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Original Article

Contribution to the Viability of the DMF-T Simplification in Adults and Older Adults

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Abstract

Objective: To verify the validity of two simplified DMFT indexes compared to the full DMFT. **Material and Methods:** This is an exploratory observational validation study with sample defined by convenience of 88 adult and older adult volunteers treated in a university dental clinic. After calibration, two examiners performed inspection tests with application of the DMFT index. The average total DMFT was compared with crossed quadrants (DMF2Q) and DMF of the right and left sides by age and sex using the Wilcoxon test. **Results:** The mean age of participants was 42.2 years and median of 44 years, and of these, 53 (60.2%) were female. The analysis showed no statistically significant difference between the means of DMFT and DMF2Q indexes between sexes (males 16.1 vs 16.1; $p = 0.87$ and females 16.4 vs 16.6; $p = 0.24$) or between the right and left sides (males 8.1 vs. 8.1 $p = 0.50$ and females 8.3 vs 8.1; $p = 0.99$). In addition, no differences were observed between DMFT and DMF2Q in the age groups of adults (30-44 years 17.8 vs 17.4; $p = 0.564$) and older adults (60 and over 23.4 vs 24.0; $p = 0.298$). The comparison between DMF OF right and left sides also showed no difference between adults (8.8 vs 9.1; $p = 0.134$) and older adults (11.8 vs 11.7; $p = 0.951$). **Conclusion:** Data obtained were consistent with similar studies on the distribution of dental caries in quadrants, allowing simplifying the DMFT index for epidemiological estimates.

Keywords: Dental Caries; DMF Index; Health Surveys.

Introduction

Brazil has in its history three national oral health surveys. In relation to dental caries, data have shown a trend of decreasing prevalence, but dental caries still remains a public health problem, marked by inequality among population groups mainly with regard to age and social status, in which tooth loss is a serious problem [1].

Among the different epidemiological indexes used to assess dental caries manifestation, the DMFT index stands out, which considers, for each individual, the sum of Decayed (D), Missing (M) and Filled (F) Teeth (T) registered for each of the twenty-eight teeth in the mouth, excluding third molars. The use of this methodology represents a high operating cost, requiring considerable training effort and calibration of examiners to ensure reproducibility and reliability of data [2,3].

From the epidemiological point of view, the reduced prevalence of dental caries, a trend that can be seen in Brazil and several countries, determines the need to increase the sample size of individuals to be examined [4] to obtain a representative probability sample. This represents an increase in costs of epidemiological surveys in oral health. On the other hand, the reduction of the number of teeth to be examined in epidemiological surveys by offsetting the increasing number of individuals can result in efficiency gain, since this simplification of the method does not compromise the accuracy of data, and the teeth examined can be capable of representing the full-mouth condition.

In this perspective, it is important to know that dental elements could accurately sample the prevalence of dental caries, restorations and lost teeth, the components of the DMFT index of each individual.

A theme that has recurrently been approached in scientific literature refers to symmetry or bilateralism with dental caries appears on both sides of the mouth. Dating back to the 50's, recurrent studies in scientific literature point to dental caries bilateralism, symmetrically affecting corresponding teeth in different quadrants, and this knowledge has promising application in public health [5-12], in case studies confirm the validity of partial exams to reveal the full manifestation of dental caries in the population.

Regarding the evidence of symmetry and bilateralism of dental caries occurrence in the oral cavity, efforts have been made to simplify the DMFT index in order to reduce the time of testing and operating costs.

Few studies conducted in Brazil and abroad have evaluated if the simplified DMFT index would be a safe estimate of the prevalence of dental caries. A method tested was the examination of inspection and registration of decayed, missing and filled teeth in half of the upper arch and the opposite half of the lower arch, multiplying by two [7,12]. Thus, from the record of caries attack of only two quadrants (DMF_{2Q}), upper and lower, crossing the sagittal plane, the number of teeth to be examined would be reduced by 50%, giving a value that if multiplied by two would correspond to the full-mouth DMFT [12].

In Germany, the population-based study "SHIP - Study of Health in Pomerania", with 4,022 participants aged 20-79 years living in eastern Germany analyzed the average DMFT and DMF_{2Q}

in the same age groups recommended by the WHO has revealed that the dental caries distribution is symmetrical on both sides of the mouth. From this finding, the criterion to examine the right or left quadrants randomly in the study volunteers to express dental caries manifestation representing a simplification of the DMFT index [13] was adopted. It should be noted that the average DMFT and DMF2Q in this study, referring to the region of Pomerania, eastern Germany, was considered high, as well as the prevalence of dental caries.

