

## Dental caries and oral hygiene in 12 year-old Lithuanian schoolchildren

Simona Milciuviene, Egle Bendoraitiene, Vilija Vaitkeviciene,  
Julija Narbutaite, Ingrida Vasiliauskiene, Egle Slabsinskiene  
Kaunas, Lithuania

### Summary

**Objective.** The aim of this study was to describe the prevalence of dental caries, DMFT and evaluate the oral hygiene among 12 year-old schoolchildren in ten counties of Lithuania.

**Material and methods.** One thousand thirty five (1035) 12 year-old schoolchildren were clinically examined for dental caries and evaluation of oral hygiene was performed. Caries was recorded in accordance with the WHO criteria. Oral hygiene was evaluated by OHI-S index (Green and Vermillion).

**Results.** The prevalence of dental caries was 74.5% and varied between counties from 59.4% to 96.2%. The mean DMFT was  $2.56 \pm 0.07$  and varied between counties from  $1.41 \pm 0.15$  to  $4.46 \pm 0.25$ . Oral hygiene was satisfactory (mean OHI-S  $1.36 \pm 0.06$ ). 37.3% of the children brushed their teeth twice per day, 49.1% - once daily, and 13.6% brushed their teeth seldom. An association between dental caries and oral hygiene was found.

**Conclusions.** The prevalence of dental caries was 74.5%. The mean DMFT was  $2.56 \pm 0.07$ . Oral hygiene was satisfactory and the mean OHI-S was  $1.36 \pm 0.06$ . The number of teeth affected by dental caries ranked from 1 to 4, result found in 61.6% of schoolchildren examined.

The oral health status may be improved by the implementation of preventive programs. The creation of the program was based on the findings of the present study. A program based on main methods, as teaching proper oral hygiene habits and application of sealants on the first molars was implemented in 6-8 year-old children.

**Key words:** 12 year-old schoolchildren, caries prevalence, DMFT index, OHI-S index.

### Introduction

Dental caries preventive programs for children of different ages implemented in many European countries have shown excellent results - a significant decrease in the prevalence and severity of dental caries (Marthaler et al., 1996; Friis-Hasche, 1994; Bolin et al., 1997; Mandel, 1996). The analysis of dental status in 12 year-old Swedish and Danish children showed that during a period of 20 years DMFT decreased from 5.7 to 1.3 (Friis-Hasche, 1994; Bolin et al., 1997; Petersen et al., 1999). In Belgium, DMFT decreased from 2.66 to 1.38 (Vanobberger, 2001). In Slovenia, DMFT decreased from 5.1 to 1.8 between 1987-1998 (Vrbic, 2000). DMFT dynamics was noticed in Croatia: between 1968 and 1991 DMFT had decreased from 7.0 to 2.6, while in

1999 slightly increased up to 3.5 (Rajic et al., 2000).

Good results in caries prevention were achieved in Great Britain where DMFT decreased from 3.1 to 0.9 in the period 1983-2001. In France, DMFT decreased from 4.2 to 1.9 during the period 1987-1998. Similar data were registered in Norway and Switzerland (WHO Global Oral Data Bank 2001-2004).

Meanwhile, in Eastern European countries, high prevalence of dental caries and DMFT was still observed. According to the study of Kunzel, the DMFT in Latvia was 7.7, in Estonia - 4.1, in Byelorussia - 3.3, in Ukraine - 4.4, in Bulgaria - 3.1, and in Poland - 5.1 (Kunzel, 1996). According to the findings of previous epidemiological studies performed in Lithuania, the DMFT in 12 year-old schoolchildren was 3.5-4.9 (Machiuls-

kiene et al., 1998; Milciuviene et al., 1999; Aleksejuniene et al., 1996). However, recent studies show significantly positive changes in the dynamics of dental caries in these countries.

DMFT in Latvia had decreased from 7.7 to 3.5 (WHO Global Oral Data Bank 2001-2004).

