

SOCIO-BEHAVIORAL FACTORS AND EARLY CHILDHOOD CARIES AT PRESCHOOL CHILDREN IN THE SARAJEVO CANTON, BOSNIA AND HERZEGOVINA

Senka Serhatlić, Nina Marković*, Lejla Selmanović, Amra Arslanagić, Emina Čengić, Elmedin Bajrić

*Corresponding author

Nina Marković, Assistant professor
Department of Preventive and
Pediatric Dentistry Faculty
of Dentistry, University of Sarajevo
Bolnička 4, 71 000 Sarajevo, BIH
Phone: + 387 33 214 249
e-mail:
ninamarkovic37@gmail.com

Department of Preventive and Pediatric Dentistry, Faculty of Dentistry,
University of Sarajevo, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Objective: The aim was to investigate the correlation between social factors, parental knowledge and practice about oral hygiene and proper dietary habits of their children with early childhood caries (ECC).

Materials and Methods: The research was conducted as a cross-sectional study. The survey involved intraoral examination of children and the questionnaire filled out by parents. Total number of 165 children aged 3-5 years (mean 4.08 ± 0.79) and their parents participated in the study.

Results: The number of children without caries (dmft=0) was 28 (17%), indicating that prevalence of caries within total sample was 83%. The highest prevalence for decay component of dmft was in 5-year-olds (98.3%). The severity of caries distribution was assessed by Wyne's index. Sixty percent of respondents were classified by as type 1, 15.8% as type 2 and 7.3% were in type 3. Most of the parents 90.9%, responded that caries could be prevented with good oral hygiene. Almost the same number of parents knew about fluorides as a protective factor against caries 67.3%, 70.3% were aware that proper dietary habits can help to prevent caries and 93.9% were aware of the importance of regular dental visits.

Conclusion: Present results showed the discrepancy between parental knowledge about ECC risk and observable caries indices for examined population. Parents of preschoolers had solid knowledge about ECC risks, but recorded caries prevalence and severity indicated that further researches were necessary to establish clear predictive model for community-based prevention.

Key words: Early childhood caries, social and behavioral factors, preschool children

Introduction

Early childhood caries (ECC) is defined as the presence of one or more decayed (non cavitated or cavitated lesions) teeth, missing (due to caries) teeth or filled tooth surfaces in any primary tooth of a child 71 months old or younger [1]. Early childhood caries is considered as multifactorial disease. [2, 3] ECC as a chronic noncommunicable disease, is still one of the most prevalent pathological conditions within child population [4]. The most frequent risk factors contributing to high prevalence of ECC are inadequate diet, socioeconomic background of parents, lower parental education, and lack of the access to the dental care. Oral health is very important for maintaining the oral functions of eating, speech development and a positive self-image. All those functions are not important only to general health but for grow and development and quality of life as well. In extreme cases ECC can even lead to total loss of tooth structure and the only treatment becomes extraction of the affected primary tooth [5].

Early childhood caries is associated with other health problems, including but not limited to the local pain, infections, abscesses, chewing difficulties, malnutrition, gastrointestinal and sleeping disorders. It is well known that appropriate prophylactic measures applied early in life can minimize the incidence of caries [6, 7, 8, 9].

The aim was to investigate the correlation between social factors, parental knowledge of oral hygiene practice and proper dietary habits of their children with ECC.

Materials and methods

The research was conducted at the University in Sarajevo, Faculty of Dentistry, Department of Preventive Dentistry and Pedodontics and in the three dental departments for preschool children in The Public Health Centre of Canton Sarajevo from December 2013 to March 2014, as a cross-sectional study. It was consisted of an oral health

