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Učinkovitost različitih preventivnih postupaka u kontroli nekih čimbenika rizika za karijes

Effectiveness of Different Preventive Procedures in the Control of Some Caries Risk Factors

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Sažetak
Procjena rizika kad je riječ o karijesu važan je klinički postupak koji na više načina olakšava primjenu preventivnih postupaka u cijeloj populaciji. Kako bi se identificirali pojedinci s visokim rizikom za nove karijesne lezije, potrebno je primijeniti najučinkovitiji preventivni protokol. Svrha istraživanja bila je ispitati vrijednosti određenih postupaka u prevenciji karijesa u situaciji in vivo. Pet skupina ispitanika, svaka s osamnaestero djece u dobi od 4 do 5 i od 10 do 12 godina (n=90), podvrgnuto je različitim preventivnim postupcima (otopina aminfluorida, profesionalna profilaktička pasta, žvakaća guma s ksilitolom i fluoridom, otopina klorheksidina i klorheksidinski gel). Tijekom dva mjeseca obavljeno je pet mjerenja, a procjenjivale su se sljedeće varijable: broj bakterija Streptococcus mutans (SM) i lactobacill (LB), indeks oralne higijene (OHI), količina stimulirane sline i puferski kapacitet. Na kraju je najbolji rezultat u redukciji broja bakterija postigla primjena paste Proxyt i svakodnevno žvakanje žvakaće gume ($p<0,001$). Kod pacijenata kod kojih se koristila ta preventivna metoda broj SM-a pao je za jednu klasu, a broj LB-a na manje od 104, nakon dva mjeseca od početka istraživanja. Rezultati pokazuju da je profesionalno čišćenje zuba i svakodnevna upotreba žvakaće gume s ksilitolom i fluoridom učinkovit protokol za kontrolu najvažnijih čimbenika rizika i prediktora karijesa.

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Ključne riječi
čimbenik rizika za karijes; fluoridi; Streptococcus; žvakaća guma

Uvod

Posljednjih nekoliko desetaka godina prosječna incidencija karijesa kod školske djece stalno se smanjuje (1). No, bez obzira na tu činjenicu, određen broj učenika i dalje ima poteškoća s karijesom te on predstavlja ozbiljan zdravstveni problem. Taj fenomen naziva se polarizacija karijesa – ako 20 do 30% populacije razvija 60 do 85% karijesnih lezija u pregledanoj populaciji (2,3). Zbog multifaktorske etiologije, prepoznavanje karijesa kod tih pacijenata

Introduction

Over the last few decades the average incidence of caries in school/children has steadily decreased (1). However, regardless of this fact, a specific number of school/children have great difficulties with caries, which represents a serious health problem. Such a phenomenon is known as caries polarization, where 20-30% of the paediatric population develops between 60 and 85% of the carious lesions of the total examined population (2,3). Because of the

predstavlja velik problem te onemogućuje provedbu učinkovitog modela koji bi se mogao jednostavno primjenjivati kako bi se točno prepoznali takvi pacijenti u cjelokupnoj populaciji (4-6). Posebice je važno imati na umu da intenzivna individualna prevencija može i duže biti učinkovita. To je osobito važno kod djece s povećanim rizikom za karijes (7). Potrebno je istaknuti da postoje suprotna mišljenja o učinkovitosti intenzivne prevencije kod visokorizičnih pacijenata (8).

Danas se mnogobrojni čimbenici pojavljivanja karijesa mogu klasificirati kao njegovi prediktori. To su broj bakterija sojeva *Streptococcus mutans* (SM) i lactobacill (LB) u slini, prehrana, navike oralne higijene, nedostatak primjene fluorida, produljena laktacija, socioekonomski status, rasa, spol, dob, količina stimulirane sline, indeks i metabolička aktivnost plaka (9 -11). Sve nabrojeno može imati veći ili manji utjecaj na razvoj karijesa. Iako neki autori tvrde da broj bakterija ima malu prediktorsku vrijednost kod pojave karijesa (12,13), ima još više onih koji tvrde da ti podaci mogu točno otkriti pacijenta s visokim rizikom (14,15). Takvi podaci dobivaju na vrijednosti ako se kod istog pacijenta procijene i drugi rizični čimbenici, kao primjerice prošlo iskustvo s karijesom (DMF indeks), indeks vidljivog plaka, ili količina stimulirane sline. Kontrolom ranije spomenutih čimbenika može se postići dobar preventivni učinak.

Svrha istraživanja bila je procijeniti in vivo vrijednosti prevencije karijesa nekih preventivnih metoda nakon njihova učinka na prediktore karijesa kao što su broj bakterija Streptococcus mutans i lactobacill u slini, indeks vidljivog plaka, količina stimulirane sline te puferski kapacitet sline.

