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Dental Caries Experience in Children in Public Kindergartens of Sarajevo, Bosnia and Herzegovina

Karijes u djece u javnim vrtićima u Sarajevu, Bosna i Hercegovina

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Abstract

Objectives: Dental caries first occurs within primary dentition in toddlers and preschool children, in a form of early childhood caries (ECC). In every day's busy and employment burdened parenting, caretakers and institutions have become important even more nowadays, not only for forming child general behavior and character, but also for maintenance of their general and oral health as well. **Aims:** To evaluate the presence and severity of ECC in children who attended public kindergartens in Sarajevo, and to offer basic information for the maintenance and improvement of child oral health to their parents and kindergarten teachers. **Methods:** The study included 1722 preschool children aged 3-6 years who attended kindergartens within Sarajevo public kindergarten institution, together with their parents and kindergarten teachers. Dental team members gradually visited all kindergartens situated in four Sarajevo city municipalities and examined kindergarten children according to the WHO Oral Health Survey Manual. Oral health promotion material for parents and kindergarten teachers was also distributed simultaneously during sequential visits. **Results:** ECC was present in preschool kindergarten children in Sarajevo, with its high prevalence (67.71%), dmft-value (3.97) and severity (SiC index 8.79). There was also a significant lack of dental healthcare to examined children mostly related to lack of visiting dental offices by children's parents (CI=10.55%, RI=10.80%, TI=12.98%). **Conclusion:** Parental role in preserving and improving of their children oral health should be systematically and profoundly improved. Kindergarten officials and staff should recognize the importance of anticariogenic diet menus and oral hygiene maintenance within their institutions.

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Introduction

Dental caries first occurs within primary dentition in toddlers and preschool children in the form of early childhood caries (ECC). ECC is a specific form of dental caries from many aspects, including its pathogenesis, treatment and prognosis, as well as the causes for its occurrence (1-3). The unjustified routine of lack of oral hygiene maintenance and uncontrolled consumption of added sugars, together with nocturnal feeding, was established and well known within a large number of families, which continued in preschool period. All of this is usually followed with the lack, or complete absence, of dental visiting. These bad habits can result in early forms of ECC, sometimes in younger toddlers, which can even result in severe forms of ECC (S-ECC). Furthermore, toddlers and preschool children have been nowadays more taken care of by others than by their parents (grand-

Uvod

Zubni karijes kod male i predškolske djece prvi se put pojavljuje u mliječnoj denticiji u obliku karijesa ranog djetinjstva (KRD). KRD je specifičan oblik karijesa s više aspekata, uključujući njegovu patogenezu, liječenje i prognozu, ali i uzroke nastanka (1 – 3). Neopravdano neodržavanje oralne higijene i nekontrolirana konzumacija dodatnih šećera, uz noćno hranjenje, uvriježeni su i dobro poznati u mnogim obiteljima, a to se nastavlja i u predškolskom razdoblju. Sve to obično prate neredoviti posjeti stomatologu ili njihov potpuni izostanak. Te loše navike mogu rezultirati ranim oblicima KRD-a, katkad i kod mlađe djece, što čak može završiti teškim oblicima te bolesti (S-ECC). Nadalje, o maloj i predškolskoj djeci danas se obično ne skrbe roditelji nego netko drugi (bake i djedovi, dadilje, vrtići), što može pojačati pojavu i posljedice loših navika. Liječenje KRD-a obično je

parents, nannies, kindergartens), which can strengthen expression and results of bad habits. The treatment of ECC is usually complicated due to several main factors: lack of cooperation in dental office, more frequent appearance of S-ECC and dental emergencies, and consequent bad prognosis of ECC-affected primary teeth. If ECC is not resolved on time, dental caries disease just mercilessly continues to affect and waste newly emerged permanent teeth (1-3).

Bad oral habits within families in Bosnia and Herzegovina had their origin in lack of oral health literacy. This situation was not recognized by state health legislation and not supported with implementation of public oral health preventive programs in our country, also without continuous interdisciplinary preventive collaboration between dentists and other healthcare workers (gynecologists, pediatricians) (3-5). The parents were consequently left to themselves and intentionally became self- taught, mostly under influence of mass media (internet, TV commercials, etc.). Also, this self-education was usually not specifically related to the level of personal formal education.

In every day's busy and employment burdened parenting, caretakers and institutions have become important even more nowadays, not only for forming child general behavior and character, but also for maintenance of their general and oral health as well (3, 6, 7). There are many obstacles and challenges within this process, especially in institutionally oriented nurturing places (kindergartens) (3, 6, 7).

The aim of this study was to evaluate presence and severity of ECC in children who attended public kindergartens in Sarajevo, and to offer basic information for the maintenance and improvement of child oral health to their parents and kindergarten teachers.

Patients and methods

This cross-sectional observational prospective study included preschool children aged 3-6 years who attended kindergartens within Sarajevo public kindergarten institution „Djeca Sarajeva", together with their parents and kindergarten teachers, during the period from February to December, 2022. This research was approved by the Ministry of Education and Child Care of Sarajevo Canton and conducted by dental teams of Clinic for Preventive and Pediatric Dentistry of Faculty of Dentistry with Dental Clinical Center of Sarajevo University, in concordance with Helsinki declaration (8). Informed written consent was obtained from participants' parents and from the kindergarten children prior to study research.

Research design was based upon Austrian Oral Health Promotion Program (9). In brief, during research period dental team members gradually visited all kindergartens situated in four Sarajevo city municipalities. Plan of visits to kindergartens was created in advance, and in coordination with teachers who were in charge of this project. Each dental team consisted of two members. Child participant single record consisted of general information (age and gender), total number of present teeth, and number of decayed (d), missing (m) and filled (f) primary teeth. Examination of teeth in

kompliciranо zbog nekoliko glavnih čimbenika: nedostatka suradnje u stomatološkoj ordinaciji, češće pojave teškog oblika KRD-a i potrebe za hitnim stomatološkim posjetima te posljedično loše prognoze za mliječne zube zahvaćene KRD-om. Ako se KRD ne sanira na vrijeme, karijes će nemilosrdno nastaviti pogađati i uništavati tek iznikle trajne zube (1 – 3).

Loše oralne navike u obiteljima u Bosni i Hercegovini imaju korijene u nedostatku oralno-zdravstvene pismenosti. Državna zdravstvena legislativa takvo stanje nije uočila i nije poduprla provedbu javnih preventivnih programa oralnoga zdravlja u našoj zemlji. Također nema kontinuirane interdisciplinarne preventivne suradnje između stomatologa i drugih zdravstvenih radnika (ginekologa, pedijatara) (3 – 5).

