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Stomatološki vjesnik

CONTENTS

ORIGINAL SCIENTIFIC ARTICLES

PARENTAL KNOWLEDGE OF THE IMPACT OF SCHOOL CHILDREN ORAL HEALTH ON THEIR QUALITY OF LIFE

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ABSTRACT

The influence that oral health has on physical and psychical development of children, especially on their self-esteem, picture that they have about themselves and the level of their socialization, is very well known.

The study aimed to assess the parental attitude regarding the impact of oral care habits of their school-aged children on their Oral health-related quality of life.

The signed information consent form presented the agree of 100 parents to participate in the research and they present the final sample of the study.

The study was conducted using a self-administered questionnaire comprising children's age and gender, parents' educational level, questions related to parent knowledge about oral health of their children, routine dental visits, oral hygiene habits, dietary, and problems which their children may have with their appearance, comfort, and social life due to oral health problems.

Half of the participants claimed that they clean their children's teeth or children brush their teeth alone twice or more times a day, 15 (15%) once a day, whereas 5% of the participants never clean their children's teeth. Study participants reported irregular dental attendance (44%) and most of the parents in this study (81%) thought that their children are satisfied with the appearance of their teeth.

The results of the present study suggested the continuous implementation of oral health programs which will start at an early age and which will mandatory include the parents, as the main caregiver of oral health to their children.

Keywords: OHRQoL, children's oral health, oral health habits

Introduction

Oral health is an important factor in wellbeing and health in general and it has a significant impact on the quality of life. World Health Organization (WHO) defines oral health as "a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing" [1].

Having in mind that the orofacial conditions impact children's quality of life, it is very important to know their oral health status. Oral health status influences the way they enjoy food, chew, how they look and speak and participate in daily activities. Oral health status affects them physically and psychologically. It also affects their self-esteem, self-image, and feelings of social well-being. The most common dental disease present in children is dental caries. WHO indicated that: "Dental caries results when microbial biofilm (plaque) formed on the tooth surface converts the free sugars contained in foods and drinks into acids that dissolve tooth enamel and dentine over time." It is also known that:" Continued high intake of free sugars, inadequate exposure to fluoride and without regular microbial biofilm removable, tooth structures are destroyed, resulting in development of cavities and pain, impacts on oral-health-related quality of life, and, in the advanced stage, tooth loss and systemic infection" [1].

Various studies [2, 3] have shown that poor dental hygiene, especially in primary school children, is a predictor of poor quality of life caused by oral health. Proper oral hygiene and better oral health were based on oral health knowledge and studies have shown the lack of this knowledge in developing countries [4].

Convenient fact is that children can be considered as ideal for early intervention because healthy behavior and lifestyle developed at an early age are more sustainable. Education on oral health and responsible health behavior is the most important factor in the preservation of teeth health. Responsible health behavior is impacted by the level of information about proper nutrition and the attitudes and habits in maintaining oral hygiene [5].

Family plays the most important role in shaping the attitudes of children because the health behavior of parents directly affects the behavior of children. Parents share their knowledge and experience with their children, and therefore, educating parents can influence the health behavior of their children.

Having in mind that the parents are the role model for the children's health behavior and principal decision-makers concerning a child's health [6] it seems reasonable to examine parental attitude on children's Oral Health-Related Quality of Life (OHRQoL) in the city of Sarajevo.

The Aim of the Study

The study aimed to assess the parental attitude regarding the impact of oral care habits of their school-aged children on their Oral Health-Related Quality of Life (OHRQoL).

Materials and Methods

The study was conducted in Primary health care centers (PHCCs) Center and Old Town, City of Sarajevo, after the approval from the Ethical Committee of the Faculty of Dentistry, University in Sarajevo No. 02-3-4-102-2/ 2019. and the approval from the Ethical Committee of Primary Health Care Center Sarajevo Canton No. 01-06-977-3/ 19. during March and April 2019.

Participants in the study were 100 parents who previously signed an information consent form for participation in the research 7.

The study was conducted using a self-administered questionnaire comprising children's age and gender, parents educational level,

questions related to parent knowledge about oral health of their children (3), routine dental visits (2), oral hygiene habits (2), dietary (1), and problems which their children may have with the appearance, comfort, and social life due to teeth problems (1).

Assessment of children's oral health-related practices included questions regarding the use the fluoridated or fluoride-free toothpaste, the dental floss if used and the frequency of brushing. Assessment of children's oral health-related attitude included items on the frequency of visits to a dentist and reasons for visiting and not going to the dental office. Assessment of a children's dietary habits included questions of daily consumption of sugar in different food and beverage. Oral health-related quality of life was assessed by a series of questions like:

- The frequency of unpleasant situations which they may have like difficulties in chewing firm foods and eating/drinking hot/cold foods;
- The frequency of situations when they avoided smiling/laughing and felt irritable/ frustrated and upset,
- The frequency of situation when they were concerned what people think about their teeth/mouth.

The obtained data was compiled and analyzed using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 15.0 for windows). Frequency analysis was done using descriptive statistics.

	6-7 yrs.	8-10 yrs.	11-14 yrs.	Total
Male	8 38,1%	29 67,4%	17 47,2%	54 54,0%
Female	13 61,9%	14 32,6%	19 52,8%	46 46,0%
Total	**21** **100,0%**	**43** **100,0%**	**36** **100,0%**	**100** **100,0%**

Table 1. The distribution of the children by age and gender, by frequencies and percentage

Visits to a dentist during the last year	Number	%
Once	11	11,0
Twice	22	22,0
Three times	20	20,0
Four times	16	16,0
More than four times	26	26,0
I did not visit a dentist for the past 12 monts	3	3,0
I never visited a dentist during the past 12 monts	1	1,0
I do not remember	1	1,0
TOTAL	**100**	**100,0**

Table 2. Visits to dentist by frequences and percentage

What was the reason for your last visit?	Number	%
Pain or teeth issues	12	12,0
Treatment or continuation of treatment	29	29,0
Routine examination of teeth / treatment	56	56,0
I do not know / I do not remember	3	3,0
TOTAL	**100**	**100,0**

Table 3. Attitude towards professional dental care by frequencies and percentage

Results

For the study purpose, a total of 100 parents (mother or father) answered the questionnaire consisted of 11 questions included the questions of their educational level. The distribution of children by age and gender, whose parents were study participants, is illustrated in Table1.

Table 2. and 3. summarized the information about the practice of using professional dental care. For eleven children (11%) parents claimed that they visited a dentist once in the past year, 22 (22%) visited a dentist twice, 20 (20%) visited a dentist three times during the last 12 months and

Child is not satisfied with the appearance of their teeth	Number	%
Yes	14	14,0
No	81	81,0
I do not know	5	5,0
TOTAL	**100**	**100,0**
Your child avoids laughing because of the appearance of their teeth	**Number**	**%**
Yes	11	11,0
No	87	87,0
I do not know	2	2,0
TOTAL	**100**	**100,0**
Other children mock your child' teeth	**Number**	**%**
Yes	8	8,0
No	90	90,0
I do not know	2	2,0
TOTAL	**100**	**100,0**
Toothache or discomfort caused by teeth made your child to miss school classes or a whole day	**Number**	**%**
Yes	7	7,0
No	93	93,0
I do not know	0	0,0
TOTAL	**100**	**100,0**
Child experiences difficulties while consuming solid food	**Number**	**%**
Yes	11	11,0
No	88	88,0
I do not know	1	1,0
TOTAL	**100**	**100,0**
Child experiences difficulties while chewing food	**Number**	**%**
Yes	10	10,0
No	88	88,0
I do not know	2	2,0
TOTAL	**100**	**100,0**

Table 4. Parental knowledge of oral impacts on oral health-related quality of life of their children

only 3 (3%) did not visit a dentist in the past 12 months (Table 2).

Parents of 56 children (56%) said that the routine examination of the teeth was the reason for their last visit to the dentist, treatment or continuation of treatment was cited as a reason by 29 (29%) of the examinees, while parents of only 12 children (12%) stated that their children visited the dentist because they had pain or problem with the teeth (Table 3).

Table 4. reveals the information about the parental knowledge of the impact of school children oral health to their quality of life. Most of the parents (81 %) think that their children are satisfied with the appearance of their teeth. Eleven participants thought that their children avoid laughing because of their teeth and eight of them claimed that their children experienced mocking by other children because of the appearance of their teeth.

Regarding absenteeism from school, seven parents claimed that toothache is one of the reasons why their children did not attend the school for a whole day, 11 parents (11%) reported that their children experience difficulties while eating solid food, while 10 parents (10%) reported that their children had difficulty while chewing (Table 4).

Oral impacts on oral health-related quality of life of children were compared to the parent's level of education in Table 5. Some minor differences in the effect of oral health on everyday activities in children whose parents have secondary education and those whose parents have a college education are visible.

Discussion

Children are always the responsibility of adults, and decisions about their children's health rely on them. That's why is important to assess parents' perceptions regarding the influence of oral health problems and its treatment on their children's quality of life. On the other side, the studies showed

Child is not satisfied with the appearance of their teeth		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	7	38	2	47
		7,0%	38,0%	2,0%	47,0%
	COLLEGE EDUCATION	7	43	3	53
		7,0%	43,0%	3,0%	53,0%
TOTAL		14	81	5	100
		14,0%	81,0%	5,0%	100,0%
Your child avoids laughing because of the appearance of their teeth		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	6	40	1	47
		6,0%	40,0%	1,0%	47,0%
	COLLEGE EDUCATION	5	47	1	53
		5,0%	47,0%	1,0%	53,0%
TOTAL		11	87	2	100
		11,0%	87,0%	2%	100,0%
Other children mock your child' teeth		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	5	40	2	47
		5,0%	40,0%	2,0%	47,0%
	COLLEGE EDUCATION	3	50	0	53
		3,0%	50,0%	0,0%	53,0%
TOTAL		8	90	2	100
		8,0%	90,0%	2%	100,0%
Toothache or discomfort caused by teeth made your child to miss school classes or a whole day		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	3	44	0	47
		3,0%	44,0%	0,0%	47,0%
	COLLEGE EDUCATION	4	49	0	53
		4,0%	49,0%	0,0%	53,0%
TOTAL		7	93	0	100
		7,0%	93,0%	0%	100,0%
Child experiences difficulties while consuming solid food		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	5	41	1	47
		5,0%	41,0%	1,0%	47,0%
	COLLEGE EDUCATION	6	47	0	53
		6,0%	47,0%	0,0%	53,0%
TOTAL		11	88	1	100
		11,0%	88,0%	1%	100,0%
Child experiences difficulties while chewing food		**Yes**	**No**	**I do not know**	**Total**
PARENTAL LEVEL OF EDUCATION	SECONDARY SCHOOL	3	42	2	47
		3,0%	42,0%	2,0%	47,0%
	COLLEGE EDUCATION	7	46	0	53
		7,0%	46,0%	0,0%	53,0%
TOTAL		10	88	2	100
		10,0%	88,0%	2%	100,0%

Table 5. Frequencies and percentage distribution of parental answers regarding the knowledge of quality of life.

that children at the age of eight are able to understand and explain all aspects of their health experiences and can respond to a five-point response format. Children aged 6-7 understood the basic task of the questionnaires and were able to explain their health experiences but they had difficulties with understanding some health-related terms and tended to use extreme responses (8). Having in mind all those facts, the participants in this study were the parents of primary school children aged 6 to 14.

Only half of the participants in this study claimed that they clean their children's teeth or children brush their teeth alone twice or more times a day, 15 (15%) once a day, whereas 5% of the participants never clean their children's teeth. In order to improve plaque control, most of dentists recommended tooth brushing twice a day [9] but the frequency of subjects brushing teeth twice daily shows a wide variation between the countries and can be attributed to their different economic and social conditions [10]. Studies suggested that tooth brushing typically occurs within family-based traditions with the persistence of the practice throughout life [11]. Tooth brushing habits and adequate oral hygiene in parents can affect the quality and appropriateness of tooth brushing in children. So, regular tooth brushing habits and sound dentition in children are associated with their parents' positive oral health-related attitudes.

Studies in Netherlands and Australia show the influence of parents on the development of oral hygiene habits their offspring by transferring knowledge and by supervising children's health behavior [12,13].

So, a family-based approach, suggested by Wainwright J and Sheiham A. with the focus on active parent involvement, targeting multiple family members, can have better results in dental caries prevention, than the preventive measures with the focus on the child alone [14].

Results of the study "Parental knowledge of the impact of school children oral health on their quality of life" reported irregular dental attendance (44%) and this finding is consistent with findings of similar studies [15, 16].

Most of the parents in this study (81%) thought that their children are satisfied with the appearance of their teeth. Although the studies indicate that it is both acceptable and accurate to have a parental report when evaluating child's quality of life, there is a possibility for inaccuracy when relying on the parents to report only in comparison to survey the very child directly. Distinction between parental and child responses to the questionnaire may reflect real differences in perspectives [17,18].

Some studies suggested that the agreement level for questions for which the child and the parents have different information (e.g. peer interactions), as well as the items for which the possible answers are more abstract (e.g. emotions) support the hypothesis that parents' knowledge of their children is limited [19,6].

This study used the level of parental education as a measure of childhood socio-economic background. The study results demonstrated that there is no significant difference between the educational level of the parents and their knowledge of the impact of the oral health of their children on their quality of life. These results can be interpreted by the fact that the study group didn't have parents with primary school only or parents without education, groups which traditionally represent the lowest social class. Similar studies conducted in the world demonstrated the relationship between the socioeconomic situation and OHRQoL, in the way that the parents with low socioeconomic status had poor oral health with the more impact on OHRQoL, as compared to parents who had high socioeconomic status [20].

Even in Sweden, the country where the majority of young people have good oral health, children in socioeconomically weak groups have worse oral health than other children [21,22].

Most of the researches on oral health focused on the associations between a low socioeconomic

status during childhood and its consequences on oral health during adulthood. From the perspective of dental prevention, it is evident that early childhood is a sensitive period with an influence on lifelong oral health status. While the research suggests that the socio-economic conditions under which children grow up have a great impact on the presence of oral diseases in adult, there is some evidence that these influences can be changed thus this area of research demands further investigation.