According to the findings of the study by Aleksiejuniene and co-authors (Aleksejuniene et al., 2004), the DMFT among 12 year-old schoolchildren in Lithuania had decreased from 5.8 to 3.6 (by 30%) between 1993 and 2001.

There are numerous studies showing an association between oral hygiene and dental caries (Harris et al., 1991). Proper oral hygiene is an inexpensive and effective method in caries prevention, decreasing the prevalence and severity of dental caries and gingivitis (Axelsson et al., 1997; Kidd et al., 2003; Luciak- Donsberger et al., 2004).

Previous studies were mostly held in major cities of Lithuania (Vilnius, Kaunas, Klaipeda, Siauliai), and therefore findings did not reveal the real situation in other regions. There are 10 counties in Lithuania, but epidemiological studies have not yet been performed in all of them. Taking into consideration that oral hygiene is very important in maintaining dental health in children, the evaluation of oral hygiene habits and determination of the oral hygiene index are also very important factors.

The aim of this study was to evaluate the prevalence of dental caries and DMFT among 12 year-old schoolchildren in all 10 counties of Lithuania. Data will be used in planning and implementing of caries preventive programs.

## Material and methods

The study was held in ten counties of Lithuania (Figure 1).

Schoolchildren were randomly selected in schools of each county. Children, who at that time were aged from 11.5 to 12.5 years, were considered to be as a 12 years old. The mean age of participants was  $11.85 \pm 0.45$  years.

The study was performed in schools of Kaunas, Vilnius, Klaipeda, Siauliai, Panevezys, Alytus, Taurage, Utena, Telsiai, and Marijampole. A total number of 1035 schoolchildren: 512 boys (49.5%) and 523 girls (50.5%) were



**Figure 1. Distribution of the country (Lithuania) into counties**

clinically examined. The number of participants in each county varied between 95 and 122.

Dental caries was scored by tooth in accordance with the WHO criteria (WHO, 1997). The experience of dental caries was determined by the prevalence and DMFT. Oral hygiene was evaluated by OHI-S (Green and Vermillion) (1964).

A questionnaire designed to inquire all subjects was performed in order to evaluate how often they brushed their teeth. Participants were distributed into three groups: 1 - who brushed their teeth twice a day, 2 - who brushed their teeth once a day, 3 - who brushed their teeth several times per week or less.

The fluoride concentration in drinking water was different in different counties and varied from 0.16 ppm in Kaunas up to 1.7 ppm in Klaipeda.

The data were recorded in specially designed record forms, transferred to computer, corrected for logistical errors. The analysis was performed using the SPSS for Windows.

## Results

The results of the study showed that the prevalence of dental caries was 74.5%, but differed from county to county (Table 1). The prevalence of dental caries was lower in boys (72.5%) than in girls (76.5%). The highest prevalence of dental caries was in 12 year-old schoolchildren in Panevezys county (96.2%), and it significantly differed statistically from that in schoolchildren in all other counties ( $p < 0.001$ ).

The mean DMFT of all studied 12 year-old schoolchildren was  $2.56 \pm 0.07$ . The lowest DMFT mean was in schoolchildren of Siauliai ( $1.41 \pm 0.15$ ) and it significantly differed statistically ( $p < 0.05$ ) from that in children in all other counties (Table 1).

According to the data presented in Table 2, it has been found that the part of filled teeth in DMFT was 1.44 and made up 56.25% of the composition of DMFT; decayed teeth (1.06) made up 41.4%, and missing teeth (0.06) - 2.35% of the composition of DMFT. It is important to describe the composition of DMFT, which allows us to evaluate the level of dental care in the county.

Similar to the prevalence of dental caries, the composition of DMFT varied from county to county. Panevezys county significantly differed from the others, as schoolchildren were mostly affected by dental caries. The composition of the DMFT index here was also different. The D part was 3.06 and predominated by making up 68.6% of the DMFT. The filled (1.34) teeth part was 30.05%, and extracted (1.44) - 1.36%.

