Assessing the caries risk factor among children at age prom 4-5 using the cariogram program

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Abstract—The Cariogram is a new concept, primarily evolved as an educative model, focused towards simple presentation of the numerous factors which cause dental caries.For the realization of this doctorate, we defined and accomplished the goal, which was based on the assessment of the dental caries risk profiles, in examinees with primary teeth, using the Cariogram model.
The research is carried out in a longitudinal study, that lasted 2 years, in which we included 60 examinees at a preschool age, from 4 -5 years (31 male and 29 male). The following was done in every examinee : clinical detection of the dental health; assessment of the diet-lactobacillus in the saliva; assessment of the oral hygiene index (OHI); assessment of the frequency of meals; assessment of the flow rate of the 'stimulated' saliva; assessment of the buffering capacity of the saliva; assessment of the clinical evaluation of the examiner.
After finishing the clinical and laboratorial examinations, the results were applied in the Cariogram program, from which we got data about the caries risk level for every examinee, and then we got recommendations about application of specific preventive measures.
The results of the descriptive statistics and the carried out analysis of the analyzed dental caries risk factors for the dmft and the caries risk factors, show that the average value of the dmft in the first year of the examination varied in the interval from 2,31±0,62 and the average value of the dmft index during the second year of the study varied in the interval from 2,88±0,39; the quantity of Lactobacillus in the saliva varied in the interval from 1,41±0,50 CFU/ml; the average frequency of having meals varied in the interval from 1,94±0,43; the average value of the plaque index varied in the interval from 1,45±0,50; the average value of Streptococcus Mutans in the saliva varied in the interval from 2,55±0,50 CFU/ml; the average value of administering fluoride was in the interval from 1,22±0,42; the average value of the buffering capacity of the saliva varied in the interval from 0,80±0,41; the opinion and the assessment of the examiner varied in the interval from 1,41±0,57. The results of the Mann-Whitney U Test (Z=0,51) and p>0,05 (p=0,61) for the dental caries risk profiles in the first year compared to the value of the same test in the second year of the study, showed that there was no statistical significance.
The assessment of the dental caries risk is a very important clinical step, especially when we use the Cariogram model, which in many ways can lead us to the use of specific preventive measures.

Key words: *caries risk factors; Cariogram; dmft*
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1 INTRODUCTION

THE dental caries, according to the modern literature, is considered, as a result from an imbalance of the ecological system of the oral cavity, moreover then as a result of bad oral hygiene or a bad diet. The dental caries always evolves when the aggressive factors dominate while the defenses proceed to stay at the same level, when the strength of the aggressive factors continues while the defense is weakened and when these two factors function together (1,2,3).

The medical approach in the treatment of dental caries, is a responsibility of every dentist, which in their everyday work with patients must include risk assessment of the onset of dental caries. Risk assessment of the onset of caries in individuals can be done in numerous ways and they can be subjective and objective (4).

The predilection models for caries can be simple models, in which only one risk factor is assessed, from which a prediction about the onset of caries can be made, or they can be complex multifactorial models, which besides the clinical parameters, the risk factors and the risk indicators, include analysis of the saliva, microbiological analysis and exc. (5). Although these facts about caries are not a new concept, they have never been implemented in everyday dentistry routine. The last decade, the treatment of patients with dental caries is rarely done based on the risk assessment for the beginning of dental caries(6).

One way to do risk assessment, is with a computer program named Cariogram, a contemporary concept, which at the beginning was made as an educative model, focused to present the numerous factors that cause dental caries, but over time evolved to become a reality. The main goal of the Cariogram is to graphically present the risk of dental caries, shown as 'opportunity to evade new dental caries' in the near future(7).

The Cariogram, is consisted of 5 sectors with a different color (Green sector shows the 'real opportunity to evade new carious lesions'', the dark blue sector shows the diet, the red sector or 'bacteria', light blue sector - susceptibility is based on the combination of administration of fluoride, saliva secretion and the defense mechanism of the saliva, and a yellow sector, ''environment''. The 5 different sectors with 5 different colors (green, dark blue, red, light blue and yellow), as shown in im-

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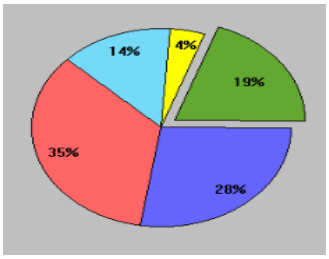
age 1, are allocated in a round diagram, in which every sector signifies different groups of factors which are associated with the beginning of dental caries(8).



Img. 1 The five sectors of the Cariogram

The Cariogram, exclusively takes into consideration the factors, that have an impact on the surface of the tooth and contribute to the evolvement of the carious lesion, which are then determined by these three factors: quantity, frequency and duration. Every factors should be analyzed from all three aspects, so the exact dental caries risk can be set (8).

The multifactorial etiology of the dental caries, and its recognition in the caries risk population makes it a problem to compare the usual models which with certainty would recognize the patients in the general population (9).

