

The Effectiveness of Reform in the Dental Health Systems of Transitional Countries: The Case of Montenegro Health Reform (pilot study)

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Objective: The main objective of this research is to evaluate the influence of reform in the dental health care system in Montenegro on the oral hygiene awareness and health practices among children aged 11 to 14. **Materials and Method:** The research was performed among public schoolchildren in Montenegro. Data was obtained by evaluating a structured questionnaire fulfilled by 300 children, aged between 11 and 14 years, at the beginning of reform in the dental health care system in 2009 (n = 150) and in 2018 (n = 150). Participants were selected from three different geographical regions (North, Central and Southern). **Result:** Most participants reported brushing their teeth twice daily (2009: 46% in Rozaje, 48% in Podgorica and 36% in Budva; 2018: 50% in Rozaje, 48% in Podgorica and 40% in Budva). There was no difference by region in either 2009 or 2018 in the rate of self-reported gum bleeding when brushing teeth (p values 0.387 and 0.825, respectively). Most respondents went to the dentist only when they needed treatment. **Conclusion:** There is no significant change in the awareness and practices of oral hygiene maintenance among children aged 11 to 14 years in Montenegro at the beginning of the reform of dental health care compared to nine years later. It is necessary to introduce more continuous education programs to promote oral health.

Keywords: Montenegro, oral health, reform, health system

Introduction

Oral health is an essential part of our systemic health, thus is crucial for overall function and quality of life.

The proper maintenance of oral hygiene, including the use of fluoride toothpaste is necessary for prevention of caries and periodontal diseases. These are the most common oral diseases, with impacts on general health and social and economic outcomes.

Some key objectives of the World Health Organization (WHO) Global Oral Health for 2020 involve the development of oral health systems for prevention and control of oral disease, together with integration of oral health promotion and care with other sectors that influence health (Petersen 2003).

The results of numerous studies indicate that the silent epidemic of caries has greatly reduced in Western and Northern Europe and the US (Marthaler *et al.*, 1996; Marthaler, 2004). In these regions, countries have implemented preventive measures through systematic school and health education programs. The use of fluoride, improved oral hygiene, changes in diet and living conditions have also contributed to this development (Petersen, 2003).

However, in Eastern and Central European countries, caries is still present as a serious public health and socio-economic problem. Moreover, political and economic changes in these countries have led to health systems reform. For example, public health systems that provided

oral health care for children have been decentralized and privatized (Petersen, 2003).

Montenegro is a country of the former Yugoslavia, with a population of 631,536, it covers an area of 13,812 km². After its independence in 2006, the health care system, which was based on the principles of the Bismarck social health care insurance, financed from the contributions of employers and insured citizens was reformed (Kezunovic *et al.*, 2013).

The objectives of the health reform in Montenegro were the development of a financially stable health system in line with the health systems of developed European countries, which implies increasing the efficiency of the healthcare system, improving accessibility and quality of services, using modern technology and creating a health policy that will increase citizens' awareness of the health consequences of their decisions and encourage them to take greater responsibility for their health (Master plan Razvoja Zdrastva Crne Gore 2010-2015). At the beginning of 2008, the dental health care reforms were carried out through the reform of primary health care and dentistry was privatised.

According to WHO, there are still insufficient data on the frequency of oral diseases in children in Montenegro. Based on data obtained from a limited number of studies, Montenegrins remain at high risk of caries and periodontal disease (Ljaljevic *et al.*, 2010; Djurickovic and Ivanovic, 2011). The mean number of decayed, missing, and filled teeth due to caries (DMFT) among 12-year-olds was 4.4

(Ljaljevic *et al.*, 2010). Four decades ago similar caries levels were present in countries that now have the lowest values for 12-year DMFT in Europe: Denmark (0.6), Sweden (0.8), Norway (1.7), Germany (0.7), Italy (1.1) and France (1.1).

Health system reform was carried out in a similar way after the proclamation of independence in Slovenia in 1991, which like Montenegro is a former Yugoslavian country. 12-year DMFT decreased significantly from 5.1 in 1987 to less than 1.7 in 2008 ($p < 0.0001$) (Vrbič and Vrbič, 2016). Improvement in oral health status in these countries has appeared with better living standards, increasing awareness of prevention from the marketing of toothpastes in commercials and widespread use of fluoride toothpaste and implementation of oral health promotion programs in the education and health systems (Jakovljevic *et al.*, 2016; Eaton and Carlile, 2008; Zaborskis *et al.*, 2010).