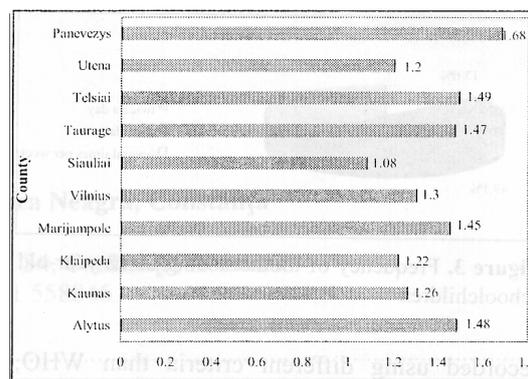
In Kaunas, Klaipeda, and Utena counties the situation was different and filled teeth comprised the biggest part of the DMFT (69.56% - 74.15%). In the rest of counties, filled teeth comprised more than half of the DMFT and varied between 52.5% and 68.3%.

Findings of the study showed that 25.8% of the examined participants had healthy teeth (Table 1). The highest percentage of schoolchildren with healthy teeth was in Siauliai (40.6%) and Klaipeda (35.5%), and the lowest - in Panevezys (3.2%). The predominant number of decayed teeth among clinically examined participants was from 1 to 4 (61.6%). 12.1% of schoolchildren had 5-10 decayed teeth. Unfortunately, a few children showed even 12-15 decayed teeth.

The analysis of the oral hygiene (Figure 2) showed that it was satisfactory, and the OHI-S, according to Green and Vermillion was higher than 1. The best oral hygiene (OHI-S  $1.08 \pm 0.14$ ) was in schoolchildren in Siauliai county, and the poorest - in Panevezys -  $1.68 \pm 0.15$ .

The frequency of toothbrushing is presented in Figure 3. Results showed that the once-daily toothbrushing was predominant (49.1%).

The relation between the frequency of toothbrushing, the DMFT index, and the preva-



**Figure 2.** OHI-S (according to Green and Vermillion) index in 12 year-old schoolchildren in 10 counties of Lithuania

lence of dental caries is presented in Figure 4. It has been found that the higher percentage of schoolchildren with healthy teeth was among those who brushed their teeth twice a day.

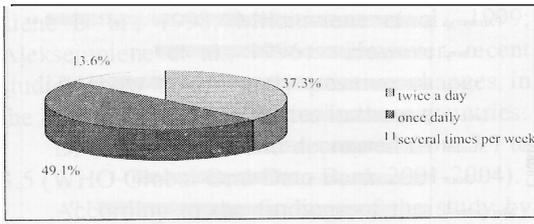
The DMFT in schoolchildren who brushed their teeth more frequently (twice a day), was also lower ( $2.04 \pm 0.10$ ), in comparison with those who brushed their teeth only several times per week ( $2.92 \pm 0.22$ ) (Table 3).

The analysis of the frequency of toothbrushing showed that girls brushed their teeth more frequently (twice daily) (62.9%), than boys (37.1%) ( $p < 0.05$ ). 53.8% of the boys and 46.2% of the girls brushed their teeth once a day. There was no statistically significant difference between girls and boys with respect to toothbrushing once daily. Only 148 children (14.3%) of all examined schoolchildren (1053) brushed their teeth seldom, and 8 of them did not brush their teeth at all.

## Discussion

The findings of the present study showed that the prevalence of dental caries and DMFT in 12 year-old schoolchildren in Lithuania had a tendency to decrease. Results of the study showed that the prevalence of dental caries in the 10 counties was 74.5%, while previous studies in 12 year-old schoolchildren in 5 counties showed the prevalence to be as high as 90.8% (Milciuviene et al., 1988).

