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Factors associated with self-rated oral health in adolescents in São Luís, Maranhão, Brazil, 2014

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Abstract

Objectives: This cross-sectional study investigated associations among clinical measures of oral health, socio-demographic variables and self-rated oral health, and evaluated possible impacts of oral health on daily activities, in a population of adolescents (15 to 19 years old) at a public school in the city of São Luís, northeast Brazil.

Methods: From clinical examination of the oral cavity, prevalences were estimated by number of dental caries, by periodontal condition and by dental occlusion condition. Data was analysed by calculating descriptive statistics, bivariate analyses and multiple correspondence analyses.

Results: Oral health was self-rated adversely by 30.2% of the adolescents, while 69.8% reported impact of some kind by dental problems on daily performance. On average, oral health had impact on two daily activities (SD=1.3). Adolescents who reported fair/poor oral health were three times more likely to report oral impact than those who considered their oral health excellent/very good/good (95% CI 1.6-6.4). Multiple correspondence analysis revealed similar behavior between responses on overall health and oral health, indicating that both were measuring similar concepts (total inertia=34%). The variables income and sex managed to explain 43% of the variability in responses on oral health.

Conclusion: The study yielded evidence of an association between adolescents' oral health and overall health (reinforcing the idea that oral health is an integral part of overall health) and of potential impact of poor oral health on performance of their daily activities.

Introduction

There has been a growing recognition in recent years that oral health has significant impact on physical, social and psychological well-being. Although most oral diseases are not fatal, they do have health consequences that affect people's quality of life [1].

Self-perception of health is influenced by personal characteristics and social context and, accordingly, not everyone with impaired oral health is necessarily dissatisfied with its status [2]. People's self-perceived needs are one of the immediate causes of their approaching and using health services [3].

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Adolescence is a peculiar stage in life, when numerous physical and psychological changes take place and dental changes can cause major suffering and embarrassment, impairing self-esteem and interfering in personal relations [4]. Meanwhile, it is also a critical period, during which many risk behaviours for developing oral diseases become established, such as diet habits and tobacco use, which can have repercussions throughout life and be a differential as regards future quality of life [5].

Understanding the factors that influence perception of oral health provides information to complement clinical assessment [6] and improve service planning [7]. However, few studies in Brazil have addressed self-perceived oral health and the impact of dental problems on daily life, particularly among adolescents.

In that context, this study investigated associations among clinical measures of oral health, self-perceived health, and socio-demographical characteristics. The Oral Impact on Daily Performance (OIDP) instrument was used to assess the aesthetic impact, and the Dental Aesthetic Index (DAI) was used for clinical assessment in adolescents in São Luís, Maranhão, and northeast Brazil.

Material and methods

A cross-sectional epidemiological study was conducted on a study population comprising students enrolled at the Instituto Federal do Maranhão in 2014. Students from 15 to 19 years old in the institution's upper secondary school were eligible. The research project that gave rise to this study was approved by the research ethics committee of Brazil's Escola Nacional de Saúde Pública (No. CAAE 34770214.6.0000.5240). After obtaining informed consent from the students and their guardians, data were collected by applying a self-completed questionnaire and clinical mouth examination. All clinical examinations were performed by the lead researcher.

The study sample size was estimated considering a 5% sampling error, 0.05 alpha probability of error and 24.0% prevalence of caries, arriving at a total of 222 individuals from a universe of 1060 students in the target age group enrolled at the institution.

For more feasible execution, it was decided to make an initial random draw in order to select classes. From each class drawn, all students in the 15 to 19 year age group who agreed to participate were interviewed and examined. There were 31 classes at the institute, each with 24 to 41 students in the study age group. Accordingly, on the basis of a mean of 30 students per class, it was calculated that a total of eight classes were to be drawn, corresponding to 240 students to be interviewed and examined.

The study questionnaire contemplated socio-demographic variables (age, sex, self-reported race/colour, living with both parents, with only one or with some other guardian, occupation of father, mother or guardian, number of people residing in the domicile and family income in reals. The clinical examination collected information on the following variables: dental caries, DMF-T index, periodontal status (healthy, bleeding, calculus and periodontal pocket 6mm or more in depth) and dental occlusion status by the dental aesthetics index (DAI), evaluating dentition, space and occlusion [8].

Self-perceived health was evaluated by the question "Generally speaking, would you say your health is excellent, very good,

good, fair or poor?", while self-perceived oral health was measured by the question "Generally speaking, would you say your oral health is excellent, very good, good, fair or poor?".

