Malocclusion and social vulnerability: a representative study with adolescents from Belo Horizonte, Brazil

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Abstract *Malocclusion is public health problem because of its high prevalence, treatment possibility, and impact on the individual's quality of life. This article aims to determining the prevalence of malocclusion in adolescents and to test its association with social vulnerability. A representative transversal study was performed with 1612 adolescents aged between 11 and 14 years old who came from public and private schools in Belo Horizonte, Brazil. The adolescents were examined by three calibrated examiners for diagnosis of malocclusion, using the Dental Aesthetic Index. The Social Vulnerability Index from Belo Horizonte was used to determine the degree of social vulnerability from adolescents. The data were analyzed using Poisson regression with robust variance (p<0,05). Most adolescents presented absence/minor malocclusion (68.7%). Dental crowding was diagnosed in 51.9% from the sample, diastema in 23.7%, anterior open bite in 7.6 %. Malocclusion was associated with social vulnerability (PR=1.25;95% CI=1.01-1.55). Dental crowding was the most prevalent type of malocclusion. The more socially vulnerable adolescents had worse indicators of malocclusion.*

Key words *Adolescent, Socioeconomic factors, Malocclusion*

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Introduction

Despite the possibility of treatment, malocclusion is considered a public health problem due to its high prevalence and the extent to which it affects the quality of life of affected individuals[1-7]. A Brazilian population-based study conducted in 2010 showed that 38.8% of 12-year-old adolescents suffered from malocclusion[7]. Tooth crowding and spacing, as well as marked horizontal overjet, are the types of malocclusion that most affect individuals in the 9 to 14year age group[1,8].

In general, individuals with low socioeconomic status suffer greater degrees of oral problems[9,10]. Previous studies have shown that adolescents from low-income families whose parents have a lower level of schooling have a higher prevalence of malocclusion[6,11,12]. However, this association remains controversial, as some studies have not identified this relationship[1,13,14].

A Brazilian study evaluated the association between malocclusion in 12-year-old children and individual and contextual factors and found that individuals from sanitation districts with worse conditions of basic sanitation, housing, family income and schooling had a higher prevalence of malocclusion[12]. A nationwide Brazil-based study showed that 12-year-old children living in cities where more families were dependent on government social benefits, which had a lower gross domestic product, and which performed worse in terms of population health care, had higher prevalences of malocclusion[6]. It is essential to use local indexes that assess the social vulnerability of the population through the influence of neighborhoods and access to basic services such as health, transport and general living conditions when considering the most prevalent oral disorders, such as malocclusion[11]. However, studies that analyze the influence of environment and access to infrastructure on the occurrence of malocclusion are scarce.

The identification and early treatment of individuals with malocclusion is important in terms of public health performance, as it directly affects the cost of treatment, with preventive and interceptive orthodontic practices improving occlusion during pre-adolescence and adolescence[15,16]. In this scenario, there is a need for studies thathelp to identify the relationship between malocclusion and conditions of social vulnerability. The use of the Social Vulnerability Index (SVI), an instrument developed and applied specifically for the city of Belo Horizonte, Brazil, contributes to a better understanding of the influence of environment and access to infrastructure on the occurrence of health/disease indicators. The SVI measures the vulnerability of the population of the city through five dimensions of citizenship, addressing access to housing, basic infrastructure, schooling, income, work, legal support, health, food security and social security[17]. Therefore, the objective of the present study was to evaluate the prevalence and severity of malocclusion and its association with the social vulnerability to which adolescents aged 11 to 14 years in the city of Belo Horizonte are exposed.

Methods

The present study was carried out in the city of Belo Horizonte, the capital of the state of Minas Gerais, Brazil. Belo Horizonte has a population of 2,375,151 inhabitants, and is divided into nine administrative regions[18]. The Human Development Index (HDI) of the cityis 0.810, putting it in 20th position in the HDI ranking of Brazilian municipal districts[19]. According to the Instituto de Pesquisa Econômica Aplicada(the Institute of Applied Economic Research) (IPEA), the social vulnerability index of Belo Horizonte is 0.276. This value indicates that the city has conditions of social vulnerability that are similar to those in the state of Minas Gerais (0.282), and better than those in Brazil (0.326)[20].

