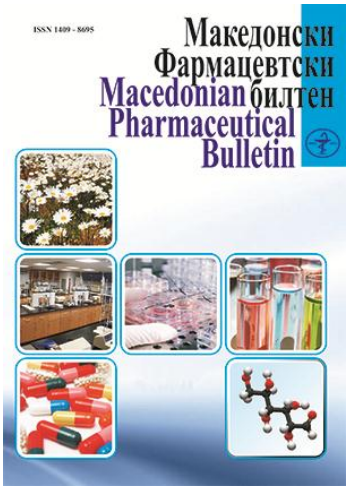
Accepted Manuscript



Title: **The appearance of the "Baby bottle caries"**

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DOI:

Received date: April 2018

Accepted date: June 2018

UDC:

Type of paper: *Short communication*

Please cite this article as:

doi: *Short communication*

The appearance of the "Baby bottle caries"

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Abstract

Baby bottle caries occurs in the earliest age of the children (1-1.5 year), immediately after the eruption of the deciduous teeth. The latest scientific literature uses the term *Early Childhood Caries* (Tooth decay in early childhood).

The aim of this study was to determine the level of the glucose values in the saliva samples taken in different time intervals: 5, 15, 30 and 60 minutes after consuming two types of liquid food (sweetened milk and fruit juice).

The study included test-group of 40 children, age 3-3.5 years, with Baby Bottle Caries that were still using baby bottles for feeding, and the control group of 40 children the same age, but without caries. The glucose concentrations of the saliva samples were determined with enzyme method GOD/PAP (Berhan and Trinder, 1972) at the Institute of Biochemistry at the Faculty of Medicine, University "Ss. Cyril and Methodius*"* in Skopje, Republic of Macedonia.

The analysis of the results showed statistically significant differences in determined values in saliva samples of the test-group and the control group ($p<0.01$). These differences were more expressed after consuming the fruit juices, and lead us to a conclusion that fruit juice is stronger caries causing liquid than milk ($p<0.001$).

Keywords: baby bottle caries, saliva, glucose, sweetened milk, fruit juice

Introduction

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There is a specific type of caries found in the primary teeth, which can be detected, even in very young children (age1-1.5), immediately after the teeth eruption and reaching its culmination between the ages of 2 to 5. This type of caries is often found in the literature as "Baby bottle syndrome", *i.e.* Syndrome of children fed with the bottle and "Nursing bottle caries" (Muller, 1996; Schwartz, 1993; Verkamp and Weerheijm, 1995). In the modern world terminology, this caries is also known as "Baby bottle caries" while latest scientific literature uses the term *Early Childhood Caries* (Tooth decay in early childhood) (Carević et al., 2009; Kokoceva-Ivanovska, 2011; Kokoceva Ivanovska, 2017; Louloudiadis, 2001).

In the everyday dental practice, due to an unbalanced diet (Acs, 1990; Edgar and Doods, 1985; Geddes, 1994) and the lack of oral hygiene in the early childhood (Crossner et al., 1991; Edgar and Highman, 1996; Louloudiadis, 2001; Luke et al., 1999; Weinstein et al., 2004), we often face the problem of diagnosing of the advanced forms of Early Childhood Caries (Kokoceva-Ivanovska, 2011; Louloudiadis, 2001; Verkamp and Weerheijm, 1995).

The increase of this prevailing caries (Kokoceva - Ivanovska, 2002; Lehl et al., 1993; Srkoc et al., 1989), as well as the unclear etiopathogenic mechanisms was the main reasons for this study (Acs, 1990; Kokoceva - Ivanovska, 2002; Woodward and Walker, 1994). The appearance of the baby bottle caries is characteristic for those who use the feeding bottle as passive, prolonged and inappropriate mean of feeding (Geddes, 1994; Kokoceva-Ivanovska, 2002; Moss, 1996). A content rich in fermentable carbohydrates such as sucrose, which in the oral environment is decomposed in glucose and fructose, simultaneously decrease the pH level and favour the disease (Edgar and Highman, 1996; Lulić-Dukić and Jelinek, 1979).

Thus, the task of this study was to determinate the sucrose concentrations through the evaluation of the concentration of glucose in the saliva samples.

Material and methods

The test group comprised of 40 children with baby bottle caries, aged 3-3.5 who were still using a baby bottle for feeding. The group was divided into two subgroups according to the type of food used through baby bottle: 20 examined patients were consuming milk with 2 tablespoons of sugar and the other 20 were consuming fruit juice.