Self-perceived oral health impact was measured using the Oral Impact on Daily Performance (OIDP) questionnaire [9]. This instrument comprises eight questions designed to evaluate the impact of dental problems on individuals' daily activities, by the following dimensions: functional (eating and appreciating food, speaking and pronouncing clearly, cleaning teeth), psychological (sleeping and relaxing, smiling, laughing and showing teeth without embarrassment, maintaining a balanced emotional state and not being irritated) and social (teeth preventing performance of main job or social role or contact with people).

Responses to the questionnaires were coded to EpiData, version 3.1, and the results were analyzed using SPSS, version 21. The analysis consisted in calculating descriptive statistics to profile the individuals by frequency distributions, bivariate analyses among the socio-demographic, clinical and self-rated health variables, Pearson chi-square tests and/or Fisher exact tests and the multivariate statistical technique of Multiple Correspondence Analysis (MCA) to test associations among groups or categories of responses to the research instruments. All analyses were to a 5% level of significance.

The technique used to study the associations between the covariables and self-rated health was multiple correspondence analysis. By means of linear combinations, this statistics tool brings out correlations between categories of responses given by the participants. The results afford interpretations similar to those obtained by the technique of multivariate factorial analysis when used for continuous variables.

The results are displayed in the form of graphs, on which the categories of each variable are represented and relations among them can be observed by way of the distances between the points drawn. Total inertia was the measure used to define the proportion of variability explained by each dimension. Absolute total inertia was decomposed into partial (percentage) inertias for each dimension, which showed how much of total inertia was explained by any given derived dimension.

The variable income was divided into quartiles by the following distribution: up to R$1,200; R$1,200 to 2,000; R$2.000 to R$3,000; and more than R$3,000. Self-rated health and self-rated oral health were dichotomised into good (excellent, very good and good) and poor (fair and poor). Oral Impact on Daily Performance (OIDP) was categorised dichotomously into without impact and with impact the normative variable DMF-T was divided into terciles: lower (0 to 2.6), middle (2.7 to 4.4) and upper (4.5 or more). The DAI was dichotomised into normal occlusion (up to 30) and malocclusion (greater than 30). The Community Periodontal Index (CPI) was categorised into healthy, bleeding, calculus and periodontal pocket. Only the severest condition was recorded.

Results

Of the adolescents selected for the study, 225 were examined, after loss of 15 individuals (6.2%) for refusal to take part.

The adolescents' mean age was 16.2 years (SD = 0.98). There was a slight predominance of males (51.6%) and brown-skinned (61.8%) in the study population. Most of the adolescents (60.9%) lived with both parents. Mean family income was R$ 2,350 (SD=1,640). Overall health was self-rated as fair or

poor by 14.7% of the adolescents. Oral health, meanwhile, was self-rated adversely (as fair or poor) by a far larger percentage (30.2%).

Valid responses on the impact of dental problems on daily performance were received from 204 individuals. Of these 69.8% (157) reported dental problems' having impact of some kind on their daily activities. The impact most reported, by 53.3% (120) of the adolescents, was difficulty eating or pain on drinking cold or hot liquids, followed by being embarrassed when smiling or speaking (52; 23.1%) and being made nervous or irritated by teeth (50; 22.2%).

The other impacts evaluated returned low frequencies of affirmative responses. Of the 157 adolescents reporting oral health impact on their activities, 81 (51.6%) reported only one impact, 37 (23.6%) reported two and 20 (12.7%) reported three. Mean daily activities impacted by oral health was 1.96 (SD=1.3), ranging from 1 to 7 activities (Table 1).

Table 1: Socio-demographic, perceived health and oral impact on daily performance variables in adolescents. São Luís, Maranhão, Brazil. 2014-2015 (N = 225).

Variables	N	%	p-value
Socio-demographic			
Sex			
Male	116	52	0.689
Female	109	48	
Age			
15 years	60	27	
16 years	87	39	
17 years	54	24	< 0.001
18 years	21	9.3	
19 years	3	1.3	
Self-reported race/colour			
White	53	24	
Black	24	11	< 0.001
Brown-skinned	139	62	
Others	9	4	
Income (in R$)			
Up to 1200.00	66	30	
From 1201.00 to 2000.00	70	31	0.011
From 2001.00 to 3000.00	41	18	
3001.00 or more	46	21	
Residence			
With both parents	137	61	
With mother only	66	29	< 0.001
With father only	9	4	
With other person	12	5.3	
Perceived health			
Self-rated health			
Excellent	9	4	
Very good	64	28	
Good	119	53	< 0.001
Fair	29	13	
Poor	4	1.8	
Self-rated oral health			
Excellent	6	2.7	
Very good	46	20	< 0.001
Good	105	47	
Fair	58	26	
Poor	10	4.4	