Calculation and selection of sample

The sample size was calculated based on a margin of error of 3, a confidence level of 95.0% and a prevalence of 62.6%, found in a previous study conducted in Belo Horizonte with adolescents from 10 to 14 years of age[1]. To improve precision, a correction factor of 1.4 was applied, as the multi-stage sampling method was used instead of simple random sampling[21]. According to the calculation, the minimum sample size was estimated as 1408 subjects. A further 20.0% (n=1690) was added to compensate for possible losses.

Adolescents between 11 and 14 years of age, representing all adolescents from the city of Belo Horizonte, were randomly selected from a population enrolled in 456 public and private schools in 2009. Initially, a public and a private school were drawn from each of the nine administrative districts (Barreiro, Center-South, East, West, Northeast, Northwest, North, Pampulha and Venda Nova) (Table 1). Next, a classroom was selected randomly in each of the schools.

A letter was sent to the parents or guardians of the adolescents selected, explaining the objective, importance and methods of the study. Only adolescents whose parents/guardians signed a Free and Informed Consent Form participated in the study, in accordance with the ethical requirements for research involving humans (Resolution 466/12 ofthe National Health Council/ Ministry of Health).

Dependent variable

The clinical criteria to determine the prevalence of malocclusion (dependent variable) were taken from the Dental Aesthetic Index (DAI)[22,23]. The DAI includes the evaluation of the following conditions: absent incisors, canines and premolars; crowding in incisor region; spacing in incisor region; diastema; largestupper anterior irregularity; largest lower anterior irregularity; anterior maxillary overjet; anterior mandibular overjet; vertical anterior open bite; and antero-posterior molar relation. Following clinical evaluation, the values were calculated using a specific equation[22].

The DAI provides four diagnostic possibilities in relation to malocclusion: absence of abnormality or minor malocclusion, with ortho-dontic treatment unnecessary (DAI ≤ 25), definite malocclusion, where orthodontic treatment is elective (DAI = 26-30), severe malocclusion, with orthodontic treatment highly desirable (DAI = 31 to 35) and very severe or handicapping malocclusion, where orthodontic treatment is essential (DAI ≥ 36)[22,23].

For aesthetic analysis, this variable was dichotomized into absent/minor malocclusion (DAI ≤ 25) and malocclusion present (DAI > 25).

Calibration exercise

The clinical exams were performed by three calibrated dentists, who participated in training and calibration exercises based on the criteria proposed by the DAI. Training was performed using plaster models, with the objective of studying the main clinical characteristics of each condition. Forty-four adolescents who were not included in the study population were examined by each of the three dentists separately to determine inter-examiner agreement. After one month, ten children were reexamined to calculate intra-examiner agreement. The kappa values were 0.84 for inter-examiner agreement and 0.90 for intra-examiner agreement.

Table 1. Distribution of sample of adolescents, in absolute and proportional values, by administrative district and school type, Belo Horizonte, Brazil (n = 1.612).

Administrative district	First stage (distribution by district)		Second stage (distribution by type of school)		
	Total adolescents, n (%)	Sample, n (%)	Type of school	Total adolescents, n (%)	Sample, n (%)
Barreiro	22.129 (13.0)	210 (13.0)	Public	20.349 (92.0)	193 (91.9)
			Private	1.780 (8.0)	17 (8.1)
Center-South	22.946 (13.4)	216 (13.4)	Public	13.054 (57.0)	124 (57.4)
			Private	9.892 (43.0)	92 (42.6)
East	19.972 (11.7)	189 (11.7)	Public	16.243 (81.0)	153 (80.9)
			Private	3.729 (19.0)	36 (19.1)
Northeast	20.991 (12.3)	198 (12.3)	Public	18.410 (88.0)	173 (87.4)
			Private	2.581 (12.0)	25 (12.6)
Northwest	18.988 (11.1)	179 (11.1)	Public	14.184 (75.0)	134 (74.9)
			Private	4.804 (25.0)	45 (25.1)
North	13.692 (8.1)	130 (8.1)	Public	12.635 (92.0)	119 (91.5)
			Private	1.057 (8.0)	11 (8.5)
West	16.330 (9.6)	155 (9.6)	Public	13.140 (80.0)	124 (79.9)
			Private	3.190 (20.0)	31 (20.1)
Pampulha	13.441 (7.9)	127 (7.9)	Public	9.608 (71.0)	90 (70.9)
			Private	3.833 (29.0)	37 (29.1)
Venda Nova	21.899 (12.9)	208 (12.9)	Public	20.472 (93.0)	193 (92.8)
			Private	1.427 (7.0)	15 (7.2)
Total	170.388 (100.0)	1.612 (100.0)		170.388 (100.0)	1.612 (100.0)