Machiulskiene (Machiulskiene, 1998) in her study, performed in 1994 in Kaunas city, found that the prevalence of dental caries was 99.8%. However, dental caries in this study was



**Figure 3.** Frequency of toothbrushing in 12 year-old schoolchildren

recorded using different criteria than WHO, where white spot lesions were registered. Thus, the prevalence and the DMFT were higher. The study was performed only in one city, and therefore it cannot characterize other regions. In our study, dental caries was registered according to WHO criteria. Therefore the values of the DMFT differ due to different evaluation criteria.

According to the findings of the present study, after analyzing the DMFT level in 12 year-old schoolchildren, with respect to the levels indicated by the WHO, we can conclude that our country DMFT level corresponds to low. The findings of our study showed that the DMFT values in schoolchildren of Siauliai, Klaipeda, Alytus, Vilnius, Telsiai, and Utena counties were low, in schoolchildren of Kaunas and Taurage counties - medium, and in schoolchildren of Panevezys county - high (*Table 1*).

The findings of our study in comparison with those presented by Marthaler and co-authors (Marthaler et al., 1996), made us conclude that Lithuania is on the same level as France, Germany, and Italy. There is no big difference with the other European countries as Belgium, Czech Republic, Spain, Austria, Romania, Slovakia, and Hungary (Petersen et al., 2001; Szoce et al., 2000; Carvalho et al., 2001; Bolin et al., 1997; Schulte et al., 2001; Vanoberger et al., 2001; WHO Global Oral Data Bank 2004).

We are still behind the leaders in dental caries prevention - the Northern countries (Friis-Hasche 1994; Mejare et al., 1999; Petersen et al., 1999; Bolin et al., 1997), but in better position among our neighbors - Latvia, Poland, Estonia, as well as the former USSR - Ukraine (DMFT 4.4-5.7), Russia (DMFT 3.7), and Byelorussia (DMFT 3.3) (Kunzel, 1996; Andrushkevich, 2004).

When the analysis of the composition of the DMFT was performed, we have found that the part D was still a significant part and varied between 23.6% and 63.09%. Panevezys county was especially prominent here - 68.60%. That can be explained by the fact that dental clinics in schools were closed, and children did not receive any professional dental care. Caries prevention programs had not been implemented in this county.

Findings of the study concerning oral hygiene showed that it was satisfactory in most regions (OHI-S varied between  $1.08 \pm 0.14$  and  $1.68 \pm 0.15$ ). However, although schoolchildren stated that they brushed their teeth every day (group 1 and group 2 in Figure 3) (85.7%), the quality of toothbrushing was not good and the oral hygiene skills were insufficient. The frequency of toothbrushing (according to the inquiry) and the quality of toothbrushing (OHI-S) did not always coincide.

It has been found that 11.5% of schoolchildren did not brush their teeth daily, while 1.3% of the participants answered that they brushed their teeth very seldom and 0.8% of schoolchildren did not brush their teeth at all. Nearly twice more girls than boys brushed their teeth twice daily ( $p < 0.05$ ). Therefore, we conclude that 12 year-old girls are more aware of their teeth than boys of the same age.

A number of authors (Addy et al., 1994; Harris, 1994; Viglid et al., 1999; Fejerskov et al., 2003; Axelsson, 2000) emphasized in their studies the association between oral hygiene and dental caries. The findings of our study showed that the DMFT in schoolchildren who brushed their teeth twice daily was  $2.04 \pm 0.10$ , while in those who brushed their teeth less than once daily -  $2.92 \pm 0.22$  ( $p < 0.05$ ).

A similar tendency was found when comparing the frequency of toothbrushing with the prevalence of dental caries. The data presented in Figure 4 show that children who brushed their teeth regularly (twice daily) had more healthy teeth (31%) compared to those who brushed their teeth seldom (21%). Thus, the findings of our study confirmed an association between the frequency of toothbrushing, caries and DMFT.