Variables	N	%	p-value
Oral impact			
Difficulty eating			
Yes	120	53	
No	100	44	0.2
Don't know	5	2.3	
Difficulty cleaning teeth			
Yes	32	14	
No	190	84	< 0.001
Don't know	3	1.4	
Difficulty speaking			
Yes	11	4.9	
No	213	95	< 0.001
Don't know	1	0.4	
Difficulty sleeping			
Yes	23	10	
No	200	89	< 0.001
Don't know	2	0.9	
Ashamed to smile or speak			
Yes	52	23	
No	168	75	< 0.001
Don't know	5	2.2	
Gets nervous			
Yes	50	22	
No	172	76	< 0.001
Don't know	3	1.4	
Difficulty studying			
Yes	10	4.4	
No	212	94	< 0.001
Don't know	3	1.4	
Difficulty going out			
Yes	8	3.6	
No	212	94	< 0.001
Don't know	5	2.2	

In terms of normative health status, prevalence of caries was 41.3%, while 6.7% of the adolescents had lost at least one tooth. Mean DMF-T was 1.98 (SD=2.31), with the "carried" component constituting 50.5% of the index, the "filled" component contributing 44.5% and the "lost" component, 0.05%. Male adolescents showed more caries (p value=0.027). Prevalence of periodontal problems was 18.7%, with dental calculus the most prevalent condition, affecting 13.3% of participants. Normal occlusion was observed in 56% of participants and malocclusion, in 44%. The most prevalent malocclusion conditions were molar misalignment (43%), dental crowding (34.3%) and maxillary protrusion (maxillary overjet of more than 4mm; 12.1%). Male adolescents also displayed greater frequency of malocclusions (p-value=0.022). (Table 2).

Table 2: Normative oral health conditions in adolescents. São Luís Maranhão. 2014-2015 (N=225).

Variables	N	%	p-value
Teeth carried			
0	132	59	
2-Jan	61	27	< 0.001
≥ 3	32	14	
Teeth lost			
None	210	93	< 0.001
1 or more	15	6.7	
Teeth filled			
0	138	61	< 0.001
2-Jan	60	27	
≥ 3	27	12	
CPO-D			
0	85	38	< 0.001
2-Jan	70	31	
≥ 3	70	31	
CPI			
Healthy	183	81	< 0.001
Gum bleeding	12	5.3	
Calculus	30	13	
Dentition			
No anterior teeth missing	225	100	-
Crowding			
No crowding	148	66	< 0.001
Crowding in one arch	60	27	
Crowding in two arches	17	7.6	
Spacing			
No spacing	199	88	< 0.001
Spacing in one segment	23	10	
Spacing in two segments	3	1.4	
Incisor diastema			
No	193	86	< 0.001
Yes	37	14	
Maxillary misalignment			
No	201	89	< 0.001
Yes	24	11	
Mandibular misalignment			
No	173	77	< 0.001
Yes	52	23	
Maxillary overjet			
Normal	186	83	< 0.001
Tip-to-tip	11	4.9	
Protrusion	27	12	
Mandibular overjet			
Without crossbite	224	99	< 0.001
With crossbite	1	0.1	

Variables	N	%	p-value
Openbite			
No	210	93	< 0.001
Yes	15	6.7	
Molar relationship			
Normal	128	57	< 0.001
Half cusp	40	18	
Whole	57	25	
DAI			
Normal occlusion	126	56	0.083
Malocclusion	99	44	

No differences were observed in self-rated oral health status by sex, age, race and income.

A statistically significant association was observed between self-rated oral health and self-rated overall health, and adolescents who reported fair or poor oral health were 34% more likely to self-rate their overall health as fair or poor (Table 3). Similarly, a significant association was found between self-rated oral health and reported dental impact on daily activities. Adolescents who considered their oral health to be fair or poor were three times more likely to report some dental impact than those who considered their oral health to be excellent, very good or good. Of the normative oral health conditions, statistical association was observed only between self-rated oral health and the CPOD index. Also, the three normative conditions considered associated positively with reported dental impact, although only DMF-T attained statistical significance.

Table 3: Normative oral health conditions in adolescents. São Luís Maranhão. 2014-2015 (N=225).