Pilot study

A pilot study was conducted with a sample of 66 adolescents who did not participate in the main study. The objective of the pilot study was to test methods such as clinical examination and questionnaire application, as well as to prepare examiners. There was no need for changes in the study methodology following the pilot study.

Data collection

The adolescents were examined in their own school, in pre-determined order, during class time. Artificial lighting (Petzl Zoom head lamp, Petzl America, Clearfield, UT, USA) and the examiners used appropriate personal protective equipment. Disposable mouth mirrors (PRISMA®, São Paulo, Brazil) and sterilized WHO probes (OMS-621 Trindade, Campo Mourão, Pará, Brazil) were used for the intra-oral clinical exams.

Social vulnerability

The Social Vulnerability Index (SVI) of Belo Horizonte was used to classify social vulnerability. The SVI is a locally-based social indicator, developed and applied specifically for the city of Belo Horizonte. It is used to measure the vulnerability to social exclusion of the resident population in each of the 81 planning units of the city, through five "Dimensions of Citizenship": Environmental - access to housing and basic infrastructure; Cultural - access to schooling; Economic - access to income and work; Legal - access to legal support; and Survival Security - access to health, food security and social security[24]. The SVI determines the extent to which the population of each city planning unit is vulnerable to social exclusion. SVI values are classified into five groups, ranging from Class I, which comprises the most socially vulnerable families to Class V, who are the least socially vulnerable families[25]. As adolescents usually reside near their schools and study in social settings similar to their homes, school districts were used for this classification. The SVI was dichotomized as high social vulnerability (Classes I and II) and low social vulnerability (Classes III, IV and V).

Data analysis

Statistical analysis was performed using theStatistical Package for the Social Sciences (SPSS for Windows, version 22.0, SPSS Inc., Chicago, IL, USA). Data analysis included descriptive statistics (frequency distribution and cross-tabulation) and Poisson regression with robust bivariate and multivariate variance, to observe the association between malocclusion and the independent variables of social vulnerability, gender and age. The level of significance was set at 5%.

Results

The sample of the present study consisted of 1612 adolescents, 940 (58.3%) of whom were female, representing adolescents aged 11 to 14 years residing in Belo Horizonte, Brazil. Due to the high response rate (95.4%), the sample size was slightly larger than the minimum size estimated by the sample calculation (n = 1408). The majority of these adolescents were from regions of high social vulnerability (67.5%) and had absent/minor malocclusion (68.7%) (Table 2).

Table 3 shows the distribution of the clinical criteria that make up the DAI. Tooth crowding was the most prevalent type of malocclusion in the sample (51.9%), with the presence of only one crowded segment (29.3%) more common than two crowded segments (22.6%). Anterior spacing in only one segment was found in 21.4% of adolescents, while diastema was present in 23.7% of the sample.

The result of bivariate analysis showed that only social vulnerability was associated with malocclusion, and this result was confirmed by multivariate analysis, adjusted by gender. Adolescents from regions of high social vulnerability were more likely to present malocclusion (PR = 1,163, CI = 1.006-1.344) than those from low vulnerability regions (Table 4).

Discussion

The present study demonstrated the association between the social vulnerability to which adolescents from Belo Horizonte are exposed and the presence of malocclusion, and corroborated some findings from literature, even though other methods to measure socioeconomic conditions were used in such studies[6,12,26-28].

A previous study published with data from the national oral health survey conducted in Brazil in 2010, evaluating 12-year-old children, found that the severity of malocclusions increased as family income decreased[6]. A study

Table 2. Distribution of sample of adolescents, in absolute and proportional values, by dependent and independent variables, Belo Horizonte, Brazil (n = 1.612).

