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Aetiological Factors of Molar Incisor Hypomineralization

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SUMMARY

Introduction Teeth hypomineralization that involves molars only, or molars and incisors is known as disease Molar Incisor Hypomineralization (MIH). Aetiology of MIH is not known, however, factors responsible for this disease are present in the first year of life. The aim of this research was to identify possible aetiological factors responsible for the occurrence of this disease.

Material and Methods The study included eight years old children from the municipality of Foca. Parents who gave their consent for the participation of children in the study completed a questionnaire in which they listed aetiological factors described in the literature to be responsible for the emergence of hypomineralization. Modified DDE index (Modified DDE Index for Use in Epidemiological Surveys) was used to estimate hypomineralization on all teeth; however, MIH changes were classified separately.

Results More than ninety different factors may be responsible for enamel defects. Possible aetiological factors listed in the literature are: premature birth, low weight of newborns, hypoxia, metabolic disorder of calcium and phosphate, fever, genetic factors, etc. Results did not confirm statistical significance for any of examined aetiological factors.

Conclusion In this study a retrospective analysis of data was performed. Etiological factors of MIH were identified but the most responsible for MIH were not determined.

Keywords: aetiological factors; incisors; hypomineralization; MIH; molars

INTRODUCTION

Abnormalities of tooth structure are caused by the action of various general or local factors on tooth germ. These factors usually act in the apposition, mineralization or maturation stage of enamel and dentin. They can affect all teeth tissues or some of them, individual tooth or entire dentition. If the disturbance occurs in early stages of development it affects the shape of teeth while in cases where the disorder occurs in the later stage the structure of dental tissues i.e. their mineralization is affected [1].

Hypomineralized teeth that are not the part of some other structural anomalies have been observed for long time in everyday practice. In some countries where health education is at very high level, it has been noticed that hypomineralized defects in enamel of the first permanent molars are more frequent than caries on occlusal surface of these teeth [2]. Hypomineralization is clinically characterized by enamel translucency (enamel opacity) and can be different in size, color and shape with or without atypical cavities on the crown of teeth. Histological analysis shows hypomineralized zone on affected teeth clearly separated from normal enamel [3]. Localized (limited) enamel turbidity represents idiopathic structural disorder often noticed on labial surface of central incisors,

cuspid tips of canines and first permanent molars. In 2003, Weerheijm [4] described clinical picture of idiopathic enamel hypomineralization and suggested the term Molar Incisor Hypomineralization (MIH) for this phenomenon. It is hypomineralization of systemic origin that affects one or more first permanent molars, often associated with changes in maxillary and mandibular incisors. The prevalence of this phenomenon varies between 2.61 to 25% as suggested by the literature [5-8].

Teeth affected by MIH are frequently sensitive to thermal, chemical and mechanical stimuli. Children with hypomineralized molars often avoid brushing their teeth due to painful sensations. This leads to accumulation of large amount of dental plaque that causes rapid progression of carious lesions and destruction of crowns and eventually teeth loss. In addition to causing discomfort to children and concern to parents, these changes on labial surface of incisors produce serious esthetic problem [9, 10]. It is not easy to place a restoration on MIH teeth, and the treatment requires ten times longer time than the treatment of carious teeth [11, 12].

Aetiology of molar and incisor hypomineralization is not known yet. Over ninety different factors may be responsible for enamel defects [3]. However, it is often not possible to identify specific factors responsible for

hypomineralization except in case when it is caused by fluoride.

Enamel changes specifically on molars and incisors indicate that MIH is caused by factors that occur in a certain period of time. These findings suggest systemic disturbance during the first year of life, or more precisely, during the period of crown mineralization of first permanent molars and incisors [13, 14].

Premature birth, low weight of newborns, hypoxia, metabolic disorder of calcium and phosphate as well as common diseases in early childhood accompanied with fever (otitis media, tonsillitis, urinary tract infections, pneumonia) are listed in the literature as possible aetiological factors of hypomineralized teeth [14, 15, 16]. Recent studies have shown that frequent use of antibiotics and vitamin D deficiency may have an impact on the occurrence of hypomineralization [17]. Vaccines administered to infants are also referred as possible etiologic factor; however, there is still no significant scientific evidence to confirm this suspicion [7, 12]. Genetic influence should not be ignored and excluded as possible aetiological factor. More reliable information about distribution and prevalence of MIH in different countries in Europe and worldwide could direct researchers to possible causes of this phenomenon.