Materijal i metode

Uzorak se sastojao od 90 djece, pacijenata Zavoda za pedodonciju, u dobi od 4 do 5 te od 10 do 12 godina. Imali smo dvije dobne skupine, budući da mliječna i mješovita denticija ispitanika mogu imati veliki utjecaj na mjerene varijable. Svi su uključeni u istraživanje nakon pristanka roditelja. Djecu je klinički pregledao sondom i stomatološkim ogledalom u ordinaciji iskusan pedodont (kappa vrijednost iznosila je 0,83), uz pomoć izvora svjetlosti na stomatološkoj jedinici. Sva djeca obavljala su isti postupak oralne higijene dva puta na dan, identičnim četki-

multifactorial causes of caries recognition of such patients, it represents a significant problem and hinders the realization of an effective model which would be simple to apply and accurate for identification of such patients in the total population (4-6). It is particularly important to take into account the fact that intensive individual prevention of caries can be effective over a longer period of time. This is particularly so in the case of children with increased risk of caries (7). It should be emphasized that contrary opinions exist on the effectiveness of intensive prevention in the case of high-risk patients (8).

Today, a large number of factors for the occurrence of caries can be classified as caries predictors. A number of *Streptococcus mutans* (SM) and lactobacilli (LB) in saliva, diet, oral hygiene habits, lack of fluoride application, prolonged lactation, socioeconomic status, race, sex, age, amount of stimulated saliva, plaque index, metabolic plaque activity (9-11). All the aforementioned factors have more or less influence on the development of caries. Although some authors emphasize that a number of *mutans streptococci* and lactobacilli has little predictor value for the occurrence of caries (12,13), there are still many more who consider that these data can accurately detect the caries high-risk patient (14,15). Such data increase in value when other caries risk factors are assessed in the same patient, such as past caries experience (DMF index), visible plaque index or the amount of stimulated saliva. By controlling the aforementioned factors good caries preventive effect can be expected.

The aim of this study was to assess *in vivo* the caries preventive value of some preventive methods, through their effect on caries predictors, such as the number of S*treptococcus mutans* and lactobacilli in saliva, visible plaque index, amount of stimulated whole saliva and buffer capacity.

Materials and methods

The sample consisted of 90 children, all patients of the Department of Pedodontics, aged between 4 to 5 and 10 to 12 years. We used two different age groups because primary and mixed dentition and age of subject can have significant influence on measured variables. All patients have been included in the study with the consent of their parents. Children were clinically examined in a dental practice with dental mirror and probe by one experienced pedodontist (intraexaminer kappa value was 0.83), with a light source attached to the chair. All children followed the same oral hygiene procedure

cama i zubnom pastom s fluorom. Ni jedno dijete nije primalo antibiotsku terapiju tijekom istraživanja, a ni najmanje dva mjeseca prije njegova početka.

Djeca su podijeljena u pet skupina od 18 ispitanika, s istom distribucijom dobi. Karijes (dmf-s i DMF-S indeksi) procjenjivao se standardnim metodama i kriterijima SZO-a (16) za procjenjivanje prijašnjeg iskustva unutar skupina uzorka.

U prvoj skupini korišteno je 0,5 ml otopine aminfluorida (Aminfluorid, Belupo, Koprivnica, Hrvatska). Otopina je primijenjena jedanput izravno vatom na površine svih zuba. U drugoj skupini rabila se profesionalna profilaktička pasta Proxyt (RDA 36) (Vivadent, Schaan, Lihtenstein) sintetičkom četkicom na mikromotoru koji se okretao prosječnom brzinom od 200 okretaja u minuti. Osim abrazivnih elemenata, te pasta sadržava i dva aktivna sastojka - 0,05%-tni fluor u organskom obliku (cetalamindihidrofluorid) i ksilitol. U trećoj skupini primijenjena je ista profilaktička pasta kao i u drugoj, ali je dodana žvakaća guma "Sensodyne" (GlaxoSmithKline, London, Velika Britanija) jer sadržava ksilitol i fluorid. Tijekom prvih tjedan dana nakon početnog postupka, djeca su žvakala pet guma tijekom dana - nakon svakog jela i užine. Drugi tjedan djeca su žvakala tri žvakaće gume na dan - svaku nakon jednog jela. Od početka trećeg tjedna istraživanja djeca su žvakala jedanput na dan - svaku večer prije jela. Žvakanje je bilo ograničeno na 10 minuta. U četvrtoj skupini svaki se dan rabila 0,2%-tna otopina klorheksidina (CHX) i to prvih pet dana istraživanja (0,5 ml na dan). Otopina CHX-a najprije je primijenjena u ordinaciji nakon prvog mjerenja na malom komadu vate, a kasnije aplikacije obavljane su kod kuće – navečer četkicom najmanje sat nakon četkanja zuba. Djeca u petoj skupini tretirana su 1%-tnim gelom CHX-a (Corsodyl, GlaxoSmithKline, London, Velika Britanija). Svaki dan tijekom prvih pet dana, gel se primjenjivao jedan sat nakon četkanja zuba. Na četkicu bi se stavilo 0,1 ml gela kojim bi djeca četkala zube dvije minute.