Conclusion

It is well known that health behavior can be influenced by a large number of factors like knowledge, beliefs, attitudes, skills, finance and time. The influence of family members, friends, co-workers, opinion leaders, and even health workers themselves on oral health behavior is also evident. School-age is the right time when the behavior can still be modified. A parent positive attitude and the correct practice are essential to bringing about a change in the oral health behavior of the school children. The present study stresses the need for continuous implementation of school oral health programs which will mandatory include the parents, as the main caregiver of oral health to their children during the preschool and early school phase of their life.

DECLARATION OF INTEREST

There is not any conflict of interest for all authors, between the authors, or for any organization.

Literature:

1. World Health Organization. World Oral Health Report 2003.
2. Sheiham A, Watt,R. G. The common risk factor approach: A rational basis for promoting oral health. Community Dent Oral Epidemiol 2000; 28 (6): 399–406. doi:10.1034/j.1600-0528.2000.028006399.x.
3. Watt R. G, Sheiham A. Integrating the common risk factor approach into a social determinant's framework. Community Dent Oral Epidemiol 2012;40(4): 289–296. doi:10.1111/j.1600-0528.2012.00680.x.
4. Pack AR. Dental services and needs in developing countries. Int Dent J 1998;48 (3Suppl 1):239-47
5. Scardina G.A, Messina P. Good Oral Health and Diet. J. Biomed. Biotechnol 2012, 2012, 720692. doi:10.1155/2012/720692
6. Parsons S, Barlow S, Levy S, Supran S,Kaplan S. Health-related quality of life in pediatric bone marrow transplant survivors: according to whom? Int J Cancer 1999; 12:46-51
7. WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. Bulletin of the World Health Organization, 2001, 79
8. Rebok G, Riley A, Forrest C, Starfield B, Green B, Robertson J, Tambor E: Elementary school-aged children's reports of their health: a cognitive interviewing study. Qual Life Res 2001; 10:59-70.
9. Attin T, Hornecker E. Tooth brushing and oral health: how frequently and when should tooth brushing be performed? Oral Health Prev Dent 2005;3(3):135–40.
10. Blaganna A. et al., Oral Health Knowledge, Attitudes and Practices among Secondary School Children in Chandigarh. J Clin Diagn Res 2016; 10 (10): ZC01-ZC06 doi: 10.7860/JCDR/2016/23640.8633

11. Aunger R. Tooth brushing as routine behaviour. Int Dent J 2007; 57: 364-76
12. Duijster D, Jong-Lenters M, Verrips E, Loveren C. Establishing oral health promoting behaviours in children - parents' views on barriers, facili-tators and professional support: a qualitative study. BMC Oral Health 2015; 15: 157.
13. Virgo-Milton M, Boak R, Hoare A et al. An exploration of the views of Australian mothers on promoting child oral health. Aust Dent J 2015; 61: 84-92.
14. Wainwright J, Sheiham A. An analysis of methods of tooth brushing recommended by dental associations, toothpaste and toothbrush companies and in dental texts. Br Dent J 2014;217 doi: 10.1038/sj.bdj.2014.651.
15. Mehta A, Kaur G. Oral health-related knowledge, attitude, and practices among 12-year-old schoolchildren studying in rural areas of Panchkula, India.Indian J Dent Res 2012;23(2):293. doi: 10.4103/0970-9290.100446.
16. Gurunathan D, Moses J, Arunachalam SK. Knowledge, Attitude, and Practice of Mothers regarding Oral Hygiene of Primary School children in Chennai, Tamil Nadu, India. Int J Clin Pediatric Dent 2018;11(4):338–343. doi:10.5005/jp-journals-10005-1535
17. Jokovic A, Locker D, Guyatt G. How well do parents know their children? implications for proxy reporting of child health- related quality of life. Qual Life Res 2004;13(7):1297-1307. doi: 10.1023/B: QURE.0000037480.65972.eb.
18. Jokovic A, Locker D, Stephens M, Guyatt G. Agreement between mothers and children aged 11–14 years in rating child oral health-related quality of life. Community Dent Oral Epidemiol 2003;31(5):335-343. doi: 10.1034/j.1600-0528.2003.00012.x.
19. Sawyer M, Antoniou G, Toogood I, Rice M. A comparison of parent and adolescent reports describing the health-related quality of life of adolescents treated for cancer. Int J Cancer 1999; 12 (Suppl): S39–S45.
20. Andruškienė J, Barsevičienė Š, Dvarionaitė L, Grubliauskienė J, Mažionienė A. Socioeconomic characteristics, oral care habits and oral health-related quality of life among the parents of pre-school children in Klaipėda. Applied Research In Health And Social Sciences: Interface And Interaction 2016;13(1):27-39 doi: 10.1515/arhss-2016-0004
21. Nordenram G. Dental health: Health in Sweden: The public health report 2012. Scand. J. Public Health 2012; 40(9): 42-70.
22. Kapoor V, Gupta A, Arya V. Behavioral changes after motivational interviewing versus traditional dental health education in parents of children with high caries risk: Results of a 1-year study. J Indian Soc Pedod Prev Dent 2019; 37:192-7

CARIES STATUS, TREATMENT NEEDS AND ORAL HEALTH CARE EVALUATION OF CHILDREN AND ADULTS ATTENDING A CENTER FOR SPECIAL HEALTH CARE NEEDS IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Objective: The objective was to assess caries status and treatment needs at children with special healthcare needs being residents of the School for children and adults with special healthcare needs "Mjedenica" and to evaluate planned treatment efficiency after eight months period.

Subject and Methods: The research was conducted at the dental office established in the School specialized for children with special health care needs "Mjedenica", Sarajevo. The sample consisted of 124 respondents. Clinical examination was performed to assess caries status and treatment needs and to evaluate planned treatment after eight months period.

Results: The total number of residents in "Mjedenica" was 185, number of examined respondents was 124 and percentage of untreated caries was 85.48%, the percentage of teeth extraction needs was 39.51% and the percentage of filling teeth needs was 83.06%. The number of absolute noncooperative respondents was 49. After 8 months of intensive and dedicated dental treatment in the dental office "Mjedenica", the caries prevalence was reduced up to 22.95%.

Conclusion: Adequate treatment supported with efforts in preventive oral health care, continuous monitoring of oral health habits is fundamental for oral health improvement of individuals with disabilities and special healthcare needs.

Key words: oral health, individuals with special healthcare needs, treatment needs, caries prevalence.

Introduction

The American Health Association defines a child with disability as: „A child, who, for various reasons, cannot fully make use of all his or her physical, mental and social abilities – in other words, a child who cannot play, learn or do things that other children his or her age can“ [1]. They can also be defined as „Special health care needs (SHCN) children “because they have physical, mental, sensory, behavioral, emotional and chronic medical conditions requiring health care beyond those being considered as a routine [1, 2]. UNICEF Report estimates that there are at least 93 million children with disabilities in the world, but numbers could be much higher [3]. According to the World Report on Disability approximately one billion people in the world are living with a disability, and 80% is living in developing countries [4].

Oral health is essential to the general health of children and can affect the quality of life, especially if children have any disability [5]. Oral disease is a major health problem for individuals with disabilities and they have a higher prevalence and severity of oral diseases compared to the general population [6]. High rates of dental caries, missing teeth and other oral diseases are the indicators of poor oral health of children and adults with disabilities [7].

Children and adults with special healthcare needs are not often able to take care of their own oral hygiene, and often their parents/caregivers are not educated enough. That implies poor oral health and has consequences like dental caries, parodontopatics, gingivitis and other oral conditions. Risk factors of caries are the same for healthy individuals and those with special needs, but impaired oral hygiene and absolute and relative non-cooperation in dental treatment by individuals with special needs, makes preventive measures and necessary treatment more difficult to conduct [8].

Studies from Bosnia and Herzegovina in 2016 reported 83% of healthy preschool children affected with caries and 90% of children with Down Syndrome [5, 6].The percentage of untreated caries in the most researches was over 60% [9, 10, 11]. Preventive programs and strategies for dental disease for children with special healthcare needs in the community are lacking. However, dental caries is a disease that can be prevented in time if preventive measures are applied. The key of prevention is to motivate, educate and raise awareness of parents/caregivers about the importance of oral health.

Periodical oral health surveys conducted for children with special healthcare needs is important for developing proper strategies for oral health care community-based programs for this high-risk population group.

The aim of this study was to assess caries status and treatment needs of children with special healthcare needs being residents of the School for children and adults with special healthcare needs "Mjedenica" and to evaluate planned treatment efficiency after an eight-month period.

Subjects and methods

School specialized for children and adults with special healthcare needs "Mjedenica" in Sarajevo, Bosnia and Herzegovina, is covered by Public Institution-Institute for special education and upbringing of children. Beneficiaries are from the whole territory of Bosnia and Herzegovina. Dental office was established in April 2019. Dental team was composed of one general dentist and one dental nurse. The main goal for established dental office was to assess dental status of residents and to provide treatment plan for each patient for complete rehabilitation and preventive strategy for long-term maintenance of oral health. Established dental office belongs to the Clinic of Preventive dentistry and Pedodontics being a part of the Faculty of Dentistry University of Sarajevo.

Total number of residents in the Institution in April 2019 was 185 individuals affected by different disabilities - Mental Retardation (MR), Autistic Disorder (AD), Down Syndrome (DS) and other (OTH). Information consent document for patient screening, treatment options and possible non-personal data use for educational and scientific purposes was offered to all parents/caregivers or legal representatives. Signed consent as an official document of the Faculty of Dentistry University of Sarajevo, approved by Education and Scientific Committee of the Faculty of Dentistry University of Sarajevo was a prerequisite for inclusion in the dental screening and further treatment. In the initial screening did not participate 61 residents for one of the following reasons: informed consent was not signed for 9 subjects, 49 weren't cooperative for screening and 3 left school before the screening was done. Total number of subjects screened for dental status and treatment needs was N=124.

The survey was done on the dental chair, using CPI-WHO dental probe (Community periodontal index type E by WHO dental probe) and plain dental mirror under artificial light, using air flow and cotton walls if needed for better visuality. Presence of caries was assessed in accordance to the World Health Organization (WHO) criteria [12]. After assessing treatment needs, eight-month treatment plan was developed for each participant. Dental team employed in the dental office was previously trained by experienced specialists for Preventive and Pediatric dentistry for initial dental status screening, treatment plan developing and conducting treatment and preventive actions. Treatment plan included decay treatment, tooth cleaning and polishing, fissure sealing, professional topical fluoridation, of oral health habits evaluation and instructions of healthy lifestyle for oral health improvement. Three independent trained researchers reviewed initial records for dental status and treatment plans at the beginning of the initial screening of dental status and treatment needs and eight months after the planned treatment outcomes.

Screening was done in a residential institution groups as follows:

Group I: 8 children aged 0-7;
Group II: 84 children aged 7-14;
Group III: 10 children aged 14-18;
Group IV: 22 adults aged 18+

Prevalence of caries was calculated as frequency and percentage of decayed teeth, missed teeth due to caries and filled teeth due to caries for total sample and by residential groups.

The results were analyzed by means of descriptive statistics as frequency of distribution and percentage. Statistics were done in Microsoft Excel for Mac, version 16.32.

Results

Total number of residents in the Institution was 185 children and adults with special healthcare

Type of disease	Male	Female	Total
Autism	28	8	36
Mild mental retardation	11	5	16
Mild mental retardation and autism	1	0	1
Psychomotor retardation	4	2	6
Moderate mental retardation	11	2	13
Moderate mental retardation and autism	1	0	1
Polymyalgia rheumatic	1	0	1
EPY	5	3	8
Down syndrome	0	3	3
Disorder of behavior and emotions	1	0	1
Speech disorder	1	0	1
Encephalitis and EPY	1	0	1
Combined disorders and syndromes*	6	2	8
No diagnosis**	56	33	89
Total	127	58	185

Table 1. Frequency of distribution of respondents by medical condition. (*includes disharmonic development, intellectual disability, speech delay, syndromes and other) (**no recorded medical diagnoses)

Study group	Absolute noncooperative	Cooperative for dental status	Cooperative for preventive measures	Cooperative for restauration	Absolute cooperative
Group I: age 0-7	8	2	6	-	-
Group II: age 7-14	28	18	40	8	18
Group III: age 14-18	3	-	2	5	3
Group IV: age 18+	10	1	13	-	8
Total	49	21	61	13	29

Table 2. Distribution of participants by cooperation for dental treatment presented in frequencies

Study group	Decayed teeth (%)	Missed teeth (%)	Filled teeth (%)
Group I: age 0-7	5 (4.03)	1 (0.8)	1 (0.8)
Group II: age 7-14	75 (60.48)	9 (7.25)	40 (32.25)
Group III: age 14-18	9 (7.25)	4 (3.22)	8 (6.45)
Group IV: age 18+	17 (13.71)	17 (13.71)	15 (12.09)
Total	106 (85.48)	31 (25)	64 (51.61)

Table 3. Results of the assessment of subjects affected with untreated caries, missed and filled teeth due to caries in different age groups presented in frequencies and percentages

Study group	Sample size	Caries free	No treatment need	Filling need	Extraction need
Group I: age 0-7	8 (6.45%)	1 (0.80%)	1 (0.80%)	5 (4.03%)	1 (0,54%)
Group II: age 7-14	84 (67.74%)	1 (0.80%)	7 (5.64%)	73 (58.87%)	37 (29.83%)
Group III: age 14-18	10 (8.06%)	0 (0%)	1 (0.80%)	9 (7.25%)	4 (3.22%)
Group IV: age 18+	22 (17.74%)	0 (0%)	4 (3.22%)	16 (12.90%)	7 (5.64%)
Total	124	2 (1.61%)	13 (10.48%)	103 (83.06%)	49 (39.51%)

Table 4. Percentage and frequency of caries free subjects and overview of treatment needs in different age groups

needs who are members of the School "Mjedenica" which included 127 male and 58 female residents with different medical diagnosis. The number of residents having no medical diagnosis recorded in their files was 89. Frequency of distribution of respondents by medical condition was given in Table 1. Parents/caregivers did not sign the consent for 9 residents and 3 left the School before initial screening was done, 49 was not cooperative for dental examination. Distribution of participants by cooperation for dental treatment is presented in Table 2. Total sample of examined individuals for dental status and treatment needs was N=124. The percentage of untreated caries was 85.48%. Treatment needs for tooth filling was recorded in 83.06% and for tooth extraction in 39.51% of examined teeth. Results of the assessment of subjects affected with untreated caries, missed and filled teeth due to caries in different age groups are presented in Table 3.