Variables	Oral Health	Dental Impact
	Prevalence ratios	Prevalence ratios
	(95%CI)	(95%CI)
Self-rated health	1.34 (1.13; 1.58)	-
Reported dental impact	3.25 (1.64; 6.42)	-
CPOD	1.88 (1.24; 2.85)	2.32 (1.01; 5.36)
DAI	1.44 (0.94; 2.20)	1.44 (0.94; 2.20)
CPI	1.19 (0.68; 6.42)	1.19 (0.68; 2.06)

* 95% CI: 95% Confidence Interval

Figure 1 shows, from correspondence analysis, that the responses to questions on self-rated health and self-rated oral health behave similarly, especially in the very good and good categories and, less strongly, in the poor and fair categories. Self-rated oral health can thus be said to act as a good approximation to self-rated overall health. In view of this, in the other analyses, it was chosen to use the self-rated oral health responses as also representing self-rated overall health. Also, in order to improve interpretation of the results, it was decided to reclassify the categories, as can be seen in the other figures.

Figure 2 shows that the upper (third and fourth) quartiles of income associate clearly with excellent, very good and good self-rated oral health. However, poor self-rated oral health displayed no association with any income category. Poor self-rated oral health shows a dissimilarity from excellent self-rated oral health and from the upper income quartiles. Income and sex explained more than 40% of variability in self-rated oral health (42.75% total inertia). An association was also observed between no oral impact on daily activities and low DMF-T, normal occlusion and presence of bleeding. DMF-T, CPI, DAI and oral impact explained 38.33% of variability in self-rated oral health. Poor self-rated oral health showed an association with high and moderate DMF-T, malocclusion, presence of calculus and reported impact on daily activities, clearly opposite to good self-rated oral health, which associated with low DMF-T, healthy CPI, normal DAI and absence of impact on daily activities.

Discussion

More than one third of the adolescents examined declared they were dissatisfied with their oral health. The main factors associated with self-rated oral health in this population were DMF-T and reported dental impact on daily activities. This kind of impairment can be much more harmful in adolescence, which is a stage during which appearance, contact and social approval gain major importance. Oral complications can affect individuals' overall well-being and lives.

This study's finding of dissatisfaction with oral health (30.2%) is similar to that observed in Brazil's 2010 National Oral Health Survey (Pesquisa Nacional de Saúde Bucal) [10], in which 24.4% of adolescents surveyed in the northeast region reported fair or poor oral health. Finlayson et al. [11] and Kojima et al. [12], in similar studies of adolescents in the United States and Japan, found 28% and 26% prevalences of dissatisfaction with oral health, respectively. Pattussi et al. [13] found a prevalence of 44.6% in adolescents who reported fair or poor oral health in Brazil's Federal District.

Bivariate analysis of the factors associated with fair or poor self-rated oral health found a statistically significant association only with the DMF-T index. However, it must be stressed that both the DAI and CPI showed positive associations with fair or poor oral health, which were not statistically significant, possibly due to the sample size. Correspondence analysis reinforced the association observed between oral health and DMF-T. Other studies have also shown that the DMF-T index can affect adolescents' perceptions of their oral health [11,12]. This finding suggests that a simple, quick question, such as the one used for self-rated oral health, can be used as a predictor of untreated caries.

Lima et al. [14] warned that various individual factors can influence self-rated oral health, among them social and psychological factors, as well as subjective factors, which may explain discrepancies observed between self-rated oral health and certain clinical findings.

Correspondence analysis revealed the association between excellent, very good and good self-rated oral health and family income in the upper (third and fourth) quartiles, corroborating the findings of other studies that have signalled the importance of socioeconomic position in oral health [2,6,7,15]. However, Andrade et al. [7] found no association between self-rated oral health and income.

In this study, a weak positive association was found between malocclusion and self-rated oral health, while Kojima et al. [12] found a strong association between these variables. It is a consensus in the literature that the appearance and position of anterior dentition has psychological and social impact on individuals [16,17].

The prevalence of reported dental impact on daily activities observed in this study was similar to that observed in studies by Astron & Okullo [18], in which 68.6% of participants reported impact. Difficulty eating was the impact most commonly mentioned, consistent with the findings of previous studies [2,18,19], followed by embarrassment and maintaining a balanced mood, agreeing with the findings of a study in Belo Horizonte with children from 12 to 14 years old [16], suggesting that, in addition to the physical dimension, the psychological dimension is also important when evaluating the oral health of populations of adolescents. Studies that have investigated relations between the behaviour of oral health and psychological factors have shown that adolescents with better self-esteem are more likely to care for their teeth [17,20], which is considered to lead to a virtuous circle, while individuals with adverse dental impact such as those mentioned above may care less for their oral health, leading to further adverse impacts over time.