Mjerenja su tijekom dva mjeseca provedena pet puta: prije preventivnih postupaka, 30 minuta, 7 dana, mjesec dana te dva mjeseca nakon prve primjene preventivnih postupaka. Svako mjerenje uključivalo je određivanje broja SM-a i LB-a, količinu stimulirane sline, indeks OHI-ja prema Green-Vermillionu (17) te puferski kapacitet sline.

Broj SM-a i LB-a određivao se dijagnostičkim testom CRT-bacteria (Vivadent, Schaan, Lihtenstein). Kod svih testova poštovale su se upute proizvođača. Slina se skupljala u mirovanju, u mirnoj protwice a day with the identical toothbrushes and fluoride tooth pastes. None of the children received antibiotic therapy during and at least 2 months before the study.

The children were divided in five equal groups of 18 subjects with the same age distribution. Caries (dmf-s and DMF-S index) was assessed by standard methods and WHO criteria (16) for estimating the past caries experience among the groups in the sample.

In the first group 0.5 ml aminfluoride solution (Aminfluorid, Belupo, Koprivnica, Croatia) was used. The solution was applied only once, directly to the surfaces of all the teeth with cotton pellet. In the second group professional prophylactic paste Proxyt (RDA 36) (Vivadent, Schaan, Liechtenstein) was applied with synthetic brush on a slow-speed hand piece at an average speed of 2000 RPM. Beside abrasive elements Proxyt paste contains two active ingredients, 0.05% of fluorides in organic form (cetalamindihydrofluorid) and xylitol. In the third group prophylactic paste Proxyt was applied in the same procedure as in the second group, with the addition of chewing gum "Sensodyne" (GlaxoSmithKline, London, UK), containing xylitol and fluoride. During the first week after the basic procedure, children were chewing five chewing gums per day, after each meal or snack. During the second week, children were chewing three chewing gums per day, one after each meal. From the third week up to the end of the study, children were chewing only one per day, every evening after the meal. Chewing was restricted to 10 minutes for each chewing gum. In the fourth group, 0.2% chlorhexidine solution (CHX) was applied daily for a period of first five days of the study (0.5 ml each day). CHX solution was first applied in the dental surgery after the first measurement by means of a small cotton pellet, and later applications were done at home with a toothbrush, minimum one hour after regular teeth brushing in the evening. Children in group five were treated with 1% CHX gel (Corsodyl, GlaxoSmithKline, London, UK). Each day, in the first five days of the study, one hour after the evening teeth brushing, 0.1 ml of CHX gel was applied also with toothbrush during 2 minutes.

During two months measurements have been performed for five times: before the preventive procedure, 30 minutes, 7 days, 1 month and 2 months after the first application of preventive procedure. Each of five measurements contained *mutans streptococci* and lactobacilli, the amount of stimulated

storiji između 9 i 10 sati prije podne, najmanje dva sata nakon jela ili pića. Da bi se dobili uzorci sline za test CRT-bacteria, ispitanici su jednu minutu žvakali 1g parafina ili voska. Prije nego što se uzela slina vosak se žvakao pet minuta. Tijekom svakog uzimanja uzorka sline ispitanici su ispljunuli svu slinu u suhu, steriliziranu staklenu epruvetu. Količina se mjerila u ml/min. Vrijednosti SM-a prezentirane su u klasama od 0 do 3, to jest kao vrijednosti manje od 10^4 (klasa 0), do vrijednosti većih od 10^6 (klasa 3) CFU/ml sline (18). Rezultati za LB očitavani su kao vrijednosti od 10^3 do 10^6 CFU/ml sline (19). Puferski kapacitet određivao se testom Dentobuff-strip (Vivadent, Schaan, Lihtenstein) odmah nakon što se uzela stimulirana slina. Vidljivi plak markiran je Plaque-testom istog proizvođača.

Statistička analiza provedena je programom STATISTICS za Windowse 5,5 te SPSS za Windowse 7,5. Izračunane su srednje vrijednosti i standardne devijacije svih varijabli (dmfs/DMFS, broj salivarnih bakterija (SM-a i LB-a), indeks OHI-ja te količina stimulirane sline). Za statističku analizu koristio se neparametrijski Kruskal-Wallisov test, a za ponovljena mjerenja ANOVA. Razlike u distribuciji između skupina ispitane su χ^2 testom.