The validity of the different methods and programs for assessment of the risk factors (NUS-CRA(reduced Cariogram), Cariogram and CAT(Cambra)) was assessed, in a study in Hong Kong, which included 544 kindergarten children at an age from 3 to 4 years. All the children underwent tests for assessing the risk factors, after which the diet habits and their knowledge of the teeth were noted. In the first year of the study, the sensitivity of the examined parameters and the assessment of the NUS - CRA screening model (without biological tests) was 72%, for the total Cariogram 85%, for the CAT 100% and for Cambra 92.7%. Twelve months later, the sensitivity was much lower, for CAT-3%, for Cambra 46%, for the Cariogram and for the NUS - CRA model it was almost identical as before - 76%/64%. The authors concluded, that the two Cariogram model are a much more accurate tool for predicting new carious lesions in preschool children ($p<0.05$) in correlation to the CAT and Cambra models (10).

The studies that were carried out for the assessment of the caries risk profiles in the groups with older children with primary teeth, showed, that there is differences in the socio-economical status of the children, in which we can note that the least favorable caries risk profile and the biggest caries risk was seen in children with the worst socio-economical standard(9).

Most of the authors, concluded that with the Cariogram model we can successfully define the caries risk profiles of 12 year old children from different socio-economical statuses, which then can be used in the evolution of the preventive strategies for reduction of the caries risk in children (10,11,12,13).

2 GOAL OF THE STUDY

Considering that the data about the caries risk factors which are gotten from the Cariogram software are scarce, and also the fact that studies like these are not carried out anywhere in this region or farther, our goal, was to assess the caries risk profiles in examinees with primary dentition, using the Cariogram model.

3 METHODS AND MATERIAL

The study was carried out in a two year long, longitudinal study in which we included 49 preschool examinees at the age from 4-5 years (28 females and 21 males).

3.1 Study design

The design and the clinical steps of the study are consisted of the following 5 components: questionnaire, interview, objective clinical examination, taking samples of the saliva and forming of the Cariogram.

The children, were re-examined after two years, using the same criteria

3.1.1 Questionnaire, the questionnaires consisted of basic data for the examinees, medical history with focus on the conditions that can have a contribution to the evolvement of carious lesions, the frequency and content of the meals, oral hygiene, data for the usage of the fluoride program.

3.1.2 The assessment of the diseases connected with the start of carious lesions was noted in the questionnaire in the following manner: 0:Disease free; 1:A disease which can indirectly have a contribution to the evolvement of a mild degree carious lesion; 2: A chronic and generalized disease which can indirectly have a contribution to the evolvement of a severe degree carious lesion.

3.1.3 The assessment of the frequency of meals was noted in the questionnaire in the following manner: 0:maximum of 3 meals a day (including snacks); 1: maximum 4-5 meals a day; 2: maximum of 6-7 meals a day; 3: more than 7 meals a day.

3.1.4 The assessment of the level of fluoride administered, was noted in the following manner: 0 - maximal fluoride program (tooth paste, tablets, mouthwash, polishes); 1- rarely additional fluoride measures (only tooth paste and mouth rinse); 2 - only fluoride tooth pastes; 3 - no fluoride prophylaxis.

3.2 Objective clinical examination

In all of the examinees with the clinical examination we noted the level of inclusion of the dental caries and the index of oral hygiene (OHI - 'Oral Hygiene Index').

The clinical detection of the dental health was carried out according to the basic criteria for assessment of oral and dental health set by WHO (World Health Assessment Form, 1987) (14).The existence of dental caries in the past was split into two groups and the results were noted in the following manner : 2- those without dental caries; 3-those with dental caries.

Assessment of the oral hygiene index (OHI**)** according to Greene Vermillion (15) with scores from 0 to 3.

3.3 Laboratory investigations

The saliva samples from the examinees were taken between 9 and 10 o'clock in the morning, at least one hour after a meal and after brushing their teeth.

For the determination of the buffering capacity of the saliva, the number of Lactobacilli and number of Streptococcus Mutans, we used non stimulated saliva.

The assessment of the number of Lactobacilli and of the bacteria Streptococci Mutans in the saliva was done using the diagnostic CRT test (Vivadent, Schaan, Lihtenstein), during which, we strictly followed the guidelines set by the producer.

The data from the Lactobacillus test was noted in the following manner: 0:Very little consumption of cariogenic food and $<10^3$ (CFU)/ml (colony forming units) Lactobacilli ; 1:Little consumption of fermented carbohydrates and a cariogenic diet with 10^4 CFU/ml ; 2:Moderate consumption of fermented carbohydrates and a cariogenic diet with 10^5 CFU/ml; 3:Consumption of highly fermented carbohydrates and an inappropriate diet with $>10^6$ CFU/ml.

The assessment of the number of the bacteria Streptococcus Mutans in the saliva was noted in the following manner : 0=$<10^3$ CFU/ml saliva (non significant values). Around 5% of the surface of the crown is colonized by bacteria; 1= 10^4 CFU/ml saliva (low levels of Streptococcus Mutans in the saliva). Around 20% of the surface of the crown is colonized by bacteria; 2=10^5 CFU/ml saliva (high levels of Streptococcus Mutans in the saliva). Around 60% of the surface of the crown is colonized with bacteria; 3=10^6 CFU/ml saliva (very high quantities of Streptococcus Mutans in the saliva). Around 80% of the surface of the crown is colonized with bacteria.

