



Evaluation of the differences of the caries risk detected in young adults using different risk level in cariogram

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Abstract

Objective: The aim of this study is to evaluate of the validity of the caries risk detected in young adults using different risk level in Cariogram

Methods: Detailed clinical and radiographic examinations of 120 young adult individuals (between the ages of 18 and 25) and the number of DMFT (Decay=Decay=Caries, Missing= Pulled teeth and Filling=Filling) of each individual were determined. Initially, detailed questionnaire form from each participant and data on general health, diet, oral hygiene, fluorine use and education levels were obtained. Saliva tests involving saliva mutans streptococcus count, saliva flow rate and buffering capacity were performed with ready-made kits. The standard set option in the group setting was selected and scoring of 10 risk factors in the Cariogram program was performed, resulting in a percentage of the chance of protection from caries for each individual (Cariogram A). After other cariogram model were created by selecting the High set option in the group setting (Cariogram A-H).

Results: According to the results obtained, the percentage of caries protection obtained from cardiogram programs decreases as the scoring of risk factors increases. But this reduction did not make statistical sense for all Cariogram models. There was significant difference between the risk levels of all parameters values and the Cariogram values obtained in Cariogram A-H models ($p<0,05$). At the same time, there was no significant difference between saliva buffering capacity scores and Cariogram values of all Cariogram models created in both standard set and high set setting ($p<0,05$). There was no statistically significant difference between the values compared to the average values of the different Cariogram models created in both the standard set and the high set setting.

Conclusion: It was concluded that the Cariogram program, which is one of the caries risk assessment programs can be used, but there is significant difference in the risk estimates obtained between standart set and high set.

Keywords: cariogram, evaluation, DMFT

Introduction

Dental caries is still an important health problem worldwide, with a multifactorial etiology, as it results from the interaction of various factors such as diet, host susceptibility, and the presence of microorganisms over a period of time [1]. With the dramatic decline in caries prevalence in industrialized countries in the last 30 years, the search for acceptable, accurate and cost-effective strategies to identify high-risk individuals has intensified, and multiple risk factors and indicators have been proposed as targets [2]. It is therefore important to include the assessment of caries risk in the development of targeted preventive measures [3]. Although many different models have been developed to predict caries risk, none have proven to be truly effective [4].

In order to solve the problem that arises when applying these risk estimation methods, free shared Cariogram software, which is seen to evaluate patients more accurately than other risk estimation models, has been developed (4-6). The purpose of the Cariogram was explained; (a) identifying people who are most likely to develop caries; and (b) providing them with appropriate preventive and therapeutic measures to stop the disease [5, 6]. This program aims to show the multifactorial background of dental caries by showing the interaction of nine caries-related factors. Patients are scored according to diet, plaque, caries experience, bacterial count, and salivary secretion, and the

results are shown as a pie chart risk profile. The aim of this study is to evaluate of the validity of the caries risk detected in young adults using different risk level in Cariogram.

Materials and methods

This study was carried out at Necmettin Erbakan University Faculty of Dentistry, Department of Restorative Dentistry. Approval for the study was obtained from the Ethics Committee of Necmettin Erbakan University Faculty of Dentistry. After the approval of the ethics committee, the individuals who will participate in the study were informed and their consent forms were obtained. 120 young adult individuals (18-25 years old) who applied to Necmettin Erbakan University Faculty of Dentistry, Department of Restorative Dentistry, were evaluated within the scope of this study. Detailed clinical and radiographic examinations of the individuals were performed and the number of DMFT (Decay = Caries, Missing = Extracted teeth and Filling= Filling) of each individual was determined.

Inclusion criteria for the study

- Individuals between the ages of 18-25 who are systemically healthy and do not use drugs regularly,
- Individuals who do not have any developmental disorders in their teeth and jaws,
- Not using antibiotics, antibacterial mouthwash, probiotic products, topical fluoride (except toothpaste) until at least 1 month ago,

- Individuals who promise to perform their daily oral care procedures without interruption,
- No symptoms of serious periodontal disease,
- Individuals who do not have very carious or irreparable teeth.