survey of children and a questionnaire for parent-sc caregivers. Sampling method was adopted from World Health Organization (WHO) prescribed methodology for Oral Health Surveys for examined population group [10]. Research was conducted in accordance with the ethical standards and 1964 Helsinki declaration and was approved by Faculty of Dentistry, University of Sarajevo (Scientific and Educational Committee, 01-2-155-22/2013). The informed consent was obtained from children's parents. The participants were healthy preschool children aged 3 to 5 and their parents admitted for the first time for dental visit at the location site. Total sample consisted of 165 children and one of the parents who accompanied the child. Response rate was 100%. Main outcomes were to assess and correlate ECC prevalence, distribution and severity, family social factors, parental knowledge and attitude regarding ECC behavioral factors such as: oral hygiene and dietary habits and frequency of dental visits. A standard questionnaire for parents caregivers' knowledge and attitude about ECC doesn't exist. In order to avoid significant methodological problems, the questionnaire for the research was designed using guidelines for oral health of children from the American Academy of Pediatrics [11]. The questionnaire was designed as a closed type survey with multiple choice or true-false format answers, for anonymous individual response on 32 questions divided in four sections: social factors, oral hygiene, dietary habits and child attitude toward dental visits.

Dental status, ECC severity and oral hygiene were assessed by Wyne index, Schröder and Granath index and WHO methods for dmft/DMFT assessment. [9, 10, 12].

A database in Microsoft Office Excel 2007 was created for the purpose of statistical processing. Statistical program IBM SPSS Statistics 20 was used for processing the final results. The data were processed by statistical method of descriptive statistics, ANOVA test for the significance of differences in the average values of clinical parameters of ECC among the study groups. The Spearman correlation was used to assess the linkage between dmft, Wyne types, oral hygiene and dietary habits. The level of significance was set at $p < 0.05$.

Results

The sample consisted of 165 children aged 3-5. Average age of examined children was 4.08 (SD± 0.79), parental average age was 32.56 (SD±13.46) for fathers and 31.04. (SD±10.30) for mothers.

The sample dmft was 6.79 (SD± 5.25) in total. The number of caries free children (dmft=0) was 28 (17%), indicating that caries prevalence of the total sample was 83%. The highest prevalence for decay component of dmft was in 5-year-olds (98.3%) with dmft value of 8.35 (SD± 4.41). Percentage of caries free patients by the age groups is given in **Table 1**.

The severity of caries distribution was assessed by Wyne's index (9). Sixty percent of respondents were classified as type 1, and 15.8% as type 2 and 7.3% were in type 3. Score 0 for oral status assessed by Schröder and Granath had 52.7% of examinees, that indicated good oral hygiene.

The questionnaire was filled out anonymously by parents of children aged 3-5. Total number of 165 parents, 37 fathers and 128 mothers were asked to fill out the questionnaire about social factors, oral hygiene, dietary habits and frequency of dental visits of their child. Almost all fathers had high school education (45.5%), and the half of the mothers had university degree (47.9%). Detailed information about parental level of education and employments are shown in **Table 2**. Two parents out of 165 did not answer questions related to employment status.

The statement that caries could be prevented with good oral hygiene practice was indicated by 90.9% of parents and almost the same number were aware of protective effects of fluorides (67.3%), and they use fluoride toothpastes as well. High percentage of parents indicated that caries can be prevented with proper dietary habits (70.3%), and 93.9% taught that with regular dental visit caries could be reduced. Children who

Table 1. Percentage of caries free subjects within children's age

Children's age	Frequency of all subjects in age group	Number of caries free subjects (n)	Percentage of caries free subjects (dmft=0)*
3-year-olds	46	19	41.3%
4-year-olds	59	8	13.6%
5-year-olds	60	1	1.7%
Total	165	28	17%

*dmft = decay, missing due to caries, filled due to caries teeth index

Table 2. Social factors observed by parental level of education and employment

Variables	Fathers N (%)	Mothers N (%)
Educational level	Elementary	1 (0.6%)
	Secondary	75 (45.5%)
	Higher and University	86 (52.1%)
Employment status	Employed	93 (56.4%)
	Unemployed	96 (58.2%)
		68 (41.2%)

Table 3. Parental knowledge and attitude about the oral hygiene, dietary habits and dental visits