Rezultati

Ranije iskustvo s karijesom. Vrijednosti indeksa DMF-S i dmf-s prikazane su u Tablici 1. i pokazuju da se radi o uzorku s visokim rizikom za karijes te sličnoj distribuciji djece s visokim rizikom za karijes unutar skupina. Nije bilo statistički znatne razlike između pet ispitivanih skupina (p=0,448 za dob od 4 do 5 godina; p=0,366 za dob od 10 do 12 godina). Također nije bilo znatnih razlika u broju SM-a, LB-a, indeksu OHI-ja te u količini stimulirane sline opažene tijekom prvog mjerenja.

Streptococcus mutans. Svi ispitanici imali su razmjerno velik broj SM-a u slini tijekom prvog prikupljanja sline. Prosječna količina iznosila je 2,5 ili više, što predstavlja izrazito mnogo kariogenih bakterija u 1 ml sline, a s time u vezi i povišen rizik za karijes.

saliva, OHI index according to Green-Vermillion (17) and buffer capacity of saliva.

The count of SM and LB were determined by using diagnostic test CRT bacteria (Vivadent, Schaan, Liechtenstein). All the tests were performed according to the instructions of the manufacturer. Saliva was collected under resting conditions in a quiet room, between 9 AM and 12 PM, at least 2 h after the last intake of food or drink. In order to sample saliva for CRT bacteria test, subjects were asked to chew a standard piece (1 g) of paraffin wax for 1 min. Saliva sampling for flow rate measurements comprised paraffin wax chewing for 5-min. During either sampling procedure patients were asked to occasionally expectorate whole saliva into dry, sterilized and calibrated glass tubes. The flow rate was calculated in ml/min. Values for SM are presented in class from 0 to 3, i.e. values of less than 10^4 (class 0) up to values of more than 10^6 (class 3) CFU/ml saliva (18). Results for LB were read and valued from 10^3-10^6 CFU/ml saliva (19). Buffer capacity was determined by Dentobuff-strip test (Vivadent, Schaan, Liechtenstein) immediately after collecting the stimulated saliva. The visible plaque was stained by Plaque Test of the same manufacturer.

Statistical analyses were performed using STATISTICS for Windows 5.5 and SPSS for Windows 7.5. The mean values and standard deviations of dmfs/DMFS, number of salivary bacteria (SM and LB), OHI index and amount of stimulated saliva in every group for each measurement were evaluated. Non-parametric Kruskal-Wallis test for statistical analysis of the results and ANOVA for the repeated measurements were used. Differences in distribution between groups were tested by χ^2 test.

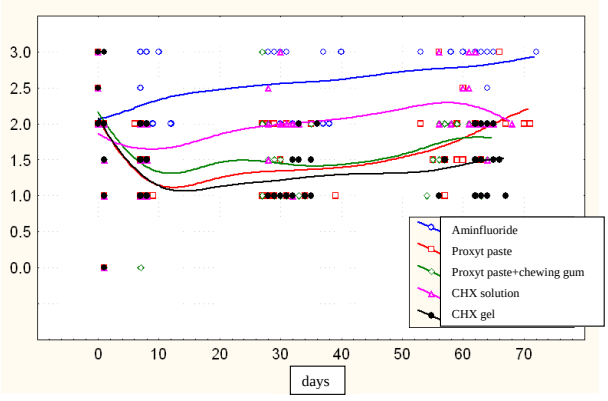
Results

Past caries experience. DMF-S and dmf-s indices presented in Table 1. indicate the sample with high risk of caries and similar distribution of higher risk children among the groups. No statistical differences were observed between all five study groups (p=0.448 for 4-5 yrs old; p=0.366 for 10-12 yrs old). Also, no significant differences in number of *mutans streptococci*, number of lactobacilli, OHI index and the amount of stimulated saliva were observed in the first measurement.

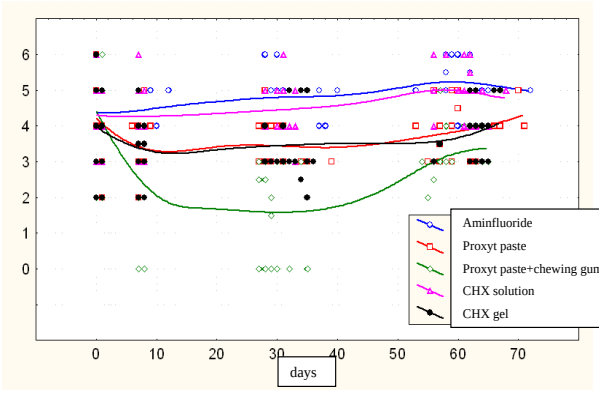
Streptococcus mutans. All the subjects had relatively high number of *Streptococcus mutans* in the saliva during the first collection of specimens. The average class amounted to 2.5 or more, which represents a very high number of cariogenic bacteria

Tablica 1. Prosječne vrijednosti dmfs-a i DMFS-a u svim skupinama
Table 1 Average dmfs and DMFS index in all groups.

