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Razvojni defekti cakline kod djece s intelektualnim teškoćama

Developmental Defects of Enamel in Children with Intellectual Disability

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Sažetak

Svrha: Istražiti frekvenciju razvojnih defekata cakline (RDC) kod djece s intelektualnim teškoćama. **Ispitanici i postupci:** U istraživanju su sudjelovala djeca u dobi od 5 do 18 godina (72 djeteta s intelektualnim teškoćama i 72 kontrolna ispitanika). Ispitivala se pojavnost razvojnih defekata cakline na svim zubima koristeći se modificiranim indeksom razvojnih defekata cakline. **Rezultati:** Od 72 djeteta s intelektualnim teškoćama u ovom istraživanju, njih 20 (27,78 %) imalo je razvojne defekte cakline, za razliku od 8 djece (11,11 %) u kontrolnoj skupini, što je bilo statistički značajno ($p = 0,021$). Većina djece u objema skupinama imala je ograničena zatamnjenja. Dječaci i djevojčice u jednoj i drugoj skupini češće su imali zahvaćene gornje zube od donjih, a asimetrična ograničena zatamnjenja bila su češća od istovrsnih simetričnih defekata. Djeci u objema skupinama većinom su bili zatamnjeni gornji sjekutići. **Zaključak:** Djeca s intelektualnim teškoćama češće imaju razvojne caklinske defekte od kontrolnih ispitanika. Caklinski defekti povećavaju rizik od nastanka karijesa, a slabija mehanička svojstva cakline utječu na neuspjeh konzervativne terapije.

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Ključne riječi

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Uvod

Zubni zametak u razvoju vrlo je osjetljiv na različite lokalne traumatske i sistemske poremećaje koji se mogu manifestirati na mlječnim i trajnim zubima u obliku razvojnih defekata cakline (RDC). RDC se može podijeliti na caklinske hipoplazije i caklinska zatamnjenja (1). Izgled i stupanj caklinskih defekata ovisi o intenzitetu, trajanju i fazi razvoja u kojoj je poremećaj djelovao (1, 2, 3). Caklinska hipoplazija nastaje na zubu zbog poremećaja tijekom sekretorne faze amelogeneze (3). Caklinska zatamnjenja pojavljuju se zbog ozljeda tijekom kasnijih stadija formiranja cakline, kalcifikacije i maturacije (2, 5).

U formiranju cakline izmjenjuju se ritmička stanična aktivnost i faza mirovanja. Selektivna zahvaćenost samo onih ameloblasta aktivnih u vrijeme djelovanja poremećaja rezultira varijabilnostima u razvoju defekata. Neki zahvaćeni ameloblasti umiru i prestaju proizvoditi caklinski matriks, a drugi nastavljaju izlučivati normalnu caklinu preko defektnih područja (6).

Sistemske čimbenici povezani s razvojnim defektima cakline su sljedeći: prijevremeno rođenje, niska porođajna težina, terapije s tetraciklinom i talidomidom, prekomjerno uzimanje fluorida, intrauterina malnutricija, nedostatak vita-

Introduction

The tooth germ is very sensitive to various local traumatic and systemic disturbances during its development which may be manifested on deciduous and permanent teeth as developmental defects of enamel (DDE). The DDE can be classified as enamel hypoplasia and enamel opacity (1). The presentation and the enamel defects severity are dependent on the intensity and duration of the insult as well as on the stage of development during which the insult occurs (1, 2, 3). Enamel hypoplasia may develop on the tooth due to disturbances during secretory stage of amelogenesis (3). Injuries during later stages of enamel formation, calcification and maturation, may result in enamel opacities (2, 5).

Enamel formation involves a rhythmic sequence of cellular activity and resting phases. Variability in the development of the defects is caused by selective involvement of only those ameloblasts that had been active at the time of disturbance. Some of the affected ameloblasts die and stop secreting enamel matrix, while other cells continue to secrete normal enamel over the defective areas (6).

Systemic factors associated with developmental defects of enamel include premature birth, low birth weight, ingestion of tetracycline and thalidomides, excessive fluoride intake, in-

mina D, nedovoljno izlaganje Sunčevu svjetlu, hiperbilirubinemija, tireoidni i paratireoidni poremećaji, majčin dijabetes, urođene greške metabolizma, celijakija, bolesti jetara, zarazne bolesti i genetski poremećaji poput *amelogenesis imperfecta* i tuberozne skleroze (1, 2, 3).

