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Caries Risk Assessment At Dental Students and its Association with Caries Experience

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ABSTRACT

Introduction: The 'Cariogram' aiming to illustrate the multifactorial background of dental caries in a simple way. This study aimed to determine whether caries risk from Cariogram relates to caries experience in younger population. Methods: One hundred sixty-two subjects and Cariogram files were completed from patients aged twenty-two to twenty-four years (mean: 23.5) completed the Cariogram. The percentage of "chances of avoiding new lesions" (caries risk) was obtained from Cariogram, and the subjects were classified into five risk groups. Statistical data processing was performed with SPSS 14.00 for Windows, $p \leq 0.05$. Results: Caries risk assessment revealed that most subjects showed a low risk of caries 70.4% (114). Most subjects presented average values 39.5% (64) or low values for 35.2% (57) of their caries experience. Conclusion: Caries risk assessment using Cariogram appears to be unrelated with caries experience in this younger population.

KEYWORDS : Caries Risk Assessment, Cariogram, Caries Experience, Younger.

INTRODUCTION

Caries continues to affect nearly every adult in the world(Petersen, Bourgeois, Ogawa, Estupinan-Day and Ndlavel (2005)

The 'Cariogram' is a new concept, conceived initially as an educational model, aiming to illustrate the multifactorial background of dental caries in a simple way (Hänsel-Petersson, Carlsson and Bratthall, 1998). Risk is the probability of a person to develop a particular disease or experience a particular health status in a specified time period. Caries risk relates to the likelihood of a person developing caries lesions or not. Hausen, Seppä andFejerskov (1994) found the caries risk is the probability for a person to develop a certain number of carious lesions and achieve a certain stage of disease progression in a certain period of time, provided that the situation of its exposure remains stable for the specified period.

In the last few decades there have been significant changes in the pattern of distribution and polarization of dental caries. These trends should be evaluated and monitored carefully to understand the factors that influence oral health. Besides the significant reduction in the prevalence of caries there is a change in distribution, in the sense of polarization of dental caries by the extremes. For this reason, the average values of the DMF index can no longer be considered representative for the population to detect the population with increased caries risk Andrian (1999), Andrian (2002) Dănilă (2005).

The cariogram concept was first described by Bratthall in 1996 and represents a new model to illustrate the interaction between oral bacterial flora, alimentation and host response (Bratthall&Ericsson 1994, Bratthall (1996), Hänsel-Petersson et al. (1998), Hänsel-Petersson&Bratthall 2000, Hänsel-Petersson, Twetman and Bratthall (2002)).

Cariogram has shown promising results in predicting caries in younger population (Hänsel-Peterssonet al.(2002), Giacaman, Reyes and León (2013)). Indeed, Cariogram was more accurate in predicting caries for children. In younger population, however, only few studies have been published (Miravet, Company and Silla. (2007)).

This study aimed to determine whether caries risk from Cariogram relates to caries experience in younger population.

METHODS

Clinical records from the Dental Clinics UMF Grigore.T.Popa, Romania was used in this cross-sectional study. This study was carried out with the clinical records of subjects regularly attending the University's Dental Clinics. All subjects signed an informed consent to allow the researchers to use their data. The study was conducted on a sample of 162subjects students of Dentistry. The patients had a mean age of 23,5 years. Eight component factors of the Cariogram were included to complete the required information in the program, as described in Table 1. Caries related factors according to the program were caries experience which was evaluated in conformity with: past caries experience, including cavities, fillings and missing teeth due to caries. Several new cavities definitely appearing during the preceding year should score '3' even if number of fillings is low. Caries experience was obtained from the DMFT of the patients, visually assessed using WHO

criteria. Cariogram scoring for the DMFT was based on whether the subject had a DMFT below, within or above the age group range (Table 1). Related diseases were obtained from the questionnaire in the patient's record. The general diseases or conditions associated with dental caries were evaluated based on medical history and medication.

The diet was analyzed by two factors: the contents by estimation of the cariogenicity of the food, in particular fermentable carbohydrate content. The diet history was recorded and the frequency was estimated by the number of meals and snacks per day, mean for a normal day. Dietary information was collected from a dietary questionnaire completed by each patient. Patients completed a questionnaire. Plaque quantity was assessed by the Quigley-Hein index and scored as shown in Table 1.The fluoride program was assessed through an interview for fluoride exposure of the patient. Stimulated saliva flow was estimated through the amount of saliva, using paraffin-stimulated secretion and expressing results as ml saliva per minute and the stimulated saliva test - secretion rate was used. Saliva buffer capacity was made by determination of the capacity of saliva to buffer acids, using the Dentobuff test. Clinical judgment was determined by evaluation of the opinion of the dental examiner, 'clinical feeling' (examiners own clinical and personal score for the individual patient).