The aim of this study was to evaluate possible aetiological factors responsible for the occurrence of MIH changes in teeth of children from Foca, Republika Srpska.

MATERIALS AND METHODS

The study included eight years old children from the municipality Foca. Parents were informed about the purpose of research and methodology that will be applied, after which they gave their written consent for children's participation in the study. A questionnaire that listed possible aetiological factors described in the literature as responsible for manifestation of hypomineralized changes was prepared for the research. Parents who signed their consent for the participation in the study completed the questionnaire. Dental mirror, probe and daylight were used for clinical examination. Probe was used only to remove dental plaque.

To assess the prevalence and severity of hypomineralization in first permanent molars and incisors as well as other developmental defects the modified DDE index (Modified DDE Index for Use in Epidemiological Surveys) was used [18]. All hypomineralized changes were identified while MIH changes were classified separately. The criteria used for the diagnosis of MIH are proposed by Weerheijm et al. [19]: limited enamel opacity, post-eruptive enamel breakdown, atypical restorations, extracted molars due to MIH and unerupted teeth.

Examinations were conducted by one researcher, previously trained and calibrated to estimate hypomineralization and other developmental enamel defects. Verification of researcher reliability (intra-examiner reliability) was performed on 10% of planned sample. Ten percent of respondents were examined twice with a minimum

interval of 4 hours between inspections and thus obtained Kappa value indicated examiner reliability (Kappa = 0.85). The study was approved by the Ethical Committee of the Medical Faculty in Foca. Data was analyzed by descriptive statistics using χ^2 test (SPSS 11.5, Chicago, IL, USA).

RESULTS

The study included 141 eight year olds, 50.4% were boys and 49.6% were girls. Out of the total number of children involved in the study, 18.4% had hypomineralized changes on teeth. In 5.6% of children hypomineralized changes were diagnosed only on incisors, in 6.4% on molars and incisors and in 6.4% of subjects only on molars. Changes that affect molars only or molars and incisors at the same time (MIH) were detected in 12.8% of patients.

The questionnaire provided data related to mothers' pregnancy period, infant development, and all factors that can act in the first year of child's life and mentioned in the literature as possible cause of MIH. Only questions answered by all mothers were considered.

Hypomineralized changes were more frequent in the group of boys (21.1%) compared to girls (15.7%). Data analysis did not show statistically significant difference ($\chi^2=0.687$, $p>0.05$). These changes were more common in children from the city (20.4%) compared to children from suburban municipalities (13.2%) but there was no statistically significant difference between these two groups ($\chi^2=0.965$, $p>0.05$).

When assessing the period of mothers' pregnancy it was found that only a small percentage of mothers (2.1%) suffered some illnesses. However, their children did not show hypomineralized changes. About 11% of mothers used fluoride tablets during pregnancy while a little more than 50% of them had completely restored teeth. Statistical analysis showed no significant difference between these children and those whose mothers neither used fluoride tablets ($\chi^2=0.027$, $p>0.05$) nor had restored teeth ($\chi^2=0.259$, $p>0.05$). In the group of children that were born by caesarean section, every third child had hypomineralized defects, however, χ^2 test revealed no significant difference compared to naturally born children ($\chi^2=1.969$, $p>0.05$).

According to the data related to the period immediately after childbirth it was noted that 6.4% of children were born prematurely, 9% of children spent some time in incubator after the birth while 6.4% of children had weight less than 2,500 g at birth. Every third child from these three groups had hypomineralized changes on permanent teeth. However, there was no significant difference compared to children who were born at term ($\chi^2=1.418$; $p>0.05$), or did not spend any time in the incubator after birth ($\chi^2=1.447$; $p>0.05$), or had normal body weight at birth ($\chi^2=1.418$; $p>0.05$).

Every third child that was not breastfed had hypomineralization. The lowest percentage of hypomineralized changes was in the group of children that were breastfed over twelve months. However, there was no significant difference between these two groups.