Roditelji su uglavnom prepušteni sami sebi, samouki su i većinom pod utjecajem masovnih medija (internet, TV, reklame i sl.). To samoobrazovanje obično nije bilo posebno povezano s razinom osobnoga formalnoga obrazovanja.

U današnjem užurbanom i opterećenom roditeljstvu, osobe i institucije koje čuvaju djecu postale su još važnije, ne samo kad je riječ o usmjeravanju općeg ponašanja i oblikovanju karaktera djeteta, nego i o održavanju njegova općega i oralnoga zdravlja (3, 6, 7). Mnogo je prepreka i izazova u sklopu tog procesa, posebice u institucionalno orijentiranim odgojnim mjestima (dječji vrtići) (3, 6, 7).

Cilj ovog istraživanja bio je procijeniti prisutnost i težinu KRD-a kod djece koja pohađaju javne vrtiće u Sarajevu te roditeljima i odgajateljima ponuditi osnovne informacije za održavanje i poboljšanje oralnoga zdravlja njihove djece.

Ispitanici i metode

Ova presječna opservacijska prospektivna studija obuhvatila je djecu predškolske dobi od 3 do 6 godina koja su pohađala vrtiće Javne ustanove „Djeca Sarajeva" te njihove roditelje i odgajatelje u razdoblju od veljače do prosinca 2022. godine. Istraživanje je odobrilo Ministarstvo za odgoj i obrazovanje Kantona Sarajevo. Proveli su ga stomatološki timovi Klinike za preventivnu i dječju stomatologiju Stomatološkog fakulteta sa Stomatološkim kliničkim centrom Sveučilišta u Sarajevu. Istraživanje je obavljeno u skladu s Helsinškom deklaracijom (8). Prije početka istraživanja roditelji djece vrtićke dobi potpisali su informirani pristanak za sebe i svoju djecu.

Dizajn istraživanja temelji se na austrijskom programu za promicanje oralnoga zdravlja (9). Ukratko, tijekom istraživanja članovi stomatološkog tima postupno su posjećivali sve vrtiće koji se nalaze u četirima sarajevskim gradskim općinama. Plan posjeta bio je pripremljen unaprijed, a u dogovoru s odgojiteljicama koje su za to bile zadužene. Svaki stomatološki tim sastojao se od dva člana. Za svakog ispitanika zabilježene su opće informacije (dob i spol), ukupan broj zuba, broj karijesnih/pokvarenih (k), ekstrahiranih zuba (e) i zuba s ispunima (p) te mliječnih zuba. Pregled zuba u terenskim uvjetima obavljen je prema 5. izdanju Priručnika za pregled oral-

the field conditions was performed according to the 5th edition of WHO Oral Health Survey Manual (10), where 12 examiners were previously calibrated in order to be able to conduct the study research. Oral health promotion material for parents and kindergarten teachers was also distributed simultaneously during sequential visits. Parents obtained information about their children oral health and its importance, and the parental roles and ways for its maintenance and improvement; in specially designed video material in Bosnian language entitled «Healthy Teeth, Healthy Child, Happy Parent». Each parent was encouraged to access, download and watch this YouTube video via the following link https://youtu.be/VhKXF2nBJO4. The kindergarten teachers received similar printed promotion materials adjusted for them and their roles in oral health maintenance and improvement of kindergarten children. Dental team members also discussed, together with teachers, the current conditions for possible existence of possibility of anticariogenic nutrition and oral hygiene maintenance conditions within each visited kindergarten.

Descriptive results obtained in study research were presented in tables and figures. Paired sample t-test was used for analysis of related samples, and one-way ANOVA with Bonferroni post-hoc test for analysis of independent samples. The Chi-square test was used for analysis of contingency tables. All statistical analyses were performed with the Microsoft Excel software version 2021 and IBM Statistical Package (IBM, Armonk, NY, USA) for Social Sciences software version 23 (SPSS Inc., Chicago, IL, USA) for the Windows operative system, at 0.05 level of significance.

Results

Public preschool educational institution "Djeca Sarajeva" included 37 kindergartens with 2595 enrolled children aged 3-6 years in total for the research period. All kindergartens were gradually visited by research teams on 48 occasions, with 1722 examined children in total, 876 boys (50.87%) and 846 girls (49.13%). The difference of 873 children (33.64%) between the number of all kindergarten children and examined participants was due to their current absence (731 children, 28.17%) or lack of cooperation for examination (142 children, 5.47%), during the time of planned, previously announced visit to specific kindergarten. The descriptive characteristics of examined children distributed in kindergartens by city municipalities are presented in Table 1.

Field oral health survey of examined children showed further dental caries experience characteristics in primary dentition represented in Table 2 and Figures 1a-1c. The results showed that younger 3-year-old and 4-year-old children had statistically significant more caries-free individuals and those with all sound primary teeth than in the older ones (chi-square test, $p<0.001$), without any other determined statistically difference among other variables. Examined children showed statistically more caries-free individuals than those with all sound teeth, within all observed variables (chi-square test, $p<0.001$, for all comparisons). Older 5-year-old and 6-year-old participants had statistically higher caries prevalence

noga zdravlja Svjetske zdravstvene organizacije (SZO) (10), pri čemu je 12 ispitivača prije toga kalibrirano kako bi mogli provesti studijsko istraživanje. Tijekom tih uzastopnih posjeta podijeljeni su roditeljima i odgajateljima materijali za promicanje oralnoga zdravlja u vrtiću. Roditelji su, u posebno osmišljenom videomaterijalu na bosanskome jeziku pod nazivom «Zdravi zubi, zdravo dijete, sretan roditelj», dobili informacije o oralnome zdravlju svoje djece i njegovu značenju te o načinima njegova očuvanja i poboljšanja, ali i o svojim dužnostima. Svaki roditelj potaknut je da pristupi, preuzme i pogleda video na Youtubu koji je bio dostupan na adresi https://youtu.be/VhKXF2nBJO4. Odgajateljice u vrtiću dobile su sličan tiskani promidžbeni materijal prilagođen njima i njihovoj ulozi u očuvanju i poboljšanju oralnoga zdravlja djece vrtićke dobi. Članovi stomatološkog tima također su s odgojiteljicama razgovarali o trenutačnim uvjetima za eventualno uvođenje antikariogene prehrane i o stvaranju uvjeta za održavanje oralne higijene u svakom vrtiću koji su posjetili.

