Prevalence of Malocclusions and their Impact on the Quality of Life of 18-Year-Old Young Male Adults of Florianópolis, Brazil

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Purpose: To evaluate the prevalence and the impact of malocclusions on the quality of life of 18-year-old young male adults.

Materials and Methods: Cross-sectional study involving young adults who applied for military service in the city of Florianópolis in the year 2003 (N = 3735). The sample size was 414 individuals randomly selected during the health examination days. The malocclusion data were obtained through the Dental Aesthetic Index variables. The impact of the oral health conditions on the quality of life was obtained through the Oral Impact on Daily Performance.

Results: The highest prevalence was the molar relationship in mesio- or disto-occlusion with 57.3% (95%CI 52.5 – 62.1); 36.4% (95%CI 28.6% – 4.2%) of the applicants reported an impact on their quality of life as a result of the oral health condition. Results from the multiple logistic regression analysis showed that only the incisal crowding [OR 1.9 (95%CI 1.2 – 3.1)] (p = 0.008) showed an impact on the applicants' quality of life.

Conclusion: The malocclusion of highest prevalence was molar relationship disorders (57.3%), and only the dental crowding generated an impact on the quality of life.

Key words: malocclusions, epidemiology, self-perception, impact, young adults

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E pidemiological studies on oral health have used clinical parameters to evaluate health conditions. However, such parameters evaluate only the physical conditions based on researchers and professionals' judgments, minimising the determination and the social consequences of the oral conditions (Chen and Hunter, 1996). As this limitation has been recognised, researchers have investigated the impact resulting from oral health clinical conditions on the quality of life of individuals (Cushing et al, 1986). The World Health Organization (WHO) defines quality of life as the perception of individuals regarding life and the cultural and values context in which they live and in relation to their objectives and expectancies (WHO, 1997a). Quality of life in relation to oral health is based on three main dimensions – physical symptoms, perception of welfare and physical and social functional capacity (Chen and Hunter, 1996).

Quality of life and factors associated with oral health have not been deeply investigated in epidemiological studies (Chen and Hunter, 1996). With the outstanding decline in the dental caries prevalence (Murray, 1994) other oral health outcomes have been emphasized – among them the malocclusions, reported by the WHO as the third most important problem of dental public health (Petersen, 2003).

The impact on the quality of life generated by malocclusions is not yet clear, since the investiga-

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tions that use self-perception judgments are still at an early stage (Gandini et al, 1994; Jacobsen and Lennartsson, 1996; Peres et al, 2002). The objective of this study was to evaluate the prevalence and the impact of malocclusions on the quality of life of 18-year-old young male adults.

METHODS

This study was performed in the city of Florianópolis, capital of the state of Santa Catarina, Southern Brazil, with a population of 341,781 (IBGE, 2001).

A cross-sectional study was carried out. The populations of reference were the 3,735 18-year-old male young adults who composed the applicants' list for military service in the city in the year 2003. Military service is compulsory for all Brazilian 18-years-old males.

The sample size was calculated as follows: prevalence of the investigated outcome – impact of the oral health on the quality of life – was estimated at 35% (Cortes et al, 2002) in individuals exposed to malocclusions, and 20% in individuals not exposed to malocclusions. The test power of 90% was adopted ($\beta = 10\%$) and the confidence interval of 95% ($\alpha = 0.05$). The minimum required sample size was 394 individuals. This value was increased by 5% in order to compensate for eventual refusals, giving a total of 414 individuals.