Drinking water as possible cause of the above mentioned changes showed that 8% of children were drinking bottled water but the greatest number of children drank water from municipal water supply. However, in regards to hypomineralization there was no significant difference between these two groups ($\chi^2=0.955$, $p>0.05$).

Low number of mothers (about 6%) reported frequent fevers (more than three times) in the first year of life. Only one child in this group had hypomineralized changes. Analysis of data showed no significant difference between these children and those who did not have frequent fevers ($\chi^2=0.436$, $p>0.05$).

The greatest number of children (96%) had regular childhood immunizations. There was no significant difference between these children and children that were not vaccinated ($\chi^2=0.008$, $p>0.05$). The analysis of the questionnaire revealed that 33% of children changed the place of residence in their first year of life, 15.2% of them had hypomineralized changes. No statistically significant difference was found compared to the group of children who did not change the place of residence ($\chi^2=0.471$, $p>0.05$).

About 60% of examined children were passive smokers; they were exposed to cigarette smoke in the first year of life. There was no significant difference between them and children who were not exposed to cigarette smoke in regards to hypomineralized changes of teeth ($\chi^2=0.871$, $p>0.05$).

DISCUSSION

It was found that MIH occurs as a result of changes that act in the first year of child's life [13, 14]. Data in this study was obtained from retrospective analysis. Prospective studies that collect data from birth until first permanent molars eruption would certainly provide better evidence. This kind of information is essential for better understanding of this disease [12].

Analysis of the results obtained in this study showed no statistically significant difference in the occurrence of hypomineralization in relation to gender and place of residence. Similar results were obtained in other studies [20, 21].

Nearly 50% of mothers did not have restored teeth during pregnancy. Although this did not affect the incidence of structural defects on teeth of their children it was noticed that high percentage of women was not aware of the importance of healthy and rehabilitated mouth on health in general, both mothers' and infants'.

According to the questionnaire, questions related to childbirth period revealed that more than 30% of children were born prematurely and immediately after birth spent some time in incubator. The same number of children had weight less than 2,500 g at birth. The current study did not confirm assumptions of other researchers who found hypoxia and low body weight as possible etiological factors for MIH [14, 15, 16]. Johnsen et al. [22] in their study of enamel defects found hypoxia and low weight as possible causes for structural irregularities of teeth. The Dutch pilot study, based on records of children with de-

velopmental enamel defects, showed that in 48% of cases there were problems related to childbirth [23].

In the group of children who were not breastfed every third child had molar incisor hypomineralization. Children who were breastfed had lower percentage of hypomineralized changes (5%). Low percentage of hypomineralized changes was found in the group of children who were breastfed over twelve months. Even though in the current study it was not confirmed statistically that breast milk affects development of dental tissues, mothers should be encouraged to breastfeed their children for at least six months due to its benefits on general health. Alaluusua et al. [24, 25] found an association between prolonged breastfeeding and hypomineralization of first permanent molars. They stated that environmental pollutant, such as dioxin or dioxin-like compounds ingested through breast milk lead to aforementioned changes.

Some studies found positive correlation between the use of certain antibiotics and the occurrence of molars and incisors hypomineralization [17, 26]. It is not easy to determine the mechanism of hypomineralization in the case of antibiotics. Since antibiotics are used to treat certain diseases, it is necessary to consider whether a disease or antibiotic caused enamel changes. This question was not answered by all mothers in the current study; therefore incomplete answers were not analyzed.

Possible etiological factors for teeth hypomineralization are frequent fevers and irregular vaccinations. None of these factors was confirmed in the current study even though some authors reported these causes [7, 14, 26].

Change of the place of residence is often referred in the literature as possible cause of hypomineralization. Data from the current study showed that 33% of children changed the place of residence in their first year of life and 15.2% of them had hypomineralized changes. Statistical analysis did not show significant difference between them and children who did not change the place of residence. Suckling et al. [27] in their study were not able to identify etiological factors responsible for the most of enamel defects. 60% of children in the present study were exposed to cigarette smoke. This study did not prove that smoking affects the occurrence of hypomineralized changes. However, it can be concluded that despite warnings about danger of active and passive smoking, a large number of parents do not care even though it is about their children's life.