Although there are studies in literature suggesting the possibility of simplifying the DMFT index, it has been currently used in the traditional format, i.e., full mouth examination [3], and additional studies on this topic are required to contribute to the debate on simplification and standardization of epidemiological indexes on oral health.

The aim of this study was to verify the validity of two simplified DMFT indexes compared to the full DMFT index.

Material and Methods

This is an observational, exploratory and validation study with sample defined by convenience that included all adult and older adult volunteers undergoing treatment at the university dental clinic. They were addressed according to the scheduling flow in the school period of the second half of 2013 and first half of 2014. Those who had natural teeth with various caries attack conditions represented by decayed, missing and filled teeth and who agreed to participate in the study were included. The following exclusion criteria were considered: to be under 18 years of age, to have all healthy teeth, to be fully edentulous or have disabilities that would limit examination, understanding and / or communication.

Prior to examination, examiners went through a theoretical and practical training for the application of the DMFT index according to the examination criteria of WHO [3] with direct lighting in a clinical setting. Then, calibration was performed with four previously screened volunteers, which gathered most necessary conditions such as decayed, healthy, missing and filled teeth. After calibration, 2 examiners who have obtained inter-examiner agreement above 80% were kept. The data obtained in the calibration stage were not counted as study data. All tests for data collection were performed at the university dental clinic.

Dental caries distribution was measured from the examination of the tooth crown condition under direct lighting using atraumatic explorer recommended by WHO [3]. Full-mouth oral inspection examinations were systematically carried out starting from the third molar to the central incisor of the upper right quadrant and then from the central incisor of the upper left quadrant to the third molar, moving to the lower left quadrant from the third molar to the central incisor, ending in the lower right quadrant in the same order, from the central incisor to the third molar. The following conditions were considered in all examinations per tooth: decayed; filled with caries; filled without caries and lost due to caries [14,15].

For purposes of analysis, the following parameters were considered: a) mean DMFT [15] obtained by the average of decayed, missing and filled teeth of all teeth; b) DMF2Q [12] calculated by the average of decayed, missing and filled teeth in the upper left and lower right quadrants multiplying by two; c) DMFT of the right and left sides by separately registering the average of affected teeth in the upper and lower left quadrants and upper and lower right quadrants [13].

Data were submitted to descriptive statistical analysis and Shapiro-Wilk test for normality. In the presence of normal distribution, the unpaired "Student's t" test was used to compare means (age x sex). Due to the fact that samples are dependent, the comparison between the average total DMFT x DMF2Q values and DMFT values of right and left sides, as well by sex and age was performed by the Wilcoxon test (nonparametric), adopting significance level of $p < 0.05$.

All volunteers signed the Informed Consent Form before starting examinations. All oral conditions found were reported to volunteers, who were referred for care at the dental clinic whenever needed. This project was approved by the Ethics Research Committee on Human Beings of FURB, CEPH protocol No. 016/12 of May 3, 2012, according to precepts of bioethics of Resolution No. 196/1996 / CNS / MS / CONEP.

Results

Overall, 88 volunteers with mean age of 42.2 years (standard deviation 15.2) and median of 44 years were examined, of which 53 (60.2%) were female. There was no statistically significant age difference between sexes ($t = -0.8029$; $p = 0.4242$).

Table 1 shows the distribution of mean values and standard deviations of full-mouth DMFT, DMF2Q and DMFT of Right Side and Left Side.

Table 1. Comparison of dental caries distribution based on the full-mouth DMFT index, DMF2Q and DMFT of Right Side and Left Side of all volunteers.

Variable	DMFT	DMF2Q *		DMFT RS	DMFT LS	
	mean (sd)	mean (sd)	p(**)	mean (sd)	mean (sd)	p(**)
Total (n=88)	16.3 (9.1)	16.4 (9.5)	0.397	8.2 (4.6)	8.1 (4.7)	0.657

* DMFT index simplified by quadrant (**) Wilcoxon test

There were no statistically significant differences among mean DMFT and DMF2Q values or between DMFT RS and DMFT LS. The same result was also observed in the analysis of means by sex and age, according to Tables 1 and 2.

Table 2. Comparison of dental caries distribution based on the DMF2Q and DMFT of Right Side and Left Side of all volunteers for sex.