In the 25 days of September 2003 allocated to general health exams of the applicants, the dental clinical examinations and the interviews were performed. The applicants were randomly selected on the 25 days. The malocclusions data were obtained through the Dental Aesthetic Index – DAI variables, as suggested by the WHO (WHO, 1997b). This index is composed of the following variables: 1 number of missing incisors, canines and premolars; 2 - presence of incisal crowding in one or two anterior segments (linear displacement of the anatomical points of contact of the incisors); 3 presence of incisal spacing in one or two anterior segments (spaces between the upper and lower incisors); 4 - presence of diastema (space between the upper central incisors greater than 2 mm in width); 5 – presence of anterior maxillary irregularity (teeth rotated or out of alignment in the maxilla); 6 – presence of anterior mandibular irregularity (teeth rotated or out of alignment in the mandible); 7 - overjet measure (distance from the vestibular face of the most prominent upper incisor to the vestibular surface of the corresponding lower incisor); 8 – presence of mandibular protrusion (front teeth protruding beyond the normal vestibulo-lingual relationship); 9 – presence of anterior openbite (when there is a gap between the incisal borders of the anterior teeth and the posterior teeth, in the normal biting position); 10 - molar relationship (observed when the cuspid of the upper first molar occludes medially the mesio-vestibular sulcus of the lower first molar, characterising a class II angle, or alternatively, when the cuspid of the upper first molar occludes distally the mesio-vestibular sulcus of the lower first molar, characterising a class III angle). Dental caries and treatment needs were also obtained according to WHO criteria (WHO, 1997b). The traumatic dental injuries were examined according to criteria adopted in the United Kingdom Children's Dental Health Survey (O'Brien, 1993).

Three calibrated examiners performed the exams and interviews in an army sickroom, with the applicant supine, under the room's own white light. Oral clinical mirrors, CPI-type millimetric probes, wooden spatulas as well as sterilised gauze packed in sufficient quantities for each workday were used. All bio-security standards were rigorously followed.

Non-clinical data were obtained through a questionnaire applied as a structured interview. The questions concerned the impact of the oral health conditions on the quality of life through the Oral Impacts on Daily Life – OIDP (Adulyanon and Sheiham, 1997), classified into applicants who did report and who did not report oral health impacts (OIDP = 0 and OIDP > 0).

The socioeconomic conditions were also surveyed: the family income, assessed in Reais (Brazilian currency) earned in the month preceding the study, divided by the number of people who actually live in the house, thus obtaining the per capita income that was subsequently dichotomised, the cut-off point being the median of the distribution. The education level of the applicants and their parents were also requested in relation to the number of school years accomplished. As with the family income, the education level was also dichotomised, the cut-off point for which was the median of the distribution. The self-evaluation of the general health conditions was also assayed, access to and the type of dental service used, whether the participant had suffered from dental pain in the past 12 months and the use or not of dental braces.

2003		, ,
DAI VARIABLES	PREVALENCE	95%CI
	n (%)	
	42 (40.0)	70 440
Missing incisors, canines and premolars	43 (10.9)	7.8 - 14.0
Incisal crowding in at least one segment	190 (48.0)	38.4 – 57.6
Incisal spacing in at least one segment	84 (21.2)	17.3 – 25.1
Diastema	26 (6.7)	4.3 - 9.1
Anterior maxillary irregularity	70 (17.7)	14.0 - 21.4
Anterior mandibular irregularity	74 (18.7)	14.9 – 22.5
Overjet measure of 5 mm or more	18 (4.6)	2.6 - 6.6
Mandibular protrusion	57 (14.5)	11.1 – 17.9
Anterior openbite	80 (20.2)	16.3 – 24.1
Molar relationship in mesio or distal occlusion	228 (57.3)	52.5 - 62.1
OIDP > 0	144 (36.4)	28.6 - 44.2

Table 1Prevalence and confidence interval (95%) of malocclusionsin 18-year-old young male adults according to DAI variables andimpact on quality of life according to OIDP. Florianópolis, SC, Brazil.2003

Previously, examiner calibration exercises were performed with 41 18- to 19-year-old army recruits, according to methodology previously described (Peres et al, 2001). The questionnaire pre-test and a pilot study were performed with 40 army recruits with the purpose of testing the examination methodology and the management aspects.