Teško je identificirati etiološke čimbenike razvojnih caklinskih defekata jer se roditelji ne mogu sjetiti svih podataka o bolestima tijekom prvih godina djetetova života (7). Caklinska hipoplazija češća je kod djece s cerebralnom paralizom, intelektualnim teškoćama ili slušnim oštećenjima (8), što sugerira da neki sistemski poremećaji koji utječu na neurološki razvoj mogu utjecati i na razvoj zubnog zametka (4). Jedanput oštećena caklina ne može se oporaviti, pa zato otkriva podatke o vremenu i prirodi oštećenja drugih struktura nastalih od ektoderma, kao što je mozak (1).

Etiološki čimbenici intelektualnih teškoća su genetski faktori, infektivni agensi (citomegalovirus, virus rubeole, *Trichomonas*), zatim perinatalni (periventrikularna krvarenja u slučaju ekstremne preternosti, hipoksija, u slučaju prijevremenog porođaja, kongenitalne hipotireoze) ili postnatalni (meningitis, neurodegenerativni poremećaji, traumatske ozljede mozga) te otrovne tvari (izloženost alkoholu ili olovu) (9, 10).

Mineralizacija cakline prvih trajnih kutnjaka počinje u vrijeme rođenja djeteta (11). Prijevremeno rođenje, koje je jedan od mogućih uzroka i intelektualnih teškoća, često je povezano s medicinskim komplikacijama tijekom porođaja i nezrelim tjelesnim funkcijama djeteta, a oboje povećava opasnost od nastanka hipoksije (10, 11). Nedostatak kisika i kalcija utječu na normalnu funkciju ameloblasta te su važan čimbenik u nastanku RDC-a (4). Kod 75 posto prijevremeno rođene djece pojavljuje se neonatalna hipokalcijemija. Djeca tijekom posljednjeg tromjesečja trudnoće nisu nakupila dovoljno kalcija i fosfora (7), a majčino mlijeko sadržava premalo tih elemenata za prerano rođenu djecu (2). Naslanjanje tubusa na gornju čeljust orotrahealno intubirane ili mehanički ventilirane djece u perinatalnom i postnatalnom razdoblju, također uzrokuje RDC na gornjim zubima (11).

Cilj našeg presječnog istraživanja jest utvrditi frekvenciju i distribuciju razvojnih defekata cakline kod djece s intelektualnim teškoćama.

Ispitanici i postupci

Istraživanje je trajalo dvije godine (2012. i 2013.). Odobrilo ga je Etičko povjerenstvo Stomatološkog fakulteta, a skrbnici su potpisali informirani pristanak za sudjelovanje djece u istraživanju. Istraživanje je provedeno na odgovarajućem uzorku djece iz *Kuća za djecu s tjelesnim i mentalnim oštećenjima*. Kontrolnu skupinu činio je pak odgovarajući uzorak iz domova za zbrinjavanje djece s neodgovarajućom roditeljskom skrbi (*Sv. Franjo, Kuća ljubavi, Trešnjevka i Emaus*), no bez intelektualnih teškoća. Djeca su smještena u navedene ustanove ovisno o tome imaju li dijagnosticirano intelektualno ili tjelesno oštećenje. Obje skupine sastojale su se od 72 djeteta u dobi od 5 do 18 godina. Bila su isključena djeca koja nisu iznikli svi prvi trajni kutnjaci ili su im izvađeni, ona

trauterine malnutrition, vitamin D deficiency; deprivation of sunlight, hyperbilirubinemia; thyroid and parathyroid disturbances; maternal diabetes; inborn errors of metabolism, coeliac disease, liver diseases, infectious diseases and genetic disorders such as *amelogenesis imperfecta* and tuberous sclerosis (1, 2, 3).

Parents are not able to recall all the illnesses during their child's first years of life, making it difficult to identify etiological factors behind DDE (7). Enamel hypoplasia is more common in children with cerebral palsy, intellectual disabilities or hearing defects (8), which suggests that certain systemic disruptions interfering with neurological development may also alter the development of tooth germ (4). Damaged enamel cannot recover from the injury, therefore it may give information on the timing and nature of insults potentially affecting other ectodermally derived structures, such as the brain (1).

The etiology of intellectual disability includes genetic factors, infectious agents (cytomegalovirus, rubella virus, *Trichomonas*), toxic substances (alcohol or lead exposure), perinatal factors (periventricular hemorrhage in extreme prematurity, hypoxia at preterm gestation, congenital hypothyroidism) or postnatal factors (meningitis, neurodegenerative disorders, traumatic brain injury) (9, 10).