CONCLUSION

In this as well as previous studies data was obtained mostly by retrospective analysis, long time after the occurrence of the event that could cause the disturbance in mineralization. It is not easy to determine etiological factors responsible for the emergence of hypomineralized changes in permanent teeth, but their identification would certainly help to solve this important problem in dentistry.

Successful solution for the problem of MIH is primarily implementation of preventive measures and health education of children. Promotion of oral health in community,

region and state is very important because it will improve overall living standard, level of culture, and most importantly increase awareness on health importance.

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Etiološki faktori odgovorni za nastanak hipomineralizacije zuba na sekutićima i kutnjacima

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KRATAK SADRŽAJ

Uvod Hipomineralizacija zuba koja zahvata samo kutnjake ili kutnjake i sekutiće istovremeno je oboljenje koje se u anglosaksonskoj literaturi naziva *molar incisor hypomineralisation (MIH)*. Etiologija MIH promena još nije dovoljno poznata, ali se zna da faktori odgovorni za ovo oboljenje deluju kod deteta u prvoj godini po rođenju. Cilj rada je bio da se ustanove mogući etiološki faktori koji su odgovorni za nastanak hipomineralizacije zuba na sekutićima i kutnjacima dece u regionu opštine Foča, u Republici Srpskoj.

Materijal i metode rada U istraživanje su uključena osmogodišnja deca koja žive na teritoriji opštine Foča. Roditelji dece su dali pristanak za njihovo učešće u istraživanju i popunili anketni upitnik gde su navedeni etiološki faktori koji su, prema podacima iz literature, odgovorni za nastanak hipomineralizovanih promena. Za procenu hipomineralizacije na svim zubima korišćen je modifikovani DDE indeks (*Modified DDE Index for Use in Epidemiological Surveys*), ali su MIH promene i posebno klasifikovane.

Rezultati Više od 90 različitih faktora može biti odgovorno za oštećenje gleđi. Kao mogući etiološki faktori u literaturi se navode: prevremeno rođenje deteta, mala telesna težina novorođenčadi, hipoksija, poremećaj metabolizma kalcijuma i fosfata, visoka temperatura, uticaj genetskih faktora itd. U ovoj studiji nije potvrđena statistička značajnost ni za jedan ispitivani etiološki faktor.

Zaključak U ovom istraživanju nalazi su dobijeni na osnovu retrospektivne analize podataka. Ustanovljeni su brojni etiološki faktori, ali je bilo teško izdvojiti najodgovornije za nastanak MIH.

Ključne reči: etiološki faktori; hipomineralizacija; kutnjaci; MIH; sekutići

UVOD

Nepravilnosti strukture zuba nastaju dejstvom opštih ili lokalnih faktora na klicu zuba. Ovi faktori obično deluju u fazi apozicije, mineralizacije ili maturacije gleđi i dentina. Mogu da zahvate sva zubna tkiva, neka od njih, pojedine zube ili celokupnu denticiju. U slučaju da do poremećaja dođe u ranijim fazama razvoja, promene se odražavaju na oblik zuba, dok u slučajevima kada poremećaj nastaje u kasnijim fazama, promene se odražavaju na strukturu zubnih tkiva, tj. njihovu mineralizaciju [1].

Hipomineralizovani zubi, koji nisu u sklopu neke druge strukturne anomalije, već odavno su privukli pažnju stomatologa u svakodnevnoj praksi. U pojedinim zemljama sveta gde su mere zdravstvene kulture na zavidnom nivou zapaženo je da su hipomineralizovana oštećenja gleđi na prvim stalnim kutnjacima češća od pojave karijesa na okluzalnim površinama istih zuba [2]. Hipomineralizacija se klinički manifestuje kao poremećaj u translucenciji gleđi (zamućenje gleđi) koje mogu biti različite veličine, boje i oblika, sa netipičnim kavitetom na krunici zuba ili bez njega. Histološki, hipomineralizovane zone na kvržicama zahvaćenih zuba jasno su ograničene od normalne gleđi [3]. Lokalizovana (ograničena) zamućenost gleđi je idiopatska strukturna nepravilnost, koja je često primetna na labijalnim površinama centralnih sekutića, vrhovima kvržica očnjaka i prvih stalnih kutnjaka. Tek 2003. godine Verhejm (*Weerheijm*) [4] je prvi uočio i opisao kliničku sliku idiopatske gleđne hipomineralizacije i za ovu pojavu predložio termin *Molar Incisor Hypomineralisation (MIH)*. Ona se definiše kao hipomineralizacija sistemskog porekla jednog ili više prvih stalnih kutnjaka koja je često udružena s promenama na maksilarnim i mandibularnim sekutićima. Podaci iz literature ukazuju na različitu prevalenciju ove pojave u svetu – od 2,61% do 25% [5-8].