For the attainment of the intra-examiner diagnostic reliability degree during the fieldwork, 10% of the total sample was examined twice. The reliability was assessed using the Kappa test (Landis and Kock, 1977).

The research project was approved by the Committee on Ethics and Research in Humans of the Federal University of Santa Catarina, Brazil.

The calculation of the frequency distribution and the chi-square association tests (χ^2) were performed. In order to test the association of the several studied variables and the dependent variable, OIDP dichotomised in OIDP = 0 and OIDP > 0, unconditional simple and multiple logistic regression analyses were performed. The variables with significance level lower than 0.20, observed in the univariate analysis, were assessed in the analysis of the multiple regression (Hosmer and Lemeshow, 1989). The model was begun with the highest statistical significance variable in the univariate analysis. The other variables were then added, one by one, following a decreasing order (stepwise forward) of significance keeping into the multiple

model, if statistically significant (p < 0.05) or if it was a control variable. The occurrence of caries and the necessity for traumatic dental injury treatment were considered as control variables, since such conditions indeed affect the dental aesthetics and cause an impact on the quality of life of the applicants.

RESULTS

The response rate was 95.6% (n = 396). The examination results in duplicate showed that the lowest intra-examiner kappa value was of 0.7 for overjet.

The malocclusion prevalences are shown in Table 1. One can observe that the highest prevalence was of molar relationship in mesio- or disto-occlusion with 57.3% (95%Cl 52.5 - 62.1). According to the DAI instructions (WHO, 1997b) both situations are seen and are indistinguishable in the clinical examination, as a result of which a single value for prevalence is presented.

The prevalence of applicants who reported any type of impact on their quality of life in function of the oral health condition was 36.4% (95%Cl 28.6% - 44.2%).

Education level below eight years for both the recruits and their parents, *per capita* income below R\$ 333.33 (approximately US\$ 111.00), poor general health self-perception, the use of a dental ser-

to OIDP, Florianópolis, SC, Brazil, 2003					
NON-CLINICAL VARIABLES	IMPACT YES n (%)	IMPACT NO n (%)	Χ2	р	
School level of applicant			21.487	< 0.001	
> 8 years	103 (71.5)	226 (89.7)			
≤ 8 years	41 (28.5)	26 (10.3)			
School level of father*			9.831	0.007	
> 8 years	48 (34.3)	118 (50.9)			
≤ 8 years	75 (53.6)	95 (40.9)			
Unknown	17 (12.1)	19 (8.2)			
School level of mother*			23.792	< 0.001	
> 8 years	50 (35.5)	150 (61.2)			
≤ 8 years	91 (64.5)	95 (38.8)			
Per capita income*			15.427	< 0.001	
> R\$ 333.33**	52 (36.6)	141 (57.3)			
≤ R\$ 333.33**	90 (63.4)	105 (42.7)			
General health of applicant			9.328	0.009	
Good	37 (25.7)	86 (34.1)			
Average	70 (48.6)	131 (52.0)			
Poor	37 (25.7)	35 (13.9)			
Access to oral health service*			0.795	0.373	
Did use	76 (54.7)	146 (59.3)			
Did not use	63 (45.3)	100 (40.7)			
Type of oral health service*			9.268	0.026	
Private	48 (40.0)	102 (47.2)			
Covenant	30 (25.0)	70 (32.4)			
University	3 (2.5)	5 (2.3)			
Public Health Unit	39 (32.5)	39 (18.1)			
Dental pain in the past 12 months			22.238	< 0.001	
No	95 (66.0)	217 (86.1)			
Yes	49 (34.0)	35 (13.9)			
Use of dental braces			18.641	< 0.001	
Yes	16 (11.1)	76 (30.2)			
No	128 (88.9)	176 (69.8)			
* Missing information. ** US\$ 111 (September/2003).					