There was only one child caries free in the youngest age group (Group I), and in the oldest age group (Group IV) there were two edentulous individuals with total prothesis. Results of caries free subjects by study groups and treatment needs assessment is given in Table 4.

Eight months after the initial screening, patients' dental records were analyzed for treatment outcome. Twenty - eight children completed caries treatment with preventive and prophylactic care included. During 8-month period, 151 teeth was filled and 30 teeth were extracted, preventive treatment was provided regularly including education and monitoring of oral hygiene and diet, professional tooth cleaning local fluoridation and fissure sealing. By the end of eight -month period new cavities were not detected.

The goals of the dental office for children with special healthcare needs "Mjedenica" were to educate the parents/caregivers and the staff working with children with special healthcare needs about oral hygiene, dietary habits and the importance of regular dental visits, to implement regular dental care for optimal oral health achievement.

Discussion

Oral disease is serious health problem among individuals with disabilities [7]. The prevalence and severity of oral disease among this group are higher when compared to the general population [7]. The oral health of children and adults with special healthcare needs in our country is worrisome bad and not in line with international trends of continuous improvement. A lack of preventive programs and low motivation and knowledge of the whole population and especially caregivers/parents could be leading cause for such situation.

Of the total sample of screened subjects 85.48% had untreated caries. The frequency of dental caries was the highest among group III (100%). The review of epidemiological studies of oral health in population of Bosnia and Herzegovina revealed high caries prevalence's for all studied age groups [5, 13, 14].

Results of epidemiological study for 12-years-old healthy children in Bosnia and Herzegovina reported untreated caries in 45.4%, missed teeth 12.5% and filled teeth 42.1% [14]. If we compare the caries prevalence of healthy children and children with special healthcare needs of similar age, major difference could not be found. Healthy children had a higher number of filled teeth, and children with special healthcare needs had more extracted teeth. These results indicate differences in treatment plan due to limited dental procedures for children with special health care needs [14].

The study of oral health of Adults with Down syndrome in Bosnia and Herzegovina reported high DMFT value of 15.9 for participants aged 19 to 49 [6]. The results of tested parameters of oral hygiene (plaque, gingival and calculus index) in previous studies indicate low oral hygiene practices and serious lack of systematic preventive practices [5, 6, 13, 14, 15].

Case-controlled study conducted in Serbia reported statistically significant higher mean dmft/DMFT values in both dentitions for children with special health care needs than for healthy children [16]. Authors compared dmft/DMFT among the study subgroups (autism, cerebral palsy and mental retardation), and no statistical significance was observed [16]. Serbian authors considered that medically compromised children were taken to the dentist usually when they had experienced symptoms of acute pain, and that higher incidence of caries could be due to the lack of awareness about the importance of regular dental visits and both preventive and prophylactic care [16]. High caries prevalence for this population was reported in Kosovo with the percentage of 82%, and Croatia where reported DMFT for individuals with cerebral palsy was 18.5 [10, 17]. A poor collaboration of disabled children usually doesn't leave much space for a dentist in planning further dental treatments requiring complex restorations and/or endodontic treatment. Unfortunately, the most cases would therefore end up with extractions, as a treatment

choice. Kakaounakiet al., reported that 82% of interventions in children with disabilities were extractions, MacPhersonra et al., presented that 96% of cases of extractions were performed in general anesthesia and 48% in local anesthesia. According to Hosey at al., there was an increasing trend in the number of extractions in the period of 13 years varying from 26% up to 74% of cases. Similar problems such as the insufficient care and unsuccessful dental care for children with special healthcare needs, were presented by different authors and in many other countries [17, 18, 19, 20].

In the study from Nigeria in 2019, the prevalence of periodontal disease was 96.1% for the children and teenagers with special healthcare needs and the most of them had gingivitis (88.8%). Only 3.9% had healthy periodontium [21]. The mean dmft/DMFT scores was 0.02, and the untreated caries was 49% [21]. Indian study in 2015 had a low score of reported dmft/DMFT as 2.5. The same study reported up to 53.7% of the total population required oral prophylaxis, 33.3% required restorations on their posterior teeth and 12.9% required veneers for labial facing of hypoplastic enamel, 9% required orthodontic treatment and 7% required extractions [22]. Differences in epidemiological data for caries and periodontal diseases prevalence among countries could be related to the established community preventive health care system, socio-economic status and genetic related factors affecting incidence of periodontal disease occurrence worldwide [23].

Studies from developed countries in Europe, USA, Canada and others related to the oral health of children with special health care needs are very rare. The study conducted in Netherland in 2008 reported 57.4%, of children with untreated caries, while dentists considered communication problems as the most important barrier to the treatment [24]. Dutch non institutionalized children with severe disabilities still receive a relatively low degree of quality dental care [24].

Studies also showed that children with severe disabilities could have lower recorded dmft/DMFT when compared to children with mild or moderate disabilities [25, 26]. It is probably because caregivers/parents of children with severe disabilities are more dedicated and motivated in general.

Eight months after an intensive and dedicated dental treatment in dental office “Mjedenica” the caries prevalence is reduced up to 22.95% indicating that adequate treatment supported with efforts in preventive oral health care, continuous monitoring of oral health habits is fundamental for oral health improvement in individuals with disabilities and special health care needs.

Literature

1. American Academy of Pediatric Dentistry Council on Clinical Affairs. Definition of persons with special health care needs. Pediatric Dent 2005;27:15-2.
2. Saravanakumar MS, Vasanthakumari A, Bharathan R. Oral health status of special health care needs children attending a day care Centre in Chennai. Int J Students' Res 2013;3(1):12-5.
3. UNICEF. UNICEF for every child. Official web site, 2019.
4. WHO. World report on disability: Malta, WHO; 2011.
5. Šačić L, Marković N, Arslanagić Muratbegović A, Zukanović 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.

6. Porović S, Zukanović A, Jurić H, Mesihović Dinarević S. Oral Health of Down Syndrome Adults in Bosnia and Herzegovina. Journal of the Academy of Medical Science of BIH, Materia Socio-medica 2016; 28(6): 437-439.

7. Altun C, Guven G, Akgun OM, Akkurt MD, Basak F, Akbulut E. Oral Health Status of Disabled Individuals Attending Special Schools. Eur J Dent 2010;4 (4):361–6.

8. Aggarwal VP, Kakkar A, Sidhu S, Singh S. Oral health status and treatment needs among SHCN. Int J Med Pap 2016;1:14-9.

9. Al-Maweri SA, Zimmer S. Oral Health Survey of 6-14-Year-Old Children with Disabilities Attending Special Schools Yemen. Journal of Clinical Pediatric Dentistry. 2015; 3 (39): 272-276.

10. Xhemajli L, Begzati A, Kutllovci T, Ahmeti Blerta D. Dental Health Status of Children and Adolescent with Special Health Care Needs. J Int Dent Med Res 2018; 11(3):945-949.

11. Shivakumar KM, Patil S, Kadashetti V, Raje V. Oral Health Status and Dental Treatment Needs of 5–12-year-old Children with Disabilities Attending Special Schools in Western Maharashtra, India. Int J Appl Basic Med Res 2018; 8 (1): 24–29.

12. Oral Health Surveys. Basic methods, Geneva: WHO;1997, 4th ed.

13. Selimović-Dragaš M, Huseinbegović A, Bajrić E, Marković N, Arslanagić Muratbegović A, Kobašlija S. Thirty years of oral health surveys in Bosnia and Herzegovina: A review. Stomatološki vjesnik 2018; 7 (2): 38-44.

14. Marković A, Arslanagić Muratbegović A, Kobašlija S, Bajrić E, Selimović-Dragaš M, Huseinbegović A. Caries prevalence of children and adolescents in Bosnia and Herzegovina. Acta Medica Academica 2013;42(2):108-115.

15. Ihtijarević-Trtak S, Kobašlija S, Hadžagić-Ćatibušić F, Huseinbegović A. Periodontal status in permanent dentition of children with cerebral palsy. Stomatološki vjesnik 2014; 3 (1); 51-57.

16. Mandić J, Jovanović S, Mandinić Z, Ivanović M, Kosanović D, Miličić B, Živojinović-Toumba V. Oral health in children with special needs. Vojnosanit Pregl 2018; 75(7): 675–681.

17. Gržić R, Bakarčić D, Prpić I, Jokić NI, Sasso A, Kovac Z, Lajnert V. Dental health and dental care in children with cerebral palsy. Coll Antropol.2011; 35(3):761-4.

18. Kakaounake E, Tahmassebi JF, Fayle SA. Further dental treatment needs of children receiving exodontia under general anesthesia at a teaching hospital in the UK. Int J Paediatr. Den 2006; 16 (4): 263-9.

19. Macpherson LM, Pine CM, To-Chel C, Burnside G, Hosey MT, Adair P. Factors influencing referral of children for dental extractions under general and local anesthesia. Community Dent Heth 2005; 22 (4) 282-8.

20. Hosey MT, Bryce J, Harris P, Mchugh S, Campbell C. The behavior, social status and number of teeth extracted in children under general anesthesia: a referral center revisited. Br Dent J 2006; 200 (6): 331-4.

21. *Akinwonmi BA, Adekoya-Sofowora CA.* Oral health characteristics of children and teenagers with special health care needs in Ile-Ife, Nigeria. African Journal od Oral Health 2019; 8 (2):13-23.

22. Jain A, Thakur S, Singha P, Thakur P. Oral Health Status and Treatment Needs of Children and Young Adults Attending a Day Centre for Individuals with Special Health Care Needs in Shimla. Int J Dent Med Res 2015; 1(6): 32-36.

23. De Moraes D, Pini P, Gil C, Frohlich R. Oral health evaluation in special needs individuals. Einstein. 2016; 14 (4): 501–507.

24. deJongh A, van Houtem C, van der Schoof M, Resida G, Broers D. Oral health status, treatment needs, and obstacles to dental care among noninstitutionalized children with severe mental disabilities in The Netherlands. Spec Care Dentist 2008; 28 (3):111-5.

25. Costa AA, Della Bona Á, Trentin MS. Influence of Different Intellectual Disability Levels on Caries and Periodontal Disease. Braz Dent J 2016; 27 (1): 52–5.

26. Duddu MK, Muppa R, Nallanchakrava S, Bhupatiraju P. Prevalence of dental caries in people attending special schools in Hyderabad-Secunderabad, India. J NTR Univ Health Sci 2016; 5: 137-41 .

ORAL HEALTH RELATED KNOWLEDGE, BEHAVIOR AND ATTITUDE IN A GROUP OF 12-YEAR-OLD SCHOOL CHILDREN

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ABSTRACT

Objective: The aim of this study was to investigate the oral health knowledge, behavior and attitudes in a group of 12-year-olds in Bihać, Bosnia and Herzegovina.

Methods: The study was designed as a cross-sectional and included 434 seventh-grade students. A structured questionnaire consisted of 25 questions was constructed, probing areas such as oral health knowledge, attitudes towards oral health, behavior and socio-demographic data.

Descriptive statistics was performed and frequency distributions and percentages were used for data presenting. For the independent variables, the Chi-square test was used.

Results: The most common reason for dental visit was a regular checkup (64, 26%). Most students brush their teeth twice a day (51, 44%) or more than twice (25, 38%). Toothbrush and toothpaste are used by 68, 39%, while dental floss additionally by 31, 62% subjects. Soft drinks are consumed daily by 70, 72%, sweets by 57, 67% every day after the meal, while 10, 27% students consume sweets daily with no restrictions. Approximately half of all respondents (53, 69%) answered that they felt normal when they visited the dentist, 10, 83% students felt positive and 3% relaxed. About one third of respondents have reported negative feelings: 11, 06% responded that it was stressful, 8, 29% uncomfortable, 7, 6% worried, while 1, 84% students felt scared and terrified.

Conclusion: Introducing an oral health educational program into schools and preschool institutions could be a significant step towards improvements in oral health status of children and adolescents in our country in which dental care is predominantly based on treating existing pathology.

Key words: oral health, attitudes, behavior, knowledge, 12-year-old

Introduction

Good oral health is important part of general health and also one of its key indicators. It is well established that poor oral health can impede a child's growth and development, negatively affect diet and nutrition, deprive sleep, lead to short or prolonged physical pain and discomfort, and also disrupt psychological and social well-being and general quality of life [1-3]. Furthermore, the effects of a child's poor oral health have far-reaching consequences into adulthood [4].

Dental caries and periodontal diseases account for most of the oral disease burden in childhood and adolescence, even though both are preventable and can be treated in early stages.

Gum disease prevalence in children is very high globally. WHO (World Health Organization) data demonstrated that 90% of 12-year-old children in Portugal and 100% of 6- and 12-year-old children in Niger have signs of gum disease requiring treatment [5].

Although WHO data show a significant decline in childhood caries prevalence in previous decades in the Western European countries and the USA, in low-income countries this disease still poses a significant public health problem [6]. A most recent study among schoolchildren conducted in Bosnia and Herzegovina showed that the DMFT (decayed, missing and filled teeth) in 12 -year-olds was 4.16 and that the D-component constituted a significant part of the index (45.43%) [7]. To the contrary, in numerous European countries, like Belgium, Denmark, Finland, Germany, Netherlands and Sweden, DMFT values are lower than 1 (0.9, 0.4, 0.7, 0.5, 0.6 and 0.8 respectively) [8].

Such low caries prevalence in these developed countries has been mainly attributed to the widespread use of fluoridated toothpastes and the increased awareness of the importance of maintaining high levels of oral hygiene [6], as well as to the low intake of added sugars, that are known to be correlated with an increased risk of caries [9].

Good oral health practices should be developed in early childhood. For the young children, the primary source of the proper oral health behavior is the family, which is important, since the earlier the behavior is formed, the more difficult it is to change it later.

As children grow up, oral health behavior is influenced by the process of secondary socialization in which the environment and peer groups play a leading role [10].