Deskriptivni rezultati dobiveni studijskim istraživanjem nalaze se u tablicama i grafikonima. T-test uparenih uzoraka korišten je za analizu povezanih uzoraka, a jednosmjerna ANOVA s Bonferronijevim post-hoc testom za analizu nezavisnih uzoraka. Za analizu tablica kontingencije korišten je hi-kvadrat test. Sve statističke analize obavljene su u softveru Microsofta Excel v. 2021 i IBM-ovu statističkom paketu (IBM, Armonk, NY, SAD) softvera za društvene znanosti v. 23 (SPSS Inc., Chicago, IL, SAD) za operativni sustav Windows. Razina značajnosti bila je 0,05.

Rezultati

Javna predškolska odgojno-obrazovna ustanova "Djeca Sarajeva" uključila je u istraživanje 37 vrtića s ukupno 2595 upisane djece u dobi od 3 do 6 godina. U sve vrtiće postupno su dolazili istraživački timovi (48 puta) te su pregledali ukupno 1722 djeteta, i to 876 dječaka (50,87 %) i 846 djevojčica (49,13 %). Od ukupnoga broja djece njih 873 (33,64 %) nije pregledano i to zato što su bila odsutna (731 dijete, 28,17 %) ili zbog nedostatka suradnje (142 djeteta, 5,47 %) tijekom prethodno najavljenog posjeta određenom vrtiću. Deskriptivne karakteristike ispitane djece raspoređene u vrtićima u gradskim općinama nalaze se u tablici 1.

Terenski pregled oralnoga zdravlja djece pokazao je daljnje karakteristike karijesnog iskustva u mliječnoj denticiji koje su prikazane u tablici 2. i grafikonima od 1. a do 1. c. Rezultati su pokazali da je kod mlađe trogodišnje i četverogodišnje djece statistički znatno više onih bez karijesa na zubima nego onih sa svim zdravim mliječnim zubima u odnosu prema starijoj djeci (hi-kvadrat test, $p < 0,001$), bez statistički značajnih razlika između ostalih varijabli. Kod pregledane djece bilo je statistički znatno više njih bez karijesa na zubima nego onih sa svim zdravim zubima, unutar svih promatranih varijabli (hi-kvadrat test, $p < 0,001$, za sve usporedbe). Stariji petogodišnji i šestogodišnji sudionici imali su statistički znatno više vrijednosti prevalencije karijesa od mlađih (hi-kvadrat test, $p < 0,001$), a statistički značajne razlike između ostalih

lence values than the younger ones (chi-square test, p<0.001), without any other statistical significance confirmed between observed variables in this matter.

It was obvious that decayed primary teeth have been highly statistically dominating in dmft-structure within all observed variables, with the missing teeth as statistically lowest ones (paired sample t-test, p <0.001, for all comparisons). Although with higher mean value, the dmft-values in boys were not statistically significant. Younger children showed statistically lower dmft-values than older ones. The lowest values were for 3-year-olds (one-way ANOVA, p=0.001) followed by for 4-year-olds (one-way ANOVA, p<0.001). Children in Centar municipality kindergartens showed statistically highest dmft-values (one-way ANOVA, p=0.05). SiC index was statistically higher than dmft-index in all observed variables, as expected (paired sample t-test, p <0.001, for all comparisons). Dental caries disease was most severe in older children, with the highest SiC-index mean value in 6-year-olds (one-way ANOVA, p=0.004), followed by 5-year-olds (one-way ANOVA, p=0.008). There were no statistically significant differences related to child gender or specific municipality kindergartens.

Levels of oral health care provided for examined child participants by dental healthcare system are shown in Table 3. All of three dental healthcare implementation indexes were statistically higher in girls (one-way ANOVA; p=0.011 for CI, p=0.018 for RI, and p=0.050 for TI), older children (one-way ANOVA; p<0.001 for 6-year-ols, and p<0.001 for 5-year-olds, for all three indexes), and with the lowest values for Novi Grad municipality kindergartens (one-way ANOVA; p values from 0.007 – 0.001, for all three indexes).

YouTube promotive research video material for parents has been seen more than 1890 times since it was first uploaded in January 2022. Printed promotional material was distributed to 96 teachers during sequential visits to kindergartens. During targeted conversations with the teachers, they have stated that the needs and actions for the establishment of anticariogenic diet through planning daily, weekly and monthly menus, and specific places for maintaining oral hygiene of children within kindergartens, have not been recognized so far, mostly with expressed disbelief that this would be established in the future within kindergartens.

Discussion

It was approximately 30 years ago when the first Global burden of diseases (GBD) study was conducted by WHO and World Bank, and at similar time ECC was finally stated by the US Centers for Disease Control and Prevention (11, 12). But, only after GBD study from 2010, there was a clearer global picture about ECC and its prevalence, when the first global oral health report was published (13). Nowadays GBD studies offer better ways for global observing of oral diseases including ECC, with recent issuing of the Global Oral Health Status Report in 2022 (14). The latest known data related to GBD 2019 study were that the global pooled ECC prevalence was 48% with more than a half billion of children worldwide suffering from it (14, 15). The pooled prevalenc-

promatranih varijabli nisu utvrđene.

Očito je da su kariozni mliječni zubi bili dominantni u kep-strukturi u sklopu svih promatranih varijabli, pri čemu su zubi koji nedostaju statistički bili najmanje zastupljeni (t-test uparenog uzorka, p < 0,001, za sve usporedbe). Iako s većom srednjom vrijednošću, kep-vrijednosti kod dječaka nisu bile statistički značajne. Mlađa djeca imala su statistički niže kep-vrijednosti od starije. Najniže vrijednosti dobivene su za trogodišnjake (jednosmjerna ANOVA, p = 0,001), a zatim za četverogodišnjake (jednosmjerna ANOVA, p < 0,001). Djeca u vrtićima općine Centar imala su statistički najviše vrijednosti kep-indeksa (jednosmjerna ANOVA, p = 0,05). SiC-indeks bio je statistički viši od kep-indeksa u svim promatranim varijablama, kao što se i očekivalo (t-test uparenog uzorka, p < 0,001, za sve usporedbe). Najviše vrijednosti prisutnosti zubnog karijesa registrirane su kod starije djece, s najvišom srednjom vrijednošću SiC-indeksa kod šestogodišnjaka (jednosmjerna ANOVA, p = 0,004), a slijede petogodišnjaci (jednosmjerna ANOVA, p = 0,008). Nije bilo statistički značajnih razlika vezanih uz spol djeteta ili pojedine općinske vrtiće.