Table 2 Association between non-clinical variables and oral health ct on quality of life of 18-year-old young male adults, according

vice in a health public unit, the occurrence of dental pain in the past 12 months and the non-use of dental braces, showed to be statistically associated with the impact (Table 2). Furthermore, the presence of incisal crowding, an anterior maxillary irregularity of 2 mm or more, a molar relationship in mesio- or disto-occlusion, an overjet measure of 5 mm or more, the presence of dental caries and

to OIDP, Florianópolis, SC, Brazil, 2003					
CLINICAL VARIABLES	IMPACT YES n (%)	IMPACT NO n (%)	Х2	р	
Missing incisors canines and			0.046	0 831	
premolars			0.010	0.001	
None	129 (89.6)	224 (88.9)			
≥ 1	15 (10.4)	28 (11.1)			
Incisal crowding			11.066	0.001	
No	59 (41.0)	147 (58.3)			
Yes	85 (59.0)	105 (41.7)			
Incisal spacing			1.296	0.255	
No	109 (75.7)	203 (80.6)			
Yes	35 (24.3)	49 (19.4)			
Anterior maxillary irregularity			8.339	0.004	
≤ 1mm	108 (75.0)	218 (86.5)			
2 mm or more	36 (25.0)	34 (13.5)			
Anterior mandibular irregularity			2.664	0.103	
≤ 1mm	111 (77.1)	211 (83.7)			
2 mm or more	33 (22.9)	41 (16.3)			
Mandibular protrusion			0.949	0.330	
No	120 (83.3)	219 (86.9)			
Yes	24 (16.7)	33 (13.1)			
Anterior openbite			3.231	0.072	
No	108 (75.0)	208 (82.5)			
Yes	36 (25.0)	44 (17.5)			
Molar relationship			8.871	0.003	
Regular	47 (32.6)	121 (48.0)			
Mesio or distal occlusion	97 (67.4)	131 (52.0)			
Diastema			1.153	0.283	
≤ 1 mm	132 (91.7)	238 (94.4)			
2 mm or more	12 (8.3)	14 (5.6)			
Overjet measure			7.483	0.006	
≤ 4 mm	132 (91.7)	246 (97.6)			
5 mm or more	12 (8.3)	6 (2.4)			
Dental caries			30.576	< 0.001	
No	24 (16.7)	111 (44.0)			
Yes	120 (83.3)	141 (56.0)			
Treatment need due to dental caries	. ,	. ,	60.108	< 0.001	
No	49 (34.0)	186 (73.8)			
Yes	95 (66.0)	66 (26.2)			
Traumatic dental injury	. 7	. /	2.402	0.121	
No	107 (74.3)	204 (81.0)			
Yes	37 (25.7)	48 (19.0)			
	/	/			

Table 3Association between clinical variables and oral healthimpact on quality of life of 18-year-old young male adults, accordingto OIDP, Florianópolis, SC, Brazil, 2003

treatment need also appeared to be statistically associated with the presence of impact on quality of life (Table 3). The simple logistic regression analysis showed that, among the studied variables, only the educational level of the applicant, the mandibular protru-