The assessment of the flow rate of 'stimulated saliva' was the following: 0 - normal secretion of saliva (>1.1ml/min); 1- slightly decreased secretion of saliva (0.9-1. ml/min); 2- decreased secretion of saliva (0.5-0.9ml/min); 3-very little secretion of saliva (<0.05 ml/min).

The assessment of the buffering capacity of the saliva was done with the industrial DENOBUFF test (Vivadent, Schaan, Lichtenstein).

The assessment of the buffering capacity of the saliva was the following: 0-pH>6 - normal (good buffering capacity of the saliva) blue color; 1- pH 4.5-5.5 - decreased (low acid buffering capacity of the saliva) green color; 2-pH<4.0 low (acid buffering capacity of the saliva) yellow color.

3.4 Creating a profile with the Cariogram model

Creating a risk profile with the Cariogram model was done with the goal to: present the existence of the level of risk for developing dental caries in each patient individually; to show the etiological factors which are considered to be the most responsible risk factors for developing dental caries in each patient individually; to show us the best actions we can take, which will have the best effect towards improving the situation.

The results we got from the questionnaire, the interview, the clinical examinations and the values of the salivary investigations, were inputted in to the Cariogram internet version 2004, all with the goal to determine the caries risk profile for each examinee individually, to determine the 'caries risk' and oppositely of that to determine the 'chances of evading caries'. The chances varied from a scale of 0-100%, from which 0% chance means that a carious lesion will surely happen and a 100% chance means that there is no chance for a carious lesion to occur(16).

3.5 Statistical assessment of the results

The analysis of the data is carried out in the statistical program Statistica 7.1 for Windows. The following methods were used: In the analysis of the series with attributive marks the percent of the structure (%) is determined; In the series with numerical marks we developed a Descriptive Statistics (Mean; Std. Deviation; ± 95,00%; Minimum; Maximum); The distribution of the data is tested with: Kolmogoro-Smirnov test; Lilliefors test; Shapiro-Wilks test(p); The difference in the values of the caries risk profiles in the first (I) and second (II) year of the study, also the difference in the reduced Cariograms is tested with the Mann-Whitney U test (Z); A multivariable regresion analysis was carries out with the goal to see the correlation (association) of the Cariogram variables with the caris risk profile (R).

The significance is set for p<0,057.

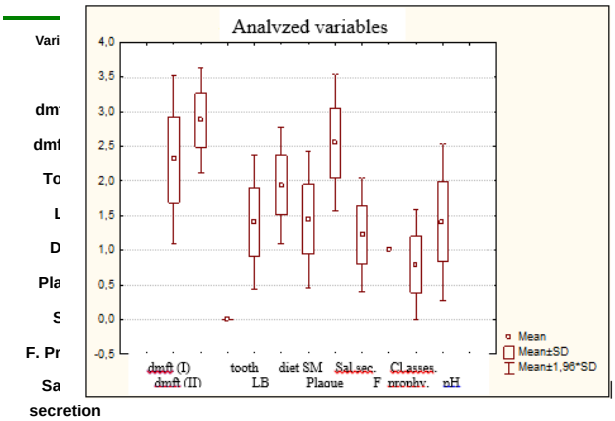
4 RESULTS

The descriptive statistics of the analyzed caries risk factors is shown on table 1 and graph 1.

The average value of the dmft (I) index varies in the interval from 2,31±0,62; the average value of the dmft (II) index varies in the interval from 2,88 ±0,39; the quantity of Lactobacillus in the saliva varies in the interval from 1,41±0,50CFU/ml; the average frequency of having meals varies in the interval from 1,94±0,43; the average value of the plaque index varies in the interval from 1,45±0,50; the average level of Streptococcus Mutans in the saliva varies in the interval from 2,55±0,50 CFU/ml; the average value of administering of fluoride varies in the interval from 1,22±0,42; the average value of the buffering capacity of the saliva varies in the interval from 0,80±0,41; the opinion and the assessment of the examiner varied in the interval from 1,41±0,57.

TABLE 1
DESCRIPTIVE STATISTIC/ANALYZED VARIABLES

Vari							Std.Dev.
dm							0,62
dml							0,39
To							0,00
L							0,50
D							0,43
Pla							0,50
S							0,50
F. Pr							0,42
Sa secretion							0,00
pH	49	0,80	0,68	0,91	0,00	1,00	0,41
Cl. Assessment	49	1,41	1,24	1,57	0,00	2,00	0,57



Graph 1.

The distribution of the Cariogram variables and the scores registered in preschool children at the age from 4-5 years is shown od table 2.

According to dmft (I) / first year /, one examinee (2,04%), was without dental caries and fillings, in one examinee (2,04%) the status was better than normal, in 29 (59,18%) examinees the status was normal for the age group, and in 18 (36,73%) examinees the status was worse that the normal one for the age group.

According to dmft (II) / second year /, one examinee (2,04%), was without dental caries and fillings, in 4 examinees (8,16%) the status was better than normal, in 44 (89,80%) examinees the status was normal for the age group.