The mineralization of enamel in the first permanent molar starts around the time of birth (11). Preterm birth, one of the possible causes of intellectual disabilities, is often associated with medical complications at birth and child's immature body functions, both of which may increase the risk of hypoxia (10, 11). Oxygen deficiency and calcium deficiency are important factors in the etiology of DDE considering the fact that both of them may affect normal function of the ameloblasts (4). Neonatal hypocalcaemia has been reported in 75% of infants born preterm. Children have not accumulated enough calcium and phosphorus during the last trimester of pregnancy (7) because breast milk contains too little calcium and phosphorus for preterm infants (2). Pressure from the tube on the maxilla during orotracheal intubation and mechanical ventilation during perinatal and postnatal period may also cause DDE on children's upper teeth (11).

The purpose of our cross-sectional study was to determine the frequency and distribution of DDE in children with intellectual disabilities.

Subjects and methods

The study was conducted in the period of two years (2012 and 2013). The Ethics Committee of the School of Dental Medicine approved the study and legal guardians gave informed consent for the children to participate. The study included a convenience sample of children selected from the 'Home for children with physical and mental disabilities'. The control group consisted of a convenience sample of children without intellectual disability, from the homes for children without adequate parental care (St. Francis House, The House of Love, Trešnjevka House and Emaus House). The children have been situated in the homes based on their diagnosis of physical or intellectual disorder. Both groups consisted of a total of 72 children aged 5 – 18 years. Children

koja nisu surađivala tijekom pregleda i ako su odbila sudjelovati u istraživanju. Zub se smatrao izniklim ako je izrasla najmanje jedna trećina zuba (12).

Svu djecu pregledala je jedna ispitivačica, specijalistica dječje stomatologije, u kućama u kojima žive. Sve površine zuba pregledane su vizualno pod umjetnim svjetlom, prema kriterijima Svjetske zdravstvene organizacije (13), a defektna caklina ispitana je sondom. Djeca s intelektualnim oštećenjem pregledana su u stomatološkoj ordinaciji njihove institucije. Zabilježeni su broj, boja, lokalizacija i vrsta caklinskih defekata prema modificiranom indeksu razvojnih defekata cakline koji preporučuje ispitivanje na vlažnim zubima očišćenima gazom, a ne bilježe se defekti manji od milimetra (14).

Hipoplazija cakline definirana je kao kvantitativni defekt cakline, a caklinska zatamnjenja kao kvalitativni. Zatamnjenja su definirana kao caklina normalne debljine, glatke površine i promijenjene translucencije (5). Ograničena zatamnjenja defekti su bijele, žute ili smeđe boje, okruglog ili ovalnog oblika, oštro ograničena od susjedne normalne cakline (2, 5). Difuzna zatamnjenja bijele su boje, nejasnih granica, u obliku linija i mrlja ili mogu konfluirati (7). Zatamnjenja se razlikuju od bijelih karijesnih inicijalnih lezija na temelju teksture, ograničenosti promjene i odnosa prema gingivi (15). Caklinska hipoplazija je translucetna ili opaktna caklina s jamicama ili žljebićima, odnosno caklina smanjene debljine s okruglim i glatkim granicama (5).

Deskripcija i obrada podataka obavljena je programskim paketom Medcalc Statistical Software version 14.12.0 (MedCalc Software bvba, Ostend, Belgija; <http://www.medcalc.org>; 2014). Test χ^2 korišten je za ispitivanje razlike u prevalenciji RDC-a kod djece s intelektualnim teškoćama i u kontrolnoj skupini. Za ispitivanje razlika kategorijskih varijabli među skupinama korišteni su test χ^2 i Fisherov egzaktni test. Stupanj značajnosti određen je kao $p < 0,05$

Rezultati

U istraživanju su sudjelovala 84 dječaka (58,33 %) i 60 djevojčica (41,67 %) u dobi od 5 do 18 godina. U ispitivanoj skupini bilo je 26 djevojčica (36,11 %) i 46 dječaka (63,89 %), a u kontrolnoj 34 djevojčice (47,22 %) i 38 dječaka (52,78 %). Razdioba djece prema spolu u istraživanoj i kontrolnoj skupini statistički se ne razlikuje ($\chi^2 = 1,400$; $df = 1$; $p = 0,237$).

Djeca s intelektualnim teškoćama u prosjeku imaju 12,44 godine ($\pm 3,65$), a ispitanici u kontrolnoj skupini 12,83 ($\pm 3,40$). Djeca u ispitivanoj i kontrolnoj skupini statistički se ne razlikuju prema dobi ($p = 0,509$).