After assessing all of the information of the eight factors considered in this study, they were entered into the Cariogram software. Once information is entered into the program, a pie chart is automatically generated that shows a green area of the chart indicating the "actual chance to avoid new cavities", which is expressed as a percentage of the pie chart. Thus, the subjects were classified into 5 caries risk groups according to the percentage shown by the Cariogram: English Version 2.1: very low risk: 81–100%, low risk: 61–80%, moderate risk: 41–60%, high risk: 21–40% and very high risk: 0–20%. The hypothesis in this study was that caries risk, as assessed by Cariogram, corresponds with the caries experience of a dental younger's population.

Statistical analysis

To determine whether the patient distribution within each factor of the Cariogram was statistically different, a chi-square test was conducted for each variable. Statistical data processing was performed with SPSS 14.00 for Windows and p-values lower than 0.05 were considered significant.

The scores established to assess the risk factors are presented in the Table 1.

Table 1- Input variables and scores used to complete the Cariogram

S	V	Score
C	CE	0: No caries experience 1: Lower than the age group range 2: Within the age group range 3: Higher than the age group range
C	RD	0:No caries-related disease 1:Related disease-Mild degree 2: Related disease-Severe degree
D	DC	0: Very low amount of carbohydrates 1: Low amount 2: Moderate amount 3: High amount
D	DF	0: 0 to 3 daily intakes 1: 4 to 5 daily intakes 2: 6 to 7 daily intakes 3: More than 7 daily intakes
B	PI	0: <0.4 1: 0,4 - 1,1 2: 1,1 – 2,0 3: > 2,0
S	FP	0: Complete fluoride program 1: Irregular but complete fluoride program 2: Only toothpaste 3: No fluoride supplements
S	V	Score
S	SS	0: > 1,1ml/min 1: 0,9 - 1,1ml/min 2: 0,5 – 0,9 ml/min 3: < 0,5 ml/min
S	BC	0: pH> 6.0 1: pH = 4.5-5.5 2: pH <4.5
S – Sector; C – Circumstances; D – Diet; B – Bacteria; S - Susceptibility V- Variable; CE - Caries experience; RD -Related disease; DC - Diet content; DF - Diet frequency; PI - Plaque index; FP - Fluoride program; SS - Salivary secretion; BC - Buffer capacity;		

Factors involved in determining caries risk were: the caries experience, related diseases, diet content, diet frequency, plaque index, fluoridation program, salivary secretion, buffer capacity.

RESULTS

Values obtained from the Cariogram were divided into quintiles and patients were classified as having very low, low, moderate, high and very high risk of caries, depending on their percentage of risk. The patients had a mean age of 23,5 years. While no subject was classified as "very low risk" and 114 patients as "low risk", 44, 3 and 1 patients were classified as "moderate", "high" and "very high" risk, respectively. The distribution of the patients within each Cariogram variable was significantly different ($p < 0.001$) for all eight factors considered (Table 2). There was a significant positive correlation between caries experience and diet content(Pearson's R= 0,196; p= 0,012), caries risk (Pearson's R= 0,288;p=0, 000). No correlation statistically significant of the caries experience with the related disease (Pearson's R =-0,069;p= 0.383), the diet frequency (Pearson's R = -0,010; p= 0,900), plaque index (Pearson's R=0,149;p=0,059), fluoride program (Pearson's R=-0,105;p=0,185), salivary secretion (Pearson's R= -0,056, p =0,478), buffer capacity (Pearson's R = 0,035; p =0,663) was found.

Table 2 – Patient distribution by Cariogram scoring

V	Scoring	n	%	p
CE	0: No caries experience	3	1,9	*
	1: Lower than the age group range	57	35,2	
	2: Within the age group range	64	39,5	
	3: Higher than the age group range	38	23,5	
RD	0:No caries-related disease	158	97,5	*
	1:Related disease-Mild degree	4	2,5	
	2: Related disease-Severe degree	0	0	
DC	0: Very low amount carbohydrate	14	8,6	*
1: Low amount 74			45,7	
	2: Moderate amount	73	45,1	
	3: High amount	1	,6	
DF	0: 0 to 3 daily intakes	81	50,0	*
	1: 4 to 5 daily intakes	65	40,1	
	2: 6 to 7 daily intakes	15	9,3	
	3: More than 7 daily intakes	1	,6	
PI	0: <0.4	10	6,2	*
	1: 0,4 - 1,1	117	72,2	
	2: 1,1 – 2,0	34	21,0	
	3: > 2,0	1	,6	

FP	0: Complete fluoride program	8	4,9	
	1: Irregular but complete fluoride program	92	56,8	*
	2: Only toothpaste	62	38,3	
	3: No fluoride	0	0	
SS	0: > 1,1ml/min	155	95,7	
	1: 0,9 - 1,1ml/min	6	3,7	*
	2: 0,5 – 0,9 ml/min	1	,6	
	3: < 0,5 ml/min	0	0	
BC	0: pH> 6.0	157	96,9	
	1: pH = 4.5-5.5	5	3,1	*
	2: pH <4.5	0	0	