In all 49 (100%) children there were no signs of general diseases associated with dental caries.

When the diet is taken into consideration, in 29 (59,18%) children we can register a low level of fermented carbohydrates intake and in 20 (40,82%) children we register a moderate level of fermented carbohydrate intake.

When the frequency of meals is taken into consideration, 6 (12.24%) children a maximum of 5 meals per day, 40 (81,63%) children had a maximum of 7 meals per day, and 3 (6,12%) children had more than 7 meals per day.

Regarding the quantity of plaque, 27 (55,10%) children had good oral hygiene, and 22 (44,90%) children had less than good oral hygiene. In 22 (44,90%) children high quantities of Streptococcus Mutans in the saliva was registered, in 27 (55,10%) children very high quantities of Streptococcus Mutans in the saliva was registered.

When the fluoride program is taken into consideration, 38 (77,55%) children have irregular additional fluoride usage and 11 (22,45%) children used only toothpaste with fluoride.

All 49 children (100%) had normal saliva secretion.

Normal and suitable buffering capacity was seen in 10 (20,41%) children, and less than good buffering capacity was registered in 39 (79,59%) children.

The opinion and the assessment of the examiner in 2 (4,08%) children was more positive than from what the Cariogram showed, in 25 (51,02%) children the situation regarding the dental caries is in correlation with what the tests showed, and in 22 (44,90%) children the impression from the situation showed a greater risk for dental caries.

TABLE 2
CARIOGRAM VARIABLES AND SCORES

Factor	Value	Score
Caries experience/first year	0 = Without caries and fillings	1
	1 = Better than normal	1
	2 = Normal for the age group	29
	3 = Worst than normal	18
Caries experience/second year	0 = Without caries and fillings	1
	1 = Better than normal	4
	2 = Normal for the age group	44
	3 = Worst than normal	/
Associated general diseases	0 = Disease free	49
	1=Disease/Condition,medium level	/
	2 = High risk, chronic	/
Diet, consistency	0 = Very low level of fermented carbohydrates	/
	1 = Low level of fermented carbo hydrates, food that doesn't cause dental caries	29
	2 =Moderate level of fermented carbohydrates	20
	3 = High level of fermented carbohydrates	/
Diet, frequency	0 = Maximum 3 meals a day (including snacks)	/
	1 = Maximum 5 meals a day	6
	2 = Maximum 7 meals a day	40
	3 = Over 7 meals a day	3
Quantity of plaque	0 = Very good oral hygiene, Plaque index PI < 0.4%	/
	1 =Good oral hygiene, PI = 0.4-1.0%	27
	2 Less then good oral hygiene, PI= 1.1- 2.0%	22
	3 = Bad oral hygiene, PI> 2.0%	/
Streptococcus Mutans	0 = Strip for Mutans class 0	/
	1 = Strip for Mutans class 1	/
	2 = Strip for Mutans class 2	22
	3= Strip for Mutans class 3	27
Fluoride program	0 = Maximum fluoride program usage	/
	1 = Irregular additional fluoride usage	38
	2 = Only toothpaste with fluoride	11
	3 = No fluoride usage	/
Buffering capacity of the saliva	0 = Normal and suitable	10
	1 = Decreased	39
	2 = Low	/
Clinical assessment	0 = More positive	2
	1= Normal	25
	2= Worse	22
	3 = Very high risk of caries	/

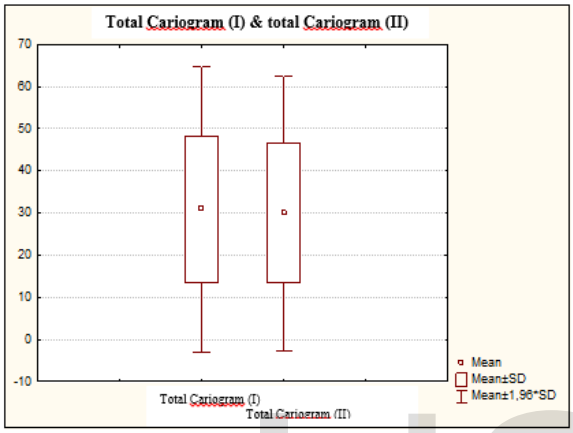
The descriptive statistics of the results from the Cariogram model in the first (I) and second year (II) of the study is presented on table 3 and graph 2, all with the goal to assess the caries risk profile in children from 4 to 5 years.

In the first year (I) the caries risk profile varies in the inter-

val from 30,88± 17,25%; 95±CI; 25,92-35,83; the minimal value is 5,00% and the maximal is 79,00%.

In the second year (II) the caries risk profile varies in the interval from 30,88±17,25%;±95,00%CI:25,92-35,83; the minimal value is 5,00% and the maximal value is 79,00%.

