache and parafunctional habits. Logistic regression models were applied to each TMD sign or symptom in an attempt to identify possible associated factors, always controlling for age, sex and ethnicity. Results: Only a few relationships were found between TMD and occlusal factors, namely: excessive overbite with mouth opening limitation; excessive overjet and submandibular pain; and Class II molar relationship and TMJ pain. Conclusions: More consistent relationships were established for age, ethnicity and parafunctional

habits as TMD contributors than occlusal factors. Reported headache and TMJ pain or fatigue also were strongly related, but interpreted as TMD outcomes.

Keywords: malocclusion, temporomandibular disorders, mixed dentition, ethnicity, parafunctional habits, headache.

Introduction

Temporomandibular disorders (TMD) are usually known as problems related to the temporomandibular joints (TMJ) and associated structures resulting on several types of malfunction or symptomatic states. Although a wide range of conditions are grouped into this non-specific term, it is possible that specific signs or symptoms are related to different contributing factors, once their etiological factors may differ.

Precedent studies have made efforts to disclose ambiguous relationships concerning the possible etiological factors to TMD. A brief review of results can be seen on Table 1. Excessive overjet, crossbites, crowding, Class II molar relationship, parafunctional habits, bruxism or attrition, and tense emotional state have been related to different TMD signs or symptoms. (1-17) (18-21)

Although many conclusions have been reached, studies are mostly short in sample size or analytical power, and many questions remain ambiguous or unanswered. Instead of merging all TMD signs and symptoms, our present intention was to disassemble TMD into its various components and to analyze each of them to test significant relationships with different types of malocclusion, ethnical background, sex, habits and possible outcomes (headache and facial pain).

Materials and methods

This study was approved by an Institutional Review Board (IESC-UFRJ) and conducted in the city of Juiz de Fora, MG, Brazil. Each child was asked about his or her intention to participate before the examination; the parent signed the informed

consent form and submitted to an interview. A pilot version was performed on 20 pairs of children and parents for inter- and intra-examiner calibration before the study started. The population was then clustered and randomly selected until 1200 examinations were performed. Children with previous or undergoing orthodontic treatment were excluded.

The exams were performed by two trained and calibrated pediatric dentists, who were able to identify mouth opening limitation, pain on passive mouth opening, opening deflection, luxation, TMJ click or crepitus (auscultated with a stethoscope) , TMJ and associated muscles pain or discomfort on palpation (inter-examiner Kappa = .761 to 1.0, mean .875; intra-examiner Kappa = .791 to 1.0, mean .895). The following muscles were evaluated: masseter, anterior temporalis, medium temporalis, posterior temporalis, submandibular and posterior mandibular areas. Mandibular condyles were palpated in lateral and posterior parts, being posterior palpation during mouth opening. The present criteria for palpation was based in the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (22) and specifications can be seen elsewhere (17, 23). To determine pain, the Revised Faces Pain Scale (24) was adopted and a placebo test performed before each examination (17).

Examiners also identified molar relationship, anterior and posterior cross bite, anterior and posterior open bite, upper and lower crowding, overjet and overbite as occlusal traits (inter-examiner Kappa = .937 to 1.0). Data was computed and later categorized within criteria published elsewhere (23). In short, malocclusions were considered present when reached a grade 3 treatment need according to the Index of Orthodontic Treatment Need (IOTN) (25). Secondly, parents were interviewed in order to report, if observed, TMJ pain or fatigue, bruxism, parafunctional habits and headache.

Statistical analyses were performed using SPSS 13.0 for Windows (SPSS Inc., Chicago, Illinois). After descriptive statistics, each TMD sign or symptom was distinctly analyzed as follow. It was first crossed with each occlusal factor and parental reported traits in univariated logistic regression models. Statistically significant and almost significant ($P<0.1$) variables were then re-analyzed together as

Table 1: Statistically significant relationships found in literature between TMD signs or symptoms and possible contributors or outcomes in children.

	Mouth opening limitation	Pain on mouth passive opening	Deflection	TMJ clicking	TMJ crepitus	TMJ pain	Masseter pain	Anterior Temporal pain	Medium Temporal pain	Posterior Temporal pain	Medial Pterygoid	Lateral Pterygoid	Muscle palpation (not specified)	TMD**
Midline deviation														Sonnesen(1)
Excessive overbite				Keeling(2)	Keeling(2)							Demir(3)		John(4)*
Excessive overjet			Sonnesen(1)*	Vanderas(5)		Riolo(6)	Demir(3)					Demir(3)		John(4)*, Pahkala(7), Sonnesen(1), Thilander(8), McNamara(9)
Anterior openbite						Riolo(6)					Demir(3)		Riolo(6)	Sonnesen(1), Thilander(8), McNamara(9)
Anterior crossbite				Riolo(6)	Riolo(6)	Riolo(6)		Demir(3)	Demir(3)	Demir(3)	Demir(3)			
Crowding				Keeling(2)	Keeling(2)			Demir(3)	Demir(3)	Demir(3)		Demir(3)		
Posterior openbite														Pahkala(7)
Posterior crossbite			Vanderas(5)	Riolo(6)	Riolo(6)	Vanderas(5)								Egermark(10), Sonnesen(1), Thilander(8), McNamara(9)
Molar Class I												Demir(3)		
Molar Class II	Riolo(6)		Sonnesen(1)*	Riolo(6)	Riolo(6)	Riolo(6)							Riolo(6)	Henrikson(11), Sonnesen(1)
Molar Class III											Demir(3)			Pahkala(7), Thilander(8)
Black ethnicity						Widmalm(12)	Widmalm(12)							
Female sex														List(13), Conti(14), Tuerlings(15), Brito(17)
Parafunctional habits		Vanderas(5)				Widmalm(16)		Widmalm(16)	Widmalm(16)	Widmalm(16)			Vanderas(5)	Sari(18), Glaros(19), Conti(14)
Bruxism / attrition	Alamoudi(20)					Alamoudi(20), Widmalm(16)	Widmalm(16)	Widmalm(16)	Widmalm(16)	Widmalm(16)			Alamoudi(20)	Sari(18), Alamoudi(20)
Headache														Bertoli(21)
Tension / emotional status						Alamoudi(20)							Alamoudi(20)	Bertoli(21), Glaros(19), Alamoudi(20)

* negative association.