Zubi koji su zahvaćeni MIH osetljivi su na dejstvo termičkih, hemijskih i mehaničkih nadražaja. Deca s hipomineralizovanim kutnjacima često izbegavaju da peru zube jer osećaju bolne senzacije. Tako nastaje veća količina dentalnog plaka, koja je praćena brзом progresijom karijesnih lezija, koje dovode do uništavanja krunice i krajnjeg gubitka zuba. Osim što deci izazivaju neprijatnost, a roditeljima zabrinutost, promene na labijalnim površinama sekutića mogu da stvore i ozbiljan estetski problem [9, 10]. Ni stomatolozima nije lako sanirati ovakve zube, jer je za terapiju zuba sa MIH promenama potrebno deset puta više vremena u odnosu na terapiju zuba koji su zahvaćenih samo karijesom [11, 12].

Etiologija MIH još nije dovoljno poznata. Više od 90 različitih faktora može biti odgovorno za oštećenje gleđi [3]. Ipak, u svakom pojedinačnom slučaju teško je utvrditi faktore, osim u slučaju fluorida.

Kombinacija promene gleđi na kutnjacima i sekutićima ukazuje na to da je kod MIH reč o specifičnim uticajima na formiranje gleđi koji deluju u određenom vremenskom intervalu. Ova otkrića ukazuju na sistemsku smetnju tokom prve godine života deteta ili, još preciznije, u periodu kada se krunice prvih stalnih kutnjaka i sekutića mineralizuju [13, 14].

Kao mogući etiološki faktori hipomineralizovanih zuba u literaturi se navode: prevremeno rođenje deteta, mala telesna težina novorođenčadi, hipoksija, poremećaj metabolizma kalcijuma i fosfata i česta oboljenja ranog detinjstva koja su praćena visokim temperaturama (*otitis media*, *tonsillitis*, urinarne infekcije, pneumonija) [14-16]. Skorašnja istraživanja pokazuju da česta primena antibiotika i nedostatak vitamina D mogu uticati na hipomineralizaciju zuba [17]. Vakcine koje su deca dobijala u ranom detinjstvu takođe se navode kao mogući etiološki faktor, ali još ne postoje značajni naučni dokazi koji bi tu sumnju i potvrdili [7, 12]. Ni genetski uticaj se ne bi smeo zanemariti kao

mogući etiološki faktor. Više pouzdanog saznanja o raspodeli i prevalenciji MIH u različitim zemljama Evrope i sveta moglo bi da usmeri istraživače i ukaže na moguće uzroke ove pojave.

Cilj rada je bio da se proceni uticaj mogućih etioloških faktora odgovornih za nastanak MIH promena na zubima dece iz regiona opštine Foča, u Republici Srpskoj.

MATERIJAL I METODE RADA

Studija je obuhvatila osmogodišnju decu koja žive na teritoriji opštine Foča. Pre početka pregleda roditelji su obavešteni o cilju istraživanja i metodologiji rada koja će se primeniti, nakon čega su dali pisanu saglasnost za učešće dece u studiji. Za istraživanje je pripremljena anketa gde su navedeni mogući etiološki faktori koji su, prema podacima iz literature, odgovorni za nastanak hipomineralizovanih promena. Roditelji koji su dali saglasnost popunili su anketni upitnik. Za preglede dece korišćena su stomatološka ogledala, sonde i uobičajena osvetljenja radnog mesta. Sonde su primenjivane samo po potrebi, i to za uklanjanje dentalnog plaka.