TABLE 3
DESCRIPTIVE STATISTICS / TOTAL CARIOGRAM (I) & TOTAL CARIOGRAM (II)



Cariogram	Valid N	Mean	Confidence -95,00%	Confidence +95,00%	Minimum	Maximum	Std.Dev.
Total Cariogram (I)	49	30,88	25,92	35,83	5,00	79,00	17,25
Total Cariogram (II)	49	29,94	25,17	34,70	4,00	68,00	16,59

Graph 2
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The presented results in table 3.1 refer to the tested differencec between the values of the caries risk profile in the first (I) and the second (II) year of the study.

The average value of the caries risk profile in the first (I) year of the study is greater but

for Z=0,51 and p>0,05(p=0,61) in correlation to the caries risk profile in the second (II) year, the difference is not significant.

TABLE 3.1
TOTAL CARIOGRAM (I) & TOTAL CARIOGRAM (II) / DIFFERENCE

Parameters	Rank Sum (I)	Rank Sum (II)	U	Z	p-level	Valid N (I)	Valid N (II)
Total Cariogram	2497,00	2354,00	1129,00	0,51	0,61	49	49

Table 4 presents the percentual distribution of the caries risk gotten with the Cariogram in the first year (I) of the study.

From a total of 49 children at the age from 4 - 5 years, in 20 (40,82%) children a high caries risk is seen, in 27 (55,10%) children a medium caries risk is seen, in 2 (4,08%) children a low caries risk is seen (the chance to evade caries in these children varies from 61% to 100%).

TABLE 4
PERCENTUAL DISTRIBUTION OF THE DENTAL CARIES RISK GOTTEN WITH THE TOTAL CARIOGRAM (I)

Chance to evade dental caries	Dental caries risk	Score
0 – 20 %	High	20
21 – 60 %	Medium	27
61 – 100 %	Low	2

Table 5 presents the percentual distribution of the caries risk gotten with the Cariogram in the second year (II) of the study.

From a total of 49 children at the age from 4 -5 years, in 22 (44,90%) children a high caries risk is seen, in 25 (51,02%) children a medium caries risk is seen, in 2 (4,08%) children a low caries risk is seen (the chance to evade caries in these children varies from 61% to 100 %).

TABLE 5
PERCENTUAL DISTRIBUTION OF THE DENTAL CARIES RISK GOTTEN WITH THE TOTAL CARIOGRAM(II)

Chance to evade dental caries	Dental caries risk	Score
0 – 20 %	High	22
21 – 60 %	Medium	25
61 – 100 %	Low	2

The multivariable regression analysis was done with the goal to examine the association between the Cariogram variables with the caries risk profile in the first (I) year of the study (table 6).

For R=0,68 and p<0,001 (p=0,0003) it established a strong and significant correlation. On the examined correlation the greatest influence had the quantity of dental plaque (Beta =-0,45); the quantity of Streptococcus Mutans in the saliva (Beta=-0,37); frequency of meals (Beta = - 0,36); fluoride program (Beta=-0,34); dmft (I) (Beta=-0,30); buffering capacity of the saliva (Beta=-0,24), and the least influence had the quality of the food (LB) (Beta=-0,20).

The increase of the quantity of dental plaque for a single value (increase of the value: 0;1;2;3) has a negative impact on the caries risk profile (B=-15,35) respectively increasing the risk for dental caries by 15,35% from which the effect is significant for p<0,01(p=0,004), when the other Cariogram variables remain the same.

The increase of the quantity of the bacteria Streptococcus Mutans in the saliva for a single value has a negative impact on the dental caries risk profile (B=-12,64), respectively increasing the caries risk by 12,64% from which the effect is significant for p<0,01 (p=0,008), when the other Cariogram variables remain the same.

The increase in the frequency of meals for a single value has a negative impact on the dental caries risk profile (B=-14,32), respectively increasing the caries risk for 14,32% from which the effect is significant for p<0,05(p=0,01) when the other Cariogram variables remain the same.

The increase in the fluoride program for a single value has a negative impact on the dental caries risk profile (B=-14,09), respectively increasing the dental caries risk by 14,09% from which the effect is not significant for p<0,05 (p=0,01), when the other Cariogram variable remain the same.

The increase in the dmft (I) for a single value has a negative impact on the dental caries risk profile (B=-8,44), respectively increasing the dental caries risk by 8,44% from which the effect is not significant by p>0,05(p=0,07), when the other Cariogram variables remain the same.

The increase in the buffering capacity for a single value has a negative impact on the dental caries risk profile (B=-9,97), respectively increasing the dental caries risk by 9,97% from which the effect is not significant by p>0,05(p=0,12), when the other Cariogram variables remain the same.

The increase in the intake of fermented carbohydrates for a single value has a negative impact on the dental caries risk profile (B=-6,92), respectively increasing the dental caries risk by 6,92% from which the effect is not significant by p>0,05(p=0,24), when the other Cariogram variables remain the same.