Razina oralne zdravstvene zaštite koju je ispitanim dječjim sudionicima omogućio sustav dentalne zdravstvene zaštite nalazi se u tablici 3. Sva tri indeksa provedbe dentalne zdravstvene zaštite bila su statistički viša kod djevojčica (jednosmjerna ANOVA; p = 0,011 za CI, p = 0,018 za RI i p = 0,050 za TI) i starije djece (jednosmjerna ANOVA; p < 0,001 za 6-godišnjake i p < 0,001 za 5-godišnjake, za sva tri indeksa), a s najnižim vrijednostima za vrtiće u općini Novi Grad (jednosmjerna ANOVA; p vrijednosti od 0,007 – 0,001, za sva tri indeksa).

Promotivni istraživački videomaterijal Youtuba za roditelje pogledan je više od 1890 puta otkako je postavljen u siječnju 2022. godine. Tiskani promotivni materijal dobilo je 96 odgajatelja tijekom uzastopnih posjeta vrtićima. U ciljanim razgovorima s odgajateljima zaključeno je da dosad nisu bile prepoznate potrebe i postupci za primjenu antikariogene prehrane pri planiranju dnevnih, tjednih i mjesečnih jelovnika, te uspostava posebnih mjesta za održavanje oralne higijene djece u vrtiću. Uglavnom je istaknuta nevjerica da će se navedeno u budućnosti urediti.

Rasprava

Prije otprilike trideset godina SZO i Svjetska banka proveli su prvu studiju o globalnom opterećenju bolesti (*Global burden of diseases – GBD*), a istodobno je Američki centar za kontrolu i prevenciju bolesti službeno uveo naziv *karijes ranog djetinjstva* (11, 12). No, tek poslije GBD studije iz 2010. godine, postala je jasnija globalna slika o KRD-u i njegovoj prevalenciji nakon što je objavljeno prvo globalno izvješće o oralnome zdravlju (13). U današnjim GBD studijama bolje se globalno promatraju oralne bolesti, uključujući KRD, što se vidi u nedavno objavljenom Globalnom izvješću o stanju oralnoga zdravlja iz 2022. godine (14). Posljednji dostupni podatci povezani sa studijom GBD-a iz 2019. godine bili su da je globalna objedinjena prevalencija KRD-a bila 48 % s

es across continents were as follows: Africa 30%, Americas 48%, Asia 52%, Europe 43, and Oceania 82% (15). Findings close to GBD 2017 study showed global ECC prevalence of 23.8 for toddlers and 57.3% for preschool children (16). In the European Union countries, ECC prevalence for children under 5 years old was 37.2%, with higher values in boys than in girls (17). So far there have been two national studies from Bosnia and Herzegovina, where ECC prevalence in primary teeth of 6-year old children was observed. In the first one that was conducted 35 years ago, with other republics of former Yugoslavia with joint collected data, the ECC prevalence was 97.3% (18). In another study that was conducted almost 20 years ago, the prevalence was 93.2% (19). In the absence of more recent national oral health surveys, there were several local or regional studies that discussed ECC in preschool children. For toddlers and preschool children, the ECC prevalence in our country varied and declined over time from 86% to 53% (studies conducted in the last 20 years, from southwest Herzegovina, northwest and east Bosnia and areas of Banja Luka, Mostar and Sarajevo) (20-24). In the neighboring countries, several studies showed further results in determining ECC prevalence: in Serbia results varied from 30.50-52.80% (25, 26), in Croatia 56.50% (17), in Slovenia 56.50% (17), and in Kosovo 86.31% (27). The ECC prevalence in primary dentition of our study participants has reached pretty high values (Table 2), and went over the most of recent local, regional, international and global findings, with reversive tendency to previous higher values. Furthermore, our study participants had statistically a larger number of caries-free primary teeth than all of sound primary teeth. The ECC prevalence also increased with age of participants.

For the dmft-index, previous domestic national surveys, and one regional, showed values for 6-year-olds with declining tendency: from 8.4 (1988) to 6.71 (2004), and 4.9 (2003) (18, 20, 28). More recent local and regional findings for preschool children conducted studies showed further declining of dmft-values: 6.8 (2016, Sarajevo area) (22), 3.94 (2016, Banja Luka area) (23) and 2.99 (2022, Mostar area) (24). Decayed/carious teeth were dominating ones in all mentioned findings, and dmft-values increased with age of the examined participants (Figures 1a-1c). Although missing teeth were mostly the rarest ones, filled teeth significantly increased only in 6-year-olds. Our findings could be in accordance with the trends showed in previous studies regarding mean dmft-value (3.97), its structure (decayed/carious teeth were dominating ones), and increasing over time (higher values present in older preschool children).

Severity of ECC in preschool children and toddlers, as its major public oral health and clinical problem, was observed in several studies, since significant caries index (SiC) has been first introduced for 12-year-old children in 2000 (29-31). As expected, SiC-values were statistically higher than dmft-values with increase over time, which was similar to our findings (Figures 1a-1c). However, in our study participants, the differences were mostly 2-2.5 times higher. Furthermore, in our 3-years-old children, there have already been 4.72% of those with at least half decayed primary teeth. In 4-year-olds, there

više od pola milijarde djece diljem svijeta koja pate od te bolesti (14, 15). Objedinjena prevalencija po kontinentima bila je sljedeća: Afrika 30 %, Amerika 48 %, Azija 52 %, Europa 43 % i Oceanija 82 % (15). Nalazi bliski studiji GBD-a iz 2017. godine pokazali su globalnu prevalenciju KRD-a od 23,8 % za malu djecu i 57,3 % za predškolsku (16). U zemljama Europske unije prevalencija KRD-a za djecu u dobi do 5 godina bila je 37,2 %, s višim vrijednostima za dječake nego za djevojčice (17). Dosad su u Bosni i Hercegovini provedene dvije nacionalne studije u kojima je promatrana prevalencija KRD-a kad je riječ o mliječnim zubima šestogodišnje djece. U prvom istraživanju provedenom prije 35 godina, zajedno s drugim republikama bivše Jugoslavije i sa zajednički prikupljenim podatcima, prevalencija je bila 97,3 % (18). U drugoj, provedenoj prije gotovo 20 godina, prevalencija je iznosila 93,2 % (19). U nedostatku novijih nacionalnih istraživanja oralnoga zdravlja u međuvremenu je bilo nekoliko lokalnih ili regionalnih studija koje su promatrale KRD kod djece predškolske dobi. Za malu djecu i onu predškolske dobi prevalencija KRD-a u našoj zemlji varirala je i padala tijekom godina od 86 do 53% (istraživanja provedena u posljednjih 20 godina u jugozapadnoj Hercegovini, sjeverozapadnoj i istočnoj Bosni i područjima Banjaluke, Mostara i Sarajeva) (20 – 24). U susjednim zemljama nekoliko je studija pokazalo sljedeće rezultate pri određivanju prevalencije KRD-a: u Srbiji rezultati variraju od 30,50 do 52,80 % (25, 26), u Hrvatskoj iznose 56,50 % (17), u Sloveniji 56,50 % (17), a na Kosovu 86,31 % (27). Prevalencija KRD-a u mliječnoj denticiji sudionika u našoj studiji dosegnula je dosta visoke vrijednosti (tablica 2.) i prešla preko većine nedavnih lokalnih, regionalnih, međunarodnih i globalnih nalaza, s tendencijom povratka prema prethodnim višim vrijednostima. Nadalje, među našim sudionicima bilo je statistički znatno više djece sa zubima bez karijesa nego onih sa svim zdravim mliječnim zubima. Prevalencija KRD-a također se povećavala s dobi sudionika.