Question	Multiple choice answer	Frequency	Percentage
Who brushes the child's teeth	Child	38	23%
	Parents	102	61.8%
	Noone	3	1.8%
	Child and the parents	22	13.3%
How often do you brush the teeth of your child daily	Never	13	7.9%
	Twice (in the morning and evening)	137	83%
	After every meal	15	9.1%
How long do you brush the teeth of your child	Less than 3 minutes	72	43.6%
	3 minutes	77	46.7%
	More than 3 minutes	16	9.7%
When did you start using toothbrush and toothpaste in the daily oral hygiene routine of your child	In the first year	85	51.5%
	In the second year	79	47.9%
	Didn't use it yet	1	0.6%
In the first two years the child was fed by	Breastfeeding	52	31.5%
	Bottle	49	29.7%
	Breastfeeding and bottle	64	38.8%
When should you stop breastfeeding your child	After age 1	49	29.7%
	Between age 1 and 2	101	61.2%
	I don't know	15	9.1%
How many meals does your child have daily	3 meals	27	16.4%
	Between 3 and 5	121	73.3%
	More than 5	17	10.3%
How often does your child consume sweetened beverages and other sweets	Once a week	5	3.0%
	Once a day	84	50.9%
	A few times daily	76	46.1%
When should you take your child to dental office for the first time	In the first 3 years	152	92.1%
	Before enrolling school	7	4.2%
	I don't know	6	3.6%
When did you take your child to dental office for the first time	In the first year	29	17.6%
	Between age 2 to 4	126	76.4%
	Before enrolling school	10	6.1%
How often does the child go to dental visits	Once a year	12	7.3%
	More than once a year	76	46.1%
	When needed	77	46.7%
What was the reason for the last dental visit of your child	On the regular visit	91	55.2%
	Pain	26	15.8%
	Extraction or filling need	48	29.1%

Table 4. Correlation between the social and behavioral factors and clinical parameters of ECC

Question	Significance	dmft	Wyne class	OHI ¹	LFE ²	EF ³	FI ⁴	LFM ⁵	EM ⁶
Sweet consumption frequency	Spearman correlation	.209	.133	.230	-.167	-.078	-.056	.045	.032
	Sig.	.007*	.089	.003*	.032	.320	.474	.563	.681
Night meals	Spearman correlation	-.220	-.211	-.221	.150	.117	.180	.021	-.071
	Sig.	.005*	.007*	.004*	.055	.136	.021*	.785	.365
Frequency of dental visits	Spearman correlation	.366	.347	.322	-.125	-.105	-.170	.093	.142
	Sig.	.000*	.000*	.000*	.108	.181	.029*	.233	.069
Breast feeding	Spearman correlation	.128	.088	.185	-.013	-.050	-.102	.070	.193
	Sig.	.100	.262	.018*	.866	.525	.194	.368	.013*
The beginning of oral hygiene	Spearman correlation	.363	.278	.261	-.238	-.214	-.260	.124	.206
	Sig.	.000*	.000*	.001*	.002*	.006*	.001*	.113	.008*
Fluoride tooth paste use	Spearman correlation	.188	.158	.251	-.136	-.120	-.107	.128	.074
	Sig.	.016*	.042*	.001*	.081	.125	.172-	.103	.347
Attitude about flouride protettive effects	Spearman correlation	.290	.182	.342	-.194	-.282	.239	-.045	.128
	Sig.	.000*	.019*	.000*	.012*	.000*	.002*	.563	.102

*Significance (Sig.) at $p < 0.05$;

¹OHI - Oral hygiene indeks; ²LFE - The level of fathers education; ³EF - father employment status;

⁴FI - Avarage family income; ⁵LFM - The level of mothers education; ⁶EM- mother employment status

started with tooth brushing earlier (age 1 or younger) had lower average dmft and were in lower Wyne types. Positive parental knowledge and attitudes of fluorides and oral hygiene practice are correlated with lower dmft, oral hygiene index and Wyne class. Parental attitude that breastfeeding should have been stopped after the age of 1 are correlated with better oral hygiene. Parents with higher educational level and better financial background started to practice oral hygiene earlier. Results of parental knowledge and attitude regarding caries prevention are shown in **Table 3**.