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All teeth that have carious lesion were restored with resin composite or amalgam. Each patient was given the same instructions with respect to oral hygiene. Using a small mirror with which subject could also see the teeth from inside the mouth, any plaque and gingival margins were shown to the subject and the importance of cleaning was well emphasized them. All patients received the usual home-care oral hygiene instructions and a packet with nonprescription fluoride toothpaste (1450 ppm of fluoride), a manual toothbrush, and dental floss. The use of sugar free chewing gum after meals was recommended for everyone. Each patient was given the same diet advice such as reduction of number of intakes per day (the amount and frequency of consumption of sugars should be reduced, avoid sugar-containing foods and drinks at bedtime, added sugars should provide less than 10% of total energy in the diet or 60g per person per day whichever is the lesser). Potentially cariogenic foods and drinks (cakes and biscuits, sugar and chocolate confectionery, jams, preserves, honey, sugared soft drinks) were described to the subjects. In addition, the results of the lactobacilli (LB) tests were shown and explained to the subjects at first visit.

The caries-risk profile of all individuals was obtained at each of the four visits using Cariogram software ^[11]. For each subject, the following ten caries-related variables were put into the Cariogram software: ^[1] caries experience, ^[2] related diseases, ^[3] diet content, ^[4] diet frequency, ^[5] MS count, ^[6] plaque amount ^[7] fluoride program, ^[8] salivary buffer capacity, ^[9] saliva secretion rate and ^[10] clinical examination. Based on the entered variables, the chance to

avoid caries in the future was calculated. Country/area was set at normal and the group as standart set (Cariogram A) and high set (Cariogram A-H) for all subjects.

The statistical analysis was processed with the SPSS 17.0 software system (SPSS Inc., Chicago, Illinois, USA). A p-value of <0.05 was considered statistically significant. Descriptive statistics, including the means, standard deviations and frequencies (percentages), were calculated. The Cariogram variables included in the statistical analysis were: (1) diet (dietary content and frequency), (2) bacteria (MS level and plaque index), (3) susceptibility (fluoride program, saliva buffer capacity, and saliva secretion rate), (4) circumstances (caries experience and related diseases), (5) the actual chance of avoiding caries and (6) cariogram risk levels. Diet, bacteria, susceptibility, and circumstances data were analyzed for statistically significant differences using Kruskal Wallis and Wilcoxon tests.

Results

The Cariogram model used in our study and the chance of caries prevention obtained were evaluated separately for each Cariogram model. As the scores entered for the variables other than the saliva buffering capacity scores in the Cariogram A value measurements of the Cariogram A model increase, the percentage of the individuals' chance of being protected from caries decreases significantly ($p < 0.05$). There was no statistically significant difference between risk levels based on saliva buffering capacity alone ($p > 0.05$). When evaluated for 120 individuals in the study, the highest Cariogram value was observed in *S. mutans* (score:0) (73.63 ± 14.80), while the lowest value was in salivary flow rate (score:2) (6.50 ± 4.95) was seen. There is no statistically significant difference between the risk levels of saliva buffering capacity in the measurements of the Cariogram A-H values created by entering the High set setting in the Cariogram A model ($p > 0.05$). However, as the scores entered for other variables increase, the percentage of the individuals in the Cariogram A-H model to be protected from caries decreases significantly ($p < 0.05$).

Discussion

Reports about oral health in young adults are rare. Young adults are subjected to many changes in life. Leaving school, getting a job or leaving home to live independently can result in significant lifestyle changes that impact on diet or oral hygiene practices. Living on fast food, lack of regular meals, frequent snacking and less frequent use of toothpaste are typical for many young adults. The lack of proper main meals may result in frequent hunger and a 'grazing' eating pattern where an individual eats small amounts of a variety of food all day long. This eating pattern often does not leave enough time for teeth to recover from acid attack and for remineralization to occur. Altered oral hygiene practices often result in lowered use of toothpaste, diminished exposure to fluoride and this can result increasing of subject's caries risk. So, we focused young adults in this prospective project ^[7-11].