Za kep-indeks, dosadašnja domaća nacionalna istraživanja te jedno regionalno, pokazala su vrijednosti za šestogodišnjake s tendencijom pada od 8,4 (1988. godina) do 6,71 (2004. godina) i 4,9 (2003. godina) (18, 20, 28). Novija lokalna i regionalna istraživanja provedena na djeci predškolske dobi pokazala su daljnji pad vrijednosti kep-indeksa – 6,8 (2016. godina, područje Sarajeva) (22), 3,94 (2016. godina, područje Banjaluke) (23) i 2,99 (2022. godina, područje Mostara) (24). U svim navedenim istraživanjima dominiraju karijesni zubi, a vrijednosti kep-indeksa rasle su s dobi ispitanika (grafikoni 1. a – 1. c). Iako su nedostajući zubi uglavnom bili najrjeđi, broj zuba s ispunom znatno se povećao samo kod šestogodišnjaka. Naši nalazi mogli bi biti u skladu s trendovima u dosadašnjim studijama u vezi sa srednjom vrijednošću kep-indeksa (3,97), njezinom strukturom (prevladavaju karijesni zubi) i povećanjem tijekom godina (više vrijednosti kod starije predškolske djece).

Ozbiljnost KRD-a kod predškolske i male djece, kao glavni javnozdravstveni i klinički problem, uočena je u nekoliko studija otkako je 2000. prvi put uveden signifikantni karijesni indeks (SiC) za dvanaestogodišnju djecu (29 – 31). Kao što se očekivalo, vrijednosti SiC-indeksa bile su statistič-

Table 1 Descriptive characteristics of child participants examined within kindergartens
Tablica 1. Opisne karakteristike pregledane djece u vrtićima

Kindergarten organizational municipality units • Vrtići na razini općinske organizacijske jedinice	Age • Dob	3-year-olds • 3-godišnjaci		4-year-olds • 4-godišnjaci		5-year-olds • 5-godišnjaci		6-year-olds • 6-godišnjaci	
		254		591		595		282	
	Gender • Spol	Boys • Dječaci	Girls • Djevojčice	Boys • Dječaci	Girls • Djevojčice	Boys • Dječaci	Girls • Djevojčice	Boys • Dječaci	Girls • Djevojčice
Centar	396	18	20	53	60	75	68	61	41
Novi Grad	745	76	89	145	145	122	109	28	31
Novo Sarajevo	350	7	11	50	49	72	76	43	42
Stari Grad	231	19	14	49	40	36	37	22	14
Total • Ukupno	1722	120	134	297	294	305	290	154	128

Table 2 Prevalence of individuals with all sound, caries-free and carious primary teeth among examined child participants
Tablica 2. Prevalencija individua sa svim zdravim zubima, zubima bez karijesa i s karioznim mliječnim zubima kod dječjih ispitanika

	Total sample • Ukupni uzorak		Boys • Dječaci		Girls • Djevojčice	
Sound • Svi zubi zdravi	n=506	29.38%	n=260	29.68%	n=246	29.08%
Caries-free • Zubi bez karijesa	n=556	32.29%	n=280	31.96%	n=276	32.62%
Carious • Zubi s karijesom	n=1166	67.71%	n=596	68.04%	n=570	67.38%
Age • Dob	3-year-olds • 3-godišnjaci		4-year-olds • 4-godišnjaci		5-year-olds • 5-godišnjaci	6-year-olds • 6-godišnjaci
Sound • Svi zubi zdravi	n=117	46.06%	n=214	36.21%	n=117	19.66%	n=58	20.57%
Caries-free • Zubi bez karijesa	n=119	46.85%	n=221	37.39%	n=143	24.03%	n=73	25.89%
Carious • Zubi s karijesom	n=135	53.15%	n=370	62.61%	n=452	75.97%	n=209	74.11%
Municipality • Općina	Centar		Novi Grad		Novo Sarajevo		Stari Grad	
Sound • Svi zubi zdravi	n=116	29.29%	n=217	29.13%	n=95	27.14%	n=78	33.77%
Caries-free • Zubi bez karijesa	n=127	32.07%	n=233	31.28%	n=113	32.29%	n=83	35.93%
Carious • Zubi s karijesom	n=269	67.93%	n=512	68.72%	n=237	67.71%	n=148	64.17%

Sound – study participant without decayed, missing or filled teeth, with all sound teeth; caries-free – study participant without carious/decayed primary teeth; carious – study participant with one or more carious/decayed primary teeth; n – number of study participants •svi zubi zdravi – ispitanik bez karijesa, zuba koji nedostaju ili imaju plombu, sa svim zdravim zubima; zubi bez karijesa – ispitanik bez karijesnih/pokvarenih mliječnih zuba; zubi s karijesom – ispitanih s jednim ili više karijesnih/pokvarenih mliječnih zuba; n – broj ispitanika studije

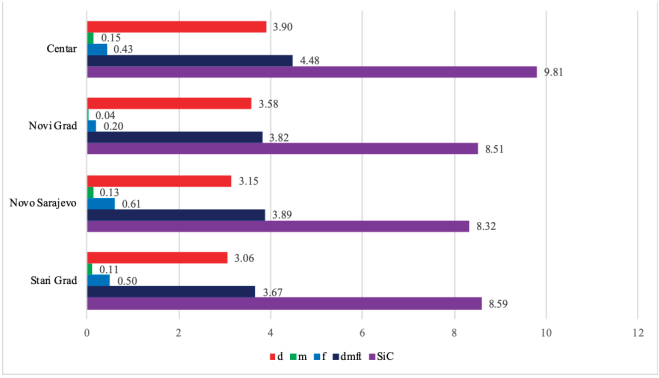
Table 3 Descriptive characteristics of determined dental healthcare indexes in examined child participants
Tablica 3. Opisna obilježja utvrđenih indeksa skrbi o oralnome zdravlju u populaciji ispitivane djece