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The control group was consisted of 40 children at the same age (3-3.5 years), with no detected caries, nor used baby bottle for their feeding. They were divided under the same criteria into two subgroups: 20 patients consumed sweetened milk and 20 consumed fruit juice, respectively.

We examined the saliva samples from each examinee, after 5, 15, 30 and 60 min after the liquid intake, as well as one saliva sample in the morning before consuming any food or liquid (on empty stomach). The samples were taken by the parents according to our instructions and morning samples were used for comparison. The saliva samples were used for determination of the glucose concentrations. The laboratory procedures were done at the Institute of Biochemistry at the Faculty of Medicine, University "Ss. Cyril and Methodius" in Skopje, Republic of Macedonia. The concentrations values were determined by enzyme method GOD/PAP (Berhan and Trinder, 1972). After determining the glucose values were compared with the basic values taken in the mornings, before consuming any food or drink (Fasting Saliva Sugar on Awakening-FSSA value).

The obtained data were analyzed with a statistic package – SPSS version 23, with the basic statistical methods: X (average arithmetic); SD (standard deviation); SE (standard error); X^2 test; Student's T-test.

Results and discussions

According to Hase's (1993), the high concentration of glucose in the oral cavity remained longer in the younger children comparing to the older ones (over 1.5), due to the slower process of the salivary self-cleaning, which goes in favor with our findings.

Obtained results are presented in Table 1 and 2.

Table 1.

Table 2.

The comparison of the salivary pH values in the examinees form the 2 subgroups of the test group, obtained 5 min after the consumption of sugared milk and juice, showed that they decreased to the value of 5.51 in the subgroup of children consuming juice, while they were 5.91

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in the subgroup that consumed sugared milk. These results corresponded to the higher average concentrations of glucose obtained in the same saliva samples after consumption of juice (1460 μmol/L), compared to milk (836.2 μmol/L).

The obtained results referred to the fact that the juice that children consume, besides the glucose and fructose from the fruit, known as internal or natural carbohydrates, contains also refined sucrose which in the process of its fermentation decomposes to its monomers: glucose and fructose (Edgar and Doods, 1985). Thus, the glucose and fructose are present in the juice in much higher concentration (coming from the fruit as well as from the added sucrose).

Our results correspond to the ones of Lehl (1993) who examined the pH level of saliva, plaque and glucose values after consumption of different types of sweetened drinks. The salivary pH value in the examinees with Decayed-Missed-Filled (DMF) = 3-5 decreased below the critical level of 5.5 after the consumption of the sweetened liquid. During the night these values decrease even lower (Muller, 1996) below 5.5. Considering the fact that during the night, the salivation is declining and reaches a minimum, so is the self-cleaning of the carbohydrates from the oral cavity (Hase, 1993). In the second group of the examined subjects without detected caries (DMF = 0), the same author obtained pH values higher than the critical level 5.5.

Bobinac (2000) obtained similar results while researching the influence of the juices (sweetened and non-sweetened) on the salivary pH in different time intervals after the consumption, and he concluded the juices were highly cariogenic liquids.

When the cariogenic liquids are taken often, one by one, the process of demineralization is speeding up (Kokoceva-Ivanovska, 2011; Kokoceva-Ivanovska et al., 2017; Lulić-Dukić and Jelinek, 1979; Edgar and Doods, 1985; Muller, 1996; Srkoč, 1989). A similar effect is produced by other types of non-liquid food (Geddes, 1994).

The same process was recorded in our study in patients consuming sweet liquids from the baby bottle often, especially before falling asleep or during the night (Schwartz, 1993; Verkamp and Weerheijm, 1995). The pH of the saliva decreased below the critical value of 5, 5 because the salivation flow also decreased during the night, while children were sleeping and there was no self-cleaning of the mouth (Bowen and Pearson, 1993, Crossner et al., 1991). The result was accelerating and emphasizing of the demineralization process in children feed with sweetened

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liquids (Miguel and Rosalen, 1997) and the development of a specific type of caries, the so-called: "Caries caused by a bottle diet", "Baby bottle caries", *i.e.* "Baby bottle syndrome".

Conclusions

The FSSA values in saliva samples were higher in the tested group, showing a statistically significant difference with coefficient $p<0.001$ compared to the control group.

The glucose concentration in the saliva samples was higher in the patients with baby bottle caries in the first 5 min after the consumption of the milk, with statistical significance ($p<0.05$) compared to the control group, while in the interval of 30 min we found higher statistical significance ($p< 0.001$).