Dental caries have multifactorial etiologies including general health, diet, plaque, saliva secretion, amount and type of microorganisms, host susceptibility, oral-hygiene habits, fluoride exposure, social and behavioral factors. There is no single test that takes into consideration all these factors and can accurately predict an individual's susceptibility to caries. Although the etiological factors

having a role in the formation of caries are certainly presented, it is stated that the success in estimation of caries risk is not a hundred percent. Estimating the individuals who will develop caries in the near future by determining the individual caries risk is reported to be very important for selecting the most suitable method to be used in diagnosis, prevention and treatment of caries [12]. That the caries etiology has multiple factors indicates that there is a need for a caries risk determination model comprising various factors that will have a role in the formation of caries. To this end, Cariogram program developed recently is reported to have been very successful in caries risk estimation [4-8]. In a study, Cariogram was reported as the most successful method among three caries risk model for caries risk determination. On the other hand, it is stated that Cariogram does not provide the number of caries that may occur in the future, but dwells on the potential risk scenario. Even in case some of the parameters required for Cariogram are lacking, same results are reported to have been obtained in recently studies. In our study, Cariogram program (despite having limitations) is preferred due to being very useful and contemporary in terms of containing extensive caries risk factors [5-8].

As new concepts and theories about caries and its etiology emerged, testing procedures and researchers' interpretations also changed. At first, it was thought that the presence of mutans streptococcus alone could provide sufficient information about caries formation. However, as the concept of "individual caries risk" was used over time, it was understood that bacterial saliva parameters were actually

only a part of a multifactorial process. Saliva has simple mechanical washing, antimicrobial activity, buffering capacity, and the capacity to reverse the demineralization of the tooth surface exposed by its calcium content. Many researchers identify low salivary flow rate as an important factor contributing to caries lesion progression, and stated that individuals with salivary flow less than 0.7 mL/min have a significantly increased risk of developing caries [13-17].

In a study involving 451 people in total, it was investigated whether caries risk assessment based on clinical observation and Cariogram model gave similar results [1]. Using the clinical examination, caries detection, saliva samples, and radiographic examination, together with the history and questionnaire, the investigators made a risk stratification and then a second risk calculation was made and evaluated according to the Cariogram. It was concluded that caries risk assessment and Cariogram model based on clinical observation gave similar results for the low-risk group, but this was not the case for other groups [3]. When the risk assessment results of the Cariogram program were compared with the assessment made by dental hygienists and dentists, it was concluded that the caries risk assessment of the Cariogram was consistent with the opinion of the majority of the participants. The risk assessment ability of the Cariogram program was evaluated by comparing it to the actual increase in caries in a group of elderly individuals over a 5-year period. At the end of this study, it was stated that Cariogram succeeded in dividing elderly individuals into risk groups reflecting the actual caries outcome [12-15].

Table 1: Cariogram value of standart set group (Cariogram A group)