Significant correlation was found between the level of education, caries prevalence and severity of disease. Caries prevalence was higher in parents with lower level of education. Children who started using toothbrushes and toothpaste earlier, and whose parents had a higher level of education and income, had lower dmft, plaque index and Wyne class. Correlation between clinical parameters, social and behavioral factors is presented in **Table 4**.

Discussion

Prevalence of ECC is increasing in many countries and has become a significant health problem especially in socially disadvantaged population [13]. Epidemiological data shows that ECC is the most common infectious disease that affects children worldwide, being a global problem although the disease itself is preventable. Despite significant progress of preventive dentistry, ECC continues to affect a large number of children globally [14]. Although representative data are sparse, general reports from several countries showed that the prevalence of ECC in 2–3-year-old children was approximately 12% to 27%. [14]. In 4- to 6-year-old children, the prevalence generally ranged from 27% to 48% with more than 76% reported from the Middle East [14, 15, 16, 17, 18].

Countries in socio-economic transition have the highest value of the DMFT index [17, 18, 19]. Unemployment, inflation, low family income and privatization of dental practice leads to the

situation in which the individual is responsible for organizing the use of oral health services based on its conscience and ability, and children are the first victims of such socio-economic situation. Reported caries prevalence for preschool children in Bosnia and Herzegovina was 83% [20].

The current concept of the etiology of childhood caries suggests a strong impact of risk factors like social/behavioral factors, clinical factors and protective factors (exposure to fluorides in drinking water, use of fluoridated toothpaste and regular dental visits) [18]. As it is shown in studies, dietary habits, oral hygiene and parents influence are the main factors that impact the onset of the disease [21, 22]. How much these factors influenced development of ECC depends on attitude and knowledge of the parents and the readiness of the medical staff to educate them. Lack of motivation could be one of key factors for not applying correct knowledge.

The role of pediatric dentist and the importance of regular dental visits at an early age is often underestimated due to believe that the primary teeth are going to exfoliate [22]. Prevention of caries in primary teeth is also important, because the post-eruptive maturation of the permanent tooth enamel can be compromised due to inadequate oral hygiene and high caries rates in primary dentitions, and lead to absence of well mineralized surfaces that make the permanent tooth less resistant [23]. Parenting styles influence the health of their children. Parents play an important role in child's behavior at the dental appointment, especially when they had their own negative experiences with dental treatment. An anxious or fearful parent can affect negatively the child's behavior in the dental office.

Working mechanism of fluorides in caries prevention is well-known as ability to promote and increase remineralization, acid resistance, and anti-microbial activity [24]. Public Health England (2014) reported that children under age of 5, living within fluoridated areas are 15% less likely to suffer from tooth decay than those from non-fluoridated areas [25].

Studies on the prevention of ECC have shown that community-level education about dietary habits and dental care is as important as measures

taken every day at home (i.e., brushing and flossing). Establishing and maintaining good dietary and oral health habits while minimizing bad habits has been shown to reduce the occurrence of ECC [26, 27, 28].

Results of the present study reported high prevalence of ECC with decay increase within children's age which are indicating a low level of preventive practice in young children. Parental awareness of proper dietary habits, oral practice and fluoride intake obviously isn't applied in everyday life. The reason for such result could be lack of motivation. Presented results observing parental level of education and financial background could be considered as potential risk factor which impact should be investigated in the future national surveys. Behavior during a pandemic such as Covid-19 could increase potential risk for deterioration of oral health in children [29]. Limitations of the present research were sample size limited on one country location, although per latest epidemiological studies in Bosnia and Herzegovina, results for the capital could be considered as representative for national interpretation, as well as a small portion of risk factors influencing ECC assessed only through questionnaire method [10, 11, 30]. Despite these limitations, presented results highlight necessity for urgent action for ECC disease control in the treated community. Global epidemiological survey for prevalence and severity of ECC with investigation of multifactorial models of risk factors including calculation of prediction for individual and combined risk factors is necessary and highly recommended for future researches.