In the same intervals of 5 and 30 minutes after the consumption of fruit juice, the glucose concentrations were higher in the patients with baby bottle caries, compared to those from the control group, showing very high statistical significance ($p< 0.001$).

Also, the difference in the glucose concentrations was more intensified after the consumption of juice, which confirmed the conclusion that the juice has more cariogenic effect comparing to the sugared milk ($p< 0.001$).

The general recommendations for our patients were to avoid feeding with bottle with sweetened liquids, especially before the sleeping time and overnight in order to prevent this highest caries risk etiological factor.

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Резиме

Појава на „Кариесот од исхрана со шише”

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Клучни зборови::циркуларен кариес, салива, глукоза, млеко, сок

Кај млечните заби се јавува посебен облик на кариес кој може да се забележи уште во најраната возраст на детето (1-1,5 година), веднаш по ерупцијата на првите млечни заби. Тоа е циркуларниот кариес, познат во најновата литературата како “Кариес на раното детство”.

Целта на оваа студија беше да го одредиме нивото на глукозните концентрации во примероци на плунка, земени во различни временски интервали: 5, 15, 30 и 60 мин. после конзумирање на две течни содржини (засладено млеко и овошен сок).

Во студијата опфативме 40 испитаници со циркуларен кариес, на возраст од 3-3,5 години, кои се уште користеа шише со цуцла исполнето со овие засладени содржини и ја сочинуваа испитуваната група. Ист број на испитаници (40), на иста возраст, без циркуларен кариес, кои не користеа шише со цуцла, ја сочинуваа контролната група. Глукозните концентрации во примероците на салива беа определени со ензимскиот метод GOD/PAP (Berhan and Trinder, 1972) на Институтот за биохемија на Медицинскиот Факултет, Универзитет „Св. Кирил и Методиј“ во Скопје, Република Македонија.

Анализата на резултатите укажа на постоење на сигнификантни разликите кај испитуваната и контролна група, во однос на глукозните концентрации добиени во различните временски интервали, после конзумирањето на двете течности ($p<0,01$). Овие

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разлики, сепак, се понагласени после конзумасијата на сокот, што не наведува на заклучок дека сокот е особено кариогена течност; покариогена во однос на засладеното млеко, со висока статистичка сигнификантна разлика ($p<0,001$).

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Table 1. Glucose values (concentration - μmol/L) in the saliva samples taken at different time intervals: 5, 15, 30 and 60 min. after consuming sweetened milk, in test and control group and FSSA values

Glucose in saliva sample (μmol/L)	N (number)	X (average glucose value)	Difference X to FSSA value	T-test	SD	p
FSSA value	Test group (20)	317.215 = B	/	4.49	62.62	<0 .001
	Control group (20)	239.275 = B	/		45.72	
After 5 min	Test group (20)	779.0	461.785	1.73	308.01	<0.05
	Control group (20)	639.0	399.725		187.94	
After 15 min	Test group (20)	470.8	153.585	6.59	127.79	<0.001
	Control group (20)	267.65	28.375		51.52	
After 30 min	Test group (20)	344.25	27.035	5.52	68.13	<0.001
	Control group (20)	242.9	3.625		45.67	
After 60 min	Test group (20)	320.7	3.485	4.54	63.60	<0.001
	The control group (20)	241.0	1.725		45.89	

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Table 2. Glucose values (concentration - μmol/L) in the saliva samples taken at different time intervals: 5, 15, 30 and 60 min. after consuming fruit juice, in test and control group and the differences in the FSSA value

Glucose in saliva sample (μmol/L)	N (number)	X (average glucose value)	Difference X to FSSA	T-test	SD	p
FSSA value	Test group (20)	330.8	/		70.505	< 0.001
	Control group (20)	243.25	/	4.56	48.915	
After 5 min	Test group (20)	1460.5	1129.7		291.954	< 0.001
	Control group (20)	836.2	592.95	7.72	213.204	
After 15 min	Test group (20)	892.95	562.15		123.970	
	Control group (20)	524.4	281.15	8.57	146.923	< 0.001
After 30 min	Test group (20)	578.7	247.9		80.159	
	Control group (20)	257.25	14.0	15.3	48.337	< 0.001
After 60 min	Test group (20)	338.45	7.65		67.604	
	Control group (20)	246.25	3.2	4.89	49.861	< 0.001

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