V- Variable; CE - Caries experience; RD -Related disease; DC - Diet content;DF - Diet frequency; PI - Plaque index; FP - Fluoride program; SS - Salivary secretion; BC - Buffer capacity; * p< 0.001

Clinical judgment has shown that the graphical representation of caries risk is correct in the 140 (86.4%) of cases. Analysis of the scores obtained by evaluating the clinical judgment of the examiner; a lower risk - clinical examination and dent-periodontal examination of the patient, including consideration of social factors give a better situation than indicated by the cariogram; normal - clinical examination and dent-periodontal examination of the patient, including consideration of social factors give the same situation as indicated by the cariogram; higher risk - clinical examination and dent-periodontal examination of the patient, including consideration of social factors give a worse situation than indicated by the cariogram

The caries risk assessment revealed that there are significant differences in favor of low caries risk 114(70.4 %;).

DISCUSSION

Caries experience continues to be considered a reliable caries predictor in the population. Unlike caries experience, Cariogram might represent a helpful tool to assess risk before caries are present. Little information exists regarding the performance of Cariogram in the younger population. We therefore attempted to determine whether Cariogram risk levels were consistent with caries experience in a population of low-caries (students). Our results showed that Cariogram risk categories by quintiles, as previously proposed, do not represent the population in general. No individual was categorized in the very low caries risk category from the Cariogram data.

Furthermore, when caries experience were compared between the remaining four risk quintiles, patients with lower caries experience than the age group range and within the age group range showed low risk of caries. This demonstrates that the DMFT index value does not influence caries risk too much.

We did not find a correlation between caries experience and any single risk factor proposed by Cariogram, except diet content.

It may be that a low-caries population, as examined here, surpasses the ability of the Cariogram to properly illustrate the association between caries risk and caries experience or caries activity. In addition, this homogeneous caries risk population impairs more definitive conclusion on the results obtained. Probably, a population with more diverse caries distribution is necessary so it may be examined in further studies. Patients with moderate sucrose content in their diet showed low and moderate risk of caries.

Because the majority of subjects have irregular but complete fluoride program and a good part of them have a complete fluoride program, this can influence the susceptibility in the caries risk assessment. Patient distribution in each individual component variable of the Cariogram was asymmetric (Table 2). In our study, several factors were adapted based on our own previous research. Although the Cariogram software includes defined parameters to use in filling the instrument, many studies have modified the variables (Hänsel-Petersson et al. (2002), Campus G, Cagetti, Sacco, Benedetti, Strohmenger and Lingstrom (2009)) or reduced the factors considered (Petersson, Isberg and Twetman (2010)).

For the patients with moderate risk for caries some actions are recommended as to reduce the risk. The diet situation with respect to frequency of intakes - a reduced number of caries-promoting intakes would be an advantage. An evaluation of both "Bacterial factors" (amount of plaque and level of S.mutans.) would make the risk evaluation more accurate. We decided not to incorporate *Streptococcus mutans* This factor was not included due to difficulties in performing the exam. The extra fluoride program installed (in addition to fluoride toothpaste) is a valuable contribution especially for the patients with high risk. In deciding which etiological factors to try to reduce, it is important to understand why the particular unfavorable factors are present. Such an approach may make it easier to assess if it is possible to improve the factor or not. As a border-line risk case, it is recommended to follow up on the results of the actions installed. It should be observed that the risk profile for a specific surface may be different from the over-all picture revealed by the Cariogram. Preventive actions for any surface showing progressing caries is encouraged. The Cariogram expresses the over-all caries risk only. It does not take into account problems such as fractures of teeth or fillings, discolorations etc. which may make new fillings necessary.

In general, caries risk factors are primarily based on expert opinions and consensus (Bratthall , Hansel-Petersson and Sundberg (1996), Giacaman et al. (2013)). Thus, the contribution of each factor to the overall caries risk may not represent the actual weight of the variable (Giacaman et al. (2013)). Although clinical judgment has shown that the graphical representation of caries risk is correct in the 140 (86.4%) of cases, in 21 (12, 96%) of cases we have considered that clinical examination and dent-periodontal examination of the patient, including consideration of social factors give a better situation than indicated by the cariogram. Our subjects are students at the Faculty of Dental Medicine and their level of education in this area is high, the use of fluorinated products, their level of diet and oral hygiene are also factors, favoring the final assessment.

Conclusions

Caries risk assessment using Cariogram appears to be unrelated with caries experience in this younger population. Knowledge of caries risk factors and the profile of the risk is important for individualizing the prophylactic and the therapeutic treatment plan.

Although most subjects had a moderate consumption of carbohydrates they showed a low caries risk. This fact oriented us to the fact that use of fluoride under conditions of salivary secretions and a normal buffer capacities provide a low caries risk.

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