** as considered by each author.

covariates in multivariated logistic regression models, except for reported headache and TMD pain or fatigue, which were treated as possible TMD outcomes, instead of contributors. In this phase, age, sex and ethnical background were also included. Age was categorized into 3 grades in order to maximize statistical power: 6 and 7-years old (corresponding to early mixed dentition stage); 8- and 9-years-old (middle mixed dentition); and 10 to 12-years-old (late mixed dentition). A 95% confidence interval was always adopted.

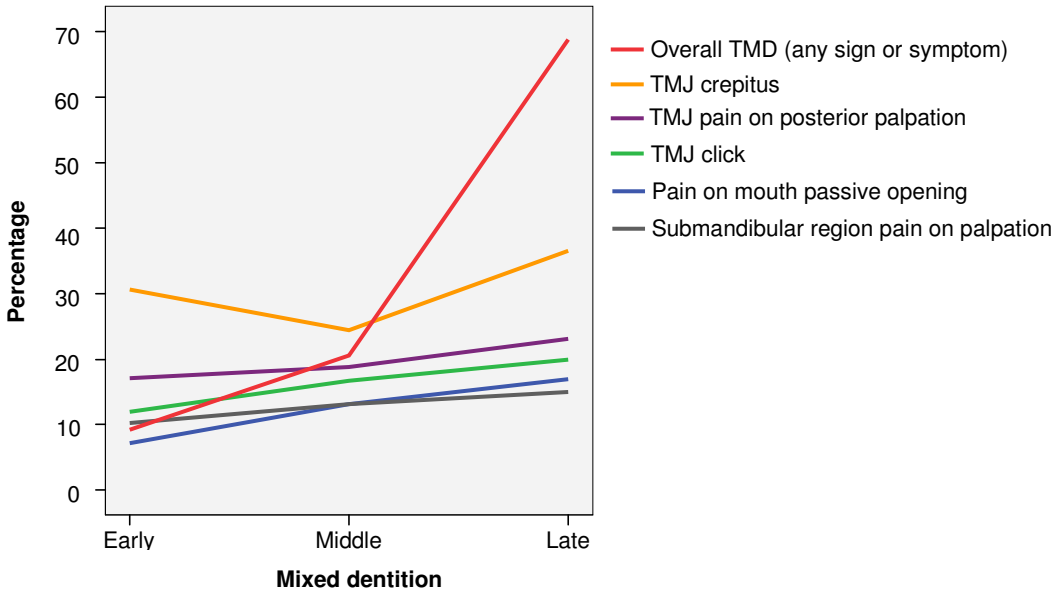
Results

High prevalence of some TMD signs and symptoms were found in this population, as seen on Table 2. The most common was TMJ crepitus, which occurred in 31.3%, being significantly more prevalent in late mixed dentition ($p<.05$). It was followed by mandibular posterior region pain on palpation (22.9%), TMJ pain on posterior palpation (19.7%), clicking (16.4), masseter pain on palpation (14.0%), pain on mouth passive opening and submandibular region pain on palpation (both 12.9%), TMJ pain on lateral palpation (11.4%) and anterior temporal pain on palpation (10.0%). All other were below 10.0%, and none of the subjects presented TMJ luxation. TMJ pain on mouth passive opening, TMJ clicking, TMJ pain on posterior palpation and submandibular region pain on palpation increased significantly from early to middle and from middle to late mixed dentitions ($p<.05$). The same occurred when the presence of any sign or symptom was considered, in an expressive way (Figure 1). Although the prevalence of any TMD sign or symptom has increased over dentition stages (Table 2), being 8.2% at early, 20.3% at middle and 67.9% at late stage, the relative frequency of number of traits remained constant. Few subjects presented three or more traits.

Statistically significant relationships were found between ethnicity and TMJ crepitus, pain on palpation of masseter, medium temporalis and submandibular region (Figure 2). Masseter and submandibular pain on palpation were observed more often in black subjects than mixed and white subjects. Those of mixed race had less crepitus but more pain on medium temporalis on palpation.

At the univariated logistic regression models, many relationships could be observed (Table 3). The most expressive were between excessive overbite and mouth opening limitation, molar class III (bilateral) and TMJ clicking, molar Class II subdivision and TMJ pain on posterior palpation, excessive overjet and anterior temporal pain on palpation, ethnical background and TMJ crepitus, masseter and medium temporal pain on palpation, parafunctional habits and submandibular or mandibular posterior region pain on palpation. The correlation between TMD features and the parental report of TMJ pain or fatigue had a very high agreement, as well as the headache report (Table 4).

Figure 1: Percentages of significant traits, per dentition stage. Only statistically significant changes were included (p<.05).



At the multivariated logistic regression models, fewer – although stronger – relationships were observed (Table 5). Excessive overbite remained linked to mouth opening limitation; excessive overjet was associated with anterior temporal and submandibular region pain on palpation; lower crowding also remained associated with masseter and posterior temporal pain on palpation; and molar Class II subdivision with TMJ pain on lateral palpation. Ethnical differences presented in Figure 2 refer to these analyses. Bruxism was associated with TMJ pain on lateral palpation, and parafunctional habits were associated with mandibular posterior pain on palpation and overall TMD (presence of any feature).

Table 2: TMD signs and symptoms total prevalence and differences among mixed dentition stages (%).