Variables	Frequency, n (%)
Gender	
Male	672 (41.7)
Female	940 (58.3)
Age	
11 and 12	856 (63.1)
13 and 14	756 (46.9)
Social vulnerability	
Low vulnerability	524 (32.5)
High vulnerability	1.088 (67.5)
Malocclusion	
Absent/minor	1.108 (68.7)
Definite	279 (17.3)
Severe	116 (7.2)
Very severe	109 (6.8)

Table 3. Distribution of sample of adolescents, in absolute and proportional values, by DAI criteria, Belo Horizonte, Brazil (n = 1.612).

Variables	Frequency, n (%)
Missing teeth	
No	895 (55.5)
Yes	717 (44.5)
Anterior crowding	
No crowding	776 (48.1)
One crowded segment	472 (29.3)
Two crowded segments	364 (22.6)
Anterior spacing	
No spacing	1.094 (67.9)
One spaced segment	345 (21.4)
Two spaced segments	173 (10.7)
Diastema	
No	1.231 (76.4)
Yes	381 (23.7)
Upper anterior irregularity	
≤ 2 mm	1.493 (92.6)
> 2 mm	119 (7.4)
Lower anterior irregularity	
≤ 2 mm	1.564 (97.0)
> 2 mm	48 (3.0)
Anterior open bite	
≤ 2 mm	1.600 (99.2)
> 2 mm	12 (0.7)
Anterior maxillary overjet	
≤ 4 mm	1.530 (94.8)
> 4 mm	82 (5.2)
Anterior mandibular overjet	
No	1.533 (95.1)
Yes	79 (4.9)

conducted in Turkey with children aged 9 to 18 yearsshowed that the higher the level of schooling of parents, the greater their perception of the dental aesthetics of their children[26]. However, findings in literature about this association remain controversial[13,14,29-32]. Studies conducted with Brazilian children aged 3 to 5 years and 5 to 12 years did not identify a relationship between socioeconomic conditions and the presence of malocclusion[13,14]. Another study carried out in Belo Horizonte, Brazil with children aged from 10 to 14 years did not find an association between the educational level of parents and the normative need for orthodontic treatment in children[1].

The differences in results found in literature can be explained by the fact that each population has its own social and economic particularities. Additionally, the differences in the indexes that assess socioeconomic status in studies from literature on this subject make it difficult to compare results. Although no systematic review of works that study the association between malocclusion and socioeconomic conditionswas found, a review published in 2012 on the association between socioeconomic indicators and dental caries showed that there is a great diversity in the indexes used. The socioeconomic indicators described by this review include levels of schooling, literacy rate, school attendance, socioeconomic status, socioeconomic trajectory, inequality in relation to municipal income, social class, family income, per capita income, government benefits, satisfaction with income, occupation, unemploy-

ment rate, and community indices such as the Gini Coefficient[33].

The socioeconomic condition of the individual is one of the determinants for the use of dental services. Literature demonstrates that social vulnerability influences the ability of parents to provide access to adequate care, which affects the health status of their children[34]. A previous study conducted in Brazil stated that among the most vulnerable individuals, the number of people withoutdental care is 16 times higher than in higher income groups[35].

In a review of literature on synthetic indexes of social vulnerability, 23 Brazilian and international indexes were identified. These indexes addressed factors related to the social determinants of health, including quality of life of individuals

Table 4. Bivariate and multivariate Poisson regression model explaining the influence of the independent variables on malocclusion, Belo Horizonte, Brazil (n = 1.612).

Variables	Malocclusion		Non-adjusted PR (95% IC)	P value*	RP ajustada (95% IC)	P value**
	Absent/ Minor n (%)	Present n (%)				
Gender						
Male	225 (33.5)	447 (66.5)	1.00	0.103	1.00	0.115
Female	279 (29.7)	661 (60.3)	0.887 (0.767-1.025)		0.890 (0.770-1.029)	
Age						
11 and 12	579 (67.6)	277 (32.4)	1.00	0.314	--	--
13 and 14	529 (70.0)	227 (30.0)	0.928 (0.802-1.073)		--	
Social vulnerability						
Low vulnerability	272 (29.2)	659 (70.8)	1.00	0.037	1.00	0.041
High vulnerability	232 (34.1)	449 (65.9)	1.166 (1.010-1.347)		1.163 (1.006-1.344)	

Notes: Poisson regression model with robust variance. * P value for bivariate analysis; ** P value for multivariate analysis. Age was not included in the final model due to p > 0.20.

and families, life course and interaction with the social environment. Indexes of social vulnerability aim to identify and analyze a certain social reality, with the purpose of providing efficient management according to the development needs of each population. The use and interpretation of vulnerability indexes allows a more effective targeting of actions and programs aimed at meeting decision-making demands in public spheres[24].