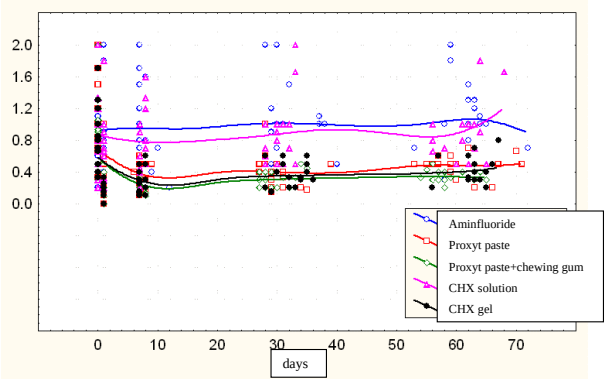
Dob • Age	Skupina • Group	N	Sred. vrijednost • Mean	Stand. deviation	Mean rank	Kruskal Wallis test		
						χ^2	df	p
4-5 godina • 4-5 years	Aminfluorid	9	9.333	5.852	22.28	3.70	4	0.448
	Proxyt	9	12.889	6.642	29.28			
	Proxyt+Xylitol	9	8.000	5.172	18.78			
	Corsodyl sol.	9	8.333	6.103	19.89			
	Corsodyl gel	9	10.111	5.419	24.78			
	Overall	45	9.733	5.860				
10-12 god. • 10-12 years	Aminfluorid	9	7.667	5.895	18.33	4.30	4	0.366
	Proxyt	9	8.444	3.909	22.89			
	Proxyt+Xylitol	9	8.111	2.892	21.33			
	Corsodyl sol.	9	8.556	4.825	21.94			
	Corsodyl gel	9	12.444	5.855	30.50			
	Overall	45	9.044	4.913				



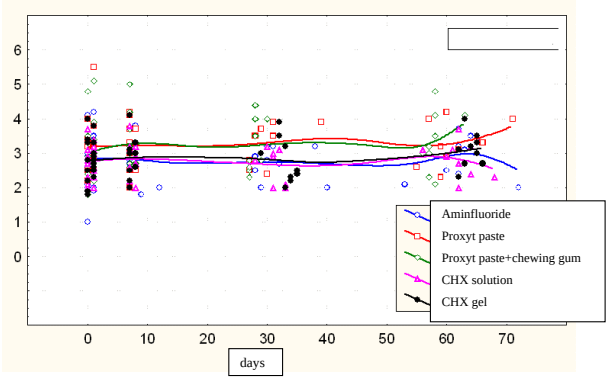
Slika 1. Prosječan broj Streptococcusa mutansa
Figure 1 Average number of *mutans streptococci*



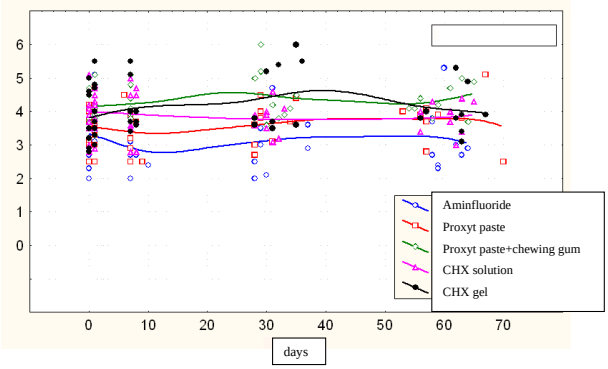
Slika 2. Prosječn broj lactobacilla
Figure 2 Average number of lactobacilli



Slika 3. Vrijednosti indeksa OHI-ja u svakoj skupini
Figure 3 Values of OHI indices in each group



Slika 4. Prosječne količine stimulirane sline kod mlađih ispitanika (4 do 5 godina)
Figure 4 Average amount of stimulated saliva in younger subjects (4-5 years)



Slika 5. Prosječna količina stimulirane sline kod starijih ispitanika (10 do 12 godina)
Figure 5 Average amount of stimulated saliva in older subjects (10-12 years)

Nakon primjene preventivnih postupaka smanjio se broj bakterija, pa je prema tome svaka od ispitivanih metoda imala preventivni učinak. U prvoj skupini nakon tjedan dana nije bilo učinka aminfluorida. U drugoj skupini je antibakterijski učinak trajao 30 dana. Najdulji preventivni učinak bio je u trećoj skupini, sa statistički znatnom ($p<0,001$) redukcijom SM-a između trećeg mjerenja i kraja istraživanja. Na kraju je ta skupina imala najbolji ukupni rezultat. Otopina CHX-a pokazala je veći antibakterijski učinak, iako je tijekom istraživanja od mjerenja do mjerenja to djelovanje bilo sve slabije (20) (Slika 1.).