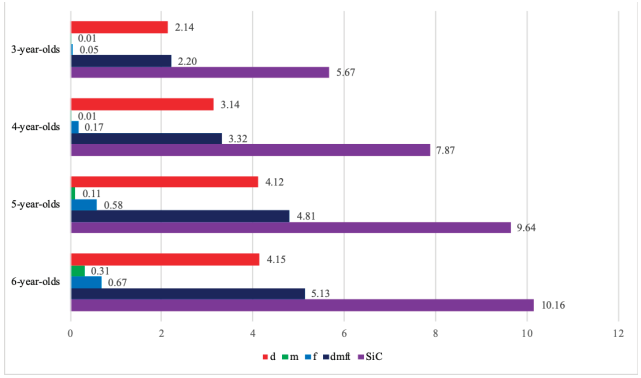
Oral health care levels • Indeksi brige o oralnom zdravlju		Total sample • Ukupni uzorak	Boys • Dječaci	Girls • Djevojčice
	CI (%)	10.55	8.82	12.32
	RI (%)	10.80	9.17	12.48
	TI (%)	12.98	11.54	14.46
Age • Dob	3-years-olds • 3-godišnjaci	4-years-olds • 4-godišnjaci	5-years-olds • 5-godišnjaci	6-years-olds • 6-godišnjaci
CI (%)	3.39	5.93	13.70	15.98
RI (%)	3.39	5.93	13.95	16.97
TI (%)	3.52	6.23	16.46	22.71
Municipality • Općina	Centar	Novi Grad	Novo Sarajevo	Stari Grad
CI (%)	11.80	6.08	16.58	13.61
RI (%)	12.47	6.13	16.79	13.91
TI (%)	14.89	7.42	19.95	17.06

CI – care index; RI – restorative index; TI – treatment index • CI – indeks skrbi; RI – restaurativni indeks; TI – indeks tretmana

already have been 8.97% of them. This prevalence slightly further increased to 11.60% in 5-year-olds and 12.41% in 6-year-olds, even with sporadic cases of all 20 decayed teeth in 4-, 5- and 6-year-olds.

Not less important were the findings regarding the level of oral health care provided for our child participants (Taki više od vrijednosti kep-indeksa s porastom tijekom godina, što je slično našim nalazima (grafikoni 1. a – 1. c). No, kod naših sudionika razlike su uglavnom bile 2 do 2,5 puta veće. Nadalje, kod naše trogodišnje djece već je bilo 4,72 % onih s barem pola karijesnih mliječnih zuba. Kod četverogodišnjaka ih je već bilo 8,97 %. Ova se prevalencija dodatno





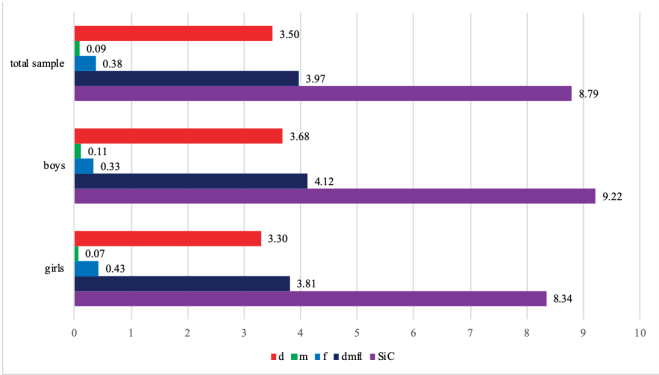


Figure 1a. Mean values of dental caries experience indexes in primary dentition among examined child participants in total sample
Grafikon 1. a. Srednje vrijednosti indeksa karijesnog iskustva u mliječnoj denticiji kod dječjih ispitanika u ukupnom uzorku
Figure 1b. Mean values of dental caries experience indexes in primary dentition among examined child participants according to their age
Grafikon 1. b. Srednje vrijednosti indeksa karijesnog iskustva u mliječnoj denticiji s obzirom na dob dječjih ispitanika u uzorku
Figure 1c. Mean values of dental caries experience indexes in primary dentition among examined child participants within municipalities
Grafikon 1. c. Srednje vrijednosti indeksa karijesnog iskustva u mliječnoj denticiji kod dječjih ispitanika u uzorku po gradskim općinama

d – decayed primary tooth; m – missing primary tooth; f – filled primary tooth; dmft – summary index of decayed, missing and filled primary teeth; SiC –significant caries index, index of dental caries severity • k – pokvareni/kariozni mliječni zub; e – nedostajući/ekstrahirani mliječni zub; p –mliječni zub s ispunom; kep – sumarni indeks pokvarenih, nedostajućih i plombiranih mliječnih zuba; SiC – signifikantni karijesni indeks, indeks težine zubnog karijesa

ble 3). Mostly as a result of absence of dental visiting by their parents, CI, RI and TI values in children were extremely low, especially in younger participants. These facts showed obvious lack of prevention in a very critical period and should raise quite a lot of general concern. Prevention of ECC was well known and easily conductive in general (1-3). Parents have to know that they need to visit the dentist to obtain guidelines for caries prevention in order to prevent the occurrence of ECC. If they had not done it on the very start (infant period), they should have to be obliged to perform it in crucial toddler period. Although it was previously considered as late, preschool period can still offer important ways for intervention in established ECC processes, if the disease has already not been prevented (1-3, 32). This should be the way to create reasonable circumstances not to intervene later in dental caries process of (young) permanent teeth in children and adolescents. If not, ECC would only mercilessly continue to endanger newly erupted permanent teeth (1-3). Therefore, the worst traditional prejudice about non-importance of primary teeth in our country only showed its worst side. This was obviously the case in our research, where mostly traditionally self-taught parents were left to themselves, without any valuable oral public health state program that could meet significant oral health preventive needs of children in our country and support parents to take over their roles in maintaining and improving oral health of their children (1-4). Our findings also showed the lowest levels of oral

blago povećala na 11,60 % kod petogodišnjaka i na 12,41 % kod šestogodišnjaka, pa čak je bilo primjera da je pokvareno svih 20 zuba kod četverogodišnjaka, petogodišnjaka i šestogodišnjaka.