Conclusion

Present results showed the discrepancy between parental knowledge about ECC risk and observable caries indices for examined population. Parents of preschoolers had solid knowledge about ECC risks, but recorded caries prevalence and severity indicated that further researches were necessary to establish clear predictive model for community-based prevention.

Literature

1. American Academy of Pediatric Dentistry (AAPD). Police on early childhood caries: Unique challenges and treatment options. [serial on the Internet] The reference Manual of Pediatric Dentistry. Chicago, Ill. American Academy of Pediatric Dentistry 2020 [cited on 10 Oct 2020]; 82-3. Available from: https://www.aapd.org/globalassets/media/policies_s_guidelines/p_eccuniquechallenges.pdf
2. Welbury R, Duggal M. S, Hosey M.T. Peadiatric Dentistry 5 th ed. Oxford University Press 2018.
3. Syed S, Nisar N, Mubeen N. Early Childhood Caries: A Preventable Disease. [serial on the Internet] Dent Open J. 2015 [cited on 10 Oct 2020]; 2(2) :55-6. Available from: https://www.researchgate.net/publication/281264997_Early_Childhood_Caries_A_Preventable_Disease.
4. Gomez G F. Early Childhood Dental Caries: a rising dental public health crisis Contemporary Issues in Early Childhood. [serial on the Internet] Sage Journals 2013 [cited on 15 Oct 2020]; 14(2): 191-194. Available from: <https://doi.org/10.2304/ciec.2013.14.2.191>
5. Karaca S, Ozbay G, Kargul B. Primary Zirconia Crown Restorations for Children with Early Childhood Caries. Acta stomatol Croat. 2013; 47(1): 64-71.
6. Anil S, Anand P.S. Early Childhood Caries: Prevalence, Risk Factors, and Prevention. [serial on the Internet] Front Pediatr. 2017 [cited on 17 Oct 2020]; 5: 157. Available from: doi: 10.3389/fped.2017.00157
7. Naidu R, Nunn J, Donnelly-Swift E. Oral health-related quality of life and early childhood caries among preschool children in Trinidad. [serial on the Internet] BMC Oral Health 2016 [cited on 18 Oct 2020]; 16: 128. Available from: doi <https://doi.org/10.1186/s12903-016-0324-7>.
8. Kraljevic I, Filippi C, Filippi A. Risk indicators of early childhood caries (ECC) in children with high treatment needs. Swiss Dental Journal SSO, 2017; 127: 398–404.
9. Wyne AH. Ealry childhood caries: nomenclature and case definition. Community Dent Oral Epidemiol 1999; 27: 313-15.
10. WHO. Oral Health Surveys: Basic methods. Geneva: WHO; 1997, 4th ed.
11. Arslanagić Muratbegovic A, Markovic N, Zukanovic A, Selimovic Dragas M, Kobaslija S, et al. Oral Health Related to Demographic Features in Bosnian Children Aged Six. Coll. Antropol. 2010; 34 (3): 1027-1033.
12. Schröder U, Granath L. Dietary habits and oral hygiene as predictors of caries in 3-year old children. Community Dent Oral Epidemiol 1983; 11: 308-11.
13. Ballatine J L, Carlson J C, Ferreira Zandona A G, Agler C, Zeldin L P, Rozier R G et al. Exploring the genomic basis of early childhood caries: a pilot study. International Journey of Pediatric Dentistry, 2017; 28 (2): 217-225.
14. Seow WK. Early childhood caries. Pediatr Clin N Am, 2018; 65(5): 941–954;
15. Folayan M O. A compendium on oral health of children around the world early childhood caries. Nova Science Publishers Inc, 2018;
16. Kaminska A, Szalewski L, Batkowska J, Wallner J, Wallner E, et al. The dependence of dental caries on oral hygiene habits in preschool children from urban and rural areas in Poland. [serial on the Internet] Ann Agric Environ Med. 2016 [cited on 18 Dec 2020]; 23(4): 660–665. Available from: <http://www.aaem.pl/The-dependence-of-dental-caries-on-oral-hygiene-habits-in-preschool-children-from-urban-and-rural-areas-in-Poland,72487,0,2.html>
17. Nota A, Darizeh A, Primožic J, Onida F, Bosco F, et al. Prevalence of Caries and Associated Risk Factors in a Representative Group of Preschool Children from an Urban Area with