Even among adolescents who reported excellent, very good and good oral health, some dental impact was reported. Góes et al. [21] found similar results. Studies with elderly populations [22,23] have shown that many individuals with clinical problems and limitations on daily activities rated their own oral health as good, the discrepancy being attributed to the fact that they believe that such issues are inevitable with advancing age. However, among adolescents, this kind of discrepancy needs to be investigated better. Lacerda et al. [24] claimed that greater insight in recognising limitations on one's daily activities is connected with cultural and social features, which determine indi-

viduals' ability to perceive such limitations.

The OIDP instrument measures the adverse effects of oral health conditions on individuals' lives. Caglayan et al. [1] state that instruments that measure impact, causing losses in daily activities, do not capture the concept of health and well-being that individuals consider when they rate their own health. In this study, however, a strong association was observed between self-rated oral health and dental impact, contrary to what is claimed by the authors cited. Note that, in this study, the impacts' severity and frequency were not calculated and, accordingly, it was not possible to evaluate the influence these may have on participants' lives.

Kida et al. [25] emphasise that OIDP covers the final impacts that affect individuals' daily lives, essentially measuring difficulties in performing daily activities and social disadvantage, that the presence of the disease does not always affect an individual's perceived well-being and, even when it does, the impact is influenced by expectations, social resources and social and cultural psychological values.

Locker & Allen [26] remark that the OIDP was developed to be used together with the clinical measures (DAI, CPI and DMF-T). All the clinical variables (DMF-T, DAI and CPI) showed positive associations with dental impact, underlining the importance of performing clinical mouth examination when impact is reported. From the correspondence analysis, it could be seen that the adolescents with low DMF-T reported no impact and self-rated their oral health as good.

Mashoto et al. [2] demonstrated the existence of an association between clinical variables and dental impact. Dental caries can cause pain, discomfort and functional limitations, greatly affecting adolescents' daily activities. Malocclusion can cause embarrassment by impairing individuals' aesthetic appearance, which may have even greater repercussions in adolescence, when various physical changes occur and when social interaction takes on major importance. Peres et al. [27] recall that malocclusions involve aesthetic impairment and that demands for orthodontic treatment may not be mere vanity, but a response to social appraisal, which is highly significant, especially to adolescents.

Self-rated oral health and self-rated overall health show an association in this study and, in correspondence analysis, the two measures were closer in the good and very good categories and slightly less so in the fair and poor categories. Pattussi et al. [13] argue that this connection between the two variables may be attributed to the similarity between unhealthy behaviours, whether for oral disease or disease in general. However, Bennyamini et al. [28] believe that the similarities between the two measures do not completely explain the association between them, and suggest considering the issue of reverse causality when they are evaluated.

A DMF-T index of 1.98 was found for the adolescents in this study, which is low compared to the 4.25 and 4.6 found for Bra-zil and São Luís, respectively, in the National Oral Health Survey (Pesquisa Nacional de Saúde Bucal) [10]. The result observed here, however, is similar to the 2.4 found by Kridapong et al. [29] in adolescents in Thailand.

The predominance of the "caried" component among the adolescents in the study points to the need for local oral health services to treat this population. The prevalence of tooth loss from caries found in this study was close to the frequency found for São Luís in the SB Brazil [10] (5.7%). However, one of the World Health Organisation's oral health goals for 2020 was for 85% of 18-year-old adolescents to have retained all their teeth.

The prevalence of periodontal problems observed among the adolescents in this sample was much lower than observed for the northeast region in the 2010 National Oral Health Survey, corresponding to 55.3%. However, the most prevalent problem in the study population (dental calculus) was the same as found for this region in the survey [10]. Chiapinotto [30] reports that prevalence and severity of periodontal disease increase with age that the severest forms of the disease are rare in 15 to 19 year olds and that, when an alteration is observed, it is related to early problems, such as dental calculus.

The Dental Aesthetics Index (DAI) showed that a high percentage of the adolescents displayed malocclusion of some kind. The value observed in this study was close to that found for the northeast region (38.2%) in the National Oral Health Survey [10]. The prevalence of malocclusion observed in this study was considerably lower than observed by Peres et al. [27] in Florianópolis (Brazil), where 71.3% of the 15 to 19 year olds studied displayed the problem.