	Factor	Risk Level	Score	Number of Individuals	Mean Cariogram - Sd	p
Environmental Factors	Caries Experience	DMFT 6	0	33	70.58±17.71	0.001*
		DMFT 7 and 8	one	40	49.88±16.75	
		DMFT 9 and 10	2	28	41.00±20.43	
		≥ DMFT 11	3	19	36.58±21.64	
	Systemic Problem	Systemically healthy individuals were included in the study.				
Diet	Dietary Content (Saliva Lactobacillus Level)	0-10 ³ CFUs	0	6	70.50±19.58	0.001*
		10 ³ -10 ⁴ CFU	1	26	61.69±18.22	
		10 ⁴ -10 ⁵ CFU	2	67	51.54±20.37	
		>10 ⁵ CFUs	3	21	32.71± 22.60 ^b	
	Dietary Intake Frequency	3 times per day	0	21	61.14±18.77	0.001*
		4-5 times a day	1	52	59.58±18.38	
		6-7 times a day	2	35	42.14±22.53	
		> 7 per day	3	12	25.83±14.29	
Bacteria	Plaque Quantity	< 0.4	0	36	61.39±20.49	0.001*
		0.4-1	1	59	51.75±22.44	
		1.01-2.002	2	19	39.00±16.49	
		> 2.0	3	6	27.17±15.94	
	Level of saliva S. mutans	0-10 ³ CFUs	0	8	73.63±14.80	0.001*
		10 ³ -10 ⁴ CFU	1	26	62.73±19.45	
		10 ⁴ -10 ⁵ CFU	2	71	48.35±21.83	
		>10 ⁵ CFUs	3	15	34.27±15.59	
Sensibility	Use of Fluoride	Maximum	0	3	66.00±18.19	0.005*
		Good	1	5	71.40±15.27	
		Middle	2	108	51.18±21.88	
		Low	3	4	21.25±18.45	
	Saliva Flow Rate	> 1.1 ml/ min	0	67	55.27±22.63	0.001*
		0.9-1.1 ml/ min	1	28	53.79±20.83	
		0.5-0.9 ml/ min	2	23	41.09±17.72	
		< 0.5 ml/ min	3	2	6.50±4.95	
	saliva Buffering Capacity	High	0	46	53.41±23.85	0.433
		Middle	1	61	51.39±21.20	
Low		2	13	44.23±23.59		

Table 2: Cariogram value of standart set group (Cariogram A-H group)

	Factor	Risk Level	Score	Number of Individuals	Mean Cariogram - Sd	p
Environmental Factors	Caries Experience	DMFT 6	0	33	65.06±18.77	0.001*
		DMFT 7 and 8	1	40	41.50±15.62	
		DMFT 9 and 10	2	28	33.93±18.86	
		≥ DMFT 11	3	19	32.11±18.95	
	Systemic Problem	Systemically healthy individuals were included in the study.				
Diet	Dietary Content (Saliva Lactobacillus Level)	0-10 ³ CFUs	0	6	64.00±22.10	0.001
		10 ³ -10 ⁴ CFU	1	26	53.58±19.10	
		10 ⁴ -10 ⁵ CFU	2	67	44.60±20.32	
		>10 ⁵ CFUs	3	21	28.50±20.95	
	Dietary Intake Frequency	3 times per day	0	21	53.76±19.65	0.001
		4-5 times a day	1	52	51.96±18.69	
		6-7 times a day	2	35	37.15±21.95	
> 7 per day	3	12	20.08±11.99			
Bacteria	Plaque Quantity	< 0.4	0	36	54.50±20.89	0.001
		0.4-1	1	59	45.28±21.39	
		1.01.2002	2	19	32.63±16.44	
		> 2.0	3	6	21.17±13.50	
	Level of saliva S. mutans	0-10 ³ CFUs	0	8	67.13±16.69	0.001
		10 ³ -10 ⁴ CFU	1	26	56.38±20.14	
		10 ⁴ -10 ⁵ CFU	2	71	41.74±20.64	
		>10 ⁵ CFUs	3	15	27.33±13.33	
Sensibility	Use of Fluoride	Maximum	0	3	58.33±19.35	0.007
		Good	1	5	64.40±17.49	
		Middle	2	108	44.59±21.35	
		Low	3	4	16.75±15.90	
	Saliva Flow Rate	> 1.1 ml/ min	0	67	48.63±22.56	0.014
		0.9-1.1 ml/ min	1	28	45.75±20.82	
		0.5-0.9 ml/ min	2	23	34.30±17.09	
		< 0.5 ml/ min	3	2	7	
	Saliva Buffering Capacity	High	0	46	47.31±22.71	0.492
		Middle	1	61	44.16±20.82	
Low		2	13	39.38±24.65		

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