Until now, there has been sporadic and incomplete research of oral health or of awareness of its importance in Montenegrin children. Therefore, the aim of this study is to compare the awareness and oral hygiene practices of children aged 11 to 14 years in Montenegro in 2009 (at the beginning of the reform of dental health care) and in 2018 (nine years later), in order to understand the impact of the dental health reforms implemented during this time.

Methods

Surveys were conducted in a dental office in each of three cities representing the northern (Rozaje), southern (Budva) and central (Podgorica) regions of Montenegro in 2009 and 2018. All three offices took part in the Dental Health reforms and established contracts with the Health Fund of Montenegro, which offers free health care for children and young adults under 18. Using quota sampling, 300 public elementary school students, aged 11 to 14 were included in the study.

Fifty participants were recruited from each dental office during October and November 2009 and during March and April 2018. Participation was voluntary. Every child agreed to take part in this research. Informed consent was signed by parents of these children approving their participation in this study.

Office staff invited children to complete a questionnaire during their dental visits. The questionnaire was

based on the World Health Organisation (2013) Basic Methods and consisted of 16 questions in three sections:

1. Basic information about the participant (gender, age, perceived material status of the family (good, less good) and whether they lived in an urban or rural area);
2. Home oral health practices (frequency of tooth brushing, method of oral hygiene, use of fluoride preparations etc.);
3. Dental visits (First dental visit, reason for first visit, frequency of visits etc.).

Data were collected in a database using an Excel 2013 file and analyzed with SPSS 20 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to summarise the data and compared by gender, city and time period using appropriate bivariate analyses, with alpha at $p < 0.05$.

Results

The socio-demographic profile of participants is presented in Table 1. More children in Rozaje were from rural areas in 2009, but in other respects the children were similar across cities and at both time points.

In 2009 and 2018, 40-50% of participants reported brushing their teeth twice daily, with frequency similar across regions ($p = 0.468$ and 0.916 respectively, Table 2.). At both time points most participants used a toothbrush and toothpaste ($p = 0.601$). In both 2009 and 2018 fewer children in Budva reported using Fluoride toothpaste than in the other cities (both $p < 0.001$), but overall the proportion of using Fluoride toothpaste increased from 69% to 76%, $p = 0.052$.

Most participants brushed for 2-3 minutes. There was no difference in brushing duration across time periods ($p = 0.984$). In 2009 and 2018 similar proportions of participants changed their toothbrush once a month ($p = 0.820$).

Similar proportions of participants reported bleeding gums across cities and at both time points.

According to both surveys most of the participants had their first dental visit when they were 4-6 years old. Over time the proportion visiting for emergencies decreased and the proportion attending for regular check-ups increased ($p < 0.001$) (Figure 1). In 2009, most participants

Table 1. Participants' socio-demographic profile

| | Rozaje (n=50) % | | Podgorica (n=50) % | | Budva (n=50) % | | Between cities 2009 | Between cities 2018 | 2009\2018 |
|----------------------------------|-----------------------|------|--------------------------|------|----------------------|------|---------------------------|---------------------------|-------------|
| | 2009 | 2018 | 2009 | 2018 | 2009 | 2018 | P (Chi sq.) | P (Chi sq.) | P (Chi sq.) |
| <i>Gender</i> | | | | | | | | | |
| Male | 44 | 52 | 48 | 50 | 52 | 48 | 0.726 | 0.923 | 0.729 |
| Female | 56 | 48 | 52 | 50 | 48 | 52 | | | |
| <i>Origin</i> | | | | | | | | | |
| Urban | 72 | 92 | 92 | 96 | 96 | 94 | 0.001 | 0.685 | 0.051 |
| Rural | 28 | 8 | 8 | 4 | 4 | 6 | | | |
| <i>Material status of family</i> | | | | | | | | | |
| Good | 88 | 90 | 88 | 90 | 94 | 92 | 0.513 | 0.924 | 0.845 |
| Less good | 12 | 10 | 12 | 10 | 6 | 8 | | | |