Razvojne caklinske defekte na trajnim zubima imalo je 28 djece (19,44 %), odnosno 17 dječaka (60,71 %) i 11 djevojčica (39,29 %). Razlika u zastupljenosti RDC-a među spo-

whose molars have not erupted or were extracted were excluded from the study, as well as non-cooperative children and children who were not willing to participate in the study. The tooth was considered as erupted if one - third of the crown was present (12).

All children were examined by one examiner, a pediatric dentist, in the institution where the children live. Tooth surfaces were examined visually, under artificial light, according to the World Health Organization criteria (13) and the teeth were tactilely explored with a probe. Children with intellectual disabilities were examined in the dental clinic of their institution. Number, color, localization and type of enamel defects were recorded using the modified Developmental defects of enamel (mDDE) index. The teeth were examined in wet condition but debris was cleaned with gauze, as recommended by mDDE index, and defects less than 1 mm were not recorded (14).

Enamel hypoplasia was defined as a quantitative enamel defect whereas enamel opacities were defined as qualitative defects. Opacities were characterized as enamel of normal thickness, altered translucency and smooth borders (5). Demarcated opacities have a distinct boundary with the adjacent normal enamel and can be white, yellow, or brown in color, and these defects are round to oval in shape (2, 5). Diffuse opacities are white defects that have no clearly defined margin with the adjacent enamel and can have a linear, patchy, or confluent distribution (7). Opacities were differentiated from white spot carious lesions based on texture, demarcation and relationship to gingival margin (15). Enamel hypoplasia presents as translucent or opaque enamel with pits or grooves or reduced enamel thickness with rounded and smooth borders (5).

Data description and statistical analyses were performed using the package Medcalc Statistical Software version 14.12.0 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2014). The chi - square test was used in order to compare the prevalence of DDEs in the intellectual disabilities group with that observed in the control group. The chi - square test or the Fisher exact test were used to assess differences in categorical variables between groups. The level of significance was set at $p < 0.05$.

Results

The study included 84 (58.33%) boys and 60 (41.67%) girls aged 5 - 18 years. There were 26 (36.11%) girls and 46 (63.89%) boys with intellectual disabilities while there were 34 (47.22%) girls and 38 (52.78%) boys in the control group. There were no gender related differences between the study group and the control group ($X^2 = 1.400$, $df = 1$, $p = 0.237$).

The mean age at examination was 12.44 (± 3.65) years for children with intellectual disabilities and 12.83 (± 3.40) years for children in the control group. No differences between the mean age in the study group and the control group were observed ($p = 0.509$).

Developmental defects of enamel were observed on permanent teeth of 28 (19.44%) children, 17 (60.71%) boys

lovima nije bila statistički značajna ($\chi^2 = 0,005$; $df = 1$; $p = 0,943$). U ispitivanoj skupini razvojne defekte cakline imalo je 20 djece (27,78 %), a u kontrolnoj 8 (11,11 %). U ispitivanoj skupini razvojne caklinske defekte imalo je 12 dječaka (60 %) i 8 djevojčica (40 %). U kontrolnoj skupini RDC je imalo ima 5 dječaka (62,5 %) i 3 djevojčice (3,75 %). Razlika u zastupljenosti razvojnih defekata cakline među spolovima nije bila statistički značajna ni kod djece s intelektualnim teškoćama ($\chi^2 = 0,128$; $df = 1$; $p = 0,720$), ni u kontrolnoj skupini (Fisherov egzaktni test; $p = 0,714$).

Djeca s intelektualnim teškoćama češće se pojavljuju razvojni defekti cakline od kontrolnih ispitanika, što je bilo statistički značajno ($\chi^2 = 5,365$; $df = 1$; $p = 0,021$).

Ograničena caklinska zatamnjenja najčešći su oblik razvojnih defekata cakline. Pojedinačna caklinska ograničena zatamnjenja ima 19 djece s intelektualnim teškoćama (26,39 %) i sva djeca koja imaju razvojne caklinske defekte u kontrolnoj skupini, a kombinaciju caklinskih zatamnjenja i hipoplazije ima jedno dijete (1,39 %) u ispitivanoj skupini. Difuzna zatamnjenja uočena su kod jednog djeteta (1,39 %) iz kontrolne skupine.

Tablica 1. pokazuje da prevladavaju bijela zatamnjenja koja su zabilježena kod većine djece – kod njih 23 (82,14 %) s caklinskim defektima. Ni jedno dijete nije imalo istodobno i bijela i smeđa zatamnjenja. Skupine djece nisu se značajno razlikovale prema boji zatamnjenja (Fisherov egzaktni test; $p = 1,000$).