Lactobacilli. Broj LB-a u prvoj i četvrtoj skupini nije bio učinkovito smanjen, što upućuje na minimalnu antibakterijsku učinkovitost aminfluorida i otopine CHX-a na LB. Pasta za poliranje pokazala je najjače antibakterijsko djelovanje na LB, posebice u kombinaciji sa žvakaćom gumom. Prije preventivnih postupaka prosječan broj LB-a u sve četiri skupine iznosio je oko 10^5 CFU/ml sline. Nakon trećeg mjerenja najjači redukcijski učinak bio je u trećoj skupini ($p<0,001$), a on je i zadržan do kraja istraživanja (Slika 2.).

Indeks oralne higijene(OHI). Indeks vidljivog plaka mjeren je prema Greenu i Vermillionu, a rezultati za svaki pregled prikazani su na Slici 3. Najbolji rezultati - znatna redukcija plaka - postignuti su pastom za poliranje i to već tijekom drugoga mjerenja. Te tri varijable analizirane su za obje dobne skupine, budući da denticija i dob nisu utjecale na razini SM-a, LB-a i OHI-ja.

Salivarna sekrecija i puferski kapacitet. Slike 4. i 5. pokazuju prosječne vrijednosti količine stimulirane sline za obje dobne skupine u mililitrima tijekom 5 minuta. Vrijednosti su razdvojene u općim veličinama. Stariji ispitanici proizvodili su od 0,6 do 0,9 ml u minuti, a mlađi od 0,5 do 0,6 ml. S obzirom na te rezultate zanimljivo je istaknuti stalno povećanu salivaciju tijekom istraživanja kod ispitanika koji su svaki dan žvakali žvakaće gume. Puferski

in 1 ml saliva and consequently increased the risk of caries. After application of the preventive procedures the number of bacteria decreased, and thus each of examined methods demonstrated its preventive effect. In the first group after one week no effect of aminfluoride solution was observed. In the second group, antibacterial effect persisted for 30 days. The longest preventive effect was observed in the third group with highly significant ($p<0.001$) reduction of SM from the third measurement to the end of the study. At the end of the study this group showed the best overall result. CHX solution showed greater antibacterial effect, although during the study this significantly weakened from measurement to measurement (20) (Figure 1).

Lactobacilli. The number of lactobacilli in the first and fourth group was not effectively reduced, indicating minimal antibacterial effect onto lactobacilli of aminfluoride and Corsodyl solutions. Proxyt paste proved to have the greatest antibacterial effect on LB, particularly in combination with chewing gum. Prior to the preventive procedure the average number of LB in all four groups amounted to approximately 10^5 CFU/ml saliva. After the third measurement a highly reductive effect was found in the third group ($p<0.001$), which was maintained up until the end of the study (Figure 2).

Oral Hygiene Index (OHI). Index of visible plaque was measured according to Green-Vermillion and the measurement results for each examination are presented in Figure 3. The best results were achieved with Proxyt paste and chewing gum, showing statistical significance ($p<0.001$) as early as the second measurement, with a notable reduction in plaque index. Those three variables were analysed for both age groups because the dentition and age do not influence on level of SM, LB and OHI index.

Salivary secretion rate and buffer capacity. Figures 4 and 5 show the average values of the amount of stimulated saliva for younger and older subjects

kapacitet nije bio statistički znatan, jer je niska razina zapažena samo kod jednog djeteta.

Rasprava

Istraživanje je provedeno kako bi se procijenila razmjerna učinkovitost određenih preventivnih metoda u kliničkim uvjetima. Tijekom istraživanja namjera je također bila steći nova znanja o protokolima prema kojima bi se primjenjivale specifične karijespreventivne metode, a u svrhu optimalnog zaštitnog učinka redukcijom bakterijske flore i stimulacijom salivacije. Na taj je način moguće odabrati najbolji klinički postupak s obzirom na cijenu i učinkovitost.

Pronašli smo razmjerno visoke vrijednosti dmfs-a i indeksa DMFS-a u ispitivanim skupinama (od 7,67 do 12,89, tablica 1). Takvo stanje oralnog zdravlja uvrštava nas u donju trećinu europskog prosjeka (3), ali istodobno opravdava naša nastojanja da u svakodnevnom radu promoviramo učinkovitiju prevenciju karijesa.

Bakterijska analiza ispitanika obavljena je na stimuliranoj slini. Pouzdanost te metode, kao referentne vrijednosti u epidemiološkim istraživanjima, tema je rasprave u literaturi. Mnoga su istraživanja pokazala statistički znatnu korelaciju između broja bakterija u plaku i slini (21). Zatim, neka istraživanja podupiru zamisao da uzorak cijelog plaka ne opisuje varijacije u prevalenciji karijesa bolje od podataka dobivenih iz sline (22). Komparativna istraživanja komercijalnih kitova za određivanje broja SM-a na temelju tehnike "dip-slida" i konvencionalnog brojenja kolonija, potvrđuju statistički znatnu korelaciju između tih dviju metoda (23). Zato se ta metoda može preporučiti - jednostavna je za upotrebu u svakodnevnom radu, pouzdana i praktična (24).