Table 2. Participants' oral hygiene behaviours

| | Rozaje | | Podgorica | | Budva | | Between cities 2009 | Between cities 2018 | 2009\2018 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|---------------------|---------------------|-------------|
| | 2009 | 2018 | 2009 | 2018 | 2009 | 2018 | P (Chi sq.) | P (Chi sq.) | P (Chi sq.) |
| | (n=50) % | (n=50) % | (n=50) % | (n=50) % | (n=50) % | (n=50) % | | | |
| Frequency of tooth brushing | | | | | | | | | |
| Once daily | 14 | 12 | 6 | 10 | 14 | 18 | 0.468 | 0.916 | 0.851 |
| Twice daily | 46 | 50 | 48 | 48 | 36 | 40 | | | |
| Thrice daily | 24 | 18 | 18 | 20 | 20 | 20 | | | |
| After every meal | 16 | 20 | 28 | 22 | 30 | 22 | | | |
| What do you use for tooth cleaning? | | | | | | | | | |
| Toothbrush and toothpaste | 62 | 62 | 50 | 56 | 56 | 56 | 0.091 | 0.926 | 0.601 |
| Toothbrush, toothpaste and fluoride | 36 | 30 | 38 | 38 | 26 | 36 | | | |
| Toothbrush, toothpaste, fluoride tablets and floss | 2 | 8 | 12 | 6 | 18 | 8 | | | |
| For how long do you clean your teeth? | | | | | | | | | |
| 1 min or less | 30 | 28 | 22 | 24 | 28 | 30 | 0.451 | 0.369 | 0.984 |
| 2-3 min | 50 | 52 | 56 | 54 | 62 | 62 | | | |
| 4 min | 20 | 20 | 22 | 22 | 10 | 8 | | | |
| How often do you change your toothbrush? | | | | | | | | | |
| Never | 6 | 6 | 8 | 4 | 8 | 6 | 0.998 | 0.992 | 0.820 |
| Once a year | 10 | 14 | 12 | 14 | 10 | 12 | | | |
| Every month | 60 | 54 | 56 | 60 | 60 | 60 | | | |
| Every 2-6 month | 24 | 26 | 24 | 22 | 22 | 22 | | | |
| Do you use toothpaste with fluoride? | | | | | | | | | |
| Yes | 74 | 84 | 92 | 90 | 40 | 54 | <0.001 | <0.001 | 0.052 |
| No | 20 | 12 | 4 | 6 | 18 | 30 | | | |
| I don't know | 6 | 4 | 4 | 4 | 42 | 16 | | | |
| Do you have bleeding gums? | | | | | | | | | |
| Yes | 22 | 18 | 12 | 14 | 20 | 18 | 0.387 | 0.825 | 0.760 |
| No | 78 | 82 | 88 | 86 | 80 | 82 | | | |

went to the dentist only when necessary (34-52%). While in 2018, most reported visiting every 3 (25-30%) or 6 months (30-35%) ($p<0.001$) (Figure 2).

The main reason for not visiting the dentist at both time points was that participants felt they did not need to, but the proportion not perceiving a need to visit decreased from 43% in 2009 to 32% in 2018 ($p=0.027$). At both time points the main reason for the last visit was for a check-up (36-56% in 2009, 54-64% in 2018, $p=0.159$).

Discussion

Improving children's dental health is a global public health priority. The basic measure for the prevention of oral and dental diseases is the correct maintenance of oral hygiene with fluoride toothpaste. One of the main goals of WHO is the development of Dental Health Systems that will focus on prevention of oral diseases by increasing the awareness of children about maintaining oral hygiene (Petersen, 2003).

The Dental Health System Reform is the first step in the Montenegrin Health Care System Reform, which was created by a private-public partnership, as a potential way of solving and modernizing the Public Health system (Kezunovic *et al.* 2013). One of the basic aims

of the reform in the field of dentistry was to focus on prevention measures such as the promotion of oral health and education programs in this matter.

This research investigated awareness and practices related to maintenance of oral hygiene in children aged 12-14 year, at the beginning of the Dental Health System reforms and a decade later.

The socioeconomic status of children influences the level of information and awareness about the maintenance of oral hygiene (Paula *et al.*, 2012; Park *et al.*, 2016). The Socio-demographic profile of participants improved in Budva, which can be related to the development of tourism in that region of Montenegro in the last 9 years.