Tablica 1. pokazuje također da su asimetrični ograničeni caklinski defekti češći od simetričnih u objema skupinama i čine 71,43 posto svih caklinskih defekata. Razlika između skupina djece nije bila statistički značajna (Fisherov egzaktni test; $p = 0,063$).

I kod djece s intelektualnim teškoćama i u kontrolnoj skupini češće su zahvaćeni gornji od donjih zuba. Donji i

and 11 (39.29%) girls. Gender difference in the prevalence of DDE was not statistically significant ($X^2 = 0.005$, $df = 1$, $p = 0.943$). In the study group developmental defects of enamel were observed in 20 (27.78%) children. In the control group 8 (11.11%) children had DDE. In the study group developmental defects of enamel were observed in 12 (60%) boys and 8 (40%) girls. In the control group, DDE were observed in 5 (62.5%) boys and 3 (3.75%) girls. Gender difference in the prevalence of developmental defects of enamel was not statistically significant, neither in children with intellectual disabilities ($X^2 = 0.128$, $df = 1$, $p = 0.720$), nor in the control group (Fisher's exact test, $p = 0.714$).

Children with intellectual disabilities had more developmental defects of enamel than children in the control group, which was considered statistically significant ($X^2 = 5.365$, $df = 1$, $p = 0.021$).

The most common types of developmental defects of enamel were demarcated enamel opacities. Isolated demarcated opacities were noticed in 19 (26.39%) children with intellectual disabilities and in all the children with developmental enamel defects in the control group, while the combination of enamel hypoplasia and opacities was observed in one (1.39%) child in the study group. Diffuse opacities were observed in one (1.39%) child in the control group.

Table 1 shows that the majority of children, 23 (82.14%) children, had white opacities. No child had both white and brown opacities. No statistical significance was found between groups regarding the color of opacities (Fisher's exact test, $p = 1.000$).

Table 1 shows that asymmetric demarcated enamel defects were more common than symmetric demarcated defects in both groups and amount to 71.43% of all enamel defects. The difference between the groups was not considered significant (Fisher's exact test, $p = 0.063$).

Tablica 1. Karakteristike defekata cakline između skupina

Table 1 The characteristics of dental defects of enamel between groups

Značajke opaciteta • The characteristics of opacities	Djeca s intelektualnim teškoćama koja imaju RDC (broj/postotak) • Children with intellectual disabilities who have DDE (number/percentage)	Djeca u kontrolnoj skupini koja imaju RDC (broj/postotak) • Children in the control group who have DDE (number/percentage)
Smeđi opaciteti • Brown opacities	4 (20%)	1 (12.5%)
Bijeli opaciteti • White opacities	16 (80%)	7 (87.5%)
Asimetrični opaciteti • Asymmetrical opacities	12 (60%)	8 (100%)
Simetrični opaciteti • Symmetrical opacities	8 (40%)	0 (0)

gornji zubi istodobno su bili zahvaćeni samo kod djece s intelektualnim teškoćama. Gornji zubi bili su zahvaćeni kod 10 djece s intelektualnim teškoćama (50 %), a gornji i donji zubi bili su zahvaćeni kod 3 djeteta (15 %). U kontrolnoj skupini šestero djece (75 %) imalo je zatamnjenja samo na gornjim zubima. Razlika između skupine djece s obzirom na lokalizaciju u čeljusti, nije bila statistički značajna (Fisherov egzaktni test, $p = 0,583$).

Najviše zatamnjenja kod djece s intelektualnim oštećenjem bilo je na gornjem lijevom središnjem sjekutiću – kod njih 7 (35 %). Petero djece (25%) imalo je RDC na donjem

Both children with intellectual disabilities and healthy children were more likely to have maxillary teeth affected than the mandibular teeth. Lower and upper teeth were affected at the same time only in children with intellectual disabilities. The upper teeth were affected in 10 (50%) of the children with intellectual disabilities, and the upper and lower teeth were affected in 3 (15%) children. In the control group, 6 (75%) children had opacities only on the upper teeth. The difference between the groups with regard to the localization of DDE was not statistically significant (Fisher's exact test, $p = 0.583$).

desnom prvom trajnom kutnjaku, a četvero (20 %) na gornjem desnom središnjem sjekutiću. Najviše zatamnjenja u kontrolnoj grupi bilo je na gornjem desnom središnjem sjekutiću – kod dvoje djece (25 %).