Stage	Mouth opening limitation	Pain on mouth passive opening	Deflection	TMJ clicking	TMJ crepitus	TMJ pain on lateral palpation	TMJ pain on posterior palpation	Masseter pain on palpation	Anterior Temporal pain on palpation	Medium Temporal pain on palpation	Posterior Temporal pain on palpation	Submandibular region pain on palpation	Mandibular posterior pain on palpation	Overall TMD*
Early mixed	.6	**.0** **	.3	**11.4** **	**30.6** **	10.0	**15.8** **	11.9	10.0	6.7	5.2	**9.4** **	20.4	**8.2** **
Middle mixed	.3	**13.2** **	.3	**16.7** **	**24.4** **	11.5	**18.8** **	14.4	9.4	4.1	5.0	**13.5** **	21.5	**20.3** **
Late mixed	1.7	**16.8** **	1.7	**19.7** **	**36.7** **	12.2	**23.0** **	15.2	10.3	4.6	5.7	**14.8** **	25.7	**67.9** **
Total	1.0	12.9	.9	16.4	31.3	11.4	19.7	14.0	10.0	5.1	5.3	12.9	22.9	36.6

* Presence of any sign/symptom

** Statistically significant values (< .05).

Figure 2: Percentages of significant traits, per ethnicity. Presented results are statistically significant (p<.05).

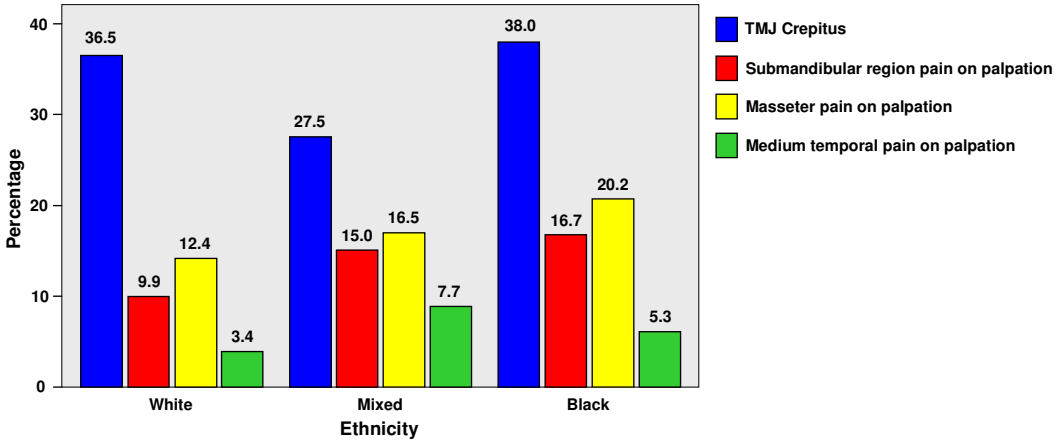


Table 3: Significant relationships between TMD signs or symptoms and possible contributors at the univariated logistic regression models. Numbers are the expected value and p-value (in parenthesis). Only statistically significant results are shown.

	Mouth opening limitation	Pain on mouth passive opening	TMJ clicking	TMJ crepitus	TMJ pain on lateral palpation	TMJ pain on posterior palpation	Masseter pain on palpation	Anterior Temporal pain on palpation	Medium Temporal pain on palpation	Posterior Temporal pain on palpation	Submandibular region pain on palpation	Mandibular posterior pain on palpation	Any TMD feature
Excessive overbite	**5.233 (.007)**	**1.521 (.042)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**1.745 (<.001)**
Excessive overjet	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**1.741 (.006)**	N.S.	N.S.	N.S.	N.S.	**1.380 (.014)**
Anterior openbite	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**.482 (<.001)**
Lower crowding	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**1.587 (.036)**	N.S.	N.S.	**1.981 (.032)**	N.S.	N.S.	N.S.
Molar class													
Class I	N.S.	N.S.	1 (.188)	N.S.	1 (.200)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class I+II	N.S.	N.S.	1.327 (.253)	N.S.	**1.753 (.031)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class I+III	N.S.	N.S.	.973 (.955)	N.S.	.256 (.182)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class II	N.S.	N.S.	1.128 (.662)	N.S.	.948 (.875)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class II+III	N.S.	N.S.	<.001 (.999)	N.S.	.704 (.737)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class III	N.S.	N.S.	**2.445 (.010)**	N.S.	1.334 (.526)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Ethnics													
White	N.S.	N.S.	N.S.	**1 .047**	N.S.	N.S.	1 (.107)	N.S.	1 (.081)	N.S.	N.S.	N.S.	N.S.
Mixed	N.S.	N.S.	N.S.	**.661 .026**	N.S.	N.S.	1.402 (.155)	N.S.	**2.364 (.025)**	N.S.	N.S.	N.S.	N.S.
Black	N.S.	N.S.	N.S.	1.065 .784	N.S.	N.S.	**1.788 (.044)**	N.S.	1.576 (.382)	N.S.	N.S.	N.S.	N.S.
Female sex	N.S.	N.S.	N.S.	N.S.	N.S.	**1.344 (.044)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**1.308 (.027)**
Parafunctional habits	N.S.	N.S.	N.S.	N.S.	**1.939 (.093)**	N.S.	N.S.	N.S.	N.S.	N.S.	**2.432 (.002)**	**2.460 (<.001)**	**1.623 (.010)**
Bruxism	N.S.	N.S.	N.S.	N.S.	**2.203 (.113)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**1.526 (.036)**	N.S.

N.S.: No statistical significance.