oral nearth on quanty of me of 10-year-old young male adults. I forlanopolis, 50, Brazil, 2000						
VARIABLES	OR (95%CI) ^{crude}	р	VARIABLES	OR (95%CI) ^{crude}	р	
Per capita income		< 0.01	Dental caries		0.01	
> R\$ 333.33*	1.0		No	1.0		
≤ R\$ 333.33*	2.3 (1.5 – 3.6)		Yes	3.9 (2.4 – 6.5)		
School level of applicant	. ,	< 0.01	Treatment need due to dental caries	. ,	0.1	
> 8 years	1.0		No	1.0		
≤ 8 years	3.5 (1.0 – 6.0)		Yes	5.5 (3.5 – 8.5)		
School level of mother			Traumatic dental injury		0.122	
> 8 years	1.0		No	1.0		
≤ 8 years	2.9 (1.9 - 4.4)		Yes	1.5 (0.9 – 2.4)		
School level of father		0.008	Incisal crowding		0.001	
> 8 years	1.0		≤ 1 mm	1.0		
≤ 8 years	1.9 (1.2 – 3.1)	0.004	2 mm or more	2.0 (1.3 - 3.1)		
Unknown	2.2 (1.1 – 4.6)	0.036	Anterior maxillary irregularity		0.01	
General health		0.011	≤ 1 mm	1.0		
Good	1.0		2 mm or more	2.1 (1.3 – 3.6)		
Average	1.2 (0.8 – 2.0)	0.379	Anterior mandibular irregularity		0.104	
Poor	2.5 (1.3 – 4.5)	0.003	≤ 1 mm	1.0		
Type of oral health service		0.029	2 mm or more	1.5 (0.9 – 2.6)		
Private	1.0		Anterior openbite		0.007	
Covenant	0.9 (0.5 – 1.6)	0.738	No	1.0		
University	1.3 (0.3 – 5.0)	0.746	Yes	1.6 (0.9 – 2.6)		
Public Health Unit	2.1 (1.2 – 3.7)	0.008	Molar relationship		0.01	
Dental pain in the past 12 months		< 0.001	Regular	1.0		
No	1,0		Mesio or distal occlusion	1.9 (1.2 – 2.9)		
Yes	3.2 (1.9 – 5.3)		Overjet measure		0.01	
Use of dental braces		< 0.01	≤ 4mm	1.0		
Yes	1.0		5 mm or more	3.7 (1.4 – 10.2)		
No	3.5 (1.9 – 6.2)					
* US\$ 111 (September/2003).						

Table 4Results of the simple logistic regression analysis between independent variables and the impact of
oral health on quality of life of 18-year-old young male adults. Florianópolis, SC, Brazil, 2003

sion, the anterior mandibular irregularity and the dental traumatic injuries proved not to be risk factors for impact (Table 4).

The results of the multiple logistic regression analysis showed that, among the evaluated malocclusions, only the presence of the incisal crowding had a statistically significant impact on the quality of life after adjustment for the variables *per capita* income, self-perception about general health, dental pain reports in the last 12 months, the use of dental braces, the presence of treatment need and the presence of dental traumatic injury. The applicants who presented incisal crowding were 1.9 times [OR 1.9 (95% CI 1.2 - 3.1)] more likely to report impact when compared to applicants who did not present incisal crowding (p = 0.008), regardless of other investigated variables (Table 5).

DISCUSSION

The high response rate and degree of reproducibility of clinical diagnosis provide consistency and credibility to the results of this study. The main reason for not taking part (4.4%) was the refusal of applicants to participate in this study.

The annual lists of applicants for military service may be an interesting alternative for oral health

epidemiological studies of the 18-year-old male population, in relation to domiciliary studies, which are more difficult and expensive to perform.

As military service is mandatory in Brazil, all 18-year-old men, independently of ethnic or socioeconomic group, undergo general and oral health exams before joining up or being discharged from military service. For this reason, and because of the parameters used for the sample calculation, the studied population can be considered representative of the 18-year-old male population of the city of Florianópolis. Also, a comparative analysis between the educational levels of the city's adult population (IBGE, 2001) and the applicants' parents showed several similarities. Nevertheless, as Brazil is a large country with marked cultural and socioeconomic differences, a study performed in one region rarely can be representative of the whole country. Generalisations cannot be made to the population of Southern Brazil or of Brazil as a whole, based upon the results of this study. Nationally based studies would be appropriate to obtain nationally representative results.