Many reviews of oral hygiene have recommend tooth brushing at least twice a day for two minutes with fluoride toothpaste (Choo *et al.*, 2001; Tolvanen *et al.*, 2010). Research conducted in Croatia in 2003 showed that only 10.57% of children aged 11 to 14 brushed their teeth several times a day (Jurić *et al.*, 2003). Similar surveys show that most children aged 11 to 13 brush their teeth twice a day in Greece, Ukraine, Belgium, Latvia and Macedonia (more than 45%), while in Lithuania (39%) and Finland (40%) the statistics are somewhat worse (Zaborskis *et al.* 2010). The best results were registered in Switzerland,

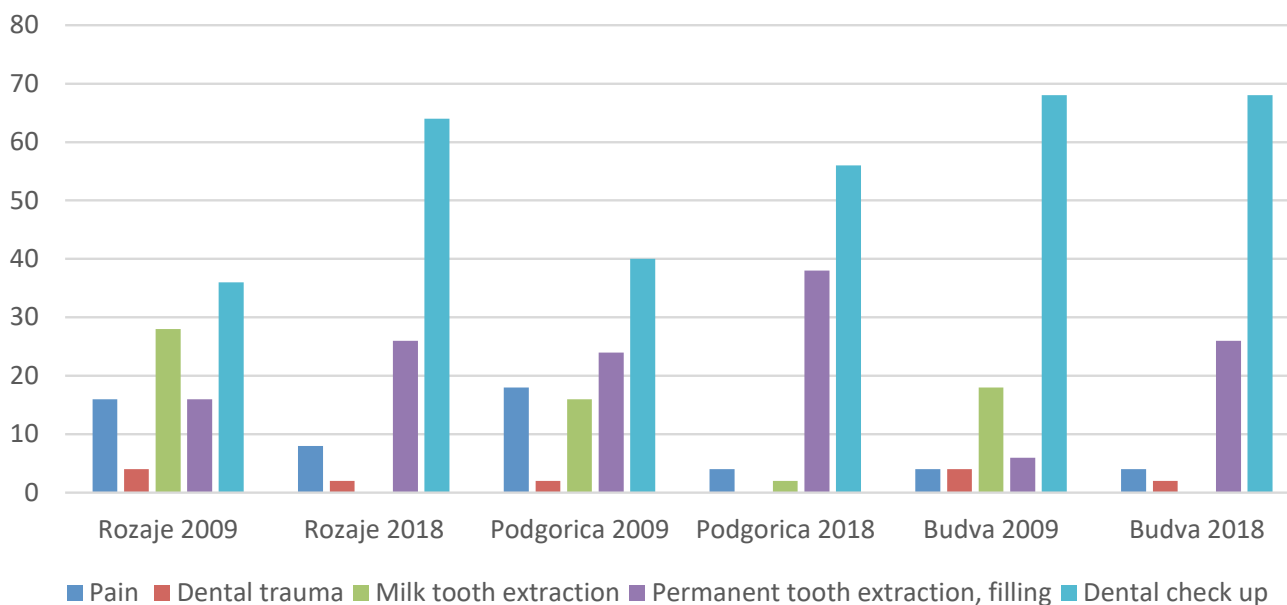


Figure 1. Reason for first dental visit (comparisons by region and years)