Discussion

Remarkable prevalence has been found for some TMD features. Implications of these results might be discussed, however. There is no consensus among authors on classifying children as TMD sufferers. Like in the study of Vanderas and Papagiannoulis(5), we considered children with at least one sign or symptom as sufferers. This operational definition was based on the assumption that any of these signs and symptoms might initiate a more serious condition later in life. Clinically, this may have a small significance, especially because our features were recorded upon exam, and not when spontaneously reported by the patient or the parent. Although this strengths the accuracy of our findings, it apart us from real distressing conditions. To our actual objectives of obtaining data for correlations with malocclusions, this was not a problem, however.

Table 4: Significant relationships between TMD signs or symptoms and parental reported outcomes at the univariated logistic regression models. Numbers are the expected value and p-value (in parenthesis). Only statistically significant results are shown.

	TMJ pain on lateral palpation	TMJ pain on posterior palpation	Masseter pain on palpation	Anterior Temporal pain on palpation	Medium Temporal pain on palpation	Posterior Temporal pain on palpation	Submandibular region pain on palpation	Mandibular posterior pain on palpation	Any TMD feature
Headache	**3.605 (<.001)**	**1.957 (.001)**	**3.345 (<.001)**	**4.133 (<.001)**	**4.134 (.001)**	**3.702 (.026)**	**1.950 (.007)**	**3.292 (<.001)**	**1.824 (.003)**
TMJ pain/fatigue	**5.708 (<.001)**	**4.798 (<.001)**	**3.583 (<.001)**	**5.959 (<.001)**	N.S.	**4.443 (<.001)**	**4.249 (<.001)**	**2.914 (<.001)**	**20.767 (<.001)**

N.S.: No statistical significance.

A similar question arises when the parental reports are analyzed. High prevalence of the reported traits was observed (17). It is known that in situations similar to our data collection, parents can over-report their observations with the purpose to gain immediate assistance to their children. Nevertheless, the present reports of TMJ pain or fatigue, parafunctional habits, and headache had very strong correlation with several TMD features. This allows us to qualify them as very reliable. Another important point is the exam reliability, which was statistically verified through high Kappa values. Despite the large number of subjects, exams were performed within a very few months. This was designed to be a short-term clinical investigation, which was considered to be important to keep the calibration updated.

Concerning statistical methods, we believe our main goal is to present the results of both uni and multivariated analyses. This allows us to compare univariated results to literature, and to understand why precedent relationships have been drawn. Our data support the opinion of Keeling et al. (2). To them, the majority of studies have shown no relation between TMJ sounds and functional malocclusions. When they were present, they did not hold up under multivariate statistical analysis, which are more powerful and trustable. We also believe that only few relationships exist between TMJ symptoms and malocclusion.

By analyzing Table 3 (univariated regression), many relations could be inferred but, as expected, only a few remained or became significant on Table 5 (multivariated regression), concerning the role of malocclusions. Children with Class II subdivision exhibited more TMJ pain on palpation than others, similar to Riolo et al. (6). Deep overbite and Class II, division 2 malocclusions are commonly cited factors in TMJ patient populations, and deep overbite is frequently said to be a cause of condylar displacement and masticatory muscle pain (3), although in the present study it was related to mouth opening limitation (Table 4). To John et al. (4), although extreme measures of overbite or overjet have been related to changes in masticatory muscle and TMJ function, chronic factors like overbite or overjet, which do not exceed the adaptive capacity of the stomatognathic system, may not necessarily translate into TMD as perceived by the patient. From that viewpoint, attempting to prevent TMD by creating ‘more normal’ values of overbite or overjet with dental treatment was not supported by them. Nevertheless, at this time there is no scientific documentation that early correction of malocclusion will prevent masticatory muscle or temporomandibular joint disorders (3). No previous study has ever pointed a specific relation of excessive overjet and anterior temporal or submandibular pain on palpation, although some correlated excessive overjet to TMD (1, 4, 7-9) and other TMD traits (1, 3, 5, 6), as seen on Table 1. It has been suggested that undue forces are placed on the masticatory muscles as a consequence of an unfavorable incisor relationship (3), which could explain this relationship.

Table 5: Significant relationships between TMD signs or symptoms and possible contributors at the multivariated logistic regression models. To each TMD trait, all significant or close to significant contributor at the univariated models were included. Analyses were controlled for dentition stages when this was significant. Numbers are the expected value and p-value (in parenthesis).

	Mouth opening limitation	TMJ crepitus	TMJ pain on lateral palpation	Masseter pain on palpation	Anterior Temporal pain on palpation	Medium Temporal pain on palpation	Posterior Temporal pain on palpation	Submandibular region pain on palpation	Mandibular posterior pain on palpation	Any TMD feature
Excessive overbite	**5.233 (.007)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Excessive overjet	N.S.	N.S.	N.S.	N.S.	**1.670 (.012)**	N.S.	N.S.	**1.898 (.041)**	N.S.	N.S.
Lower crowding	N.S.	N.S.	N.S.	**1.820 (.033)**	N.S.	N.S.	**1.981 (.032)**	N.S.	N.S.	N.S.
Molar class										
Class I	N.S.	N.S.	1 (.097)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class I+II	N.S.	N.S.	**2.398 (.009)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class I+III	N.S.	N.S.	.494 (.501)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class II	N.S.	N.S.	.713 (.502)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class II+III	N.S.	N.S.	2.744 (.377)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Class III	N.S.	N.S.	1.086 (.915)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Ethnics										
White	N.S.	**1 (.041)**	N.S.	1 (.076)	N.S.	1 (.059)	N.S.	1 (.093)	N.S.	N.S.
Mixed	N.S.	**.651 (.023)**	N.S.	1.386 (.189)	N.S.	**2.572 (.018)**	N.S.	**2.075 (.039)**	N.S.	N.S.
Black	N.S.	1.069 (.776)	N.S.	**1.951 (.025)**	N.S.	1.761 (.285)	N.S.	2.044 (.115)	N.S.	N.S.
Bruxism	N.S.	N.S.	**2.058 (.009)**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Parafunctional habits	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**2.314 (.<.001)**	**1.640 (.016)**

N.S.: No statistical significance.