U ispitivanoj skupini 8 djece (40 %) imalo je jedan zub s razvojnim defektima cakline, 7 (35 %) je imalo dva zuba zahvaćena RDC-om, zatim 4 (20 %) tri zuba, a jedno dijete (5 %) 9 zuba. U kontrolnoj skupini najviše je djece – njih 7 (87,5 %) bilo sa zahvaćenim samo jednim zubom, a jedno dijete (12,5 %) sa zahvaćenim 4 zuba. Djeca s intelektualnim teškoćama u prosjeku su imala 2,15 (\pm 1,79) zuba zahvaćena RDC-om (medijan 2), a djeca u kontrolnoj skupini 1,38 (\pm 1,06) zuba (medijan 1).

U obje se skupine većina caklinskih zatamnjenja nalazila na bukalnim plohama. Kod 21 djeteta (75 %) sa zatamnjenjima, defekti su zabilježeni na bukalnim površinama zuba. U ispitivanoj skupini je 15 djece (7,5 %) imalo RDC na bukalnoj plohi, jedno dijete (5 %) na palatinalnoj plohi i 3 djeteta na (15 %) okluzalnoj plohi, a na bukalnoj i okluzalnoj plohi jedno dijete (5 %). U kontrolnoj skupini šestoro djece (75%) imalo je RDC samo na bukalnoj plohi, jedno dijete (12,5 %) na palatinalnoj plohi, jedno (12,5 %) na bukalnoj i palatinalnoj plohi, te jedno (12,5 %) na okluzalnoj i palatinalnoj plohi.

Rasprava

Prevalencija razvojnih caklinskih defekata na trajnim zubima varira od 2 do 63,1 posto, a u našem istraživanju RDC je imalo 27,78 posto djece s intelektualnim teškoćama i 11,11 posto zdrave djece. Lin i suradnici pronašli su defekte cakline na zubima 32,6 posto djece s cerebralnom paralizom (2). Jindal i njegovi kolege izvijestili su o 40,9 posto djece s intelektualnim teškoćama koja imaju RDC (6).

Hipoplazija cakline pojavila se u 25,9 posto slučajeva u istraživanju koje su proveli Lin i suradnici i bila je je najčešći caklinski defekt, a opaciteti su bili prisutni u samo 3,7 posto slučajeva (2). Za razliku od navedenoga istraživanja, u našem su pojedinačni opaciteti bili najčešći oblik caklinskih defekata kod djece s intelektualnim teškoćama. Slično je bilo i u istraživanju Martineza i suradnika koji ističu da 37 posto djece s intelektualnim teškoćama ima RDC (1).

Martinez i suradnici također su izvijestili da su najčešće zahvaćeni zubi gornji središnji sjekutići i da nije bilo razlike među spolovima, kao ni u našem istraživanju (1). Lin i suradnici većinu defekata pronašli su na prednjim zubima i prvim trajnim kutnjacima (2). Jindal i njegov tim također su uočili da su najčešće zahvaćeni bili sjekutići (6).

U našem istraživanju 60 posto djece s intelektualnim oštećenjem imalo je asimetrične defekte, a Lin i suradnici izvijestili su da su u njihovu istraživanju češći bili simetrični defekti (2).

Lin i suradnici napominju da je prevalencija RDC-a veća na gornjim nego na donjim zubima, kao i u našem istraživa-

The majority of opacities in children with intellectual disabilities were on the upper left central incisor, in 7 children (35%). Five children (25%) had DDE on the lower right first permanent molar and four children (20%) had DDE on the upper right central incisor. Most of the opacities in the control group were located on the upper right central incisor, in two children (25%).

In the study group, 8 (40%) children had one tooth with developmental defects of enamel, 7 (35%) children had two teeth affected with DDE, 4 (20%) children had three affected teeth and one child (5%) had 9 affected teeth. In the control group, it was found that most children, 7 (87.5%) children had one affected tooth, and one (12.5%) child had 4 affected teeth. The mean number of affected teeth was 2.15 (\pm 1.79) for children with intellectual disabilities (median 2) and 1.38 (\pm 1.06) for the children in the control group (median 1).

Most enamel opacities were located on the buccal surfaces, in both groups. In 21 (75%) children with defects, opacities were found on the buccal tooth surface. In the study group, 15 (7.5%) children had DDE on the buccal surface, one child (5%) had DDE on the palatal surface, 3 (15%) children had DDE on the occlusal surface and one (5%) child had DDE on the buccal and occlusal surface. In the control group, 6 (75%) children had DDE only on the buccal surface, one (12.5%) child had DDE on the palatal surface, one (12.5%) child had DDE on the palatal and buccal surface, and one (12.5%) child had DDE on the buccal and occlusal surface.