The index used in this study was the SVI, developed for the city of Belo Horizonte, which allows the identification of the regions of the city where the population is more or less vulnerable to social exclusion. It is a composite indicator, based on data from the Demographic Census, that considers the characteristics of population groups that inhabit census tracts[24]. This indicator is an instrument used to measure a section of reality, in a rapid, abbreviated, efficient, objective manner, allowing its use as an intervention aid. By transforming perceived reality into numbers, such indicators help with the understanding of such reality. In addition, the SVI makes it possible to identify in which aspects the population is most vulnerable, as it measures five dimensions of citizenship[11,17]. Therefore, the SVI has been used as one of the many ways to understand local realities in order to guide public policies and prioritize the allocation of resources[36]. However, the development of a social indicator is complex, as it must group similar constructs together in the same index, and be based on an adequate theoretical model. These limitations can result in

indexes that fail to reflect the complexity of issues involving social vulnerability, and thus blur important factors[24].

The most prevalent types of malocclusion in this study were tooth crowding, tooth spacing and marked overjet. These results were obtained from studies carried out in Brazil[1,8]. Tooth crowding and marked overjet can represent a social disadvantage, as these aesthetic changes interfere negatively with the psychological well-being and social interaction of adolescents, with facial esthetics representing an important determinant in interrelations between individuals[1,37,38].

As a cross-sectional study is a section in time, the present work does not allow us to establish causal relationships between malocclusion and social vulnerability. However, the conduction of a representative population-based study allows the health condition of the population to be registered with external validity and the possibility of extrapolating the results to all adolescents aged 11 to 14 years old from Belo Horizonte.

Highly socially vulnerable adolescents tend to have a greater prevalence of malocclusion, as was confirmed by the present study. This social inequality observed in the occurrence of malocclusion is also reflected in the deficiency of public sector healthcare in terms of orthodontic treatment and the early evaluation of malocclusion[39]. Public health studies related to the prevalence of malocclusions provide important epidemiological data that allow the evaluation of the type and distribution of the occlusal characteristics of a given population, assessing the need for treat-

ment. These data can help direct public health programs that tackle orthodontic needs in a more active manner, aiming to reduce prevalence through diagnosis and early treatment[40,41].

Collaborations

LP Martins carried out the analysis and interpretation of the data, the writing of the article and approved the version to be published; JM Bittencourt performed the analysis and interpretation of the data, the writing of the article and approved the version to be published; CB Bendo worked on the concept, the design, the analysis and interpretation of the data, the writing of the article and approved the version to be published; MP Vale worked on the concept, design and approved the final version to be published; SM Paiva worked on the concept, the design, the writing of the article and approved the final version to be published.

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References

1. Marques LS, Barbosa CC, Ramos-Jorge ML, Pordes IS, Paiva SM. Malocclusion prevalence and orthodontic treatment need in 10-14-year-old schoolchildren in Belo Horizonte, Minas Gerais State, Brazil: a psychosocial focus. *Cad Saúde Pública* 2005; 21(4):1099-1106.

2. Anosike NA, Sanu OO, Da Costa OO. Malocclusion and its impact on quality of life of school children in Nigeria. *West Afr J Med* 2010; 29(6):417-424.

3. Bernabe E, Sheiham A, De Oliveira CM. Condition-specific impacts on quality of life attributed to malocclusion by adolescents with normal occlusion and Class I, II and III malocclusion. *Angle Orthod* 2008; 78(6):977-982.

4. Nobile CG, Pavia M, Fortunato L, Angelillo IF. Prevalence and factors related to malocclusion and orthodontic treatment need in children and adolescents in Italy. *Eur J Public Health* 2007; 17(6):637–641.

5. Shivakumar KM, Chandu GN, Shafiulla MD. Severity of Malocclusion and Orthodontic Treatment Needs among 12- to 15-Year-Old School Children of Davangere District, Karnataka, India. *Eur J Dent* 2010; 4(3):298-307.

