

## Research Article

# Oral Health in Bosnia and Herzegovina Schoolchildren – Findings of First National Survey

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## Abstract

**Aim:** The aim of this study was to investigate the oral health of schoolchildren in Bosnia and Herzegovina (BH) according to the WHO methods and propositions.

**Materials and Methods:** Survey was conducted as observational, descriptive (cross-sectional) study. Study sample were children aged 6 and 12. A total of 1,120 children were examined. Observable oral health parameters were dental caries, periodontal condition and demarcated opacities.

**Results:** In 12-year-olds the DMFT was  $4.16 \pm 2.92$ , and the decayed teeth constituted the major part of the index (45.43%). In 6-year-olds the DMFT was  $6.71 \pm 3.89$ , and the decayed teeth constituted the major part of the index (88.79%). 43% of 12-year-olds had healthy periodontal tissues. The prevalence of developmental defects of enamel among BH twelve-year-olds was 32.8%.

**Conclusion:** Results of national survey for two monitoring children population groups revealed insufficient preventive and curative dental care in all examined sites in BH.

**Keywords:** Oral health; Schoolchildren; DMFT; dmft; Periodontal status; DDE

## Abbreviations

BH: Bosnia and Herzegovina; WHO: World Health Organization; DMFT: Decayed, Missing, Filled Index; dmft: Decayed, Missed, Filled Index; CPITN: Community Periodontal Index of treatment Needs; DDE: Developmental Defects of Enamel

## Introduction

Good oral health is essential for optimal general health and life quality. It encompasses the integrity and health of specific parts of the oral cavity - teeth, oral mucosa, masticatory muscles, tongue, TMJ and salivary glands - used to perform the functions of chewing, speech and swallowing. The World Health Organization (WHO) recommends conducting periodic national oral health surveys. Ten oral health parameters has to be evaluated in precisely defined sample age groups [1]. Obtained data enables planning of measures to improve the oral health of the population of relevant countries. Similar research was conducted only in parts of Bosnia and Herzegovina's territory. Ivankovic 1997 carried out research in three cantons of the Federation of BH, pointed average DMFT ( $\pm$ SD) to  $6.2 \pm 4.0$  in twelve-year-olds while in six-year-olds it was  $4.8 \pm 3.9$  [2]. The above research conducted in Bosnia and Herzegovina (BH) indicates a poor state of oral health in our country, especially among children. Epidemiological data about the oral health status which our country currently lacks are prerequisite for developing a program and measures for the improvement of oral health. Bosnia and Herzegovina (BH) is made up of two entities: the Federation of Bosnia and Herzegovina (FBH) further divided into 10 cantons and the Republic Srpska (RS). It covers an area of some 51,128 km<sup>2</sup>, and has population of 3,717,130 million people. In the year 2000, the

country had 787 active dentists [3].

Primary oral health care in Federation of Bosnia and Herzegovina is organized within public health services and private practice. Accessibility to insurance-funded oral health care differs between cantons in Federation of Bosnia and Herzegovina as administrative units and Republic Srpska as one of two entities. The aim of this study was to present and discuss the findings of the first national oral health survey of schoolchildren population in BH according to the WHO indicators and methods.

## Material and Methods

The survey was carried out as an observational, descriptive (cross-sectional) study. The study was conducted during the year 2004 from March to May. The oral health survey was performed in total number of 1,240 schoolchildren aged 6 (N=560) and 12 (N=560). Study group 1 consisted of 6-year-old children (mean 6.2, SD  $\pm$ 0.9) attending the first grade of primary school. Study group 2 consisted of 12-year-old children (mean 12.2, SD  $\pm$ 0.8) attending the sixth grade of primary school. Children were examined in the following survey locations: Sarajevo as the capital (n=160; 40 examinees on four locations), Tuzla as a large town (n=80; 40 examinees on two locations), Banja Luka as a large town (n=80; 40 examinees on two locations); followed by Mostar, Gorazde, Siroki Brijeg, Visoko, Sanski Most as small towns but representatives of cantons with 40 examinees in each location. Selection of location sites and methods of oral health status evaluation was done according to the WHO criteria for countries with high caries prevalence [1]. Six-year-olds were targeted in order to determine the status of primary teeth, which is proven to be an important predictor of the health of permanent teeth. The age of