Also lower crowding had some implications on masseter and posterior temporal pain on palpation. Demir et al. (3) found more temporal tenderness in those children with anterior crowding, but the mechanisms of this relationship remains unknown. Although McNamara et al. (9) have pointed the absence of five or more posterior teeth as a risk factor for TMD, this could not explain the present finding as those absences were observed in adults and would hardly lead to anterior crowding.

Recent approaches have pointed local factors to have a less important role in this process (15), being occlusal factors only weakly associated with TMD signs and symptoms (26). To John et al. (4), centrally acting factors, like depression and somatization, have more evidence to support them as risk factors than peripheral (local) factors. The findings of Glaros et al. (19) suggest that behavioral and psychological factors may contribute independently to reports of TMD-related pain. To Vanderas et al. (5), the contribution of some types of malocclusion to the presence of certain signs of dysfunction is small, although not zero. The present results pointed the contribution of only four occlusal traits: excessive overbite, excessive overjet, lower crowding and Class II molar relationship. In comparison with all possible relationships analyzed, this is not much. Major contributors were age (dentition stage), ethnicity, and parafunctional habits and bruxism. Once ethnicity was observed as a strong contributor, a genetic contribution to TMD is hence suggested.

With regard to the emotional state, reported by the parents on questionnaire, it has already been observed a larger prevalence of TMD in tense children than in calm children (21). This has been explained as an increase in anxiety might lead to an increase in the muscular tension, causing pain (20, 27). Also, children with headaches show more stress and psychological and somatic symptoms (besides headaches) than children without headaches (20, 28), leading to an increase in anxiety and parafunction, and thus explaining this vicious circle. But whether headache contributes to TMD or vice-versa remains controversial (8). Thilander et al. (8) found dental wear to be associated with TMJ pain and muscle tenderness, suggesting that bruxism has an influence on TMD. Glaros et al. (19) found that prolonged light clenching can induce signs and symptoms of TMD in healthy subjects (29). It seems reasonable that TMD, bruxism, parafunctional habits, tension and headache are all parts of the same process.

Other studies have pointed sex as a contributing factor to TMD (13-15, 17). Possible explanations were mental factors, being girls more sensitive to tenderness and pain on palpation of the TMJ and muscles (8). Gender differences in the fiber composition of the jaw musculature and EMG output could partly explain earlier exhaustion and pain in the musculature of females than in males (7). Although a single difference was found in univariated analysis, as well as in our previous study (17), we did not observe significance at the multivariated models. It suggests that sex differences, if existent, play a very small role in children TMD. Bertoli et al. (21) attempted to the fact that a difference may begin after puberty, when there may be an increase among girls.

Conclusion

Based on present results, and considering the employed methods and our large sample (1200 children), we concluded that few relationships exist between TMD signs and symptoms and malocclusion, namely: excessive overbite, excessive overjet and Class II molar relationship. More consistent relationships were found for age, ethnicity and parafunctional habits as TMD contributors. Reported headache and TMJ pain or fatigue were also strongly related, this time as TMD outcomes.

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5 DISCUSSÃO

Os objetivos deste estudo foram alcançados. Um perfil epidemiológico detalhado, referente tanto a maloclusões quanto a DTM, foi estabelecido para a população estudada. Prevalências totais e pormenorizadas destes distúrbios estão disponíveis para planejamento de serviços que visem atender suas necessidades. Não obstante, novas informações nesta área de conhecimento foram geradas a fim de entender melhor os processos que levam a estas condições.

Algumas questões devem ser observadas durante a interpretação dos resultados apresentados. A primeira delas é a qualidade desta informação. O exame realizado continha variáveis de caráter profundamente subjetivo por tratarem de dor, especialmente dor infantil. Duas menções devem ser feitas aqui. Ficou claro que a adoção da escala Faces Pain Scale – Revised (Hicks, Von Baeyer *et al.*, 2001) foi uma escolha acertada, que proveu ao exame grande robustez – mesmo com alguma dificuldade nas crianças de 6 anos de idade. Outro ponto é a consideração dos bons testes de correlação intra e inter-examinadores como indicação não apenas da calibração entre os examinadores, mas também como prova da reprodutibilidade da resposta dos sujeitos frente ao método.

Interpretação semelhante pode ser atribuída a dados do terceiro artigo (Artigo 3, *Table 3*). Apesar de tratar-se da análise de regressão univariada, menos poderosa que a multivariada no que tange as correlações estudadas, ela é valiosa para o estabelecimento de relações simples. É nítida a ligação entre o relato de hábitos parafuncionais, bruxismo, dor de cabeça e fadiga articular a sintomas de DTM. Além da sugestão de correlações entre estes dados, confirmada na análise multivariada, torna-se aí evidente a confiabilidade do relato do responsável – outro ponto crítico para os dados apresentados.

Quanto à manipulação dos dados, houve certa dificuldade no enquadramento dos problemas articulares. No caso das maloclusões, isto foi menos crítico pela adoção do IOTN (Brook e Shaw, 1989). Entretanto, para DTM, não foi encontrada uma maneira universal de determinar implicações reais para o paciente. Os questionários usualmente aplicados referem-se a adultos, possuindo questões inalcançáveis pelo paciente infantil. Um índice que avalie a real necessidade de

intervenção para tratamento destas desordens em crianças precisa ser criado ou adaptado.