6. Brizon VSC, Cortellazzi KL, Vazquez FL, Ambrosano GMB, Pereira AC, Gomes VE, Oliveira AC. Fatores individuais e contextuais associados à má oclusão em crianças brasileiras. *Rev Saúde Pública* 2013; 47(3):1-11.

7. Pesquisa Nacional de Saúde Bucal. SBBrasil 2010. [página da internet]. 2016 [acessado 2016 nov 14]. Disponível em: http://dab.saude.gov.br/CNSB/sbbrasil/arquivos/projeto_sb2010_relatorio_final.pdf

8. Brito DI, Dias PF, Gleiser R. Prevalência de más oclusões em crianças de 9 a 12 anos de idade da cidade de Nova Friburgo. *R Dental Press Ortodon Ortop Facial* 2009; 14(6):118-124.

9. Piovesan C, Mendes FM, Antunes JL, Ardenghi TM. Inequalities in the distribution of dental caries among 12-year-old Brazilian schoolchildren. *Braz Oral Res* 2011; 25(1):69-75.

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10. Locker D. Disparities in oral health-related quality of life in a population of Canadian children. *Community Dent Oral Epidemiol* 2007; 35(5):348–356.

11. Bendo CB, Vale MP, Figueiredo LD, Pordeus IA, Paiva SM. Social vulnerability and traumatic dental injury among Brazilian schoolchildren: a population-based study. Int J *Environ Res Public Health* 2012; 9(12):4278-4291.

12. Jordão LM, Vasconcelos DN, Moreira RS, Freire MC. Individual and contextual determinants of malocclusion in 12-year-old schoolchildren in a Brazilian city. *Braz Oral Res* 2015; 29(1):1-8.

13. Tomita NE, Sheiham A, Bijella VT, Franco LJ.The relationship between socioeconomic determinants and oral habits as risk factors for malocclusion in preschool children. *Pesq Odont Bras* 2000; 14(2):169-175.

14. Frazão P, Narvai PC, Latorre MRDO, Castellanos RA. Malocclusion prevalence in the deciduous and permanent dentition of schoolchildren in the city of São Paulo, Brazil, 1996. *Cad Saude Publica* 2002; 18(5):1197-1205.

15. Guzzo SC, Finkler M, Reibnitz Jr C, Reibnitz MM. Ortodontia preventiva e interceptativa na rede de atenção básica do SUS: perspectiva dos cirurgiões-dentistas da Prefeitura Municipal de Florianópolis. *Cien Saude Colet* 2014; 19(2):449-460.

16. Hebling SRF, Pereira AC, Hebling E, Meneghim MC. Considerações para elaboração de protocolo de assistência ortodôntica em saúde coletiva. *Cien Saude Colet* 2007; 2(4):1067-1078.

17. Nahas MI, Ribeiro C, Esteves O, Moscovitch S, Martins VL. The map of social exclusion in Belo Horizonte: Methodology of building an urban management tool. *Cad Cienc Soc* 2000; 7: 75–88.

18. Instituto Brasileiro de Geografia e Estatística (IBGE). *Censo Demográfico 2010* [página da internet]. 2016 [acessado 2016 Abr 12]. Disponível em: http://cidades.ibge.gov.br/xtras/perfil.php?lang=&codmun=310620&search=minas-gerais|belo-horizonte.

19. Programa das Nações Unidas para o Desenvolvimento. Ranking IDHM Municípios 2010. [página da internet]. 2016 [acessado 2016 Abr 12]. Disponível em: http://www.pnud.org.br/atlas/ranking/Ranking-IDHM-Municipios-2010.aspx.

20. Instituto de Pesquisa Econômica Aplicada. Atlas da Vulnerabilidade Social nos Municípios Brasileiros 2010. [página da internet]. 2016 [acessado 2016 Nov 14]. Disponível em: http://ivs.ipea.gov.br/ivs/pt/consulta/

21. Do LG, Spencer A. Oral health-related quality of life of children by dental caries and fluorosis experience. *J Public Health Dent* 2007; 67(3):132–139.