twelve years is very important and was recommended by WHO as the earliest age in permanent dentition for assessment of oral health. The condition of twelve-year-olds' permanent teeth determines their future oral health. Therefore, this population subgroup was selected for international comparisons and observation of oral disease trends. Oral health assessments were carried out in schools, under natural light, using dental mirrors and CPITN-E periodontal probe. Oral health status was evaluated by one trained and calibrated examiner. Periodontal status was recorded by using CPI index according to WHO recommendations for subjects under 15 years of age [1]. Kappa statistics were used to present intra-examiner reliability Training and intra-examiner calibration was performed on 25 twelve-year-olds (k=0.91 for DMFT, k=0.89 for CPI, k=0.84 for DDE).

Obtained results were recorded using special WHO oral health assessment form.

The Statistical Package for Social Science, version 13.0 (SPSS Inc., Chicago, IL, SAD) was used. Results were analyzed by means of descriptive statistic (Frequencies, percentages, arithmetic mean value, standard deviation) following WHO guidelines for presenting results of survey for these population groups [1].

## Results

A study of caries prevalence has shown that the disease is widespread among twelve and six year olds in Bosnia and Herzegovina. In 12-year-olds the DMFT was 4.16 (S.D. ± 2.92) in that the D-component constituted the major part of the index (45.43%), followed by 42.07% of filled teeth and 12.50% of extracted teeth (Table 1). Percentage of children without active decay was 36.54%. In different locations DMFT was recorded in ranges from 2.70 (S.D.± 2.25) to 5.38 (S.D. ± 2.76). Although distribution of DMFT components varies in different location sites it is obvious that both preventive and curative dental care are insufficient in all location sites. Results for all examined locations are presented in Table 1.

**Table 1**

In 6-year-olds the dmft was 6.71 (S.D.± 3.89) in that the dt-component constituted the major part of the index (88.79%), followed by extracted teeth (8.89%) and a small percentage of filled teeth (2.32%). Percentage of caries free participants aged six was 6.8% Mean values of components et and ft were less than 1 for all locations revealing that dental care is insufficient in primary dentition. When analyzing descriptive statistics for this group of examinees it was obvious that dt component was dominant, making more than 80% of dmft in all examined locations. Percentage of ft was very low with the highest value in Mostar (11,35%), but with no filled primary teeth registered in Gorazde and Siroki Brijeg. Values for extracted teeth (et) were registered in range from 6.73% in Banja Luka to 15% in Siroki Brijeg, meaning that in all locations primary teeth were rather extracted than filled, if they had been treated at all.

In the group of 6-year-olds first permanent molars were analyzed as well. In this group 81.7% of examinees (N=455, mean 3.63 ±0.95) had all four FPM erupted in the time of recording dental status. Mean value of DMFT for FPM was 0.61 ±1.08. Mean values of DMFT components for FPM in all examined locations were less than 1. Results of statistic analyzes for DMFT/dmft values and treatment needs between different locations were published in previous papers [3,4].