Discussion

The prevalence of developmental defects of enamel in the permanent dentition was reported to be in the range of 2 – 63% while our study found that 27.78% of the children with intellectual disabilities and 11.11% of healthy children had some type of DDE. Lin et al. found enamel defects in 32.6% of children with cerebral palsy. Jindal et al. found that the DDE prevalence among children with intellectual disabilities was 40.9% (6).

Enamel hypoplasia was the most frequent type of enamel defect found in the study conducted by Lin et al., 25.9%, while the prevalence of enamel opacities was very low, 3.7% (2). On the other hand, the isolated opacities were found to be the most frequent type of enamel defect in our study of intellectual disabled children. These results are similar to the study of Martinez et al. who reported that 37 % of intellectually disabled children had some type of DDE (1).

Our results have shown no difference in gender distribution among children with DDE, as in the study by Martinez et al., who also reported that maxillary central incisors were the most frequently affected teeth (1). Lin et al. reported that most enamel defects were located on the anterior teeth and on the first permanent molars (2). Jindal et al. also found that the incisors were the most commonly affected teeth (6).

Lin et al. reported that most enamel defects were distributed symmetrically (2), in contrast to data presented in our research where asymmetrically distributed defects were found in 60% of children with intellectual disabilities.

nju. Defekti su najčešći na okluzalnim i bukalnim površinama zuba (2), što smo i mi uočili.

Najpogodnije vrijeme za ispitivanje prevalencije RDC-a jest odmah poslije nicanja zuba jer se nalaz može izgubiti zbog zubne traume, atricije ili karijesa (16), što su ograničenja našeg istraživanja, ali intaktnu trajnu denticiju ima 45,83 posto, odnosno 33 djeteta u ispitivanoj skupini, a u kontrolnoj skupini intaktnu trajnu denticiju ima 33,33 posto, to jest 24 ispitanika. Još jedno ograničenje našeg istraživanja jest maleni uzorak i nemogućnost istraživanja etiologije RDC-a jer su djeca u našem istraživanju bila smještena u institucijama.

Niska pojavnost difuznih zatamnjenja očekivana je s obzirom na to da su takvi defekti karakteristični za fluorozu, a voda iz vodovoda u Hrvatskoj ima nisku koncentraciju fluora (17).

Trauma i infekcija mliječnih sjekutića također mogu uzrokovati zatamnjenje na trajnim sjekutićima (18, 19).

Izolirana caklinska zatamnjenja obično ne povećavaju rizik od nastanka karijesa, ali značajan su estetski problem. Caklinske hipoplazije, osim što su estetski problemi, područja su gdje se nakuplja bakterijski plak pa čine zube podložnijima karijesu. Povećano trošenje i osjetljivost zuba rezultiraju boli i neugodom kod djeteta (3,20). Hipoplazija cakline u mliječnoj denticiji upućuje na moguću pojavu sličnih poremećaja u trajnoj denticiji. Žutosmeđi defekti, prema Knoopu, manje su tvrdi i porozniji su od bijelih defekata i normalne cakline (21). Ustanovljene su promjene u inervaciji i vaskularizaciji pulpe hipomineraliziranih prvih trajnih kutnjaka te nakupljanje imunskih stanica, što upućuje na upalni odgovor pulpe (22). Porozni ekspanzirani potpovršinski sloj cakline i dentina olakšava prodor bakterija u dentin te potiče kroničnu upalu pulpe i otežava davanje lokalne anestezije, čime terapiju čine bolnom, osobito na zubima s nezavršenim rastom korijena i velikim pulpama (7). Čak i intaktna caklina hipomineraliziranih kutnjaka može biti osjetljiva na zrak, hladnoću i toplinu, pa djeca često izbjegavaju četkanje osjetljivih kutnjaka (21, 23). Djeci s intelektualnim teškoćama teško je samostalno održavati dobru oralnu higijenu. Naime, imaju smanjenu sposobnost četkanja zuba i nemaju za to dovoljno strpljenja zbog motornih, senzornih i intelektualnih teškoća (4). Djeca koja su kod kuće, a ne u instituciji, mogu biti podložnija zubnom karijesu ako ih roditelji tješe karijesogenim grickalicama (24). Programi promocije oralnoga zdravlja trebaju se usmjeriti na centre i škole koji se brinu o djeci s intelektualnim teškoćama, što posebno uključuje redovito korištenje oralnozdravstvenih usluga, edukaciju o oralnoj higijeni i prehrambeno savjetovanje (24).