A despeito de terem sido tratados como dados preliminares deste estudo aqueles provenientes das análises descritivas, apresentados principalmente nos Artigos 2 e 3, são estes os que terão aplicação mais imediata e prática no que tange o bem-estar desta população. Um grande percentual apresentou necessidade de tratamento ortodôntico (69,5%), de acordo com o explorado no Artigo 1, sendo que esta análise foi feita baseada nos sujeitos com necessidade moderada e definitiva; aqueles com necessidade leve não foram incluídos. Já para DTM, não é possível delimitar números tão precisos. O que se pode dizer, com base no Artigo 2, é que 34,8% da amostra apresentou pelo menos um sinal ou sintoma; entretanto acreditamos que, entre estes, apenas uma pequena percentagem precise realmente de alguma intervenção.

Como explicitado no Artigo 3, os estudos disponíveis na literatura exibem análises mais simples que as presentes para determinar correlações. Utilizando o qui-quadrado (χ^2), associado à regressão logística, Widmalm et al. (Widmalm, Christiansen e Gunn, 1995) encontraram, como contribuintes para DTM, o bruxismo, roedura de unhas e sucção digital. Sonnesen et al. (Sonnesen, Bakke *et al.*, 1998) utilizaram, além do Exato de Fisher, regressão logística – porém univariada. Também encontraram muitas associações entre fatores oclusais, principalmente erros de formação dentária, e sinais ou sintomas de DTM. Sari et al. (Sari e Sonmez, 2002) utilizaram o Teste Z para investigar a relação de parafunções e DTM em dentição mista, e correlação significante foi encontrada com sucção digital ou roedura de unhas. Thilander et al. (Thilander, Rubio *et al.*, 2002), através de teste-*t* e qui-quadrado (χ^2), encontraram associação de DTM com mordida cruzada posterior e aberta anterior, Classe III de Angle e overjet extremo. Entretanto, não especificam a que sinal ou sintoma estariam relacionados. Demir et al. (Demir, Uysal *et al.*, 2005) usaram qui-quadrado (χ^2) para determinar associações entre sensibilidade de musculatura mastigatória e fatores oclusais. Como esperado, mais associações foram encontradas que no presente trabalho.

Poucos estudos usaram uma abordagem mais sofisticada, semelhante à presente. Egermark-Eriksson (Egermark-Eriksson, Carlsson *et al.*, 1987) não

encontraram correlações consistentes entre interferências oclusais e DTM após regressão multivariada. Para Keeling et al. (Keeling, Mcgorray *et al.*, 1994), apinhamento anterior maxilar e mandibular, abertura máxima aumentada e overbite acentuado relacionaram-se a sons articulares. Em Vanderas et al. (Vanderas e Papagiannoulis, 2002), regressão logística multivariada foi empregada para testar se a presença de cada sinal ou sintoma era afetada por variáveis como maloclusões, parafunção, injúria dental e stress. Mordida cruzada posterior e overjet acentuado foram as únicas variáveis oclusais significativas, junto a hábitos parafuncionais e indicadores de stress. Os dados destes estudos, embora menos numerosos, têm maior poder estatístico.

Algumas observações devem ser feitas a respeito das relações observadas entre os sexos. O Artigo 1 explicita diferenças estatisticamente significativas para overbite excessivo, mordida aberta anterior, desvio de linha média e apinhamento inferior. Diferenças entre sexos já foram relatadas na literatura (Drummond, 2003; Ciuffolo, Manzoli *et al.*, 2005) com valores significativos, apesar de clinicamente sempre pouco expressivos. A respeito dos sinais e sintomas de DTM, dados comparados dos Artigos 2 e 3 parecem conflitantes, caso não observada sua obtenção. No Artigo 2, reporta-se o achado de maior prevalência de quase todos os traços em meninas, inclusive com diferença estatisticamente significativa para dor articular à palpação posterior, dor de cabeça e hábitos parafuncionais. Já no Artigo 3, tais diferenças não foram encontradas. A explicação para esta aparente incoerência é, novamente, o tratamento estatístico dado aos dados em cada caso. Os modelos multivariados do Artigo 3 corrigiram co-variáveis interferentes, eliminando muitas das associações encontradas tanto no Artigo 2 quanto em suas próprias análises preliminares (Artigo 3, *Table 3)*. Tais diferenças entre sexos pareceram ser muito pouco expressivas, se existentes, nesta faixa etária.

De posse destes resultados, novas estratégias podem ser estabelecidas com o objetivo de assistir esta população e suas gerações seguintes. Os presentes dados permitem um planejamento mais preciso e coerente com suas necessidades. Novas informações para a compreensão dos mecanismos destas condições também foram gerados, devendo servir como base para novos trabalhos.

6 CONCLUSÃO

Alta prevalência de maloclusões, assim como necessidade de tratamento ortodôntico, foi encontrada nesta população, em crianças em idade de dentição mista. Muitos dos sinais e sintomas de DTM também exibiram alta prevalência, assim como dor de cabeça, hábitos parafuncionais e bruxismo. Dor de cabeça e relato de dor ou fadiga articular foram conseqüências fortemente associadas a vários traços de DTM. Poucos fatores oclusais foram observados como contribuintes para os diferentes sinais ou sintomas, a saber: overbite excessivo, overjet excessivo e Classe II de Angle. Bruxismo e, principalmente, idade, etnia e hábitos parafuncionais tiveram correlação mais consistente com DTM.

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ANEXOS

ANEXO 1

Aprovação do projeto pelo Comitê de Ética em Pesquisa (CEP-IESC, UFRJ)

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
INSTITUTO DE ESTUDOS DE SAÚDE COLETIVA
COMITÊ DE ÉTICA EM PESQUISA

PARECER 17/2008

PROCESSO: 51/2007

Projeto de Pesquisa: **Prevalência de moloclusões e desordem temporomandibular e sua correlação em crianças de 6 a 12 anos de idade.**

Pesquisador: Daniel Ibrahim Brito

O Comitê de Ética em Pesquisa, tendo em vista o que dispõe a Resolução 196/96 do Conselho Nacional de Saúde, resolveu APROVAR o presente projeto.