Comparing our results with other studies is difficult, as different protocols have been used in relation to different age ranges and to the different criteria of malocclusions diagnosis. A standardised protocol should be adopted to allow comparisons. However, a study using the DAI variables and similar age, 19 years, performed in Sweden (Jacobson and Lennartsson, 1996) found examples of lower prevalence. The highest prevalence found in Florianópolis was of problems related to the molar relationship (57.3%), rather higher than the prevalence found in Sweden (10.0%). The same situation occurred in relation to the prevalence of incisal crowding (48.0% and 19.5%, respectively) and incisal spacing (21.2% and 0.4%, respectively). In the diastema variable, the values were similar (6.7% and 6.6%, respectively).

In this study, only the presence of incisal crowding maintained the statistical significance in the multiple logistic regression analysis. It is interesting to note that the incisal crowding was not the malocclusion with the highest prevalence, which was in fact the problem of molar relationship. This finding shows that a higher prevalence is not necessarily related to the impact. Thus, young adults with anterior crowding were 1.9 times more likely to suffer negative impact if compared to young adults without anterior crowding (p = 0.008). This study is consistent with a preceding non-population-based study, which evaluated the malocclusions impact in Table 5Results of the multiple logistic regression analysis between independent variables and
the impact of oral health on quality of life of
18-year-old young male adults. Florianópolis, SC,
Brazil, 2003

VARIABLES	OR (95% CI) ^{adjusted}	р
Per canita income		0 742
> D\$ 222 22*	1.0	0.142
< D¢ 222 22*	11(07 19)	
≤ N¢ 333.33 °	1.1 (0.7 – 1.8)	
General health		0.052
Good	1.0	
Average	0.8 (0.5 – 1.5)	0.578
Poor	1.8 (1.0 – 3.7)	0.084
Dental pain in the past 12 months		0.041
No	1.0	
Yes	1.8 (1.0 – 3.2)	
Use of dental braces		0.032
Yes	1.0	
No	2.0 (1.0 – 3.9)	
Treatment need due to dental caries		< 0.001
No	1.0	
Yes	4.2 (2.5 – 7.1)	
Traumatic dental injury		0.005
No	1.0	
Yes	2.2 (1.3 – 4.0)	
Incisal crowding		0.008
	4.0	0.008
≤ 1mm	1.0	
∠ inm or more	1.9 (1.2 – 3.1)	
* US\$ 111 (September/2003).		

a group of teenagers from a local school. The presence of incisal crowding, besides an overjet of 4 mm or more were risk factors for dissatisfaction with appearance (Peres et al, 2002).

Identification of the type of impact caused by the incisal crowding was not the aim of this study, being approached in a separate investigation, but the dental-facial disharmony caused by the dental crowding may negatively influence the individual regarding psychosocial factors. An unpleasant dental aspect may lead to social life problems, causing a negative effect itself, leading the individual to seek orthodontic treatment almost exclusively for aesthetic reasons (Monaco et al, 1997). The presence of aligned anterior teeth affects the perception of attractiveness, the identification with professional success and intelligence, and it is often associated with wealthier individuals (Kerosuo et al, 1995). The incisal crowding possibly has great potential for interfering in the self-perception regarding aesthetics. This could be the reason why other malocclusions related to functional matters may lead to lower impact.

The results of this study are in agreement with the argument that there are some occlusal problems that are acceptable to the population (Peres et al, 2002). However, health policy decision-makers should be aware that malocclusions such as dental crowding can generate negative impact on the quality of life of individuals, leading to social embarrassment and affecting social relationships.

For this reason it is necessary for public services to be prepared to treat cases of severe malocclusions. The definition of orthodontic treatment needs and the establishment of priorities should include subjective measurements, such as the self-perception of the impact of the malocclusions. The use of clinical criteria alone may underestimate such need. Furthermore, public authorities should stimulate dental caries prevention in order to avoid missing primary dentition, an important etiological factor for malocclusions in the permanent dentition.

In conclusion, different malocclusions provide different impacts on the daily life of people. In this study, only the presence of dental crowding generated impact on the quality of life of 18-year-old applicants for military service. It is suggested that self-perception criteria can be considered simultaneously with the clinical condition in the establishment of the orthodontic treatment need.

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