**Table 1:** DMFT index and its components of twelve-year-olds in Bosnia and Herzegovina in different survey locations.

Location site	dmft index	d (%)	X±SD	m (%)	X±SD	f (%)	X±SD
Sarajevo	3.90 ±2.88	43,91	1.71±2.21	12,66	0.49±0.84	43,43	1.69±2.11
B. Luka	4.79 ± 2.87	50,91	2.44±2.72	10,44	0.50±0.95	38,64	1.85±1.99
S. Most	2.70 ± 2.25	56,48	1.53±1.57	18,52	0.50±0.87	25	0.68±1.44
Tuzla	3.51 ± 2.63	46,26	1.63±1.71	16,37	0.58±0.88	37,37	1.31±1.89
Visoko	4.45 ± 2.65	65,73	2.93±2.48	20,22	0.90±1.09	14,04	0.63±1.22
Gorazde	4.03 ± 3.13	45,96	1.85±2.10	16,77	0.68±0.96	37,27	1.50±2.27
Vitez	4.85 ± 2.99	45,36	2.20±2.54	11,34	0.55±0.71	43,3	2.10±1.83
S. Brijeg	5.38 ± 2.76	16,28	0.88±1.54	3,26	0.18±0.38	80,47	4.33±2.34
Mostar	4.32 ± 2.96	42,37	1.83±2.83	9,04	0.39±0.82	48,59	2.10±1.88

Different values of dmft and its components had been registered in different survey locations (Table 2).

**Table 2**

Periodontal condition was evaluated for 12-year-olds, recording the first three scores of CPI. Results of periodontal condition in 12-year-olds were given in Table 3. Only 43% of children aged 12 had healthy periodontal tissues.

**Table 2:** dmft index and its components of six-year-olds in Bosnia and Herzegovina in different survey locations.

Location site	dmft index	d (%)	X±SD	m (%)	X±SD	f (%)	X±SD
Sarajevo	6,90 ± 4.17	89,31	6.17±4.2	7,16	0.48±1.4	3,55	0.73± 0.5
B. Luka	7,06 ± 4.02	91,86	6.49±3.98	6,73	0.48±0.9	1,42	0.4±0.4
S. Most	6,87 ± 4.12	91,94	6.33±4.22	7,33	0.49±1.21	0,73	0.32±0.5
Tuzla	5,88 ± 3.92	90,21	5.30±3.91	9,15	0.54±1.36	0,64	0.19±0.21
Visoko	6,88 ± 3.27	88	6.15±3.07	11,64	0.78±0.9	0,36	0.15±0.24
Gorazde	8,63 ± 3.2	92,17	7.90±3.38	7,83	0.69±1.52	0	0
Vitez	7,00 ± 3.81	82,5	5.64±3.59	13,57	0.98±1.47	3,93	1.69±0.26
S. Brijeg	6,08 ± 3.34	84,36	5.36±3.09	15,64	0.9±1.56	0	0
Mostar	5,05 ± 2.95	79,21	3.95±2.75	9,41	0.50±1.33	11,39	2.18±0.35

**Table 3**

The prevalence of developmental defects of enamel among BH twelve-year-olds was 32.8%. Nearly 7% (n=390) of examined index teeth had developmental defects of enamel with the highest frequency of demarcated opacities. Demarcated opacities were diagnosed in 6.4% (n=361) of examined or 92.6% of affected teeth (Table 4).

**Table 3:** Periodontal conditions in BH 12-year-olds according to the highest CPI score per person.

Age	N	Healthy %	Bleeding %	Calculus %	Excluded sextant %
12	560	43	43	12	2

**Table 4**

## Discussion

This study presents epidemiological parameters associated with oral health for two specific index child population groups. In the present study decay contributed the most of the DMFT (dmft) for both studied population groups. It is obvious that untreated caries and gingivitis was major problem for the children investigated. There was a lack of preventive and curative treatment in primary and permanent dentition.