TABLE 6
MULTIVARIABLE REGRESSION ANALYSIS OF THE CARIOGRAM VARIABLES IN CORRELATION TO THE DENTAL CARIES RISK / TOTAL CARIOGRAM (I)

R= 0,68 ; F(7,41)=5,11 p<0,0003

	Beta	Std.Err. of Beta	B	Std.Err. of B	t(40)	p-level
Intercept			167,56	27,07	6,19	0,000
dmft (I)	-0,30	0,16	-8,44	4,56	-1,85	0,07
LB	-0,20	0,17	-6,92	5,83	-1,19	0,24
Diet	-0,36	0,13	-14,32	5,31	-2,70	0,01
Plaque	-0,45	0,14	-15,35	4,97	-3,09	0,004
SM	-0,37	0,13	-12,64	4,57	-2,77	0,008
Fluoride proph.	-0,34	0,13	-14,09	5,47	-2,58	0,01
pH	-0,24	0,15	-9,97	6,29	-1,59	0,12

The multivariable regression analysis was done with the goal to examine the association between the Cariogram variables with the caries risk profile in the second (II) year of the study (table 7).

For R=0,68 and p<0,001 (p=0,0003) it established a strong and significant correlation. On the examined correlation the greatest influence had the quantity of dental plaque (Beta =-0,42); the quantity of Streptococcus Mutans in the saliva (Beta=-0,36); frequency of meals (Beta = - 0,33); fluoride program (Beta=-0,25); buffering capacity of the saliva (Beta=-0,24),DMFT (II) (Beta=-0,21) and the least influence had the quality of the food (LB) (Beta=-0,10).

The increase of the quantity of dental plaque for a single value (increase of the value: 0;1;2;3) has a negative impact on the caries risk profile (B=-13,91) respectively increasing the risk for dental caries by 13,91% from which the effect is significant for p<0,01(p=0,006), when the other Cariogram variables remain the same.

The increase of the quantity of the bacteria Streptococcus Mutans in the saliva for a single value has a negative impact on the dental caries risk profile (B=-11,79), respectively increasing the caries risk by 11,79% from which the effect is significant for p<0,05 (p=0,01), when the other Cariogram variables remain the same.

The increase in the frequency of meals for a single value has a negative impact on the dental caries risk profile (B=-12,65), respectively increasing the caries risk for 12,65% from which the effect is significant for p<0,05(p=0,01) when the other Cariogram variables remain the same.

The increase in the fluoride program for a single value has a negative impact on the dental caries risk profile (B=-10,02), respectively increasing the dental caries risk by 10,02% from which the effect is not significant for p>0,05 (p=0,05), when the other Cariogram variable remain the same.

The increase in the buffering capacity for a single value has a negative impact on the dental caries risk profile (B=-9,59), respectively increasing the dental caries risk by 9,59% from which the effect is not significant for p>0,05(p=0,12), when the other Cariogram variables remain the same.

The increase in the dmft (II) for a single value has a negative impact on the dental caries risk profile (B=-9,08), respectively increasing the dental caries risk by 9,08% from which the effect is not significant for p>0,05(p=0,010), when the other Cariogram variables remain the same.

The increase in the intake of fermented carbohydrates for a single value has a negative impact on the dental caries risk profile (B=-3,19), respectively increasing the dental caries risk by 3,19% from which the effect is not significant for p>0,05(p=0,48), when the other Cariogram variables remain the same.

TABLE 7
MULTIVARIABLE REGRESSION ANALYSIS OF THE CARIOGRAM VARIABLES IN CORRELATION TO THE DENTAL CARIES RISK / TOTAL CARIOGRAM (II)

R= 0,68 ; F(7,41)=5,18 p<0,0003

	Beta	Std.Err. of Beta	B	Std.Err. of B	t(40)	p-level
Intercept			155,24	23,74	6,54	0,000
dmft (II)	-0,21	0,13	-9,08	5,45	-1,67	0,10
LB	-0,10	0,13	-3,19	4,46	-0,72	0,48
Diet	-0,33	0,13	-12,65	4,96	-2,55	0,01
Plaque	-0,42	0,14	-13,91	4,75	-2,93	0,006

SM	-0,36	0,13	-11,79	4,42	-2,67	0,01
Fl.proph.		0,13	-10,02	5,07	-1,98	0,05
pH	-0,24	0,15	-9,59	5,99	-1,60	0,12

5 DISCUSSION

The results we got from the descriptive statistics and the analysis we did on the analyzed caries risk factors for the dmft of the primary teeth and the caries risk factors, show that the average value during the first exam, varies in the interval from 2,31±0,62, and from the second examination, it varies in the interval from 2,88±0,39; the quantity of Lactobacillus in the saliva varied in the interval from 1,41±0,50 CFU/ml; the average frequency of meals varied in the interval from 1,94±0,43; the average value of the plaque index varied in the interval from 1,45±0,50; the average level of Streptococcus Mutans in the saliva varied in the interval from 2,55±0,50 CFU/ml; the average value of administering fluoride varied in the interval from 1,22±0,42; the average value of the buffering capacity of the saliva varied in the interval from 0,80±0,41; the opinion and the assessment of the examiner varied in the interval from 1,41±0,57.[1]

The results of the analyzed Cariogram variables and scores registered in preschool children at the age from 4 - 5 years, from the dmft in the first year of the examination we can see that only one examinee (2,04%) was without dental caries and fillings, the same number of examinees (2,04%) was with a better status than we expected, in 59,18% of the examinees the status was normal for the age group, and in 36,73% of the examinee the status was worse than the normal one for that age group.