Duža redukcija količine SM-a težak je zadatak. Tijekom dva mjeseca istraživanja najbolji su rezultati postignuti profesionalnom pastom i dnevnom upotrebom žvakaće gume s fluoridom i ksilitolom. Vjerujem da je taj rezultat, zajedno s redukcijom jedne klase s 2,5 na 1,5 tijekom dva mjeseca, djelomice potaknut dodatnim pozitivnim djelovanjem žvakaće gume i to mehaničkim čišćenjem, učinkom

in ml/5 minutes. These values are separated in overall sizes. The older subjects produced from 0.6 to 0.9 ml stimulated saliva in one minute, while the younger subjects produced from 0.5 to 0.6 ml stimulated saliva in one minute. With regard to this result it is interesting to note the constant increase in salivation during the study in the subjects who were chewing gum on a daily basis. Buffer capacity was not statistically analysed because only in one child low value of buffer capacity was registered.

Discussion

The study was carried out with the aim of assessing the relative effectiveness of certain caries preventive methods in clinical conditions. During the study the intention was also to gain new knowledge, according to which protocol specific caries preventive methods should be applied, in order to achieve optimal protective effect through a reduction in bacterial flora and saliva stimulation. In this way it would also be possible to select the best clinical procedure with regard to cost and efficacy.

We found relatively high dmfs or DMFS index in the examined groups from 7.67 to 12.89 (Table 1). Such a state of oral health places us in the bottom third of the European average (3). At the same time such results justify our efforts to promote a more effective caries preventive programme in daily work.

Bacterial analysis of our subjects was performed on stimulated saliva. The reliability of this method as a referent value in epidemiological studies has frequently been discussed in the literature. However, many studies have shown a statistically significant correlation between the number of bacteria in plaque and saliva (21). Moreover, some investigations support the fact that the whole specimen of dental plaque does not explain the variation in the prevalence of caries better than data obtained from stimulated whole saliva (22). Comparative studies between commercial kits for determining the number of SM based on dip-slide tests and conventional plate counts confirm statistical significant correlation of these two methods (23). Thus the method used in our study can be recommended for use because of its simple clinical use, reliability and practicality (24).

Reduction in the amount of SM over a longer period is a difficult task. During the two months of our study the best results were achieved with Proxyt paste and the daily use of chewing gum containing xylitol and fluoride. We believe that this result, with a reduction of 1 class from 2.5 to 1.5 during a period of two months, can partly be attributed to

salivarne stimulacije i djelovanjem ksilitola. Naši rezultati u skladu su s rezultatima drugih autora (25-27). Učinak fluorida također je višestruk. Osim remineralizacije, fluoridi specifično djeluju na inhibiciju stvaranja dentalnog plaka (28-30).

Kontrola količine LB-a pokazivala je malo veću pravilnost. Svi rezultati ispod 10^4 CFU/ml stimulirane sline mogu se smatrati zadovoljavajućim rezultatom prevencije karijesa. Postignuti rezultati u skladu su s rezultatima drugih istraživanja (14,31). Potrebno je istaknuti da su preventivni postupci u trećoj skupini imali najbolji redukcijski učinak na količinu bakterija, s nešto više od 10^3 CFU/ml stimulirane sline.

Smanjenje vrijednosti OHI-ja tijekom istraživanja vrlo je važan čimbenik, a pokazuje učinkovitost preventivnih postupaka. U trećoj skupini najbolji rezultati smatraju se ranim sekundarnim preventivnim djelovanjem, s visokom statističkom znatnosti ($p<0,001$) u odnosu prema drugim ispitnim skupinama. Takva je razina zadržana do kraja ispitivanja. Na kraju ispitivanja u trećoj je skupini vrijednost OHI-ja bila smanjena za oko 65%. To jasno pokazuje koja je preventivna mjera najučinkovitija. U sličnim su istraživanjima rezultati redukcije plaka bili nešto niži, a to se može objasniti dodatnim redukcijskim djelovanjem profesionalne paste (32,33).

Pozitivan učinak povećane salivacije poželjan je kod svake metode prevencije karijesa. Tijekom istraživanja prosječno povećanje od oko 0,1 ml/min dogodilo se u skupini sa žvakaćom gumom - iznosi oko 150 ml na dan, što je 13%-tno povećanje u dnevnoj prozivodnji sline. Naši su rezultati slični onima u drugim ispitivanjima koja su se koristila žvakaćom gumom (34-36). Kratkotrajan pozitivan učinak povećane salivacije također je primijećen u prvoj skupini, a to potvrđuje ranije rezultate stimulirajućeg učinka aminfluorida kao dodatnog sredstva u prevenciji karijesa (37).