Informamos que o CEP está à disposição do pesquisador para quaisquer esclarecimento ou orientação que se façam necessários no decorrer da pesquisa.

Lembramos que o pesquisador deverá apresentar relatório da pesquisa no prazo de um ano a partir desta data.

Cidade Universitária, 09 de abril de 2008.

Marisa Palácios
Coordenadora CEP/NESC

MARISA PALACIOS
Coordenadora
Comitê de Ética em Pesquisa
IESC - UFRJ

DELVACI CAVALCANTE DOS SANTOS
SECRETÁRIA EXECUTIVA
Comitê de Ética em Pesquisa
IESC / UFRJ

Instituto de Estudos de Saúde Coletiva-CCS/UFRJ
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Ilha do Fundão – Rio de Janeiro RJ
CEP: 21.941-598 - Rio de Janeiro –
Tel:(021) 2598 9328 Tel/Fax:(021) 2270 0097
e-mail: cep@nesc.ufrj.br

ANEXO 2

Termo de Colaboração – Universidade Federal de Juiz de Fora.

FACULDADE DE ODONTOLOGIA
DEPARTAMENTO DE ODONTOPEDIATRIA E ORTODONTIA
DISCIPLINA DE ODONTOPEDIATRIA

TERMO DE COLABORAÇÃO

Os pacientes diagnosticados como portadores de maloclusões ou desordens temporomandibulares durante a coleta de dados para o estudo "Prevalência de maloclusões e desordem temporomandibular e sua correlação em crianças de 6 a 12 anos de idade" pelo pesquisador Daniel Ibrahim Brito poderão ser encaminhados, através dos postos UBS (SUS), à triagem da Faculdade de Odontologia da UFJF.

Juiz de Fora, 13 de Março de 2008.

Prof. Dr. Antônio Marcio Rezende do Carmo
Diretor da Faculdade de Odontologia - UFJF

ANEXO 3

FACULDADE DE ODONTOLOGIA
DEPARTAMENTO DE ODONTOPEDIATRIA E ORTODONTIA
DISCIPLINA DE ODONTOPEDIATRIA

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Prezado responsável,

Será realizada na escola uma pesquisa da Faculdade de Odontologia da UFRJ, com o objetivo de estudar alguns problemas odontológicos em crianças. Nesta pesquisa, a criança será examinada, o que não será desconfortável para ela, e serão feitas algumas perguntas ao(à) senhor(a). Esta pesquisa foi autorizada pelo(a) diretor(a) da escola.

Sua participação não é obrigatória e, caso não queira participar, isto não causará nenhum prejuízo à criança. O pesquisador responsável (Dr. Daniel Ibrahim Brito) poderá ser acessado para esclarecimento de dúvidas a qualquer momento, pelos telefones (21) 2562-2101, assim como o Comitê de Ética que aprovou esta pesquisa (21 2598 9328).

Em qualquer momento o(a) senhor(a) ou a própria criança poderão desistir de participar da pesquisa. Neste caso, o Dr. Daniel não utilizará as informações obtidas. Os dados individuais dos participantes serão mantidos em segredo. Os resultados gerais serão publicados em revistas científicas especializadas, estando também disponíveis na Biblioteca da Disciplina de Odontopediatria da FO/UFRJ localizada no anexo da Disciplina no 3º andar do Hospital Universitário Clementino Fraga Filho ou na Biblioteca Central do Centro de Ciências da Saúde da UFRJ. Um resumo dos resultados será entregue à diretoria da escola.

Atenciosamente,

_____

Assinatura do Pesquisador responsável
Dr. Daniel Ibrahim Brito

Eu, _____, identidade n.º_____, certifico que entendo as informações acima e concordo com o que foi exposto, e autorizo a utilização de minhas respostas para este estudo.

Juiz de Fora, _____ de _____ de 2008.

_____

Assinatura do responsável

ANEXO 4

PRONTUÁRIO DE EXAME (ATM e musculatura)

Nome: _____ Gênero: _____ No.: _____

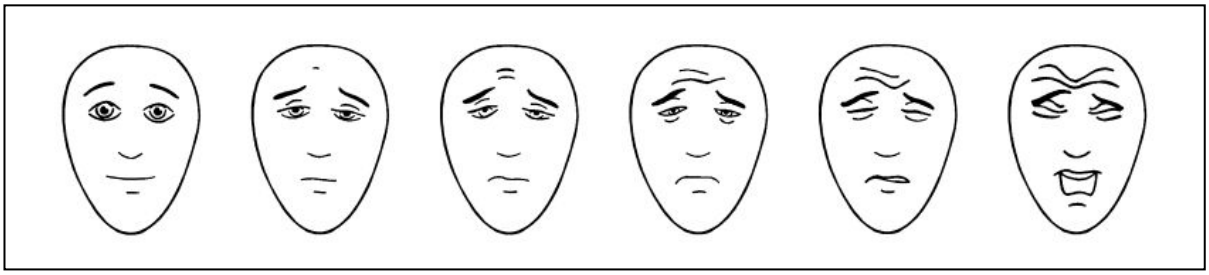
			Normal		DTM	
Abertura máxima		≥ 3 dedos		< 3 dedos		____ mm
Alongamento passivo	Dor: 0 ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( )					____ mm
Deflexão		ausente		presente		
Luxação		ausente		presente		
Laterotrusão máxima	Dir	____ mm				
	Esq	____ mm				
Protrusão máxima		____ mm				

Estalido articular	Dir	ausente		presente	
	Esq	ausente		presente	
Crepitação articular	Dir	ausente		presente	
	Esq	ausente		presente	

		0	1	2	3	4	5
ATM, pólo lateral (repouso + movimento)	Dir						
	Esq						
ATM, ligamento posterior (repouso + movimento)	Dir						
	Esq						
mm. Masseter, superficial e profundo	Dir						
	Esq						
m. Temporal, parte anterior	Dir						
	Esq						
m. Temporal, parte média	Dir						
	Esq						
m. Temporal, parte posterior	Dir						
	Esq						
m. Pterigóideo medial	Dir						
	Esq						
Região mandibular posterior (m. estilo-hióide; região posterior do m. digástrico)	Dir						
	Esq						
Região submandibular (mm. pterigóide medial, supra-hióide e região anterior do digástrico)	Dir						
	Esq						

ANEXO 5

Faces Pain Scale – Revised (Hicks et al.).