The comparison of our findings with the results of previous studies performed in Lithuania showed that the DMFT among 12 year-old

**Table 1.** The prevalence of dental caries and DMFT among 12 year-old schoolchildren in Lithuania according to counties

County	DMFT $\pm$ SE	Prevalence (%)
Kaunas	3.38 $\pm$ 0.23	81.7
Marijampole	2.33 $\pm$ 0.18	79.1
Alytus	2.05 $\pm$ 0.20	72.0
Taurage	2.82 $\pm$ 0.22	74.7
Vilnius	2.85 $\pm$ 0.23	73.0
Klaipeda	1.78 $\pm$ 0.16	64.5
Siauliai	1.41 $\pm$ 0.15	59.4
Panevezys	4.46 $\pm$ 0.25**	96.2*
Utena	2.30 $\pm$ 0.16	73.3
Telsiai	2.21 $\pm$ 0.20	71.0
Total:	2.56 $\pm$ 0.07	74.5

\*  $p < 0.001$  when compared with the other counties.

\*\*  $p < 0.05$  when compared with the other counties.

**Table 2.** The composition of the DMFT in 12 year-old schoolchildren of different counties of Lithuania

County	D		F		M	
	$\pm$ SE	%	$\pm$ SE	%	$\pm$ SE	%
Kaunas	0.91 $\pm$ 0.11	26.9	2.39 $\pm$ 0.19	70.70	0.08 $\pm$ 0.03	2.40
Marijampole	1.47 $\pm$ 0.15	63.09	0.83 $\pm$ 0.10	35.60	0.03 $\pm$ 0.01	1.31
Alytus	0.54 $\pm$ 0.09	26.34	1.40 $\pm$ 0.16	68.30	0.11 $\pm$ 0.01	5.36
Taurage	1.08 $\pm$ 0.14	38.30	1.66 $\pm$ 0.23	58.66	0.08 $\pm$ 0.03	3.14
Vilnius	1.16 $\pm$ 0.17	40.70	1.62 $\pm$ 0.15	56.80	0.07 $\pm$ 0.03	2.50
Klaipeda	0.42 $\pm$ 0.09	23.60	1.32 $\pm$ 0.13	74.15	0.04 $\pm$ 0.02	2.25
Siauliai	0.64 $\pm$ 0.10	45.40	0.74 $\pm$ 0.12	52.50	0.03 $\pm$ 0.02	2.10
Panevezys	3.06 $\pm$ 0.10	68.60	1.34 $\pm$ 0.18	30.04	0.06 $\pm$ 0.04	1.44
Utena	0.65 $\pm$ 0.10	28.26	1.60 $\pm$ 0.13	69.56	0.05 $\pm$ 0.02	2.18
Telsiai	0.64 $\pm$ 0.09	28.95	1.49 $\pm$ 0.16	67.42	0.08 $\pm$ 0.03	3.63
Total:	1.06 $\pm$ 0.048	41.40	1.44 $\pm$ 0.05	56.25	0.06 $\pm$ 0.008	2.35

**Table 3.** The frequency of toothbrushing and DMFT

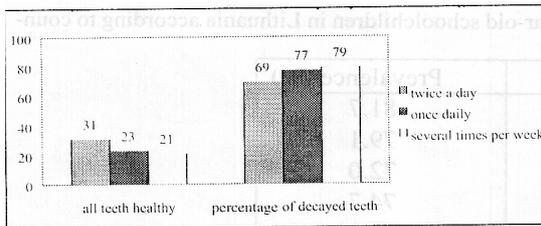
Frequency of toothbrushing	DMFT		
	N	$\pm$ SE	SD
Twice a day	383	2.04 $\pm$ 0.10	2.05
Once a day	504	2.63 $\pm$ 0.10	2.29
Several times per week or less	148	2.92 $\pm$ 0.22	2.63

schoolchildren decreased from 4.45 in year 1983 to 2.56 in year 2003. That can be explained not only by the application of preventive measures, but also by the increased frequency of toothbrushing. Other authors (Schulte et al., 2001; Carvalho et al., 2001; Aleksiejuniene et al., 2004; Petersen et al., 1999; Lunn, 1993; Tai et al., 2001) had presented data on the effectiveness of the application of various preventive methods and decreasing of dental caries. Dentists work-

ing in the counties where the study has been performed were informed about its results.