The school-age, lasting from childhood to adolescence, is another important period when children develop health behaviors as well as beliefs and attitudes. In this period, children can easily adopt new long-lasting knowledge and habits, especially given the possibility that oral health messages can be reinforced regularly during the school years. Health programs in schools are important for promoting the health and healthy lifestyles at children and young people. Oral health shown to be easily integrated into such school health activities [11].

School health promotion programs in developing country such as Bosnia and Herzegovina, with limited economic and health care resources and a high incidence of common oral diseases, could be an effective contribution to dental health care, especially having in mind that treatment of oral diseases result in significant costs [5] and caries is the fourth-most expensive chronic disease to treat [12].

Health care reform in Bosnia and Herzegovina is still ongoing and extensive preventive programs to protect the oral health of children are still lacking, therefore organizing an educational program for schoolchildren would be essential for improving their oral health.

Little information is available about the overall oral health knowledge and practices of children in our country, although this information is of utmost importance in designing educational programs.

The aim of this study was to investigate the oral health attitudes, knowledge and behavior of a group of 12-year-olds in Bosnia and Herzegovina.

Methods

The study was designed as a cross-sectional, using a convenience sampling method. The targeted population were 7th-grade students. In Bosnia and Herzegovina school-system those are 12 years old children on average. The study included 434 participants. The survey was conducted in four major primary schools with the highest number of students in the city of Bihać, namely: Prekounje, Gornje Prekounje-Ripač, Harmani 1 and Harmani 2. Prior to the beginning of the study, the permission of the Unsko-Sanski Canton Ministry of Education, Science, Culture, and Sports was obtained.

Students were invited to participate in the study using a group-administered structured questionnaire in the classroom setting. The questionnaires were completed anonymously by all seventh-grade students from selected schools who were present in the school on the day the study was scheduled and who accepted to participate in the study.

They were explained how to fill in the questionnaire, and the researcher was present in the classroom in case the respondents did not have a clear sense of the question and needed a clarification.

The school authorities informed the children and parents about the aim of the study and obtained the written consent from the parents. The Ethics Committee of the Faculty of Dentistry, University of Sarajevo, approved the study.

A structured questionnaire consisting of 25 questions was constructed using questions from previous similar studies, some of which were originally in students' native language and others were translated from English [13-15]. The questions were close-ended, either multiple choice or with true/false and yes/no options and they covered areas such as oral health knowledge, attitudes towards oral health, behavior and socio-demographic data (parental education and occupation).

Microsoft Office Excel 2013 worksheet was used for data entry. The data integrity check was done, and IBM SPSS Statistics v. 20.0 for Windows statistical software was used for data analysis. Descriptive statistics were performed and frequency distributions and percentages were used for data presenting. For the independent variables, the Chi-square test was used to determine the association between them. Statistical significance was set at $p< 0.05$.

Results

A total of 434 twelve-year old were included in this survey. Male respondents comprised 51.38% (n=223) of the sample, whereas female participated with 48.62% (n=211). The majority of students included in this survey were from Gornje Prekounje Ripač Elementary School - 140 of them, 113 and 103 participants were from Harmani 2 and Prekounje Elementary School respectively, and 78 from Harmani 1 school.

Socio-demographic characteristics:

Statistical analysis revealed significantly higher mothers' employment rate than those of fathers' in the whole sample ($\chi 2 = 62.206$; $p < 0.001$).

Out of total, 19, 12% mothers were unemployed and 44, 0% fathers.

The highest proportion of unemployed parents, 25, 71% mothers and 58, 57% fathers, was registered in the Gornje Prekounje Ripač Elementary School ($p = 0,032$).

Approximately half of all parents graduated from high school, 52, 76% fathers and 51, 99% mothers. Bachelor's degree is held by 20, 27% fathers and 17, 97% mothers, and 17, 05% fathers and 19, 35% mothers graduated from university. With only primary school education, there were 4, 37% fathers and 4, 14% mothers, and with postgraduate education 2, 07% fathers and mothers each. Fifteen students did not know the education level of their parents.

	School					
	Gornje Prekounje -Ripač	Harmani 1	Harmani 2	Prekounje	X	p
Frequency of dental visits						
once in 3 months	28,57%	38,46%	46,90%	29,13%	35,77%	
twice a year	9,29%	10,26%	14,16%	17,48%	12,80%	
once a year	8,57%	0,00%	0,00%	0,00%	2,14%	0.209
whenever I feel necessary	42,14%	48,72%	35,40%	47,57%	43,46%	
when I have a toothache	9,29%	2,56%	3,54%	5,83%	5,31%	
Reason for dental visit						
caries	8,57%	12,82%	13,27%	12,62%	11,82%	
pain/swelling	12,86%	7,69%	7,08%	4,85%	8,12%	
dental treatment	23,57%	6,41%	8,85%	14,56%	13,35%	0.029
extraction	5,71%	0,00%	0,00%	1,94%	1,91%	
regular checkups	47,14%	73,08%	70,80%	66,02%	64,26%	
Tooth brushing frequency						
once a day	5,71%	1,28%	0,88%	0,00%	1,97%	0.103
twice a day	39,29%	47,44%	53,98%	65,05%	51,44%	
more than twice a day	25,71%	32,05%	29,20%	14,56%	25,38%	
after each meal	27,14%	14,10%	16,81%	20,39%	19,61%	
rarely	2,14%	5,13%	0,00%	0,00%	1,82%	
never	0,00%	0,00%	0,00%	0,00%	0,00%	
Oral hygiene product use						
toothbrush and toothpaste	80,00%	60,26%	67,26%	66,02%	68,39%	0,81
only toothbrush	0,00%	0,00%	0,00%	0,00%	0,00%	
toothbrush, toothpaste, dental floss	20,00%	39,74%	32,74%	33,98%	31,62%	
Tongue cleaning						
daily	32,14%	25,64%	14,16%	19,42%	22,84%	
sometimes	57,86%	73,08%	75,22%	67,96%	68,53%	0,271
never	7,86%	3,85%	10,62%	12,62%	8,74%	
Use of fluoride supplements						
yes, every day	3,57%	0,00%	0,00%	0,00%	0,89%	0,879
yes, sometimes	18,57%	21,79%	17,70%	18,45%	19,13%	
yes, at school	0,00%	0,00%	0,00%	0,00%	0,00%	
never	77,86%	78,21%	82,30%	81,55%	79,98%	
Soft drinks consumption						
every day	71,43%	76,92%	74,34%	60,19%	70,72%	
several times a week	25,71%	21,79%	25,66%	38,83%	28,00%	
once a month	2,14%	0,00%	0,00%	0,00%	0,54%	0,033
never, I don't like soft drinks	0,71%	1,28%	0,00%	0,97%	0,74%	
other	0,00%	0,00%	0,00%	0,00%	0,00%	
Consumption of sweets						
every day, but only after meals	52,86%	60,26%	59,29%	58,25%	57,67%	
every day	13,57%	12,82%	8,85%	5,83%	10,27%	
once a week	9,29%	0,00%	0,00%	0,00%	2,32%	0,788
several times a week	22,14%	25,64%	30,09%	35,92%	28,45%	
once a month	2,14%	1,28%	0,00%	0,00%	0,86%	
never	0,00%	0,00%	0,00%	0,00%	0,00%	

Table 1. Oral health behavior patterns

	School					
	Gornje Prekounje -Ripač	Harmani 1	Harmani 2	Prekounje	X	p
Can oral health affect general health?						
yes	72,86%	82,05%	87,61%	91,26%	83,00%	
no	9,29%	1,28%	0,00%	0,00%	3,00%	0.041
I do not know	17,86%	16,67%	12,39%	8,74%	14,00%	
What is a consequence of inadequate tooth brushing?						
tooth decay	18,57%	3,85%	7,96%	0,97%	9,00%	
bleeding gums	8,57%	1,28%	1,77%	0,00%	4,00%	
bad breath	10,00%	1,28%	0,00%	0,00%	3,00%	
none of the above	0,00%	0,00%	0,00%	0,00%	0,00%	0.038
all of the above	62,86%	93,59%	90,27%	99,03%	84,00%	
I do not know	0,00%	0,00%	0,00%	0,00%	0,00%	
other	0,00%	0,00%	0,00%	0,00%	0,00%	
How can we prevent dental and oral health problems?						
avoiding sugary foods	5,71%	0,00%	0,88%	0,97%	1,89%	
regular brushing	15,00%	6,41%	4,42%	2,91%	7,19%	
rinsing mouth after meals	2,14%	0,00%	0,00%	0,00%	0,54%	
regular visits to the dentist	17,86%	5,13%	7,08%	3,88%	8,49%	0.011
all of the above	59,29%	88,46%	78,76%	92,23%	79,69%	
none of the above	0,00%	0,00%	0,00%	0,00%	0,00%	
I do not know	0,00%	0,00%	0,00%	0,00%	0,00%	
What is fluoride?						
cleans and whitens teeth	16,43%	10,26%	9,73%	12,62%	12,26%	
removes deposits and calculus from the tooth	15,71%	2,56%	3,54%	7,77%	7,40%	0.011
a natural element used to prevent tooth decay and improves caries resistance	41,43%	74,36%	78,76%	70,87%	66,36%	
Caries can be prevented by using fluoride toothpaste?						
yes	45,71%	75,64%	73,45%	69,90%	66,18%	
no	2,86%	0,00%	0,00%	0,00%	0,72%	
I do not know	20,71%	2,56%	0,00%	1,94%	6,30%	0.039
mostly yes	27,14%	21,79%	26,55%	26,21%	25,42%	
mostly not	0,71%	0,00%	0,00%	0,00%	0,18%	
The bulk of your knowledge of dental and oral health originates from:						
radio, television, newspapers, media	20,00%	16,67%	12,39%	12,62%	15,42%	
your dentist	73,57%	74,36%	69,03%	68,93%	71,47%	
your doctor	9,29%	0,00%	0,00%	0,00%	2,32%	0.604
friends, neighbors, or other relatives	2,86%	1,28%	0,00%	0,00%	1,04%	
from other sources	1,43%	7,69%	16,81%	18,45%	11,10%	

Table 2. Oral health related knowledge

Prekounje Elementary School students had the highest percentage of their mothers having secondary school (p=0, 04), whereas students from Gornje Prekounje Ripač Elementary School had a significantly larger proportion of fathers with only primary school education (p=0, 039) and the smallest percentage of them graduated from university.

Behavior towards oral health:

The behavior patterns toward oral health are shown in **Table 1**. The most common reason for the dental visit in the whole sample was a regular checkup, except for students from Gornje Prekounje - Ripač Elementary School who visited the dentist significantly more often because they needed the treatment (p = 0. 029).

Most students brush their teeth twice a day or more than twice and use toothbrush and toothpaste with one-third using dental floss additionally.

Fluoride supplements are rarely used. Respondents reported frequent consumption of soft drinks and sweets.

Knowledge:

Most students were aware that poor oral health can affect general health; large majority correctly recognized all of the consequences of inadequate tooth brushing and knew what were appropriate ways of maintaining good oral health (**Table 2**.)

Approximately two-thirds of respondents knew what the fluoride was and that caries could be prevented using fluoridated toothpaste.

Statistical analysis, however, revealed that all of these questions received significantly less accurate answers from students from the Gornje Prekounje-Ripač Primary School. (**Table 2.**)

The dentist was the major source of information on dental and oral health for all respondents.

Attitudes:

Analysis of students' oral health attitudes revealed that 90, 16% students fully agreed and 8, 93% mostly agreed that oral and dental health was a personal responsibility. The majority of them (76, 92%) agreed and mostly agreed (19, 86%) that they themselves can help improve their oral health. Asked if it was possible to keep their teeth for a lifetime, 69, 64% responded affirmatively - completely agreed, and 27, 67% mostly agreed, whereas only 1, 25% disagreed.

That regular visits to the dentist will prevent dental problems was the opinion of 67, 13% students and 31, 69% generally agreed with this statement, while 0, 72% did not know.

Of the total number of students, 78, 11% completely agreed and 17, 83% mostly agreed that brushing their teeth will prevent gums bleeding, while 2, 5% did not know the answer.

For the statement "I cannot prevent caries without professional help. ", opinions were divided. 26, 90% students answered that this statement was true, 27, 37% that it was false, for 23, 99% respondents it was mostly true and for 14, 57% mostly false.

Approximately half of all respondents (53,69%) answered that they felt normal when they visited the dentist, 10, 83% students felt positive and 3% relaxed. About one third of respondents have reported negative feelings: 11, 06% responded that it was stressful, 8, 29% uncomfortable, 7, 6% were worried, while 1, 84% students felt scared and terrified.

Discussion

This study aimed to probe the behavior, knowledge and attitudes in a group of 12-year-old regarding oral health.

So far, no studies addressing this subject in this age group in the Federation of Bosnia and Herzegovina have been published. Twelve-year-old are chosen for the study because they are determined as the global indicator age group for monitoring caries trends and international comparisons. At that age, all of the permanent

teeth except for third molars have erupted, and additionally, this group is through schools easily accessible for survey.

Respondents in our study reported very good oral hygiene habits, with more than 95% of them brush their teeth twice or more than twice a day. The results of 2001-2002 HBSC (Health Behavior in School-aged Children) survey among 11-13 old school children from 27 countries showed that only children from Switzerland showed similar results, with 84. 8% of them brushing teeth more than once a day, while this applies to about 80% of children from Scandinavia, the Netherlands, and Germany. In Belgium, Croatia, Greece, Latvia and some other countries, only about 50% of children or even less brush their teeth more than once a day [9].

However, with approximately two-thirds of respondents in our study consuming soft drinks and sweets daily, the nutrition behaviors are much poorer compared to the HBSC study, in which Scottish children demonstrated the poorest results with 45% consuming sweets and 41% soft drinks every day, whereas only about 12% of Danish, 14. 3% of Greek and 12. 7% of Swedish children consume sweets every day, and 9. 3%, 17. 9% and 12. 25% of them consume soft drinks daily, respectively [9].

Overall, respondents demonstrated favorable oral health-related knowledge level, although students of Gornje Prekounje-Ripač Elementary School showed poorer results. A possible reason for this is the fact that the significantly higher proportion of students from that school comes from a lower socioeconomic status, with the lowest mothers' and fathers' employment rate and significantly lower fathers' educational level.

Indirectly, these results may further confirm the findings of studies indicating that children of lower socioeconomic status are at a higher risk of developing oral diseases [16, 17].