Zaključak

Naše istraživanje pokazalo je veću zastupljenost razvojnih defekata cakline kod djece s intelektualnim teškoćama nego li kod one zdrave. Potrebna su daljnja istraživanja prevalencije RDC-a u općoj populaciji i u populaciji djece s intelektu-

lin et al. observed a slightly higher prevalence of DDE in the upper teeth than in the lower teeth, which is in agreement with our study. The authors reported that most defects were on buccal and occlusal surfaces (2), as it has been shown in our research.

Low prevalence of diffuse opacities is expected considering that the diffuse opacities are typical of fluorosis (15) and the tap water in Croatia has low fluoride concentration value (15). Trauma and infection of deciduous incisors can also cause opacities in the permanent incisors (18, 19).

Limitation of our study is the fact that the optimal time to evaluate DDE is soon after tooth eruption due to the lack of stability of these findings, which can be lost by dental trauma, attrition or caries (16). However, 33 (45.83%) children in the study group had intact permanent dentition, as well as 24 (33.33%) children in the control group. We could not identify the possible etiological factors of DDE since children in our sample were located in the institution, which was another limitation of our study, as well as the small sample size.

Isolated enamel opacity does not usually lead to an increased risk for caries; however it may be a significant esthetic problem. Enamel hypoplasia is not only a cosmetic problem, but it could also be a retentive area which favors bacterial plaque accumulation and results in increased caries susceptibility. Increased wear and tooth sensitivity lead to pain and discomfort for the child (3, 20). Enamel hypoplasia may also be predictive of similar disturbances in the permanent dentition. Yellow - brown defects have lower Knoop hardness values and greater porosity than the white defects and normal enamel (21). Hypomineralized permanent first molars demonstrate changes in pulpal innervation and vascularity, and also show immune cell accumulation which is indicative of an inflammatory pulpal response (22). The porous exposed subsurface enamel and the dentine may favor bacterial penetration into the dentine resulting in chronic inflammation of the pulp, which makes the use of local analgesia less efficient thus making the treatment painful, especially when immature teeth with large pulps are involved (7). Even intact enamel of hypomineralized molars may be very sensitive to air, cold or warmth and children often avoid brushing the sensitive molars (21, 23). It is difficult for the children with intellectual disabilities to maintain good oral hygiene by themselves. They have impaired tooth - brushing ability and less patience due to their motor, sensor and learning disabilities (4). Children can be more susceptible to dental caries if they reside at home and their parents are comforting them with cariogenic snacks (24). Oral health promotion programs should be aimed at centers and schools for children with intellectual disabilities and should include the regular use of oral health services, oral hygiene education and dietary counseling (24).

Conclusion

This study showed higher prevalence of dental defects of enamel in children with intellectual disabilities than in healthy children. Further studies on DDE prevalence in the general population of Croatia are needed, as well as those

alnim teškoćama u Hrvatskoj, te longitudinalna istraživanja etiologije navedenih defekata. Djeca s RDC-om trebaju se identificirati jer gubitak zubnog tkiva i hipersenzitivnost povećavaju rizik od nastanka karijesa, a smanjena mehanička svojstva hipomineralizirane cakline uzrok su češćeg neuspjeha konzervativne terapije.

Sukob interesa

Nije bilo sukoba interesa.

among children with intellectual disabilities. We also need longitudinal surveys on etiological factors of these defects. Children with DDE should be identified because dental tissue loss and dental hypersensitivity increase caries risk, while reduced mechanical properties of hypomineralized enamel often result in restoration failures.

Conflict of interest

None declared.

Abstract

Objectives: To investigate the frequency of developmental defects of enamel (DDE) in children with intellectual disability. **Subjects and methods:** Children aged 5–18 years (72 children with intellectual disabilities and 72 controls) were included in the study. All the teeth were screened for developmental defects of enamel using the modified Developmental defects of enamel (mDDE) index. **Results:** Out of the 72 children with intellectual disabilities in this study, 20 (27.78%) presented dental defects of enamel, compared with 8 (11.11%) of those in the control group, which was considered statistically significant ($p = 0.021$). The majority of children in both groups had white demarcated opacities. Children in both groups were more likely to have maxillary teeth affected than the mandibular teeth and the asymmetrical demarcated enamel defects were more common than the symmetric ones. Majority of opacities in children in both groups were on the maxillary incisors. **Conclusions:** Children with intellectual disabilities have more developmental defects of enamel than children in the control group. Enamel defects increase caries risk and cause reduction in enamel mechanical properties leading to restoration failures.

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Key words

Intellectual Disability; Child; Dental Enamel

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