Ne manje važni bili su nalazi o razini oralne zdravstvene zaštite koja se pružala našim sudionicima (tablica 3.). Uglavnom kao rezultat neodlaska stomatologu, vrijednosti CI-a, RI-a i TI-a kod djece bile su ozbiljno niske, osobito kad je riječ o onima mlađima. Te činjenice pokazale su očit nedostatak prevencije u vrlo kritičnom razdoblju i trebale bi zabrinuti sve odgovorne. Prevencija KRD-a dobro je poznata i općenito jednostavna (1 – 3). Roditelji moraju znati da trebaju posjetiti stomatologa da bi dobili smjernice za prevenciju kako se kod njihove djece ne bi pojavio KRD. Ako to nisu učinili na početku (dojenačko doba) morali bi to učiniti u ključnom razdoblju razvoja malog djeteta. Iako se prije smatralo kasnim, u predškolskom razdoblju ipak postoje važni načini za intervenciju u već uspostavljenim procesima KRD-a, ako bolest već nije prevenirana (1 – 3, 32). Na taj način treba stvoriti razumne uvjete da se kasnije izbjegne intervenirane u karijesni proces (mladih) trajnih zuba kod djece i adolescenata. U suprotnomu KRD bi samo nemilosrdno nastavio ugrožavati novoiznikle trajne zube (1 – 3). Dakle, najgora tradicionalna predrasuda da mliječni zubi nisu važni, kod nas je pokazala svoju najlošiju posljedicu. To je očito bio slučaj u našem istraživanju, gdje su uglavnom tradicionalno samouki roditelji bili prepušteni sami sebi, bez ikakva korisnoga jav-

healthcare provided to children from Novi Grad municipality kindergartens. This municipality had the biggest demographic size, not only in Sarajevo city, but also in our country. It was comprised not only from urban, but from suburban and somewhere rural areas as well, and was the most specific among other municipalities in our research. Access to oral healthcare was not completely equal for its citizens as it was to the other more urban Sarajevo city areas. This could be the explanation, among others, why oral healthcare index values were the lowest.

These were only the initial considerations of the current situation, and much wider than this paper intended to offer, but rather to point to the problem itself. Solving of endangered oral health in toddlers and preschool children, as crucial for better future oral health, would also be time and money consuming. In this process, the healthcare network of dental professionals should have to be reorganized and updated to obtain dental healthcare system capable to improve prevention of oral diseases. Until its future establishment and development it would be necessary to design and implement oral healthcare promotion program apart from current healthcare system. This study research was our first step to evaluate levels of oral health in preschool children through their dental caries experience. Furthermore, our very important intention was to inform their parents about the roles they should be obliged to take and implement in preserving and improving of their children's oral health (3, 9, 33). The study research was conducted in kindergartens; hence the teachers should not be left out but included as active participants in this ongoing promotion process. The plan would be to promote and perform these activities over time, and to expect first real accomplishments in improving oral health when our current 3-year-olds preserve their determined dmft-values on the same levels before going to school, and afterwards.

This study has shown several limitations as well. Regarding the number of examined children, this research has encompassed approximately 14.71% of all 3–6-year-old children that live in these four studied city municipalities by the latest census, and was designed as public kindergarten population-based study. But, at the same time, population of private kindergarten preschool children and also those who were taken care of at home were initially excluded. Although the study was not designed to observe causes of ECC in examined children, the study design itself offered solid circumstances for having all main socioeconomic and educational levels within families of kindergarten children, who additionally have lived in various urban, suburban or rural areas of Sarajevo. These two variables were crucial in determining dental caries experience in the most objective manner. Parents of the examined children were not contacted directly, but with help of kindergarten teachers. Although there were certain numbers of YouTube promotional video views, it could not be more precisely determined how many parents have really watched it and acted to improve their aforementioned parental roles. Finally, printed promotional material was given to kindergarten teachers, with an aim to distribute it to all other kindergarten employees. But, it remained unclear if the material was studied and further distributed to all kinder-

noga oralnoga zdravstvenog državnog programa koji bi mogao zadovoljiti velike preventivne potrebe oralnoga zdravlja djece u našoj zemlji i podržati roditelje da preuzmu zadaću u očuvanju i poboljšanju oralnoga zdravlja svoje djece (1 – 4). Naši nalazi također su pokazali da su najnižu razinu oralne zdravstvene zaštite imala djeca iz vrtića općine Novi Grad. Ta je općina demografski najveća ne samo u gradu Sarajevu, nego i u našoj zemlji. Obuhvaća ne samo gradska područja, nego i prigradska, a ponegdje i ruralna, te je bila specifična u odnosu prema ostalim općinama u našem istraživanju. Pristup oralnoj zdravstvenoj zaštiti građanima nije bio potpuno jednak kao što je to bio slučaj u drugim, urbanijim gradskim sredinama Sarajeva. To je moguće objašnjenje zašto su vrijednosti indeksa oralne zdravstvene zaštite bile najniže u općini Novi Grad.

Ovo su samo početna razmatranja aktualne situacije, šira nego što ovaj rad namjerava ponuditi, a to je upozoriti na sam problem. Rješavanje ugroženoga oralnoga zdravlja kod male i predškolske djece, što je ključno za bolje buduće oralno zdravlje, također bi bilo vremenski i financijski zahtjevno. U tom procesu treba reorganizirati i ažurirati zdravstvenu mrežu dentalnih stručnjaka da bi se dobio sustav dentalne zdravstvene zaštite sposoban za poboljšanje prevencije oralnih bolesti. Do njegove buduće uspostave i razvoja bilo bi potrebno osmisliti i provoditi program promocije oralnoga zdravlja mimo postojećega zdravstvenog sustava. Ovo je istraživanje prvi korak u procjeni razine oralnoga zdravlja djece predškolske dobi na temelju iskustva sa zubnim karijesom. Nadalje, vrlo važna namjera bila je informirati i potaknuti njihove roditelje da preuzmu i počnu provoditi svoju zadaću, a to je očuvanje i poboljšanje sadašnjega oralnoga zdravlja djece (3, 9, 33). Istraživanje je provedeno u dječjim vrtićima tako da odgojitelje u ovome uopće ne treba izbjegavati, nego ih treba uključiti kao aktivne sudionike u taj stalni proces promocije. Plan bi bio promicati i provoditi te aktivnosti tijekom vremena, a prva stvarna postignuća u poboljšanju oralnoga zdravlja mogu se očekivati kada naši sadašnji trogodišnjaci sačuvaju svoje trenutačno utvrđene vrijednosti kep-indeksa na istoj razini prije polaska u školu i poslije toga.