Zaključak

Prepoznati pacijenta s visokim rizikom za karijes važan je uvjet za odabir i primjenu učinkovitoga preventivnog postupka. Možemo zaključiti:

1. Profesionalni preventivni postupci koji se koriste u stomatološkoj ordinaciji i kod kuće trebali

the additional positive effect of chewing gum, both through the mechanical cleaning, saliva stimulating effect and the effect of xylitol. Our results agree with those of other authors (25-27). The effect of fluoride is also multiple. Apart from remineralisation fluorides also have a specific effect on the inhibition of dental plaque formation (28-30).

Control of the amount of LB showed slightly greater regularity. All the results, which remained at the level of less than 10^4 CFU/ml of stimulated saliva, can be considered favourable caries preventive effects. The obtained results agree with results reported previously by other investigators (14, 31). It should be emphasized that the preventive procedure in the third group showed the best reductive effect on the amount of bacteria, with slightly more than 10^3 CFU/ml stimulated saliva.

Decrease in the value of OHI during the study was a very important factor, which demonstrated the effectiveness of the preventive procedures used. In the third group the best results were realised as early as the second preventive treatment, with high statistical significance ($p<0.001$) comparing to other study groups, which were maintained up until the end of the study. At the end of the study the decrease in the OHI index in the third group was around 65%. This clearly showed the most effective preventive procedure during the study. In similar studies results of plaque reduction were slightly lower, which in this case can be explained by the additional reductive effect of professional paste (32, 33).

The positive effect of increased salivation is desirable for any method of caries prevention. During the examination an average increase of around 0.1 ml/min occurred in the group using chewing gum, which amounted to around 150 ml daily. This led to 13%-increase of total daily saliva production. Our results are similar to and agree with the results of other investigations that used chewing gum (34-36). A short-term positive effect of increasing salivation was also realised in the first examined group, which confirms earlier results on the stimulating effect of aminfluoride on salivation as an additional caries preventive effect (37).

Conclusions

The recognition of the patients with high caries risk is an important precondition for the choice and application of an efficient preventive procedure. We can conclude:

1. The preventive procedures used professionally in the dental practice and daily at home should

bi se temeljiti na procjeni stupnja rizika za karijes, posebice s obzirom na razinu SM-a i LB-a.
2. Rezultati istraživanja pokazuju da profesionalno čišćenje i poliranje zuba profilaktičkom pastom, koja sadržava abrazive, fluoride i ksilitol, u kombinaciji sa svakodnevnim žvakanjem žvakaće gume s ksilitolom i fluoridom, može biti vrlo učinkovito sredstvo u kontroli važnih čimbenika rizika za karijes. Ti zaključci mogu ubuduće osigurati dobro protektivno djelovanje opisanih postupaka prevencije karijesa, osobito za pacijente s visokim rizikom.
3. Primjena testova Dentoculta predstavlja jednostavan klinički postupak koji omogućuje detekciju pacijenata s visokim rizikom od karijesa, a istodobno daje smjernice za preventivne postupke kojima se može osigurati odgovarajuća prevencija nastanka bolesti.

be based on estimation of the degree of caries risk, with regard to the level of SM and LB.
2. The results of this study indicate that professional cleaning and polishing of the teeth with prophylactic paste containing abrasives, fluorides and xylitol in combination with daily use of chewing gum containing xylitol and fluoride can provide very effective control of important caries risk factors. Through these conclusions we can expect good protective effect from presented caries preventive regimens in prospective time, especially for high caries risk patients.
3. The application of Dentocult tests represents a simple clinical procedure, which enables detection of high caries risk patients and at the same time provides some guidelines for the preventive procedure, which can ensure adequate disease prevention.

Abstract
Caries risk assessment is a valuable clinical procedure that in many ways alleviates implementation of preventive procedures in the entire population. When high-risk individuals for new caries lesions are identified the most effective preventive protocol should be applied. The aim of this study was to investigate the caries preventive values of certain preventive procedures in in vivo conditions. Five groups of subjects, each with 18 children aged from 4-5 and 10-12 years (n=90) were treated with different preventive procedures (aminfluoride solution, professional prophylactic paste, chewing gum containing xylitol and fluoride, chlorhexidine solution, chlorhexidine gel). During a period of two months five measurements were performed and the following variables evaluated: the number of Streptococcus mutans (SM) and lactobacilli (LB), oral hygiene index (OHI), the amount of stimulated saliva and buffer capacity. At the end of the study the best result in the reduction of the number of bacteria was achieved by the application of Proxyt paste and daily use of chewing gum, ($p<0.001$). In patients treated with this preventive procedure the number of SM was reduced by 1 class and LB to <104 after two months of study. The results obtained indicate that professional teeth cleaning and use of chewing gum with xylitol and fluorides on daily basis can be very effective protocol for controlling most important caries risk factors or predictors.

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