U istraživanju je korišćen modifikovani DDE indeks (*Modified DDE Index for Use in Epidemiological Surveys*), koji je namenjen za procenu rasprostranjenosti i težinu hipomineralizacije na prvim stalnim kutnjacima i sekutićima, ali i svih drugih razvojnih oštećenja gleđi [18]. Utvrđene su ukupne hipomineralizovane promene, ali su i posebno klasifikovane MIH promene. Za postavljanje dijagnoze MIH primenjeni su kriterijumi koje su predložili Verhejm (*Weerheijm*) i saradnici [19]: ograničena zamućenost gleđi, posteruptivni prekid gleđi, netipične restauracije, ekstrakcije kutnjaka zbog MIH i retencija zuba.

Ispitivanje je obavio jedan istraživač koji je prethodno obučan za procenu hipomineralizacije i ostalih razvojnih oštećenja gleđi. Provera pouzdanosti istraživača obavljena je na 10% ispitanika planiranog uzorka (10% ispitanika je dva puta pregledano s minimalnim intervalom od četiri sata između pregleda), čime je dobijena vrednost parametra κ (kapa), koja pokazuje pouzdanost ispitivača ($\kappa=0,85$). Izvođenje istraživanja odobrio je Etički komitet Medicinskog fakulteta u Foči. Od statističkih testova korišćen je χ^2 -test, a dobijeni podaci su obrađeni u programu SPSS 11.5.

REZULTATI

Istraživanjem je obuhvaćen 141 osmogodišnjak, među kojima je bilo 50,4% dečaka i 49,6% devojčica. Od ukupnog broja učenika uključenih u ispitivanje 18,4% imalo je hipomineralizovane promene na pregledanim zubima. Kod 5,6% dece hipomineralizovane promene su dijagnostikovane samo na sekutićima, kod 6,4% na kutnjacima i sekutićima istovremeno, a kod 6,4% ispitanika samo na kutnjacima. Međutim, promene koje zahvataju samo kutnjake ili kutnjake i sekutiće istovremeno opisane su kao oboljenje koje se naziva MIH. Tako je MIH na ovom području zabeležen kod 12,8% ispitanika.

Analizom anketnog upitnika dobijeni su podaci u vezi s periodom trudnoće majke, praćenjem razvoja odojčeta, tj. svim faktorima koji se u literaturi pominju kao mogući uzrok ovih pojava a deluju u prvoj godini života deteta. Razmatrana su samo ona pitanja na koja su odgovorile sve majke.

Hipomineralizovane promene su bile nešto češće kod dečaka (21,1%) nego kod devojčica (15,7%), ali razlika nije bila statistički značajna ($\chi^2=0,687$; $p>0,05$). Promene su takođe bile češće kod dece iz grada (20,4%) u odnosu na decu koja dolaze iz prigradskih opština (13,2%), ali ni ova razlika nije bila statistički značajna ($\chi^2=0,965$; $p>0,05$).

Kada je period trudnoće majke u pitanju, uočeno je da je samo mali procenat majki (2,1%) u trudnoći preležao neka oboljenja. Deca tih majki nisu imala hipomineralizovane promene. Oko 11% majki su tokom trudnoće pile tablete fluora, dok je malo više od 50% njih imalo potpuno sanirane zube. Statističkom analizom dokazano je da ne postoji značajna razlika u odnosu na decu čije majke nisu koristile tablete fluora ($\chi^2=0,027$; $p>0,05$) ili su imale nesansirane zube ($\chi^2=0,259$; $p>0,05$) u pogledu razvoja hipomineralizovanih promena.

U grupi dece koja su rođena carskim rezom svako treće dete je imalo hipomineralizovana oštećenja, međutim, χ^2 -testom nije dobijena statistički značajna razlika u odnosu na decu koja su rođena prirodnim putem ($\chi^2=1,969$; $p>0,05$).

Iz podataka u vezi s periodom neposredno nakon rađanja može se istaći da se 6,4% dece rodilo pre vremena. Ukupno 9% dece je nakon porođaja bilo u inkubatoru, dok je 6,4% dece na rođenju bilo teško manje od 2.500 grama. Svako treće dete iz sve tri pomenute grupe je na stalnim zubima imalo hipomineralizovane promene. Međutim, ne postoji statistički značajna razlika u odnosu na decu koja su se rodila u terminu ($\chi^2=1,418$; $p>0,05$), koja nakon porođaja nisu bila u inkubatoru ($\chi^2=1,447$; $p>0,05$), odnosno koja su rođena s normalnom telesnom težinom ($\chi^2=1,418$; $p>0,05$).