Although positive attitudes towards oral health, as well as good oral hygiene habits were demonstrated, further improvements concerning dietary habits and knowledge on options to prevent oral problems are necessary,

Despite rather encouraging findings in terms of oral health-related knowledge and oral hygiene practices, that should suggest a low caries rate, epidemiological studies have shown quite the opposite.

The average DMFT in twelve-year-old in Bosnia and Herzegovina in 2008, as already mentioned, was 4. 16 7, while in the same age group in Bihać, in 2013 the recorded value was 5. 39 [18].

These data support the fact that serious measures need to be taken to improve the oral health of children and adolescents in Bosnia and Herzegovina. The most commonly emphasized success in preventing and reducing caries prevalence in schoolchildren has occurred in the Scandinavian countries, which have achieved this to a large extent through school-based prevention programs [19]. Some Eastern European countries have achieved good results, too. Through supervised toothbrushing programs with concentrated fluoride preparations and an extensive oral health education program in schools and kindergartens, Slovenia achieved significant success, reducing DMFT from 6.1 in 1987 to 1.8 in 1998 [20].

In Hungary, caries prevalence was significantly reduced in the period 1985 to 1996 through school programs, by administering fluorides either in tablets or topically, giving oral hygiene instructions and advising on proper nutrition. Teeth brushing exercises in classrooms and health education sessions were held 2-4 times a year. The caries prevalence declined in that period from 92, 5% to 84, 5% [21].

From the previous examples, it is clear that the school is the environment which enables organized way to reach the school population and implement the necessary preventive measures to reduce the prevalence of caries and other oral diseases. Given that primary school is compulsory, oral health-related education through schools is a way to reach all children, including those of lower

socioeconomic status, who have proven to be a vulnerable category.

However, for the results of the education to last over a longer period, repeated instruction by professionals is required. Oral health promotion should be integrated into the curriculum in such a way to be extended through a significant part of schooling, with intervention sessions organized several times during a school year [22, 23].

Conclusion

Despite the positive attitudes and favorable oral health-related knowledge observed in this group of 12-year-old, recent studies of this population in Bosnia and Herzegovina show high caries prevalence. The high frequency of consumption of soft drinks and sweets demonstrated in this study is undoubtedly one of the main reasons for such poor dental health. The reported good results regarding oral-hygiene habits among students should be taken with caution because of the possible desire to provide socially acceptable answers, even though the questionnaire was done anonymously.

Given these results, as well as the absence of community-based oral health prevention programs in our country in which dental care is predominantly based on treating existing pathology, introducing an educational program into schools and preschool institutions could be a significant step towards addressing the current unfavorable epidemiological situation when it comes to the oral health status of school children.

CONFLICT OF INTEREST:

The authors declare no conflict of interest.

References

1. Souza JG, Martins AM, Silveira MF, Jones KM, Meirelles MP. Impact of oral clinical problems on oral health-related quality of life in Brazilian children: a hierarchical approach. Int J Paediatr Dent. 2017 Jan;27(1):66-78.
2. Silva MJ1, Kilpatrick NM, Craig JM, Manton DJ, Leong P6, Ho H, et al. A twin study of body mass index and dental caries in childhood. Sci Rep. 2020 Jan 17;10(1):568.
3. Godson J, Csikar J, White S.Oral health of children in England: a callto action! Arch Dis Child January. 2018; 103(1) :5-10.
4. Jamieson L, Smithers L, Hedges J, Parker E, Mills H, Kapellas K et al. Dental disease outcomes following a 2-year oral health promotion program for Australian Aboriginal children and their families: a 2-arm parallel, single blind, randomized controlled trial. E Clinical Medicine. 2018; 1:43-50.
5. Kwan S, Petersen PE. WHO Information Series on School Health. Oral health promotion through schools. Document 11. Geneva: WHO; 2003.
6. Lagerweij MD, van Loveren C. Declining Caries Trends: Are We Satisfied? Curr Oral Health Rep. 2015; 2(4): 212–217.
7. Markovic N, Arslanagic Muratbegovic A. Oral Health in Bosnia and Herzegovina School-children - Findings of First National Survey. Austin J Dermatolog. 2014;1(3): 1014.
8. World Health Organization. WHO's oral health country/area profile program(CAPP) database. 2013. http://www.mah.se/CAPP/Country-Oral-Health-Profiles. Caries distribution world-wide and in relation to socioeconomic inequalities within and between countries.
9. Zaborskis A, Milciuviene S, Narbutaite J, Bendoraitiene E, Kavaliauskiene A. Caries experience and oral health behavior among

11 -13-year-olds: an ecological study of data from 27 European countries, Israel, Canada and USA. Community Dent Health. 2010 Jun;27(2):102-8.

10. Lalić M, Aleksić E, Gajić M, Malešević Đ. Oral health related knowledge and health behavior of parents and school children. Med Pregl 2013; 66(1-2): 70-80.
11. Jürgensen N, Petersen P.E. Promoting oral health of children through schools – Results from a WHO global survey 2012. Community Dent Health. 2013 Dec;30(4):204-18.
12. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of untreated caries: a systematic review and meter egression. J Dent Res. 2015 May;94(5):650-8.
13. Huseinbegović A. Social and medical aspects of primary dentition caries in urban conditions. [master's thesis] Sarajevo: University of Sarajevo, School of Dentistry; 2001.
14. Igić M., Apostolović M., Kostadinović LJ. Parental Level of Information About the Effects of Proper Nutrition, Oral Hygiene and Fluoride Prophylaxis on Dental Health of Seven-Year old. Acta Stomatol Naissi. 2005;21(50):447-456.
15. Chung MH., Kaste LM., Koerber A. Dental and Medical Students' Knowledge and Opinions of Infant Oral Health. J Dent Educ 2006; 70(5):511-7.
16. Kumar S, Tadakamadla J, Kroon J, Johnson NW. Impact of parent related factors on dental caries in the permanent dentition of 6–12-year-old children: a systematic review. *J Dent*. 2016; 46 (Supplement C):1-11.
17. Tadakamadla SK, Tadakamadla J, Kroon J, Lalloo R, Johnson NW. Effect of family characteristics on periodontal diseases in children and adolescents-A systematic review. Int J Dent Hyg. 2020 Feb;18(1):3-16.
18. Selimović-Dragaš M, Huseinbegović A, Bajrić E, Marković N, Arslanagić Muratbegović A, Kobašlija S. Thirty years of oral health surveys in Bosnia and Herzegovina: a review Stomatološki vjesnik 2018; 7 (2):38-44.
19. Fathalla LH. Caries prevention strategies practiced in Scandinavia: a literature study: bachelor thesis [Internet]. Malmo: Malmo University, Faculty of Odontology; 2011 [accessed 2020 April 08]. Available from: http://dspace.mah.se/bitstream/handle/2043/12362/Kandidatuppsats%20Laith%20Hassan%20Fathalla.pdf.
20. Vrbic V.Reasons for the caries decline in Slovenia. Community Dent Oral Epidemiol. 2000 Apr;28(2):126-32.
21. Szöke J, Petersen PE. Evidence for dental caries decline among children in an East European country (Hungary). Community Dent Oral Epidemiol. 2000 Apr;28(2):155-60.
22. Aleksejuniene J, Brukiene V, Dziaugyte L, Peciuliene V, Bendinskaite R.A theory-guided school-based intervention in order to improve adolescents' oral self-care: a cluster randomized trial. Int J Paediatr Dent. 2016 Mar;26(2):100-9.
23. Hugoson A, Lundgren D, Asklow B, Borgklint G. Effect of three different dental health preventive programs on young adult individuals: a randomized, blinded, parallel group, controlled evaluation of oral hygiene behavior on plaque and gingivitis. J Clin Periodontal 2007; 34: 407–415.

EFFECTS OF FIXED PROSTHETIC RESTORATIONS ON ALVEOLAR BONE DENSITY

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ABSTRACT

Objective. To determine the effects of fixed prosthetic restorations on alveolar bone density.

Methods. 80 subjects of both genders with fixed prosthetic restorations took part in the research. Retro-alveolar radiovisiography (RVG) images were taken of the abutment teeth with fixed prosthetics and of the homologous (control) teeth for all the subjects. All automatically digitalized RVG images were stored on a computer equipped with the Digora for Windows 2.5 software by which measurements were made in seven regions of interest (ROI), around the tooth root, each of 10-pixel size.

Results. The results of the research were processed by t-test and single factor multivariate analysis of variance (MANOVA) that showed, with a significance level of 5%, that there was no difference in the alveolar bone density between the abutment teeth with fixed prosthetic restorations and the control (homologous) teeth. No statistically significant difference was found either in alveolar bone density between the teeth with different types of restorations (crown, bridge work).

Conclusion. The good quality of fixed prosthetic restorations may be the reason why there is no difference in the alveolar bone density between abutment teeth with fixed prosthetic restorations and the homologous teeth.

Key words: the alveolar bone density, fixed prosthetics

Introduction

The alveolar bone's absorption and apposition are affected by local and system-related factors. A patient's age, gender, body mass index, osteoporotic changes in the entire body, hormonal disbalance, etc. are system factors [1]. Compressive and tensile forces, contacts of antagonists in occlusion, parafunction, hygiene and a properly contoured crown or dental bridge are considered to be local factors contributing to the apposition and absorption of bone tissue around an abutment tooth's root [2, 3]. Some life habits have a major influence on the bone system health such as smoking, alcohol consumption, caffeine, lack of physical activity, frequent diets, unhealthy foods.

Bone mass is built during youth and at the age of sexual maturity. The quantity of bone mass stabilizes in the 30-ies, reaching its highest value, i.e. "bone mass peak", as the maximum mass resulting from the normal growth and development of the body. Skeleton bone mass loss is a physiological process that may begin as early as in the third decade of human life and is marked by a reduction in density and an increase in bone tissue porosity [4]. A lack of estrogen in menopause is the most common cause of bone mass loss in women. In the first 5-7 years after menopause an average of 1-3% of bone mass is lost per year by the age of 70 when this process slows but never stops, as a result of which women lose 35-50% of total bone mass by the time they reach old age [5, 6].

The degree of alveolar bone density may indicate good function, reduced function or the loss of function of the abutment tooth with fixed prosthetic restoration. The most common and straightforward method to determine bone mass density is a routine X-ray. It takes at least 30%, and sometimes even 50 – 60% of bone mass loss before it is possible to detect osteopenia (bone loss) via X-ray [7, 8]. With the progress of IT techniques, numerous methods (software) have been developed for the computer processed RVG imaging, enabling more objective assessment of even minor changes in alveolar bone density, thus they replaced subjective and inadequate methods [9-13].

The goal of this research was to determine whether there is a difference between alveolar bone density around abutment teeth with fixed prosthetic restorations and control (homologous) teeth.

Subjects and methods

A total of 80 subjects took part in the research, aged 20 to 50, of both genders, all with fixed prosthetic restorations (crown or bridge work), who responded for regular check-ups at the Dental Prosthetics Department of the Faculty of Dentistry of the University of Sarajevo. The inclusion criteria for all subjects were as follows: having a fixed prosthetic restoration for at least three months or longer, the edge of the fixed prosthetic restoration is placed sub-gingivally, there is a homologous tooth or a tooth belonging to the same teeth group on the contralateral side as a control tooth for comparison, and both the abutment tooth and the control tooth are in occlusion.

All subjects selected in this way were divided into two groups, depending on their gender: Group A (41 subjects) were female subjects aged 20 to 50; Group B (39 subjects) were male subjects aged 20 to 50. All subjects coincided with the purpose of the research explained and signed the informative consent. Records were created for the purpose of this research into which data on alveolar bone density measurements were entered.

Retro-alveolar radiovisiography (RVGs) images were taken of the abutment teeth with fixed prosthetic restorations and of the homologous (control) teeth for all subjects. The images were obtained with a de.Götzen xgenus® digital device (De Götzen Srl Via Roma, 45-21057 Olgate Olona (VA) – Italy). The X-ray program used in this research was set as LR (low resolution) as the initial standard option due to the lower radiation

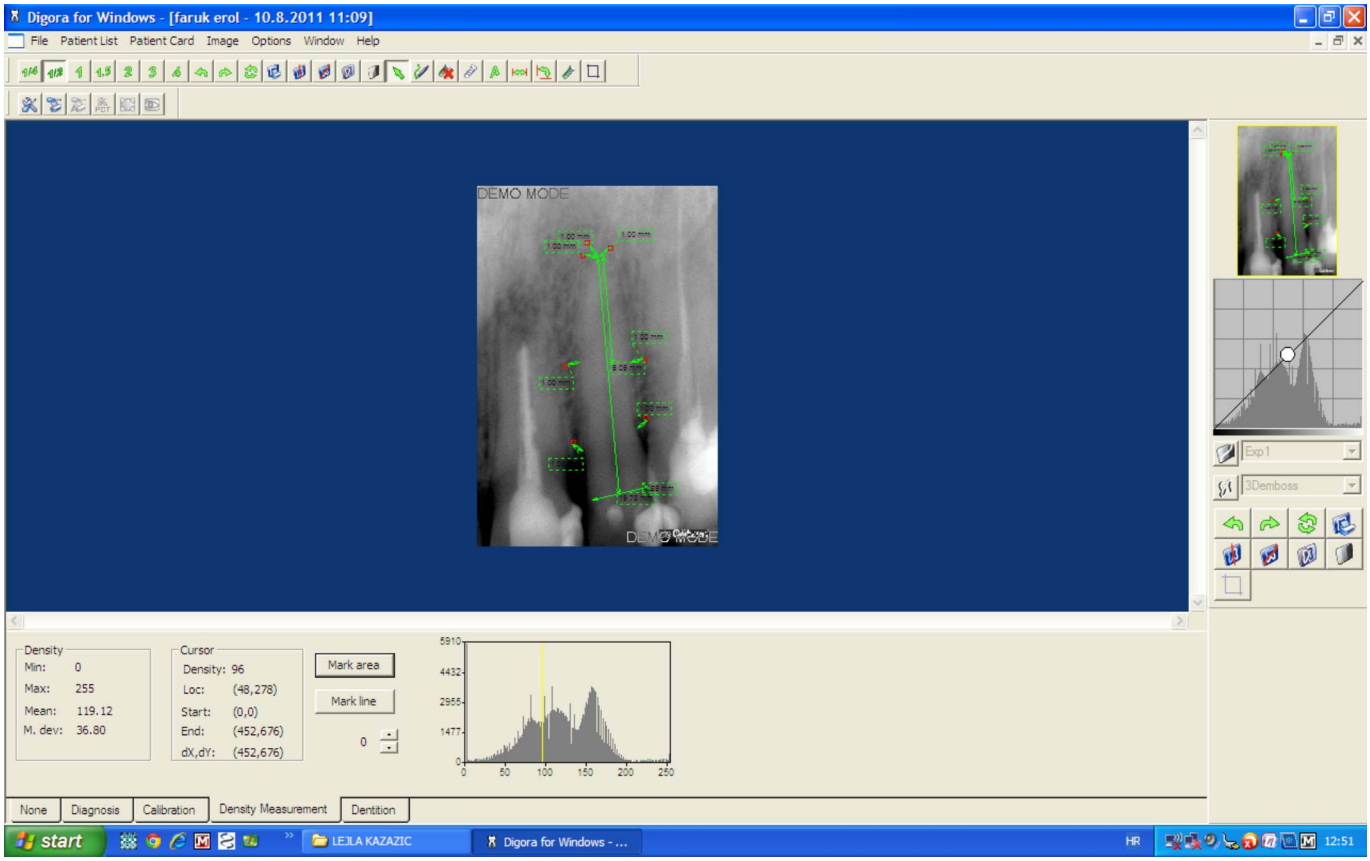

Image 1: ROI Positions

dose the patients were exposed to. Digital sensors were selected and placed as recommended by the manufacturer.