According to the findings of the present study, the conclusions are:

The prevalence of dental caries in 12 year-old schoolchildren in of 10 counties of Lithuania was 74.5% and varied between counties from 59.4% to 96.2%. The mean DMFT was 2.56  $\pm$  0.07 and varied between counties from 1.41  $\pm$  0.15 to 4.46  $\pm$  0.25, as well. The statistically sig-



**Figure 4.** Prevalence of dental caries and frequency of toothbrushing

nificant difference of the caries experience might be explained by the different fluoride concentration in drinking water.

The oral hygiene among 12 year-old schoolchildren was satisfactory (mean OHI-S of  $1.36 \pm 0.06$ ). 49.1% of children brushed their teeth twice per day, 37.3% - once daily, and 13.6% brushed their teeth seldom. An association between dental caries and oral hygiene was found.

The most common number of affected teeth varied between 1 and 4; this result was found in 61.6% of examined schoolchildren.

The oral health status may be improved by the implementation of preventive programs. The program was based on the findings of the present study and implemented among 6-8 year-old children. The main methods of the program were teaching proper oral hygiene means and application of sealants on the first molars.

## References

1. Addy M., Hunter M.L., Kingdom A. et al. An 8-year study changes in oral hygiene and periodontal health during adolescence. *Intern. J. Pediatric Dent.*, 1994; **vol 4**, No. 2: 75-80.
2. Aleksiejuniene J., Arneberg P., Eriksen A.M. Caries prevalence in Lithuanian children and adolescents. *Acta Odont. Scand.*, 1996; **54**: 75-80.
3. Aleksiejuniene J., Holst D., Balciuniene I. Factors influencing the caries decline in Lithuanian adolescents - trends in the period 1993-2001. *European Journal of Oral Sciences*, 2004; **112**(1): 3-7.
4. Andrushkevich N. Oral health status of population in Mogilev area and directions of dental care reorganization. *Stomatologicheskij Zurnal*, 2004; **3**: 60-61.
5. Axelsson P: *Diagnosis and Risk Prediction of Dental Caries*. Quintessence Publishing Co, Inc. 2000; p. 49.
6. Bolin A.K., Bolin. A., Jansson L., Calltorg J. Children dental health in Europe. *Swed. Dent. J.*, 1997; **21**: 24-40.
7. Carvalho J. C., Van Nieuwenhuysen J. P., D'Hoore W.: The decline in dental caries among Belgian children between 1983 and 1985. *Community Dentistry and Oral Epidemiology*, 2001; **vol 20**, issue 1, 55-58.
8. Fejerskov O., Kidd E.A.M. *Dental Caries. The Disease and its Clinical Management*. Blackwell Munksgaard, 2003; pp. 171-179.
9. Friis-Hasche E. *Child Oral health care in Denmark*. Copenhagen, 1994; p. 49.
10. Harris N. O., Christen A. G. *Primary preventive dentistry*. Appleton and Lange, California, 1991; pp. 35-57.
11. WHO Global Oral Data Bank 2004. <http://www.whocollab.od.mah.se/euro.html>
12. Kidd E.A.M., Nyvad B. *Caries control for the individual patient*. In: *Dental Caries: The disease and its Clinical Management*. Blackwell Munksgaard, 2003; pp. 303-312.
13. Kunzel W.: Trends in caries experience of 12-year old children in East European countries. *Int. J. Paediatr. Dent.*, 1996; **vol. 6**, No. 4: 221-227.
14. Luciak-Donsberger C., Krizanova M. Dental Hygiene in Slovakia. *International Journal of Dental Hygiene*, 2004; **2**(3): 127-131.
15. Lunn H.D.: Dental health in 12-years old children living in similar rural communities in France and England. *Int. J. Paediatr. Dent.*, 1993; **vol. 3**, No. 4: 187-193.
16. Machiulskiene V., Nyvad B., Baelum A. Prevalence and severity of dental caries in 12-year old children in Kaunas, Lithuania 1995. *Caries Res.*, 1998; **32**: 175-180.
17. Mandel I.W. Caries prevention. Current strategies: New directions. *JADA*, 1996; **vol. 127**, No. 10: 1477-1487.
18. Marthaler T.M., Mulane O., Vrbic V. et al.: The prevalence of dental caries in Europe 1990-1995. *Caries Res*, 1996; **30**: 237-255.
19. Mejare I., Kolestal C., Stenlund H. Incidence and progression of approximal caries from 11 to 12 year of age in Sweden: a prospective radiographic study. *Caries Res*, 1999; **33**: 93-100.