Kod svakog trećeg deteta majki koje nisu dojile decu ustanovljena je hipomineralizacija zuba. Najmanji postotak hipomineralizovanih promena zabeležen je u grupi dece koju su majke dojile duže od dvanaest meseci. Međutim, statističkom analizom nije utvrđena značajna razlika u korelaciji način hranjenja i zastupljenosti hipomineralizovanih promena.

Kako se u literaturi kao mogući uzrok pomenutih promena pominje i upotreba vode za piće, analizom podataka je ustanovljeno da je najveći broj dece pio vodu iz gradskog vodovoda, dok je oko 8% ispitanika pilo flaširanu vodu. U pogledu rasprostranjenosti hipomineralizacije, nije bilo statistički značajne razlike između ove dve grupe ispitanika bez obzira na vrstu korišćene vode ($\chi^2=0,955$; $p>0,05$).

Samo mali broj majki (oko 6%) se izjasnio da su njihova deca u prvoj godini po rođenju imala česte visoke temperature (više od tri puta). Samo jedno dete iz te grupe je imalo hipomineralizovane promene. Analizom podataka utvrđeno je da nije bilo statistički značajne razlike između njih i grupe dece koja nisu imala česte visoke temperature ($\chi^2=0,436$; $p>0,05$).

Najveći broj dece (96%) je u detinjstvu redovno vakcinisan. Nije bilo statistički značajne razlike između ove grupe i dece koja nisu redovno vakcinisana ($\chi^2=0,008$; $p>0,05$).

Od 33% dece koja su u prvoj godini po rođenju menjala mesto boravka, 15,2% imalo je hipomineralizovane promene. Nije bilo statistički značajne razlike u odnosu na grupu dece koja nisu menjala mesto prebivališta ($\chi^2=0,471$; $p>0,05$).

Oko 60% ispitanice dece bili su pasivni pušači, tj. tokom prve godine života bili su izloženi duvanskom dimu. Statistička analiza je pokazala da, kada su hipomineralizovane promene na zubima u pitanju, nema značajne razlike u odnosu na decu koja nisu bila konstantno izložena dimu cigareta ($\chi^2=0,871$; $p>0,05$).

DISKUSIJA

Za oboljenje MIH je utvrđeno da nastaje zbog promena koje deluju u prvoj godini po rođenju deteta [13, 14]. U ovoj studiji podaci su dobijeni na osnovu retrospektivne analize podataka. Sigurnije dokaze pružile bi svakako prospektivne studije, kojima bi se prikupljali podaci od rođenja do vremena nicanja prvih stalnih kutnjaka. Takvi podaci su neophodni za bolje objašnjenje faktora i mehanizama MIH [12].

Analizirajući rezultate hipomineralizovanih promena u ovoj studiji, uočeno je da nema statistički značajne razlike u pojavljivanju ovih oštećenja kod osoba suprotnog pola, kao i to da mesto prebivališta ne utiče na njihovo pojavljivanje. Ove rezultate su dobile sve studije koje su se bavile ovom problematikom [20, 21].

Skoro 50% majki nisu imale sanirane zube tokom trudnoće. Iako to nije uticalo na pojavu strukturnih oštećenja na zubima njihove dece, može se zaključiti da je zaista visok procenat žena koje nisu svesne koliki je značaj zdravih i saniranih usta na zdravlje uopšte, kako za majku, tako i za novorođenče.

Iz anketnih pitanja koja su vezana za posleporodajni period, dobijeni su podaci koji govore o tome da je nešto više od 30% dece rođeno pre vremena i da su odmah nakon rođenja boravila u inkubatoru. Takođe je isto toliko dece na rođenju imalo telesnu težinu manju od 2.500 grama. U ovoj studiji nije potvrđena pretpostavka drugih istraživača koji hipoksiju i malu telesnu težinu pominju kao moguće etiološke faktore za MIH [14, 15, 16]. Džonsen (*Johnsen*) i saradnici [22] u svojoj studiji o oštećenjima gleđi pominju hipoksiju i malu telesnu težinu novorođenčadi kao moguće uzroke strukturnih nepravilnosti. Holandska pilot-studija, na osnovu kartona dece s razvojnim oštećenjem gleđi, pokazala je da je u 48% slučajeva bilo problema vezanih za porođaj [23].