**Table 4:** Distribution of developmental defects of enamel in BH 12-year olds.

Developmental Defects of Enamel	N of teeth	% of teeth affected
Demarcated opacities	361	92.5
Diffuse opacities	12	3.1
Hypoplastic defects	7	1.8
Other defects	4	1.0
Demarcated / Diffuse opacities	3	0.8
Demarcated opacities/Hypoplastic defects	3	0.8
Diffuse opacities/Hypoplastic defects	0	0.0
TOTAL	390	100.00

Comparing DMFT values of the present study with those in the study performed in former Yugoslavia in 1986. (DMFT= 6.3), and the results of the study performed in parts of Bosnia and Herzegovina in 1997 (DMFT=6.1), it looks like the oral health of schoolchildren significantly improved [2,5]. It is difficult to explain reasons for this improvement because all measures taken had been insufficient and limited to local level. However, one of the possible explanations might be that this study used WHO methods for caries diagnosis where decayed teeth do not include teeth affected by changes preceding clinically detectable enamel lesions or conditions similar to the early stages of caries. Other explanation could be that CPI periodontal probe decreases the number of diagnosed cavities. Based on the established decrease in caries prevalence in highly industrialized countries, Kunzel points to the existence of two European regions. West European region (low risk countries) with average DMFT index of 1.7 and 40% of twelve-year-olds without decayed teeth and East European region (high risk countries) with DMFT index of 4.1 and 10% of twelve-year-olds without decayed teeth [6]. It is obvious that BH is a country with high caries prevalence. WHO Oral health database for DMFT of 12-year-olds show similar results for neighbouring countries: Croatia 4.9, Serbia 7.8, Former Yugoslav Republic Macedonia 3.0 and Albania 3.1. [7]. A survey conducted in eight European countries (Belgium, Germany, Greece, Ireland, Italy, Scotland, Spain and Sweden) revealed that DMFT among twelve-year-olds varies from 1.07 in Spain and 2.58 in Germany [8,9]. The values of DMFT in non-European countries also vary standing at 3.24 in Mexico [10] and 2.4 at Philippines [11]; the value registered in Israel is 1.66 [12], while the lowest values of 0.64 and 0.1 had been recorded in Nicaragua [13] and India [14] respectively. The trend of increased DMFT values was registered in in Czech Republic, Slovakia and Lithuania [7]. DMFT value is still far below the average DMFT value established by the WHO for European region based on surveys conducted in 48 European countries [7].

Among five-year-olds in eight European countries dmft varies from 0.8 in Sweden to 3.06 in Scotland [9]. In the former Yugoslavia in 1986, the dmft index for the same age group was 7.4 [4] and in Bosnia and Herzegovina, according to Ivankovic's study, it was 4.8 in 1997 [2]. This shows that the dmft index for primary teeth varies. Comparisons of dmft index values by separate survey locations again reveal differences. The care for primary teeth in all parts of the Country was neglected. The pattern of proportional share of specific components of dmft index (decayed, missing, filled teeth) was similar for the entire Bosnia and Herzegovina. Demographic features related to oral health indices were analyzed and published in previous

articles [3,4]. Despite of statistic significant differences, dmft values were high revealing oral health neglect in all location sites. Level of preventive and treatment dental care is the same and equally poor throughout the country. Previous caries experience is considered as very serious and reliable predictor of future caries development [15]. Therefore, it is urgent to develop new approaches to dental care in the country.

Partial recordings of CPITN index was in accordance with WHO guidelines for this population group [3]. Gingival bleeding (score 1) as a predominant condition, in children and adolescents was in accordance with other investigations of similar population group [15]. One third of examinees (32.8%) had at least one index teeth with some developmental defect of enamel. The presence of diffuse opacities in our sample was insignificant and indicates a low exposure to fluorides. These supported by some authors that demarcated opacities were the dominant type of DDE in areas with extremely low levels of fluorides in water were confirmed [4,16,17].

There are probably numerous reasons for such bad picture of oral health status for the youngest BH citizens. Most importantly, the difference is due to absence of oral disease prevention and oral health promotion programs that are standard in most developed European countries with well-organized system of dental care. Limiting factors include fragmented health care system in Bosnia and Herzegovina, and curative rather than preventive approach to health care.

## Conclusion

Results of national oral health survey for two monitoring children population groups revealed insufficient preventive and curative dental care in all examined sites in BH.

Bosnian national oral health goal should be development and implementation of a disease prevention programs, based on education of population and dental practitioners.