20. Milciuviene S., Vaitkeviciene V., Bendoraitiene E.: Oral health status among 12-year old schoolchildren in Kaunas, 1983-1998 (Lithuania). *Medicina*, 1999, **vol. 35**, issue 4: 8.
21. Milciuviene S. The preventive program of dental caries and periodontal diseases among children and adolescents in Lithuania. *Avtoref. Dis. Minsk*, 1988; p. 19. In Russian.
22. *Oral health surveys: Basic methods*. 4<sup>th</sup> ed., WHO, 1997; pp. 21-52.
23. Petersen P.E., Dalean D.I., Grivu O. et al. Oral health status among schoolchildren in Romania, 1992. *Community Dent Oral Epidemiol.*, 1994; **22**: 90-93.
24. Petersen A.K., Torres A.M.: Preventive Oral Health care and health promotion provided for children and adolescents by the municipal Dental Health service in Denmark. *Int. J. Paediatr. Dent.*, 1999; **9**: 81-91.
25. Rajic Z., Radionov D., Rajic-Mestrovic S. Trends in dental caries in 12-year old children in Croatia. *Coll Antropol.*, 2000; Suppl 1: 21-24.
26. Shulte A., Rossbach R., Tramini P.: Association of caries experience in 12 year-old children in Heidelberg, Germany, and Montpellier, France, with different caries preventive measures. *Community Dentistry and Oral Epidemiology*, 2001; **Vol 29**, Issue 5: 354-358.
27. Szöke J., Petersen P. E.: Evidence for dental caries decline among children in an East European country (Hungary). *Community Dentistry and Oral Epidemiology*, 2000; **vol 28**, Issue 2: 155-158.
28. Tai Baoju, Du Minguan, Bin Peng et al. Experiences from a school-based oral health promotion programme in Wuhan city, China. *Int. J. Paediatr. Dent.*, 2001; **vol. 11**, No. 4: 286-292.
29. Vanobberger J. Martens L., Declerk D. Caries prevalence in Belgian children: a review. *Int. J. Paediatr. Dent.*, 2001; **11**: 164-170.
30. Vglid M., Petersen P.E., Hadi P.: Oral health behavior of 12 year-old children in Kuwait. *Intern. Pediatric J.*, 1999; **vol. 9**, No.1: 23-31.
31. Vribe V. Reasons for the caries decline in Slovenia. *Community Dent Oral Epidemiol*, 2000; **28**: 126-132.

Correspondence to: Prof. Simona Milciuviene, DDS, PhD, Clinic of Oral Health and Paediatric Dentistry, Faculty of Odontology, Kaunas University of Medicine, Luksos - Daumanto 6, Kaunas, LT-3007, Lithuania. E-mail: vaikstom@med.kmu.lt