Ova je studija također pokazala nekoliko ograničenja. S obzirom na broj ispitane djece, ovim je istraživanjem obuhvaćeno približno 14,71 % sve djece u dobi od 3 do 6 godina koja žive u tim četirima proučavanim gradskim općinama prema posljednjem popisu stanovništva, a zamišljeno je kao populacijsko istraživanje javnih vrtića. No, istodobno bila je isključena populacija djece predškolske dobi iz privatnih vrtića, ali i ona djeca koja su zbrinuta kod kuće. Iako studija nije bila osmišljena tako da promatra uzroke KRD-a ispitane djece, sam dizajn ponudio je solidne okolnosti za analizu svih glavnih socijalno-ekonomskih i obrazovnih razina u obiteljima djece vrtićke dobi koja su, uz to, živjela u različitim urbanim, prigradskim ili ruralnim područjima Sarajeva. Te dvije varijable bile su ključne u određivanju iskustva sa zubnim karijesom na najobjektivniji način. S roditeljima pregledane djece nije se kontaktiralo izravno, nego posredstvom odgojiteljica. Iako je zabilježen određeni broj pregleda Youtubova promotivnog videa, ne može se preciznije reći koliko ga je roditelja doista pogledalo i zatim djelovalo tako da poboljša

garten teachers and officials afterwards in order for them to start creating proper anticariogenic diet and oral hygiene environments in these public preschool institutions. Establishment of these environments within kindergartens should be a final long-term objective. It is known that this could pose problems for decision makers who often have extra financial burden in their minds in this matter only. However, they are not aware that investment in prevention of disease, especially in children, will and could only pay off drastically in the future (34, 35).

Conclusions

ECC was present in preschool kindergarten children in Sarajevo, with its high prevalence (67.71%), dmft-value (3.97) and severity (SiC-index 8.79). There was also a significant lack of dental healthcare to examined children mostly related to lack of visiting dental offices by children's parents (CI=10.55%, RI=10.80%, TI=12.98%). Parental role in preserving and improving of their children oral health should be systematically and profoundly improved. Kindergarten officials and stuff should recognize the importance of establishing environments for anticariogenic diet menus and oral hygiene maintenance within their institutions.

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Conflict of interest

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svoje prethodno navedene roditeljske zadatke. Na kraju, odgajateljima u vrtićima podijeljen je tiskani promidžbeni materijal sa svrhom da ga proslijede svim ostalim zaposlenicima u svojoj ustanovi. No, ostalo je nepoznato je li materijal proučen i nakon toga uručen svim odgajateljima i službenicima u vrtiću kako bi se u tim javnim predškolskim ustanovama počelo stvarati odgovarajuće antikariogeno okruženje kad je riječ o prehrani i oralnoj higijeni. Uspostava takvih okruženja u dječjim vrtićima trebala bi biti konačni dugoročni cilj. Poznato je da bi to mogao biti problem donositeljima odluka koji često imaju u vidu samo dodatni financijski teret. No, nisu svjesni da će se ulaganje u prevenciju bolesti, posebice kad je riječ o djeci, tek u budućnosti itekako isplatiti (34, 35).

Zaključci

KRD je prisutan kod djece u predškolskim vrtićima u Sarajevu – prevalencija je visoka i iznosi 67,71 %, kep-vrijednost je bila 3,97, a težina (SiC-indeks) 8,79. Uočen je i znatan nedostatak dentalne zdravstvene zaštite kod pregledane djece, a uglavnom je povezan s neodlaskom roditelja i njihove djece u stomatološke ordinacije (CI = 10,55 %, RI = 10,80 %, TI = 12,98 %). Zadaću roditelja u očuvanju i poboljšanju oralnoga zdravlja njihove djece potrebno je sustavno i temeljito unaprjeđivati. Službenici u vrtićima i ostali trebali bi shvatiti važnost uspostavljanja okruženja za antikariogene dijetalne jelovnike i održavanje oralne higijene u svojim ustanovama.

Zahvala

Ovo studijsko istraživanje provedeno je zahvaljujući pomoći kliničkoga osoblja Klinike za preventivnu i dječju stomatologiju Stomatološkog fakulteta sa Stomatološkim kliničkim centrom Sveučilišta u Sarajevu.

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Sukob interesa

Autori nisu bili u sukobu interesa.

Doprinos autora: Svaki autor zadovoljio je uvjete autorstva. Svi su podjednako pridonijeli konceptu i dizajnu studije, prikupljanju podataka, analizi i interpretaciji podataka, pretraživanju literature i pisanju teksta. Svi su također kritički revidirali tekst zbog važnoga intelektualnog sadržaja te pročitali tekst i pristali na njegovu objavljenu verziju.

Sažetak

Uvod: Prva pojava zubnog karijesa događa se u mliječnoj denticiji male i predškolske djece i to u obliku karijesa ranog djetinjstva (KRD). U današnjem užurbanom i opterećenom roditeljstvu, osobe i institucije koje čuvaju djecu postale su još važnije, ne samo zato što oblikuju opće ponašanje i karakter djeteta, nego i zato što održavaju njegovo opće i oralno zdravlje. **Cilj:** Željela se procijeniti prisutnost i težina KRD-a kod djece koja su pohađala javne vrtiće u Sarajevu te roditeljima i odgajateljima ponuditi osnovne informacije o održavanju i poboljšanju oralnoga zdravlja njihove djece. **Metode:** Istraživanjem su bila obuhvaćena 1722 djeteta predškolske dobi od 3 do 6 godina koja su pohađala vrtiće u sklopu javnih vrtićkih ustanova u Sarajevu zajedno sa svojim roditeljima i odgajateljima. Članovi stomatološkog tima postupno su posjećivali sve vrtiće u četirima gradskim općinama i pregledali djecu prema Priručniku za pregled oralnoga zdravlja Svjetske zdravstvene organizacije. Tijekom tih posjeta također su roditeljima i odgajateljima podijeljeni materijali za promicanje oralnoga zdravlja. **Rezultati:** KRD je pronađen kod djece u sarajevskim predškolskim ustanovama – prevalencija je bila visoka, čak 67,71%, kep-vrijednost iznosila je 3,97, a težina je imala SiC indeks od 8,79. Kod pregledane djece uočen je i znatan nedostatak dentalne zdravstvene zaštite, a uglavnom je bio povezan s neodlaskom roditelja s djecom u stomatološke ordinacije (CI = 10,55 %, RI = 10,80 %, TI = 12,98 %). **Zaključak:** Skrb roditelja za očuvanje i poboljšanje oralnoga zdravlja njihove djece potrebno je sustavno i temeljito unaprjeđivati. Službenici i osoblje vrtića trebali bi u svojim ustanovama prepoznati važnost antikariogenih dijetetskih jelovnika i održavanja oralne higijene.

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