After the scans had been done, all automatically digitalized RVGs were stored on a computer equipped with the Digora for Windows 2.5 (Copyright, Sorodex, 2005) software, which was used for bone density analysis. This density measuring function provides information on the relative values of pixels using 8 – relevant scales, from full black (0) to full white (255).

After the process of image calibration, measuring the alveolar bone density followed. Seven regions of interest (ROI) were selected on each image, surrounding the tooth root, each of 10-pixel size (since the program also has the ability of linear measuring), as follows (**Image 1**):

ROI 1 – 1 mm mesial per alveolar edge from the tooth root

ROI 2 – 1 mm distally per alveolar edge from the tooth root

ROI 3 – 1 mm mesial from the tooth root apex

ROI 4 – 1 mm distally from the tooth root apex

ROI 5 – 1 mm vertically from the tooth root apex

ROI 6 – 1 mm mesial from half the range between ROI 1 and ROI 3

ROI 7 – 1 mm distally from half the range between ROI 2 and ROI 4.

For multi-rooted teeth, one root (mesial) was selected where measurements were taken.

At those points (seven ROIs shaped as small squares having the dimensions of 10x10 pixels) the alveolar bone density was measured as follows: by pointing the cursor to that particular point the density and cursor location were shown, and those values were noted and recorded.

Major advantage of this software is the fact that it enables zoom-in, so that the image can be increased four times. This made the observation of details and the correct positioning of the ROI easier.

Ethics statement

The study was approved by the Ethics Committee of the Faculty of Dentistry of the University of Sarajevo.

Statistical analysis

The parametric statistical techniques applied were the t-test of dependent samples and the single factor multivariate analysis of variance (MANOVA). The alpha significance level was set at 5% (0.05).

Results

The t-test of dependence did not reveal any statistically significant difference between the arithmetic mean of the alveolar bone density in any of the regions of interest (ROI) measured for abutment teeth with fixed prosthetic restorations (FPCT) and the control teeth (CT).

The differences between the arithmetic means, 95% confidence interval of average differences, the t-test values with degrees of freedom and the accompanying alpha value for comparisons of all variables are shown in **Table 1**.

With the single factor multivariate analysis of variance for dependent samples, all the points (ROIs) (1, 2, 3, 4, 5, 6 and 7) of the alveolar bone density were compared for the abutment teeth only. Single factor multivariate analysis of variance showed statistically significant differences in the alveolar bone density of the FPCT between all measured regions, $p<0.000$ (Wilks' Lambda=0.122, F=86.469, n=78). Descriptive statistical values with arithmetic means, standard errors, and the 95% confidence intervals are provided at **Table 2**. From the results obtained it may be observed that the bone is of higher density at the level of the middle root length and apically (ROIs 3,4,5,6 and 7) than at the level of the alveolar saddle (ROIs 1 and 2). Single-factor multivariate analysis of variance only failed to reveal statistically significant differences in the average bone density between the following points: (1 and 2 , p=0.07) , (3 and 4 , p=1) , (3 and 5 , p=1) ,(4 and 5 , p=1) , (6 and 7 , p=1).

Using the single factor analysis of dependent samples variance, all the points of bone density (1, 2, 3, 4, 5, 6 and 7) were compared for the control tooth as well. Single factor analysis of variance revealed statistically significant differences in the control teeth's bone density for all measured

Paired Differences*						
Pair	Mean	Std. deviation	95% CI difference mean	t	df	Sig. (2- tailed)
ROI 1 FPCT - ROI 1 CT	2.40	33.33	2.40±7.39	0.64	77	0.526
ROI 2 FPCT - ROI 2 CT	3.84	29.01	3.84±6.35	1.18	79	0.240
ROI 3 FPCT - ROI 3 CT	-6.16	32.08	-6.16±7.04	-1.72	79	0.090
ROI 4 FPCT - ROI 4 CT	-4.00	29.16	-4.00±6.39	-1.23	79	0.224
ROI 5 FPCT - ROI 5 CT	-6.19	34.61	-6.19±7.59	-1.60	79	0.114
ROI 6 FPCT - ROI 6 CT	-2.44	30.30	-2.44±6.64	-0.72	79	0.474
ROI 7 FPCT - ROI 7 CT	-3.14	29.00	-3.14±6.35	-0.97	79	0.336

* alpha level of significance p<0.05

Table 1. Statistical values of comparisons of alveolar bone density between the ROIs of abutment teeth with fixed prosthetic restorations (FPCT) and the ROIs of control teeth (CT) (paired samples t–test)

95% Confidence Interval				
Points	Mean	Std. Error	Lower Bound	Upper Bound
ROI 1 CT	52.413	3.604	45.237	59.590
ROI 2 CT	59.212	4.333	50.584	67.840
ROI 3 CT	128.212	3.455	121.333	135.091
ROI 4 CT	128.899	3.261	122.405	135.394
ROI 5 CT	130.406	3.383	123.669	137.143
ROI 6 CT	110.888	3.619	103.682	118.094
ROI 7 CT	114.981	3.536	107.940	122.022

Table 2.
Descriptive values of points 1, 2, 3, 4, 5, 6 and 7 on FPCT

95% Confidence Interval				
Points	Mean	Std. Error	Lower Bound	Upper Bound
ROI 1 CT	51.828	3.698	44.468	59.189
ROI 2 CT	57.426	4.084	49.298	65.554
ROI 3 CT	135.373	3.636	128.135	142.611
ROI 4 CT	134.339	3.566	127.241	141.437
ROI 5 CT	138.196	3.650	130.930	145.462
ROI 6 CT	114.881	3.765	107.387	122.375
ROI 7 CT	119.794	3.472	112.882	126.705

Table 3.
Descriptive values of points 1, 2, 3, 4, 5, 6 and 7 on CT

regions p<0.000 (Wilks' Lambda= 0.118, F= 92.06, n=80).

Descriptive statistical values with arithmetic means, standard errors, and 95% confidence levels are shown in **Table 3**. It may be seen from the results presented that the bone is of higher density on the level of the middle root length and apically (ROIs 3,4,5,6 and 7) than at the level of the alveolar saddle (ROIs 1 and 2). Single factor analysis of variance only failed to reveal statistically significant differences in the average bone density between the following points: (1 and 2 p=0.345) , (3 and 4, p=1) , (3 and 5, p=1) ,(4 and 5 , p=0.062) , (6 and 7 , p=0.701).

Table 4 shows the statistical values of *Wilks' Lambda* test obtained through the application of multivariate analysis of variance, showing whether there is a statistically significant difference in the alveolar bone density around the teeth in relation to different types of prosthetic restorations (single crown or bridge work), as a linear combination of all dependent variables of FPCT ROIs (1, 2, 3, 4, 5, 6 and 7). As it may be observed in column Sig. (p=0.497), no statistically significant difference was found between the different types of prosthetics with regard to alveolar bone density, as a linear combination for FPCT ROIs (1, 2, 3, 4, 5, 6, and 7).

Discussion

X-rays represent the most straightforward, cost-effective and accessible means of linear measuring of the amount of bone absorption and calculation of bone density loss. The radiation used is minimum and it may thus be regarded as a non-

	Value	F	Hypothesis df	Eror df	Sig.	Partial Eta Squared
Wilks' Lambda*	0.916	0.919	7.000	70.000	0.497	0.084

* alpha level of significance p<0.05

Table 4. Multivariate test (testing the effect of type of prosthetic restoration on alveolar bone density, with linear combination of FPCT ROI variables)

invasive method. [14]

In the case of radio-visiography imaging the radiation level is up to 90% lower than in the case of ordinary retroalveolar X -raysm thus being utterly negligible when compared to the benefits a patient may have from the information obtained from the X-ray images [15, 16, 17].

Each image in this research was obtained directly in digitalized form, and no RTG film developing or scanning of the image was required, whereby eliminating errors that may occur when developing a film, such as duration of developing, the developer's concentration, the date of production, as well as errors that may occur when scanning images due to non-linearity of the scanner, or glass surface stains [18, 19].

Measurements at the ROIs may be performed using different image processing programs. The Digora for Windows 2.5 (Copyright, Sorodex, 2005) program was used in this research for bone density analysis and for different linear measurements.

Good quality of fixed prosthetic restoration is probably the reason why no statistically significant differences were found in the alveolar bone density between the abutment teeth with fixed prosthetic restoration and the homologous teeth. However, it may be observed from the obtained results that the control teeth had slightly higher alveolar bone density than the abutment teeth. Lower density at the level of the alveolar saddle than in the middle of the root length and apically was also registered, both in teeth with fixed prosthetics and the control teeth. The reason for this is of course the anatomy of the bone, as the bone becomes thicker apically [20]. The reason may also be the proximity of the gingival area where factors are present that may have a major negative impact on bone density, such as plaque accumulation, gingival inflammation, an inadequate crown edge etc. It may be seen from the results of the research that there is a difference in alveolar bone density on the mesial and distal sides along the root for both abutment teeth and control teeth, although it is not statistically significant. The bone is of higher density on the distal side of the tooth's root than on the mesial side. The finding of lower bone tissue density on the mesial side of the tooth's root should not be regarded as a pathological condition, but as a physiological finding. This difference in the density on the mesial and distal sides of the tooth's root is attributed to the thickening of the alveolar process distally. No statistically significant difference was found in alveolar bone density as a linear combination for the FPCT ROIs (1, 2, 3, 4, 5, 6 and 7) regarding the type of prosthetic restoration (single crown, bridge work, appendix bridge). It should be noted that the research mostly involved minor (up to four units) bridges, with a proper unit and inter-unit ratio.

Much researches have dealt with the issue of changes in bone density and absorption below the bases of complete and partial dentures, around the abutment tooth (attachments) and bone density around an implant [21-29]. There are no data to be found in the literature regarding changes in bone density around the abutment teeth with fixed prosthetic restorations.

Conclusions

1. There is no statistically significant difference between the arithmetic means of the alveolar bone density around abutment teeth with fixed prosthetic restorations and control teeth at any of the points, i.e. regions of interest, which may be interpreted as the result of good quality of the fixed prosthetic works. The average alveolar bone density measured around the homologous teeth was insignificantly higher than around the abutment teeth.

2. Higher values of alveolar bone density were found at the level of middle root length and apically than at the level of the alveolar saddle, for both abutment teeth and control teeth, which is explained by the anatomy of the bone.

There is a difference in alveolar bone density on the mesial and distal sides along the root, both for abutment teeth and the control teeth, although it is not statistically significant. The bone is denser on the distal side of the root than on the mesial side, which may be explained by the thickening of bone distally.

3. No statistically significant differences were found between the alveolar bone density as a linear combination of ROIs (1, 2, 3, 4, 5, 6, and 7) for teeth with different types of fixed prosthetic restorations (single crown, bridge work, appendix bridge).

References:

1. Knezović-Zlatarić D, Čelebić A, Lazić B. Resorptive changes of the upper and lower jaw structures of the patients with the mobile-prosthetic replacements. [in Croatian] Resorptivne promjene koštanih struktura gornje i donje čeljusti u pacijenata nositelja mobilno-protetskih nadomjestaka. Acta stomat Croat. 2002;36(2):253-9.
2. Yamashita J, Shiozava I, Takakuda K. A comparison of in vivo and in vitro strain with posterior fixed partial dentures. J Prosthet Dent. 1997;77(3)250-5.
3. Leempoel PJ, Kayser AF, Van Rossum GM, De Haan AF. The survival rate of bridges. A study of 1674 bridges in 40 Dutch general practices. J Oral Rehabil. 1995;22(5):327-30.
4. Wowern N. Microradiographic and histomorphometric indices of mandibles for diagnosis of osteopenia. Scand J Dent Res. 1982; 90:47-63.
5. Parfitt AM, Villanueva AR, Foldes J, Rao DS. Relations between histologic indices of bone formation: implications for the pathogenesis of spinal osteoporosis. J Bone Miner Res. 1995;10:466.
6. Eriksen EF, Hodgson SF, Eastell R et al. Cancellous bone remodeling in type I (postmenopausal) osteoporosis: quantitative assessment of rates of formation, resorption, and bone loss at tissue and cellular levels. J Bone Miner Res 1990; 5:311.
7. Krhen J, Knezović – Zlatarić D, Kobler P, Čelebić A, Milat O, Džubur A. Intraoral microdensitometric test of the bone density. [in Croatian] Intraoralno mikrodenzitometrijsko ispitivanje gustoće kosti. Acta Stomat Croat. 2001;35(3):343-348.
8. Knezović – Zlatarić D, Čelebić A, Milat O. Densitometric evaluation of mandibular bone density on orthopantomograms. [in Croatian] Densitometrijska procjena gustine kostiju sa ortopantomogramima. Acta Stomat Croat. 2002;36(1):29-37.
9. Hildebolt CF, Brunsden B, Yokoyama-Crothers N, Pilgram TK, Townsend KE, Vannier MW, Shrout MK. Comparison of reliability of manual and computer-intensive methods for radiodensity measures of alveolar bone loss. Dentomaxillofac Radiol. 1998;27(4):245-50.
10. Li G, Engstom PE, Nasstrom K, Lu ZY, Sanderink G, Welander U. Marginal bone levels measured in film and digital radiographs corrected for attenuation and visual response: an in vivo study. Dentomaxillofac Radiol. 2007;36(1):7-11.
11. Bittar-Cortez JA, Passeri LA, de Almeida SM, Haiter-Neto F. Comparison of peri-implant bone level assessment in digitized conventional radiographs and digital subtraction images. Dentomaxillofac Radiol. 2006;35(4):258-62.
12. Sun Y, De Dobbelaer B, Nackaerts O, Loubele M, Yan B, Suetens P, Politis C, Vrielinck L, Schepers S, Lambrichts I, Horner K, Devlin H, Jacobs R. Development of clinically applicable tool for bone density assessment. Int J Comput Assist Radiol Surg. 2009;4(2)163-8.