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## References

- Joharji RM, Adenubi JO. Prevention of pit and fissure caries using an antimicrobial varnish: 9 month clinical evaluation. *J Dent.* 2001; 29: 247-254.
- Ivanković A, Lukić IK, Ivanković Z, Radić A, Vukić I, Simić A, et al. Dental caries in postwar Bosnia and Herzegovina. *Community Dent Oral Epidemiol.* 2003; 31: 100-104.
- Muratbegović AA, Marković N, Zukanović A, Kobaslija S, Dragas MS, Jurić H, et al. Oral health related to demographic features in Bosnian children aged six. *Coll Antropol.* 2010; 34: 1027-1033.
- Muratbegović A, Marković N, Kobašlija S, Zukanović A. Indeksi oralnog zdravlja i hipomineralizacija kutnjaka i sjekutica kod bosanske djece u dobi od 12 godina (Oral Health Indices and Molar Incisor Hypomineralization in 12 Year Old Bosnians). *Acta Stomatol Croat.* 2008; 42: 155-163.
- Vrbic V, Vulović M, Rajić Z, Topić B, Tatić E, Malić M, et al. Oral health in SFR Yugoslavia in 1986. *Community Dent Oral Epidemiol.* 1988; 16: 286-288.
- Kunzel W. Zur Konversion der epidemiologischen Zucker/ Caries-Relation in Europe. *Oralprophylaxe.* 2001; 23: 66-70.

7. WHO Oral Health Country/ Area Profile Programme, Oral health database, Malmo University, Chosen Region: Europe.
8. Almerich Silla JM, Montiel Company JM. Oral health survey of the child population in the Valencia Region of Spain (2004). *Med Oral Patol Oral Cir Bucal*. 2006; 11: E369-381.
9. Marthaler TM, O'Mullane DM, Vrbic V. The prevalence of dental caries in Europe 1990-1995. ORCA Saturday afternoon symposium 1995. *Caries Res*. 1996; 30: 237-255.
10. Villalobos- Rodelo JJ, Medina-Solis CE, Molina-Frechero N. Dental Caries in schoolchildren aged 6-12 years in Navolato, Sinaloa, Mexico: experience, prevalence, severity and treatment needs. *Biomedica*. 2006; 26: 224-233.
11. Yabao RN, Duante CA, Velandria FV, Lucas M, Kassu A, Nakamori M, et al. Prevalence of dental caries and sugar consumption among 6-12-y-old schoolchildren in La Trinidad, Benguet, Philippines. *Eur J Clin Nutr*. 2005; 59: 1429-1438.
12. Zusman SP, Ramon T, Natapov L, Kooby E. Dental health of 12-year-olds in Israel-2002. *Community Dent Health*. 2005; 22: 175-179.
13. Herrera Mdel S, Medina-Solis CE, Maupomé G. [Prevalence of dental caries in 6-12-year-old schoolchildren in Leon, Nicaragua]. *Gac Sanit*. 2005; 19: 302-306.
14. David J, Wang NJ, Astrøm AN, Kuriakose S. Dental caries and associated factors in 12-year-old schoolchildren in Thiruvananthapuram, Kerala, India. *Int J Paediatr Dent*. 2005; 15: 420-428.
15. Markovic N, Arslanagic Muratbegovic A, Kobaslija S, Bajric E, Selimovic-Dragas M, Huseinbegovic A, et al. Caries prevalence of children and adolescents in Bosnia and Herzegovina. *Acta Med Acad*. 2013; 42: 108-116.
16. Ekanayake L, van der Hoek W. Prevalence and distribution of enamel defects and dental caries in a region with different concentrations of fluoride in drinking water in Sri Lanka. *Int Dent J*. 2003; 53: 243-248.
17. Angelillo IF, Romano F, Fortunato L, Montanaro D. Prevalence of dental caries and enamel defects in children living in areas with different water fluoride concentrations. *Community Dent Health*. 1990; 7: 229-236.