ANEXO 6

PRONTUÁRIO DE EXAME (maloclusões)

Nome: _____ Gênero: _____ No.: _____

Relação molar	Dir	Classe I		Classe II		Classe III	
	Esq	Classe I		Classe II		Classe III	
Intercuspidação dos caninos	Dir	Classe 1		Classe 2		Classe 3	
	Esq	Classe 1		Classe 2		Classe 3	

Mordida cruzada anterior		Ausente		Presente	____ mm
Mordida cruzada posterior	Dir	Ausente		Presente	____ mm
	Esq	Ausente		Presente	____ mm
Mordida aberta anterior		Ausente		Presente	____ mm
Mordida aberta posterior	Dir	Ausente		Presente	____ mm
	Esq	Ausente		Presente	____ mm

Apinhamento	Maxilar	____ mm
	Mandibular	____ mm
Overjet		____ mm
Overbite		____ mm
Desvio da linha média		____ mm

Interferência entre Cêntrica e MIH (desvio > 2 mm)		Ausente		Presente	____ mm	
Interferência em protrusão		Ausente		Ausente		
Interferência em laterotrusão	Ipsilateral	Dir	Ausente		Ausente	
		Esq	Ausente		Ausente	
	Contralateral	Dir	Ausente		Ausente	
		Esq	Ausente		Ausente	

ANEXO 7

ENTREVISTA COM O RESPONSÁVEL

Nome da criança: _____

Idade: ____ anos ____ meses Sexo: ____ No.: _____

Etnia: _____ (segundo o reponsável)

Filiação: Pai: _____

Mãe: _____

Endereço: _____

_____Telefone:_____

A criança costuma sentir dor ou cansaço nos músculos ou na região da ATM ao mastigar (principalmente pela manhã)?	não		sim	
Ela costuma ranger ou apertar os dentes (principalmente enquanto dorme)?	não		sim	
A criança tem costuma ter dor de cabeça? (1 vez por semana ou mais)	não		sim	
A criança costuma sentir dor no pescoço ou nos ombros? (1 vez por semana ou mais)	não		sim	
Ela tem algum problema de saúde? Qual? _____	não		sim	

ANEXO 8

ENCAMINHAMENTO

Prezado Doutor(a),

Solicito que encaminhe formalmente (via SUS) o paciente _____ _____ para tratamento na Universidade Federal de Juiz de Fora. O mesmo apresenta maloclusões e / ou desordens temporomandibulares, diagnosticados durante a coleta de dados para o estudo "Prevalência de maloclusões e desordem temporomandibular e sua corelação em crianças de 6 a 12 anos de idade".

Atenciosamente,

_____

Daniel Ibrahim Brito
CROMG 33691

Juiz de Fora, _____ de _____ de 2008

ANEXO 9

Comprovação de submissão do artigo “Occlusion traits and orthodontic treatment need among 6- to 12-years-old Brazilian schoolchildren”.

Of. BOR 430/2008

Prezado (a) Senhor (a)

Recebemos em **07/10/2008** por e-mail o trabalho abaixo relacionado:

Título: OCCLUSION TRAITS AND ORTHODONTIC TREATMENT NEED AMONG 6- TO 12-YEARS-OLD BRAZILIAN SCHOOLCHILDREN para submissão na revista *Brazilian Oral Research*, a ser analisado pela Comissão de Publicação, recebendo o **número 430** que deverá ser utilizado para futuros contatos.

Autores: DANIEL IBRAHIM BRITO - Erika Calvano Kuchler - Rogério Gleiser

Os autores deverão estar de acordo com as normas estabelecidas pela *Brazilian Oral Research* para avaliação e publicação do artigo, conforme consta no site http://www.scielo.br/revistas/bor/pinstruc.htm.

Agradecemos o envio do seu artigo ao nosso periódico.

Atenciosamente,

Comissão de Publicação BOR.
Av. Prof. Lineu Prestes, 2227 - Cidade Universitária
CEP 05508-900 - São Paulo - SP
Fone 55 (11) 3091-7810 e-mail: bor@sbpqo.org.br

ANEXO 10

Comprovação de submissão do artigo “TMD prevalence and associated factors in Brazilian children.”

Dear Dr. Brito,

On November 4, 2008, we received your manuscript submitted to us for publication in The Angle Orthodontist. As is our usual practice, I will send your manuscript out to two reviewers. It generally takes a minimum of eight weeks for the review process to be completed.

Please note that I have assigned a number to your manuscript #110308-559.

You may check on the status of this manuscript by selecting the "Check Manuscript Status" link under the following URL:

<http://angle.allentrack.net/cgi-bin/main.plex?el=A1B7CKe1A1Dtd5F2A9T81WAPAVFtUjLeTwlifwZ>

Press/Click on the above link to be automatically sent to the web page. You will find a link there to send e-mail to me with questions about the status of your manuscript.

Thank you for the opportunity to review your work and thank you for considering The Angle Orthodontist for your publication needs.

Sincerely,

Robert J. Isaacson, DDS, MSD, PhD
Editor, The Angle Orthodontist
Professor Emeritus
University of Minnesota
Virginia Commonwealth University

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