The examined results of the dmft after the second examination showed that 1 examinee (2,04%) was without dental caries or fillings, in 8,16% of examinees the status was better than expected, and the greatest number of examinees, 89,90% were with a normal dental caries status for the age group from 4 - 5 years, which as a fact did not give us courage.

In the examined group there was no children with general diseases which could have influence as a risk factor on the evolvement of dental caries.

When the consumption of fermented carbohydrates is taken into consideration we can see that in 59,18% of children there was a low intake of fermented carbohydrates and in 40,82% of children there was a medium level of intake of fermented carbohydrates. The results we got for the frequency of meals, showed that 12,24% of the children consumed a maximum of 5 meals per day, 81,63% of children had a maximum of 7 meals a day, and 6,12 % of children had more than 7 meals per day. We would like to point out that not even one child answered that it had less than 3 meals per day.

The results we got that considered the type and frequency of the diet, and the oral hygiene, showed that children were not properly educated about oral health. The rate with witch some kinds of food and drinks are eliminated from the mouth usually is connected with the risk of dental caries. The bacteria on the plaque need a little quantity of fermented carbohydrates to produce acids. Crackers, white bread and other pastries stick to the teeth and they allow a production of acid while dairy chocolate has degradable sugars which can be degraded and eliminated by the saliva.

The analysis of the dental plaque in the examinees showed that 27(55,10%) children had good oral hygiene, 22 (44,90%) children did not have good oral hygiene and not even one child had excellent oral hygiene.

In 22 (44,90%) children we registered large quantities of Streptococcus Mutans in the saliva, and in 27(55,10%) children we registered very large quantities of Streptotocus Mutans in the saliva. It is noticeable that there was not even one child in the whole examined group that had little or very little quantities of Streptococcus Mutans in the saliva.

The analysis of the fluoride program prophylaxis showed that 38(77,55%) children did not have regular additional fluoride prophylaxis measures, 11 (22,45%) children used only fluoride tooth paste, and not even one child used maximum fluoride prophylaxis measures or intentionally totally evaded fluoride use.

10 (20,41%) children had normal referent values for the buffering capacity of the saliva, 39 (79,59%) children had decreased buffering capacity of the saliva and not even one child had low buffering capabilities, which would have a negative impact on the appearance of dental caries.

The opinion and the assessment of the examiner showed that in 2 (4,08%) children it was more positive than from what the Cariogram showed, in 25(51,02%) children the opinion and assessment was in agreement with the tests, and in 22 (44,90%) children the opinion showed a greater risk of dental caries.[2]

The results we got from the carried out descriptive analysis, with the Cariogram model, all with the goal to assess the dental caries risk profile in children from 4 - 5 years, show, that the caries risk profile in the first year of the study was 30,88, and after the second year it was with a smaller value 29,94, but still the difference in the values of the dental caries risk profile in the first year of the study compared to the value of the same for the second year of the study, show that the statistical difference in the values was not significant p>0,05. The percentual dental caries risk, assessed with the Cariogram program, in the first year of the study showed that 20 (40,82%) children had a high dental caries risk, 27 (55,10%) children had a medium dental caries risk and only 2 (4,08%) children had a low dental caries risk and the chance to evade dental caries in these children varies from 61% - 100% [4].

The same results gotten from the Cariogram after the second year of the study differed a little compared to the first year, or, 22(44,90%) children had a high dental caries risk, 25(51,02%) children had a medium dental caries risk, and the same number of children 2 (4,08%), like in the first year of the study, had a low dental caries risk, and the chance to evade dental caries in these children varies from 61% - 100%.

The assessment of the dental caries risk, is an essential component, on which we should base all of our decision about the use of preventive measures that cope with dental caries. In the search of more acceptable, concise and effective strategies to identify the high risks in every individual, the search for more risk factors is intensified, from which the most essential risk factors are implemented in the Cariogram model, which we used in the preparation of our study.

The analysis we carried out for the connection of the Cariogram variables that were included in our study with the caries risk profiles, in the first year of the study, showed a strong and significant correlation p<0,001. It is evident from the studied relationship, that the biggest influence had the quantity of dental plaque (Beta=-0,45); then the number of Streptococcus Mutans in the saliva (Beta=-0,37) followed by the frequency of meals (Beta=-0,36), then the fluoride prophylaxis program (Beta=-0,34), dmft (I) (Beta=-0,30) followed by the buffering capacity of the saliva (Beta=-0,24), and the least influence had the quality of the diet or the quantity of Lactobacillus (Beta=-0,20).