- High Income in Milan Province, Italy. [serial on the Internet] *Int. J. Environ. Res. Public Health* 2020 [cited on 18 Dec 2020]; 17 (10). Available from: <https://www.mdpi.com/1660-4601/17/10/3372/htm>
18. Markovic D, Soldatovic I, Vukovic R, Peric T, Campus GG, et al. How Much Country Economy Influences ECC Profile in Serbian Children-A Macro-Level Factor Analysis. *Front Public Health*. 2019; 7: 285.
 19. Juric H, Klaric T, Zagar M, Bukovic D Jr, Jankovic B, et al. Incidence of caries in children of rural and subrural areas in Croatia. [serial on the Internet] *Coll Antropol*. 2008 Mar [cited on 18 Dec 2020]; 32 (1):131-6. Available from: <https://pubmed.ncbi.nlm.nih.gov/18494198/>
 20. Sacic L, Markovic N, Arslanagic Muratbegovic A, Zukanovic A, Kobašlija S. The prevalence and severity of early childhood caries in preschool children in the Federation of Bosnia and Herzegovina *Acta Medica Academica* 2016; 45(1):19-25;
 21. Bell L K , Schammer C, Devenish G, Ha D, Thomson M W, Spencer J A et al. Dietary Patterns and Risk of Obesity and Early Childhood Caries in Australian Toddlers: Findings from an Australian Cohort Study. [serial on the Internet] *Nutrients* 2019 [cited on 26 Oct 2020]; 11(11): 2-15. Available from: <https://doi.org/10.3390/nu11112828>
 22. Djordjevic A. Parents' knowledge about the effects of oral hygiene, proper nutrition and fluoride prophylaxis on oral health in early childhood. [serial on the Internet] *Balk J Dent Med*. 2018 [cited on 28 Oct 2020]; 22: 2-31. Available from; doi: 10.2478/bjdm-2018-0005
 23. Arslanagic A, Markovic N, Bajric E, Burnazovic Ristic L. Demarcated Opacities as Predictors of Progression of the Molar Incisor Hypomineralisation: a Pilot Study. *Acta stomatol Croat*. 2020; 54(4): 420-430.
 24. Lee H N, Lim S R, Lee S Y. Remineralization Assessment of Early Childhood Caries using QLF-D: A Randomized Clinical Trial. *Indian Journal of Science and Technology*, 2016; 9 (40):2-7;
 25. Greenwood D. Dental Biofilm formation in young children and the long term effects of fluoride varnish [dissertation]. Salford, UK: School of Environment & Life Sciences. University of Salford; 2016.
 26. Nishide R, Mizutani M, Tanimura S, Kudo N, Nishii T, Hatashita H. Homecare protective and risk factors for early childhood caries in Japan. *Environmental Health and Preventive Medicine*, 2018; 23 (1):13:57.
 27. Pitts N, Baez R, Diaz-Guallory C, et al. Early Childhood Caries: IAPD Bangkok Declaration. [serial on the Internet] *Int J Paediatr Dent* 2019 [cited on 30 Oct 2020]; 29:384. Available from: http://www.uccoh.org/uploads/6/0/8/9/60892411/bangkok_declaration.pdf.
 28. NHS Education for Scotland [database on the Internet] *Child Smile Manual*, version 3.1. May 2018. [updated 2018 May; cited 2020 Nov 22]. Available from: <http://www.childsmile.org.uk/uploads/documents/4531-Childsmile%20Programme%20Manual%20uly%202016.pdf>
 29. Daly J, Black A. M. E. The impact of COVID-19 on population oral health. *Community Dental Health* 2020; 37: 236-238.
 30. Muratbegovic A, Markovic N, Kobaslija S, Zukanovic A. Oral Health Indices and Molar Incisor Hypomineralization in 12 Year Old Bosnians. *Acta Stomatol Croat* 2008; 42(2):155-163