13. Bozzo RO, Rocha GR, Neto FH, Paganini GA, cavacanti MGP. Linear density analysis of bone repair in rats using digital direct radiograph. J Appl Oral Sci. 2004;12(4):1-7.

Hayakawa Y

14. , Shibuya H, Ota Y, Kuroyanagi K. Radiation dosage reduction in general dental practice using digital intraoral radiographic systems. Bull Tokyo Dent Coll. 1997;38(1):21-5.

15. Edwin T, Gall F. Digital radiography: an overview. J Contemp Dent Prac. 2002; 3(4):1-13.

16. Brennan J. An introduction to digital radiography in dentistry. Journal of Orthodontics. 2002;29(1):66-9.

17. Wenzel A. Two Decades of Computerized Information Technologies in Dental Radiography. J Dent Res. 2002;81(9)590-3.

18. Van der Stelt, PF. The uses of digital radiography in dental practice. J Am Dent Assoc. 2006;136(10):1379-87.

19. Pecoraro M, Azadivatan-le N, Janal M, Khocht A. Comparison of observer reliability in assessing alveolar bone height on direct digital and conventional radiographs. Dentomaxillofac Radiol. 2005;34(5):279-84.

20. Lindhe J. Clinical Periodontology and Dental Implantology (according to the 4th English edition). [in Croatian] Zagreb: Nakladni Zavod Globus; 2004.

21. Knezović-Zlatarić D, Čelebić A, Brujić S. Alveolar bone loss on abutment and non-abutment teeth in relation to removable partial denture wearing – a six month follow up study. Acta Stomat Croat. 2003;37(2):185-188

22. Obradović B, Stajčić Z, Stojčev-Stajčić Lj. Assessment of the Quality of newly-formed bone for implant insertion after augmentation of the maxillary sinus floor. Balk J Stom. 2008;12:143-146.

23. Knezović-Zlatarić D, Čelebić A. Mandibular bone mineral density changes in complete and removable partial denture wearers: a 6-month follow-up study. Int J Prosthodont. 2003;16(6):661-5.

24. Zlataric DK, Celebic A. Clinical bone densitometric evaluation of the mandible in removable denture wearers dependent on the morphology of the mandibular cortex. J Prosthet Dent. 2003;90(1):86-91.

25. Poštić SD. Changes in the size of the jaws and bone density of patients with osteoporosis. [in Serbian] Promene dimenzija vilica i gustine kosti osoba obolelih od osteoproze. Stom Glas Srbije. 2009;56(1):15-22.

26. Brković-Popović S, Stanišić-Sinobad D, Đukanović D, Poštić S. Monitoring the alveolar bone level in the area of the retained teeth in patients with a lower total supradental prosthesis-a ten-year longitudinal study. [in Serbian] Praćenje nivoa alveolarne kosti u predjelu zadržanih zuba kod pacijenata sa donjom totalnom supradentalnom protezom-desetogodišnja longitudinalna studija. Serbian Dental J. 2006;53:17-26.

27. Kamal MY, Ibrahim SI, el Sayed SH, el Sherbeiny MI. Digital radiographic evaluation of two designs of precision attachment partial denture. Cairo Dental J. 2003;19(1):1-11.

28. Ostman PO, Wennerberg A, Albrektsson T. Immediate occlusal loading of NanoTite Prevail implants: a prospective 1- year clinical and radiographic study. Clin Implant Dent Relat Res. 2010;12(1):39-47.

29. Lin D, Li Q, Li W, Rungsiyakull P, Swain M. Bone resorption induced bz dental implants with ceramics crowns. Journal of the Australian Ceramic Society. 2009;45(2):1-7.

PREVENTION OF DENTAL HYPERSENSITIVITY

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ABSTRACT

Dental hypersensitivity is a pathological condition in which the exposed dentin is attached to a vital tooth sensitive to mechanical, osmotic, chemical or thermal smears.

The study included 30 subjects from both genders. The respondents were dental students and residents at the Faculty of Dentistry, Ss. Cyril and Methodius" University in Skopje. During the study all respondents used the Colgate® Sensitive Pro-ReliefTM paste and Slim Soft toothbrush. The investigated period lasted for 4 weeks. These surveys are based on a pre-made questionnaire, in which the following data were noted: what kind of pain the respondents feel; have they experienced an improvement after using the Colgate® Sensitive Pro-Relif™ toothpaste and after how long it occurred?

A large percentage of the respondents (86 %) experienced improvement after using the Colgate Sensitive Pro-Relif™ toothpaste, after two weeks at most (53.3 %) and after three weeks at least (3.3%). The sensitivity of the teeth among the subjects was mostly caused by cold (56.7%), and in only 3.3% of the subjects, it was provoked by sweets.

High percentage of the respondents experienced improvement after using Colgate® Sensitive Pro-ReliefTM toothpaste, after a maximum of two weeks, and at least after the third week.

Pro-arginine treatment product reduces hypersensitivity of the dentine, and in some cases it could be completely cured.

Key words: hypersensitivity, toothpaste, pro-arginine

Introduction

Teeth hypersensitivity is one of the most common clinical problem. It manifests itself in response to stimulation of the exposed dentin, regardless of its localization.[1] It is characterized by a short, acute pain caused by the exposed dentin in response to stimulations, usually thermal, volatile, tactile, osmotic or chemical, and which can not be rewritten to any other dental defect or pathology.[2]

There are three basic theories – hypotheses about the spreading/transmission of the dental pain. One of them is odontoblast theory according to which odontoblasts have a sensitive role and transmit irritations through a cholinergic sympathetic relationship. Then, a direct innervation theory that relies on findings obtained by an electron microscope (SEM). This theory demonstrated the presence of non-myelinated nerve fibers extending along the entire length of the dentinal tubules.

However, as a disadvantage of this theory, the same condition is found in a normally sensitive dentine. Today's most widely accepted is the hydrodynamic theory of the 1960s referring to the rapid loss of fluid inside the dental tubules as a result of an external stimulus. The distortion of the odontoblast extensions, by about 240 Å, is transmitted to the A-nerve fibers (in the periphery of the pulp and dentine) that act as mechanoreceptors. In accordance to this theory, the importance of the number and the circulation of dental tubules in the appearance of painful sensations in relation to the normal susceptible dentin has been proven.[3]

Teeth hypersensitivity usually occurs between 20 and 40 years of age, and more often in females. In terms of localization, it is more common in the vestibular than on the oral surfaces of the teeth. It most commonly occurs in upper canines, followed by premolar, incisors, lower premolars and lower incisors. Some studies have shown that the entire area of the hypersensitive dentin is most sensitive to the mesial and distal edges, and the central part and the incisal edge are the least sensitive, with a ratio of 3:2:1:15. The appearance of teeth hypersensitivity is in reverse proportion to the plaque index, and this condition is more common related to the teeth on the left side.[4]

Saliva plays an important role in the natural reduction of dental hypersensitivity through the supply of calcium and phosphate ions in open dentinal tubules, gradually blocking the tubules, and the formation of a surface protective layer consisting of precipitated salivary glycoprotein calcium phosphate aggregates.[5] Decreased salivary flow, hyposalivation, xerostomia are risk factors for demineralization and dental caries, but they can worse dental hypersensitivity. The saliva with its buffering systems maintains the concentration of hydrogen ions (pH) in the oral environment at physiological limits, thus preventing the demineralization process.

In 2002, Kleinberg et al. published a new anti-sensitive technology based on the saliva role in the natural reduction of dentine hypersensitivity. The basic components of this new technology are arginine, an amino acid that is positively charged at physiological pH, i.e. pH 6.5-7.5, bicarbonate, pH buffer and calcium carbonate. This technology is named as Pro-Argin.[6] Early studies showed a rapid improvement in the sensitivity of dentine after just one application, 71.7% decrease in sensitivity measured by air jet and 84.2% reduction obtained by "tooth" test of the tooth. The decrease in susceptibility to dentine occurred immediately after its administration, and the examination lasted 28 days.[7]

In 2007, Colgate-Palmolive purchased the rights of technology, known as Pro-Argin™ technology, and introduced the Colgate® Sensitive Pro-Relief™ desensitized paste. The recommendation was to apply the paste using a low speed, with a moderate amount of pressure, to place in the exposed tubules, sealing them. In clinical trials, it was found that this product provided immediate and permanent loss of hypersensitivity of teeth if used only four weeks.[8-10]

Investigating the mechanism of action of arginine and calcium carbonate containing paste using an electron microscope (SEM), Petrou et al. found that this technology completely and rapidly closed dentinal tubules as a result of the formation of deposits on the surface and in dentinal tubules containing large amounts of phosphate, calcium

and carbonate. In addition, by testing hydraulic conductivity, it was found that these deposits significantly reduced the flow of dentinal fluid into tubules.[11]

With the technological development and the advent of laser technology and its growing use in dentistry, an additional therapeutic option is available for the treatment of dental hypersensitivity.[12-14]

Restorative sensitivity - clinically it has been established that in 29% of cases there is a susceptibility after cavitation preparation and the setting of definite filling. The appearance of sensitivity occurs as a result of the interspace between the charge and the walls of the cavity as a consequence of the contraction that occurs during polymerization. The contamination of the composite leads to micro-permeability and the appearance of appropriate symptoms, that is, the tooth reacts to a cold that is a classic mechanism for dental hypersensitivity.[15]

Therapeutic procedures for dentin hypersensitivity can be divided into reversible and irreversible. Dentin hypersensitivity can be reduced by the natural closure process of the tubules lasting for long time. In addition to the numerous possibilities of reversible procedures, there are two fundamental approaches: interfering with transmission of the pain of A-nerve fibers or by blocking open tubules (with strontium, oxalate, fluoride). Certain proteins may have a double effect. Professionally fluorides are most commonly used, and they can reduce hypersensitivity with peripheral occlusion of the tubules and by reducing the movement of the fluid to and from the pulp. Fluoride gels or pastes with higher fluoride concentration (5000 ppm) can be applied. Another group of materials with similar effect are oxalate salts, such as tin and iron oxalate.[16] Also, HEMA/glutaraldehyde preparations seal the tubules or stimulate the deposition of proteins in them.

Once we diagnose dentine hypersensitivity and etiological factors were identified, therapy and prevention should be the primary goal.[14,15] If one or more teeth are predisposed to dental hypersensitivity, they should be subjected to continuous treatment. The patient should be shown a toothbrush technique to prevent further loss of dentine that would contribute to dental hypersensitivity. Inadequate brushing of teeth is also associated with this phenomenon. [17]

Various treatments in the practice or at home have been proposed by several authors to treat dentin hypersensitivity in order to immediately solve the problem.[18-20] A number of treatments with topical products in the form of tooth creams and varnishes. Various agents - strontium chloride, sodium monofluorophosphate, sodium fluoride, calcium hydroxide, calcium phosphate, potassium nitrate, potassium citrate, formaldehyde, sodium citrate-plural gel, glucocorticoids, adhesives, binding agents and resins, voice- ionomer cements, bioactive and biocompatible glasses, oxalate-containing products,[22] polymers containing Novamin and CPP-ACP (Caesin phospho peptide - amorphous calcium phosphate), [23, 24] ionophoresis and lasers. [25, 26]

Fluoride is used as a preventive agent for cavities that can help and demineralize enamel or dentin. [27] Various clinical trials have shown that the administration of a fluoride solution may reduce dental hypersensitivity. [28, 29] Fluoride acts by reducing the permeability of dentine by depositing calcium fluoride crystals inside the dentinal tubules. [30] These crystals are partially insoluble in saliva. Examination by electron microscope (SEM) revealed granular precipitates in the peritubular dentine after the application of fluoride. [31] Different fluorides are used to treat dentin hypersensitivity, such as sodium fluoride, sodium monofluorophosphate, fluorosilicates and fluoride in combination with ionophoresis. [32]

Some of the recommendations for patients to prevent the appearance of teeth hypersensitivity are: avoid using a large amount of toothpaste, do not use brushes with medium and hard fibers, avoid brushing the teeth immediately after ingestion of sour food, do not brush teeth by applying pressure and for a long time, avoid excessive and inappropriate use of inter-proximal brushing agents. [33]

Purpose

The purpose of this study was to investigate the efficacy of a paste containing 8% arginine and

calcium carbonate in the treatment of dental hypersensitivity (Colgate®Sensitive Pro-Relif™).

Material and method

The study included 30 subjects from both genders. The respondents were dental students and residents at the Faculty of Dentistry, Ss. Cyril and Methodius" University in Skopje. During the study all respondents used the Colgate® Sensitive Pro-Relif™ paste and Slim Soft toothbrush. The investigated period lasted for 4 weeks.

The exclusion criteria for the study were as follows: patients who had dental pathology causing pain similar to cervical dentinal hypersensitivity (such as teeth with caries, the presence of orthodontic appliances and restorations and/or the presence of a history of periodontal surgery in the area of the tooth during the previous three months), patients who took any medication, patients who received professional treatment with desensitizing agents in the previous six months, patients who received any treatment in the past 30 days and patients who had the presence of a vital bleaching history.