The limitations of this study include its cross-sectional design, which makes it impossible to establish a temporal relationship between self-rated oral health and the other variables. Both longitudinal studies and qualitative studies can help clarify better what factors may be related to self-rated oral health in adolescents. This is a suggestion for future research.

In addition, the students' use of orthodontic appliances was not investigated, and it is possible that they display the same trend as observed in adolescents elsewhere, where use is widespread for reasons of status and vogue, which may affect the performance of some daily activities. Another limitation is that the study did not examine for eruption of third molars (wisdom teeth), which generally occurs in this age group and is responsible for complaints such as pain and functional limitation.

From the foregoing, impaired oral health can be extremely harmful in adolescence, because generally at this stage of life, appearance, contact and social appraisal take on major importance. Knowing which factors are important to assessing the health of populations and which affect their daily lives adversely can help improve health service planning. Also, knowing the factors that influence health assessment positively can help in health promotion, and in escaping from the biomedical paradigm towards a public health approach.
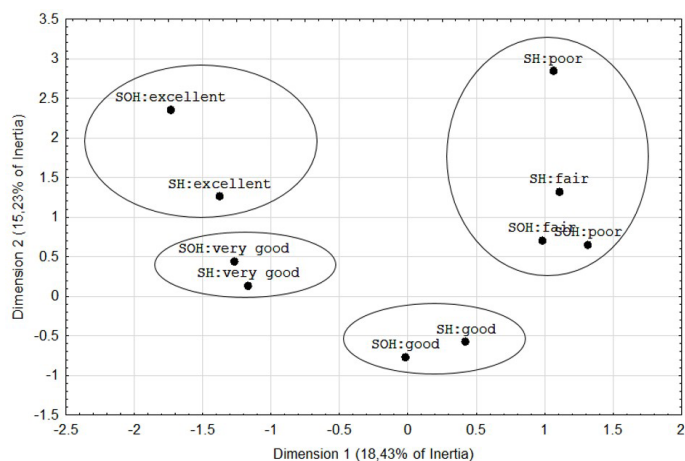
Figures

Figure 1: Result of multiple correspondence analysis between self-rated health and self-rated oral health
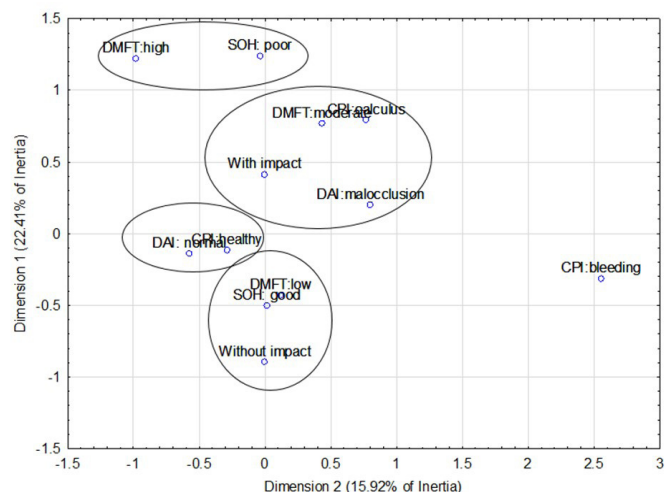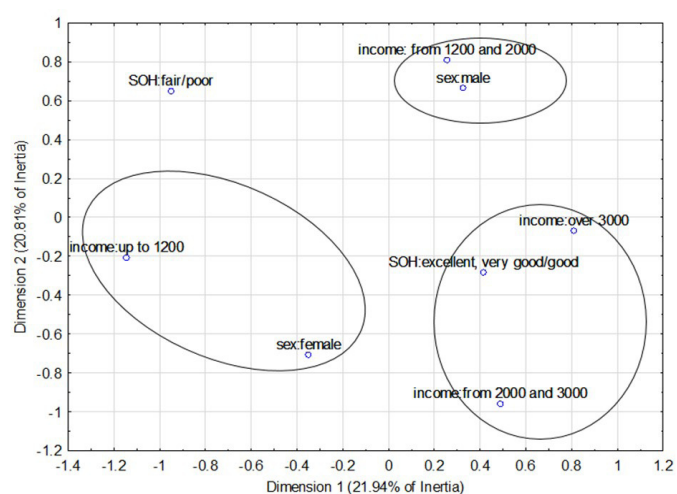

Figure 2: Result of multiple correspondence analysis between self-rated oral health and income and sex and CPOD, DAI, CPI and dental impact

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