U pogledu ishrane odojčeta, u grupi dece koja nisu dojena kod svakog trećeg deteta je ustanovljen MIH. Deca čije majke su imale dovoljno mleka za dojenje imala su i najmanji procenat hipomineralizovanih promena (5%). Mali postotak hipomineralizovanih promena ustanovljen je u grupi dece koju su majke dojile duže od dvanaest meseci. Jeste da u ovoj studiji nema statističkih dokaza o tome da majčino mleko ima uticaja na kvalitet zubnih tkiva, zbog zdravlja uopšte treba podsticati majke da doje decu najmanje šest meseci. Alalusua (*Alaluusua*) i saradnici [24, 25] su uočili vezu između produženog dojenja i hipomineralizacije prvih stalnih molara. Takođe su tvrdili da zagađenja iz okoline, kao što su dioksin i sastojci slični dioksinu, koji se unose direktno hranom preko majčinog mleka, dovode do pomenutih promena.

U nekim radovima uočena je pozitivna korelacija između primene pojedinih antibiotika i pojave MIH [17, 26]. Međutim, kod primene antibiotika nije lako odrediti šta je pravi razlog pomenutih promena. Kako se antibiotici koriste za lečenje određene bolesti, treba biti obazriv pa dokazati da li bolest ili antibiotik izazivaju promene na gleđi. U ovoj studiji na ovo pitanje nisu odgovorile sve majke, tako da nepotpuni odgovori nisu ni razmatrani.

Jedan od mogućih etioloških faktora hipomineralizacije zuba jesu i česta visoka telesna temperatura i neredovna vakcinacija. Ni u jednom, ni u drugom slučaju rezultati ove studije ne mogu potvrditi pretpostavku pojedinih autora da su ovi faktori odgovorni za nastanak hipomineralizovanih promena [7, 14, 26].

Promena mesta boravka je u literaturi često pominjana kao mogući uzrok razvoja MIH. Podaci koji su dobijeni u ovoj studiji pokazuju da je od 33% dece koja su u prvoj godini života menjala mesto boravka, 15,2% imalo hipomineralizovane promene. Statističkom analizom nije dokazana razlika u poređenju sa decom koja se nisu često selila. Sakling (*Suckling*) i saradnici [27] u svojoj studiji koja se bavila prevalencijom razvojnih oštećenja nisu mogli da utvrde etiološke faktore koji su bili odgovorni za većinu oštećenja gleđi.

Kada je pušenje u pitanju, skoro 60% ispitanice dece bilo je izloženo duvanskom dimu. U našoj studiji nije dokazano da pušenje utiče na pojavu hipomineralizovanih promena. Međutim, može se zapaziti da, i pored svakodnevnih upozorenja o štetnosti kako aktivnog, tako i pasivnog dejstva nikotina iz cigareta, većina roditelja zanemaruje ova upozorenja iako su njihova sopstvena deca u pitanju.

ZAKLJUČAK

U ovoj studiji, kao i u dosadašnjim istraživanjima, podaci su dobijeni uglavnom retrospektivnim analizama, dugo vremena posle događaja koji je mogao dovesti do poremećaja u mineralizaciji. Nije lako utvrditi koji su to etiološki faktori odgovorni za nastanak hipomineralizovanih promena na stalnim zubima, ali njihovim identifikovanjem svakako bi se umnogome pomoglo rešavanju važnog problema u stomatologiji.

Osnova za uspešno rešavanje problema koji stvara MIH je, pre svega, primena mera prevencije i zdravstvenovaspitni rad. Naravno da je i promocija oralnog zdravlja u okviru zajednice, regiona, odnosno države veoma važna, jer će dovesti do podizanja opšteg standarda života, nivoa kulture i – što je najbitnije – povećati svest o značaju zdravlja.