These surveys are based on a pre-made questionnaire, in which the following issues were noted:

a) Maintenance of oral hygiene of the mouth and teeth: the frequency of tooth brushing, duration and means used in maintaining oral hygiene: toothpaste and toothbrush, interdental floss and interdental brush, chemical means for maintaining hygiene;

b) What kind of pain the respondents feel;

c) Have they experienced any improvement after using the Colgate® Sensitive Pro-Relif™ toothpaste and when it occurred?

Statistical analysis

The statistical analysis of the obtained data was made in the statistical program SSRS IMB 20.

Results

The following tables show the results from the conducted survey and the answers to the questions.

Table 1 presents the percentage of using additional means for maintaining oral hygiene. These included: mouth rinse, interdental floss, interdental brushes used by 30% of the subjects, mouth rinse used by 20%, and only one respondent used an interdental brush and a floss.

Table 1. Did you use additional means for maintaining oral hygiene?

	Frequency	%
mouth rinse	6	20.7
interdental floss	4	13.3
mouth rinse, interdental floss	7	2.0
mouth rinse, interdental floss, interdental brushes	9	30.0
mouth rinse, interdental brushes	2	6.7
interdental floss, interdental brushes	1	3.3
water jet-tooth pick	0	0.0
I do not use additional means	1	3.3

The frequency of tooth brushing is shown in **Table 2**. All 30 subjects brushed their teeth in the morning and evening.

Table 2. You are brushing teeth?

	Frequency	%
in the morning	0	0.0
at night before going to bed	0	0.0
after every meal	0	0.0
in the morning and at night	30	100.0

The largest percentage of respondents used a soft toothbrush (60%), and none used a hard brush (**Table 3**).

Table 3. What type of brush do you use?

	Frequency	%
ultra-soft	8	26.7
soft	18	60.0
medium	4	13.3
hard	0	0.0

Table 4 shows teeth sensitivity (which causes the pain). Most of the subjects (56.7%) were sensitive to cold, and only 3.3% to sweet flavor.

Table 4. The pain (sensitivity) of your teeth appearing on?

	Frequency	%
cold	17	56.7
warm	0	0.0
sour	0	0.0
sweet	1	3.3
cold and sweet	5	16.7
did not respond	7	23.3

Table 5 shows the frequency of the pain experienced by the respondents. In the largest percentage of respondents acute and short-term pain (70%) was observed, and 23.3% of the subjects did not feel pain.

Table 5. You are brushing teeth?

	Frequency	%
sharp and short	21	70.0
faucet and long-lasting	2	6.7
I do not feel	7	23.3

Most of the respondents (60%) did not avoid using certain foods and drinks in order not to feel the pain (**Table 6**).

Table 6. Do you avoid consuming certain foods and drinks so that you do not feel pain (e.g. cold drinks)?

	Frequency	%
yes	12	40.0
no	18	60.0

Table 7 illustrates the change in the diet of the respondents. Most of them (73.3%) did not change anything in the diet to prevent the onset of pain.

Table 7. Have you changed your diet to prevent pain?

	Frequency	%
yes	8	26.7
no	22	73.3

Table 8 gives a description of the technique for brushing teeth. Even 86.7% of the respondents thought that strong and aggressive brushing is not a good technique.

Table 8. Is "strong and aggressive brushing" a good description for your teeth brushing technique?

	Frequency	%
yes	4	13.3
no	26	86.7

Table 9. Did you notice a gingival withdrawal?

	Frequency	%
yes	15	50.0
no	15	50.0

To a large extent, the respondents (86%) experienced improvement after using the Colgate Sensitive Pro-Relif™ tooth, after two weeks at most (53.3%) and at least after three weeks (3.3%), (**Tables 10 and 11**).

Table 10. Did you experience improvement after using a toothpaste? Colgate® Sensitive Pro-Relif™?

	Frequency	%
yes	26	86.7
no	4	13.3

Table 11. How long have you experienced improvement?

	Frequency	%
after one week	13	43.3
after two weeks	16	53.3
after three weeks	1	3.3

Only one respondent was not satisfied with the paste and toothbrushes Slim Soft, and 96.7% gave a positive answer (**Table12**).

Table 12. Are you satisfied with the effect of the toothpaste and toothbrushes? Slim Soft?

	Frequency	%
yes	29	96.7
no	1	3.3

Discussion

Dentin hypersensitivity is one of the most common and uncomfortable conditions affecting oral comfort and function. In this examination, a large percentage of the respondents (86%) experienced improvement after using the Colgate Sensitive Pro-Relif™ toothpaste, after two weeks at most (53.3%) and after three weeks at least (3.3%). The sensitivity of the teeth among the subjects was mostly by cold (56.7%), and in only 3.3% of the subjects it was provoked by sweets. It should be emphasized that some of the respondents in addition to the basic means of

maintaining oral hygiene (in our examination Colgate® Sensitive Pro-Relif™ and Brush Slim Soft), the largest percentage (30% of the subjects) used additional means of maintaining oral hygiene, such as: mouth rinse, interdental floss, interdental brushes.

When asked about the intensity of the pain the respondents answered that it was sharp and short (70%), and 23.3% of them did not feel pain.

Our study showed that the Colgate® Sensitive Pro-Relief™ toothpaste reduces the sensitivity of the teeth. However, the limitation of this study is the 4-week follow-up, a time that can be considered short. In parallel with the Colgate® Sensitive Pro-Relief™ toothpaste, other types of desensitize toothpastes as control groups should be included in the future to determine the benefits of this method in reducing dentin hypersensitivity.

Some of our results coincide with the results obtained by Hamlin et al.34 In their study, they applied professional tooth brushing products and immediately afterwards measurements of the sensitivity of the teeth were made. The group of subjects treated with arginine-calcium carbonate paste showed statistically significant improvements in the baseline tactile (132.1%) and air hypersensitivity (48.6%). In addition, the subjects in the control group showed statistically significant improvement in hypersensitivity clearance from the baseline in relation to mean hypersensitivity values (13.9%). Improvement in the hypersensitivity reduction in the control group for tactile hypersensitivity (21.7%) was not statistically significant. Statistically significant differences were demonstrated between the arginine-calcium carbonate group and the control group relative to the baseline tactile (110.0%) and airborne tooth sensitivity (41.9%).

In another study, immediately after the application of the product and 4 weeks later, subjects treated with arginine-calcium carbonate containing paste showed statistically significant improvements to the baseline in relation to the average value for the air stream (44.1% and 45.9%) and tactile results for hypersensitivity (156.2% and 170.3%). A group of subjects treated with arginine-calcium carbonate paste showed statistically significant reductions in dentine hypersensitivity compared to the control untreated group.35

Conclusion

The following conclusions can be derived based on the results obtained in our study:

Pro-arginine treatment product reduces hypersensitivity of the dentine, and in some cases it could be completely cured.

References

1. Addy M. Etiology and clinical implications of dentine hypersensitivity. Dent Clin North Amer 1990; 34:503-14.
2. A ddy M, Urquart E. dentinal hypersensitivity; its prevalence a etiology and clinical management. Dental update 1992; 19:407-412.
3. Brännström M. A hydrodynamic mechanism in the transmission of pain-produced stimuli through the dentine. In: Anderson DJ, editor. Sensory mechanisms in dentine. Oxford: Pergamon; 1963. pp. 73-79.
4. Porto IC, Andrade AK, Montes MA. Diagnosis and treatment of dentinal hypersensitivity. J Oral Sci 2009; 51:323-332.
5. Miglani S, Aggarwal V, Ahuja B. Dentin hypersensitivity: Recent trends in management. J Conserv Dent 2010; 13:218-224.
6. Kleinberg I, Sensistat. A new saliva-based composition for simple and effective treatment of dentinal sensitivity pain. Dent Today 2002; 21:42-7.
7. Lata S, Varghese NO, Varughese JM. Remineralization potential of fluoride and amorphous calcium phosphate-casein

phospho peptide on enamel lesions: An In vitro comparative evaluation. J Conserv Dent 2010; 13:42-6.

8. Merh A, Singhbal K, Parikh V, Mehta S, Kulkarni G. Comparative evaluation of immediate efficacy of diodent laser versus desensitizing paste containing 8% arginine and calcium carbonate in treatment of dentine hypersensitivity: an in vivo study. J of Evolution of Med and Dent Sci 2015; 4(25):4346-4355.
9. Panagakos F, Schiff T, Guignon A. Dentin hypersensitivity: Effective treatment with an in-office desensitizing paste containing 8% arginine and calcium carbonate. Am J Dent 2009; 22(Special Issue A):3-7.
10. Panagakos F, Schiff T, Guignon A. Dentin hypersensitivity: Effective treatment with an in-office desensitizing paste containing 8% arginine and calcium carbonate. Am J Dent 2009; 22(Special Issue):3-7.
11. Petrou I, Heu R, Stranick M, Lavender S, Zaidel L, Cummins D, Sullivan RJ, Hsueh C, Gimzewski JK. A breakthrough therapy for dentin hypersensitivity: How dental products containing 8% arginine and calcium carbonate work to deliver effective relief of sensitive teeth. J Clin Dent 2009; 20(Special Issue):23-31.
12. Sicilia A, Cuesta-Frechoso S, Sua´Rez A, Angulo J, Pordomingo A, De Juan P. Immediate efficacy of diode laser application in the treatment of dentine hypersensitivity in periodontal maintenance patients: a randomized clinical trial. J Clin Periodontol 2009; 36:650-660.
13. Ahmet Eralp, Suat et al. A Clinical Investigation of Low-Level Laser Irradiation on Hypersensitive Dentine. Research Journal 2006; 30(2):94-99.
14. Rosane De Fatima et al. Clinical effects of low intensity laser vs light-emitting diode therapy on dentin hypersensitivity. L Oral Laser Applications 2007; 7: 129-136.
15. Cummins D. Dentin hypersensitivity: from diagnosis to a breakthrough therapy for everyday sensitivity relief. J Clin Dent 2009; 20:1-9.
16. Gillam DG, Bulman JS, Eijkman MA, Newman HN. Dentists' perceptions of dentine hypersensitivity and knowledge of its treatment. J Oral Rehabil 2002; 29:219-225.
17. Ricarte JM, Matoses VF, Llacer VJ, Fernandez AJ, Monero BM. Dentinal Sensitivity: Concept and Methodology for Its Objective Evaluation. Med Oral Patol Oral Cirbucal 2008; 13(3):201-6.
18. Shen S-Y, Tsai C-H, Chang Y-C. Clinical efficacy of toothpaste containing potassium citrate in treating dentin hypersensitivity. Journal of Dental Sciences 2002; 4(4):173-177.
19. Pradeep AR, Sharma A. Comparison of clinical efficacy of a dentifrice containing calcium sodium phosphosilicate to a dentifrice containing potassium nitrate and to a placebo on dentinal hypersensitivity: A Randomized Clinical Trial. Journal of Periodontology 2010;81(8):1167-1173.
20. Prasad KW et al. Efficacy of two commercially available dentifrice in reducing dentinal hypersensitivity. Indian J Dent Res 2010; 21:224-230.
21. Addy M. Dentine hypersensitivity: New perspectives on an old problem. Int Dent J 2002:52(Suppl.):367-75.
22. Ye W, Feng XP, Li R. The prevalence of dentine hypersensitivity in Chinese adults. J Oral Rehabil 2012; 39:182-7.
23. Rees JS, Addy M. A cross-sectional study of buccal cervical sensitivity in UK general dental practice and a summary review of prevalence studies. Int J Dent Hyg 2004; 2:64-9.
24. Vijaya V, Sanjay V, Varghese RK, Ravuri R, Agarwal A. Association of dentine hypersensitivity with different risk factors-A cross sectional study. J Int Oral Health 2013; 5:88-92.

25. Al-Wahadni A, Linden GJ. Dentine hypersensitivity in Jordanian dental attenders. A case control study. J Clin Periodontol 2002; 29:688-93.

26. Cai F, Shen P, Morgan MV, Reynolds EC. Remineralization of enamel subsurface lesions in situ by sugar-free lozenges containing casein phosphopeptide-amorphous calcium phosphate. Aust Dent J 2003; 48:240-243.

27. Bahsi E, Dalli M, Uzgur R, Turkal M, Hamidi MM, Colak H. An analysis of the etiology, prevalence and clinical features of dentine hypersensitivity in a general dental population. Eur Rev Med Pharmacol Sci 2012; 16:1107-16.

28. West NX, Lussi A, Seong J, Hellwig E. Dentin hypersensitivity: pain mechanisms and etiology of exposed cervical dentin. Clin Oral Investing 2013;1: S9-19.

29. He S, Wang Y, Li X, Hu D. Effectiveness of laser therapy and topical desensitising agents in treating dentine hypersensitivity: a systematic review. J Oral Rehabil 2011; 38:348-358.

30. Amarasena N, Spencer J, Ou Y, Brennan D. Dentine hypersensitivity in a private practice population in Australia. J Oral Rehabil 2011; 38:52-60.

31. Vijaya V, Sanjay V, Varghese RK, Ravuri R, Agarwal A. Association of dentine hypersensitivity with different risk factors - A cross sectional study. J Int Oral Health 2013;5:88-92.

32. S.A.M. Corona, et al. Clinical evaluation of low-level laser therapy and fluoride varnish for treating cervical dental hypersensitivity. J Oral Rehabil 2003; 30:1180-1189.

33. Drisko C. Dentine hypersensitivity. Dental hygiene and periodontal considerations. Int Dent J 2002; 52:385-393.

34. Hamlin D, Williams KP, Delgado E, Zhang YP, DeVizio W, Mateo LR. Clinical evaluation of the efficacy of a desensitizing paste containing 8% arginine and calcium carbonate for the in-office relief of dentin hypersensitivity associated with dental prophylaxis. Am J Dent 2009; 22(Spec. Iss. A):16-20.

35. Schiff T, Delgado E, Zhang YP, De Vizio W, Mateo LR. Clinical evaluation of the efficacy of a desensitizing paste containing 8% arginine and calcium carbonate in providing instant and lasting in-office relief of dentin hypersensitivity. Am J Dent 2009; 22 (Spec. Iss. A):8A-15A.

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