Left Side of an Volunteer's Test Box:							
	DMFT		DMF2Q *			DMFT RS	DMFT LS
Sex	mean (sd)		mean (sd)		p(**)	mean (sd)	mean (sd)
Male (n=35)	16.1	(8.2)	16.1	(8.6)	0.873	8.1 (4.3)	8.1 (4.2)
Female (n=53)	16.4	(9.8)	16.6	(10.1)	0.235	8.3 (4.9)	8.1 (5.0)

• DMFT index simplified by quadrant (**) Wilcoxon test.

Table3. Dental caries distribution of comparison based on the DMF2Q index and DMFT of Right Side and Left Side of all volunteers for age group

	DMFT	DMF2Q *		DMFT RS	DMFT LS	
Age (years)	mean (sd)	mean (sd)	p(**)	mean (sd)	mean (sd)	p(**)
Up to 29 (n=22)	4.0 (4.6)	4.0 (4.6)	0.959	2.1 (2.6)	1.9 (2.1)	0.744
From 30 to 44 (n=25)	17.8 (6.9)	17.4 (4.5)	0.564	8.8 (3.4)	9.1 (3.8)	0.134
From 45 to 59 (n=32)	21.4 (4.5)	21.9 (5.0)	0.206	10.8 (2.4)	10.6 (2.5)	0.716
60 or older (n=9)	23.4 (6.8)	24.0 (7.2)	0.298	11.8 (3.7)	11.7 (3.2)	0.951

* DMFT index simplified by quadrant (**) Wilcoxon test.

Discussion

Classic studies on dental caries epidemiology based on the DMF index systematically use the criterion of the examination of two full arches or full mouth, according to criteria recommended by the World Health Organization [3].

Nationwide population-based studies or those with health care samples often use this methodology. In the "SB Brasil 2010" study, the mean DMFT in southern Brazil was 17.6 for adults and 27.1 for older adults aged 65-74 years [22]. In Piracicaba, the mean DMFT was 19.9 for adults and 27.0 for older adults [23]. Similar values were observed in older adults assisted in the primary care system of Londrina, with mean DMFT for older adults of 27.2 [23]. The mean DMFT values in our study were consistent in relation to adults and lower in relation to older adults, which can be explained, at least in part, since a lower cutoff point for age was used (60 years).

The alternate examination of the half upper and lower arches (half-mouth) can be used for the generic knowledge of the oral health condition; however, simplification and validation of epidemiological methods is a demand that requires continuous studies.

In this study, a systematic search in the main international bibliographic databases was conducted, and few articles whose object of analysis was the DMFT index in relation to the discussion of its methodology were found [6,12,13,16,17]. However, numerous works using this index have been identified, almost all using the "full mouth" method in order to obtain prevalence data and manifestation of dental caries in various countries, populations, age groups and study approaches, confirming the wide use of this index [4,18-21].

In this study, the comparison between DMFT index and the simplified DMF2Q index failed to identify differences between mean values found, suggesting the possibility of simplifying the index, regardless of gender and age of the study population as a reliable alternative based on symmetrical distribution of dental caries attack, similarly to other studies [6,11,12,14,16,17].

Accordingly, the means found for the right and left sides can be considered similar, considering the statistical analysis, with good possibility of examination by right or left quadrants be used for the generic knowledge of oral health status in epidemiological studies, with acceptable level of accuracy. The method of partial examination of the dental arches is based on studies showing that dental caries is a bilateral disease and that the attack on tooth surfaces is manifested in a similar

manner in both arches and both quadrants [5,6,12,13], allowing reliable estimates through partial examinations systematically carried out.

However, the decision on simplifying the DMFT index should consider the study purpose and its scope. One possible application would be in local estimates for purposes of planning by oral health teams of the Family Health Strategy. The use of simplified indexes in epidemiological population-based studies should be considered in a more judicious manner, requiring additional validation studies with larger samples. In both cases, simplification may represent a reduction in examination time and operating costs, with no apparent loss in quality results.

This study has some limitations. First, the sampling process for convenience in a university dental clinic can compromise the external validity of data because it is not a population probability sampling. Second, the reduced sample size may accentuate random errors and reduce the study power. However, DMFT values obtained by sex and age group were similar to values found in national population studies. Given these sampling limitations, consistent with its exploratory approach, further studies would contribute to the objective of validating the simplification of oral health epidemiological indexes such as DMFT.

Conclusion

Data obtained in this study were consistent with similar studies on the distribution of dental caries in quadrants, which allows simplifying the DMFT index for epidemiological estimates.

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