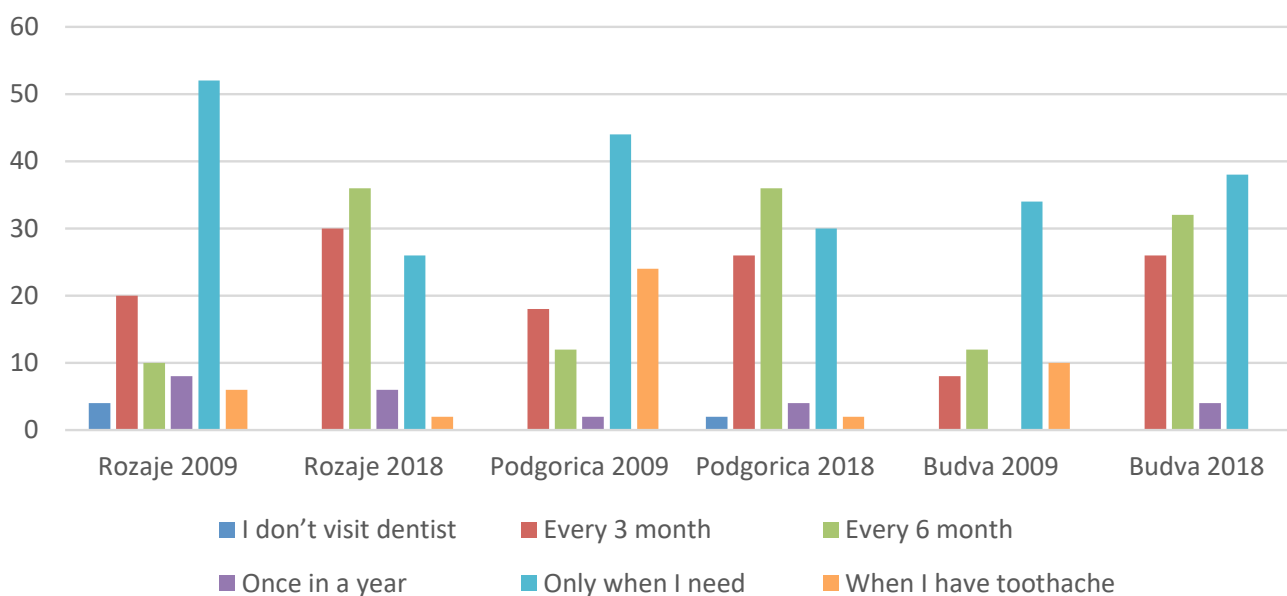


Figure 2. Dental visit frequency (comparisons by region and years)

Norway, Sweden, Denmark, Germany and Holland, where the percentage of children of this age brushing their teeth more than once daily was over 78% (Zaborskis *et al.*, 2010; Eaton and Carlile 2008).

One of the major caries preventive measures is the application of fluoride toothpaste (Choo *et al.*, 2001). Fewer children in Budva were using fluoride toothpaste at either time point but there was an encouraging and possibly significant increase in its use over time ($p = 0.052$). After the reforms were implemented other oral hygiene practices remained similar, children only used a toothbrush and toothpaste. It may be relevant that the city with the greatest increase in Fluoride toothpaste use was also the one with the greatest increase in perceived socioeconomic status.

Gingivitis, as indicated by bleeding gums is considered as a precursor for periodontitis. When compared with children of the same age in Lithuania (Zaborskyte and Bendoraitiene, 2003) where 50.6% of participants had self-reported gum bleeding only 12-22% of our Montenegrin participants

were affected.

Most participants visited a dentist for the first time when they were between 4 and 6 years old. In both study years the main reason for the first visit was for a routine check-up. There was a slight decrease in the proportion of participants who visited a dentist for the first time due to pain (4-18% in 2009 and 4-8% in 2018) ($p < 0.001$).

Regular dental check-ups are important for the prevention and early treatment of caries. The risk of developing severe caries is lower in children who receive regular dental check-ups every 6 months (Lin *et al.*, 2015). In 2009, most participants went to the dentist only when they felt it necessary (34-52%), while in 2018, most reported visiting every 3 and 6 months. Participants in a survey in Montenegro in 2012 visited the dentist every six months (36%) or three months (34%) (Ljaljevic *et al.* 2012). The fact that when compared to 2009, most of respondent visit dentist for regular check-up every 3 and 6 month is very encouraging ($p < 0.001$).

As for any research, the results of the present study should be interpreted carefully, the lack of a standard questionnaire for assessing oral health awareness and the lack of objective data on socio-economic status and the only partial evaluation of the other Health System reforms restrict conclusions in this study.

However, these data suggest encouraging improvements in some health behaviours since the reform of the Dental Health System in Montenegro. Whilst many oral hygiene behaviours have remained similar, the proportion of children using a Fluoride toothpaste may have increased. Furthermore, in the past 10 years there has been a decrease in the proportion of children visiting the dentist for emergencies and an increase in the proportion attending for regular check-ups. Further changes may be necessary to increase awareness of oral health and to improve caries prevention.

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