The statistical results for the increase of the dental plaque for a single value had a negative influence on the dental caries risk profile and it increased the dental caries risk by 15,35%, which was statistically significant (p<0,01); the results for the increase of the number of Streptococcus Mutans in the saliva for a single value had a negative impact on the dental caries risk profile, respectively increasing the dental caries risk profile for 12,64%, which was statistically significant (p<0,01); increasing the frequency of meals by a single value had a negative influence on the dental caries risk profile, respectively increasing the dental caries risk by 14,32%, which was statistically not significant (p<0,05); the results for the increase in the fluoride program prophylaxis by a single value had a negative impact on the dental caries risk profile, more concisely it increased the dental caries risk by 14,09%, which was not statistically significant (p<0,05); the increase in the dmft value in the first year of the study, for a single value, had a negative impact on the caries risk profile and it increased the dental caries risk by 8,44%, which was not statistically significant (p>0,05);the results of the increase of the buffering capacity of the saliva, by a single value had a negative impact on the caries risk profile, increasing the dental caries risk by 9,97% which was not statistically significant (p>0,05)l the increase in the intake of fermented carbohydrates in the food for a single value had a negative impact on the dental caries risk profile, i.e. increasing the dental caries risk by 6,92%, which was not statistically significant (p>0,05). We want to point out that the results which we commented were valid only when the other Cariogram variables remained unchanged.

The results we got from the multivariable regression analysis of the association of the Cariogram variables with the dental caries risk profile after the second year of the study, show a significant correlation (p<0,001). The biggest influence on the examined correlation had the quantity of dental plaque, then the number of Streptococcus Mutans in the saliva, the frequency of meals, followed by the fluoride program prophylaxis, then the buffering capacity of the saliva, the dmft(II), and the least influence had the quality of the meals i.e. the quantity of Lactobacillus.

The increase of the quantity of dental plaque by a single value (increase by: 0,1,2,3) had a negative impact on the dental caries risk profile and was statistically significant p<0,01; the increase in the quantity of Streptococcus Mutans in the saliva for a single value had a negative impact on the dental caries risk profile, which increased the dental caries risk by 11,79% i.e. it was statistically significant (p<0,05); the increase of the frequency of meals by a single value had a negative impact on the dental caries risk profile, increasing the dental caries risk by 12,65%, which was statistically significant (p<0,05); the increase of the fluoride program prophylaxis by a single value had a negative impact on the dental caries risk profile, which increased the dental caries risk by 10,02% and the same did not have a statistical significance (p>0,05)The increase of the buffering capacity of the saliva by a single value had a negative impact on the dental caries risk profile, increasing the dental varies risk by 9,59%, which was not statistically significant (p>0,05); the increase of the dmft values in the second year of the study by a single value had a negative influence on the dental caries risk profile and it increased the dental caries risk by 9,08% which was not statistically significant (p>0,05); the increase of the intake of fermented carbohydrates with the meals, by a single value had a negative impact on the caries risk profile, increasing it by 3,19%, i.e. it was not statistically significant (p>0,05). All of the mentioned parameters associated with the dental caries risk, were only valid when the other values of the Cariogram remained the same.

The results from the studies by Wilson, for different risk factors that cause dental caries in children at the age from 2-3 years and the meaning of oral hygiene, only show a weak correlation with dental caries. Contrary to that, the Streptococcus Mutans colonies in the saliva as predictors of dental carious lesions were responsible in 50% of the general population. The influence of the buffering capacity of the saliva on the formation of dental caries was also established (17). Our results were not in complete agreement with the results from Wilson, notably in our study, the dental plaque had the greatest influence for the onset of dental caries, increasing the dental caries risk by 13,91%, then Streptococcus Mutans with an increase of 11,79%, and a weaker influence was seen when the pH of the saliva changed, i.e. increasing the dental caries risk by 9,59%.

With the goal to carry out an analysis of the dental caries risk in children with primary teeth at the age of 6, Harris and col., analyzed 10929 studies which were identified by internet searches, and came to the conclusion that the greatest incidence of dental caries was in correlation with Streptococcus Mutans, which is present in the oral cavitiy since birth, and its negative influence can be compensated by having a non carious diet, good oral hygiene and plaque control (18).

This means that the compensating mechanisms of the factors which protect teeth from dental caries should always be noted when giving recommendations on how to keep teeth healthy.

Pitts argues that the dental caries risk assessment is a crucial component in the process of prevention and coping with dental caries. More risk factors and indicators were proposed as goals in the assessment of dental caries, which sometimes differ according to the age group for which they are meant. His studies were targeted towards the results from the longitudinal studies from which the accuracy of the assessment of the dental caries risk, can be set. The results from Pitts show that there is strong evidence that supports the fact that a past dental caries history is still the only best indicator for development of dental caries in the future, which doesn't mean that the other risk factors should be excluded (19).

We want to point out that we decided to do this kinds of study because they haven't been carried out in our country or

the region, until now.

The analysis of the results of our study, showed the meaning of this kind of epidemiological study. The percent of children with one or more carious lesion is too high given the preventive measures available. The results illustrate bad oral health, a low level of prevention , and the need to invest in modern preventive and therapeutic methods and measures, which will be used consistently and timely from all subjects in the society, starting from the individual itself and all up to the highest instances in the country which have the authority to uphold the dental, oral and general health of the population.

5 Conclusion

The results for the contribution of each factor separately, to the overall dental caries risk , show us that the role of each factor cannot be with the same importance from which we can conclude that other non biological factors should be included.
The assessment of the dental caries risk is a crucial clinical step especially in the pediatric dentistry segment, and from many aspects makes the use of preventive measure in the general population much easier to implement.

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