22. Organização Mundial da Saúde. Levantamentos básicos em saúde bucal. 4ª ed. São Paulo: Santos; 1999.

23. Cons NC, Jenny J, Kohout FJ, Freer TJ, Eismann D. Perceptions of occlusal conditions in Austrália, the German Democratic Republic and the United States of America. *Int Dent J* 1983; 33(2):200-206.

24. Schumann LR, Moura LB. Vulnerability synthetic indices: a literature integrative review. *Cien Saude Colet* 2015; 20(7):2105-2120.

25. Serra-Negra JM, Ramos-Jorge ML, Flores-Mendonça CE, Paiva SM, Pordeus IA. Influence of psychosocial factors on the development of sleep bruxism among children. *Int J Paediatr Dent* 2009; 19(5):309-317.

26. Dogan AA, Sari E, Uskun E, Saglam AMS. Comparison of orthodontic treatment need by professionals and parents with different socio-demographic characteristics. *Eur J Orthod* 2010; 32(6):672-676.

27. Thomaz EBA, Cangussu MCT, Assis MO. Maternal breastfeeding, parafunctional oral habits and malocclusion in adolescents: A multivariate analysis. *Int J Pediatr Otorhinolaryngol* 2012; 76(4):500-506.

28. Peres KG, Peres MA, Boing AF, Bertoldi AD, Bastos JL, Barros AJD. Redução das desigualdades na utilização de serviços odontológicos no Brasil entre 1998 e 2008. *Rev Saúde Pública* 2012; 46(2):250-258.

29. Alves JAO, Forte FDS, Sampaio FC. Condição socioeconômica e prevalência de más oclusões em crianças de 5 e 12 anos na USF Castelo Branco III: João Pessoa/Paraíba. *R Dental Press Ortodon Ortop Facial* 2009; 14(3):52-59.

30. Meyers A, Hertzberg J. Bottle-feeding and malocclusion: is there an association? *J Orthod Dentofacial Orthop* 1988; 93(2):149-152.

31. Martins JCR. Prevalência de má oclusão em pré-escolares de Araraquara: relação da dentição decídua com hábitos e nível socioeconômico. *Revista Dental Press de Ortodontia e Ortopedia Facial* 1998; 3(6):254-256.

32. Michel-Crosato E, Biazevic MGH, Crosato E. Relação entre maloclusão e impactos nas atividades diárias: um estudo de base populacional. *Rev. Odontol.* UNESP 2005; 34(1):37-42.

33. Costa SM, Martins CC, Bonfim Mde L, Zina LG, Paiva SM, Pordeus IA, Abreu MH. A systematic review of socioeconomic indicators and dental caries in adults. *Int J Environ Res Public Health* 2012; 9(10):3540–3574.

34. Mattheus DJ. Vulnerability related to oral health in early childhood: A concept analysis. *J Adv Nurs* 2010; 66(9):2116–2125.

35. Barros AJD, Bertoldi AD. Desigualdade na utilização e no acesso de serviços odontológicos: uma avaliação em nível nacional. *Ciênc saúde coletiva* 2002; 7(4):709-717.

36. Prefeitura de Belo Horizonte. Índice de vulnerabilidade da saúde 2012. [Manual na internet]. 2013 [acessado 2016 Abr 20]. Disponível em: file:///C:/Users/ADM/Downloads/IVSaúde_risco2012.PDF

37. Stenvik A, Espeland L, Mathisen A. Longitudinal study on subjective and objective orthodontic treatment need. *Eur J Orthod* 1997; 19(1):85-92.

38. Coyne R, Woods M, Abrams R. The community and orthodontic care. Part II: community-perceived importance of correcting various dentofacial anomalies. Part III: community perception of the importance of orthodontic treatment. *Aust Orthod J* 1999; 15(5):289-301.

39. Brasil. Ministério da Saúde (MS). *Diretrizes da política nacional de saúde bucal.* Brasília: MS; 2004.

40. Peres KG, Peres MA, Boing AF, Bertoldi AD, Bastos JL, Barros AJ. Reduction of social inequalities in utilization of dental care in Brazil from 1998 to 2008. *Rev Saude Publica* 2012; 46(2):250–258.

41. Tessarollo FR, Feldens CA, Closs LQ. The impact of malocclusion on adolescents' dissatisfaction with dental appearance and oral functions. *Angle Orthod* 2012; 82(3):403-409.