

Changes in dental caries and oral hygiene among 7-8 year-old schoolchildren in different regions of Lithuania 1983-2009

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SUMMARY

The objectives of this study were to evaluate and compare the changes of the dental caries prevalence and severity of 7 to 8 year old schoolchildren in six Lithuanian regions over the past 26 years (1983-2009) and to propose recommendations based on the results of the study.

The study is based on the analysis of data, containing 576 cases of children examined in 1983 and comparison with data containing 531 cases added in 2009. The studies were conducted in the same six regions of Lithuania among the children from 7 to 8 years of age. For the study of children the WHO oral assessment methodology was used (WHO Basic methods 1997). Severity of dental caries was described by *df-t* and DMF-T index. The average of individual *df-t* and DMF-T indices was calculated for all subjects and sorted by gender. Oral hygiene status was evaluated by applying the simplified Green-Vermilion index-OHI-S (1964)

The prevalence of primary dental caries among the children 7 to 8 years of age was 92.4% in 1983 and 88.7% ($p=0.43$) in 2009. The prevalence of permanent dental caries decreased from 49.6% in 1983 to 29.7% ($p<0.001$) in 2009. Mean *df-t* score decreased from 4.9 ± 3.4 in 1983 to 4.1 ± 2.7 in 2009 and DMF-T index decreased from 1.1 ± 1.7 in 1983 to 0.5 ± 1.0 in 2009 ($p<0.001$). The OHI-S index was not significantly different during 1983-2009.

In the period of last 26 years a tendency towards the decrease in the prevalence and severity of dental caries was observed. That could be related to the frequent using of the toothpastes with fluoride, as well as implementation of the caries prevention program with sealants among the children of that age. The poor oral hygiene and comparatively high caries prevalence in schoolchildren show that it is still necessary to improve preventive measures in Lithuania.

Key words: dental caries prevalence, severity, schoolchildren, oral hygiene.

INTRODUCTION

Dental caries and periodontal diseases have been reported to be among the most common bacterial diseases affecting humans. It was found that the prevalence of the dental caries increases with age. Caries damaged teeth have a negative impact on the child's growth, development and health status (1, 2). The emergence of dental caries depends on many

factors: the socio-economic conditions, healthy lifestyle, habits of oral hygiene, fluoride use and effective preventive oral health care. That's why a broad introduction of preventive measures can reduce dental caries prevalence and severity (3, 4).

Globally, over the last decade, we can observe significant changes in the structure of oral diseases. In most industrialized countries, the emergence of children's dental caries has substantially decreased. During the past 10 years the most epidemiological studies have demonstrated a marked decline in the prevalence of dental caries in Western countries (5, 6). The dental community has prided itself on efforts that have reduced dental caries including use systemic and topical fluorides, toothpastes, sealants, improvements in diet, oral health education (7-10). Different studies demonstrate that a decrease in caries prevalence has

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been achieved by conducting oral health prevention programs in countries with low caries experience. The Swedish researchers have observed that if dental fissures are coated with sealants, even after 8 years old, the possibility of caries development is reduced by 80-90 percent (11). Contrary to what observed in many Western societies, among children and adolescents in the Baltic States and other Eastern European countries up to now has been an insignificant caries decline (12-17).

Recent studies reporting alarming increases in dental caries. These increases are in children and adults primary and permanent teeth, and include coronal and root surfaces (17).

Poor oral hygiene, frequent and abundant consumption of sugars has been known for many years to play a key role as a behavioral risk factor of oral diseases. Toothbrushing less than twice daily and snacking between meals have been identified as key behaviors explaining the presence of dental caries in children. Teaching young patients to take care of their teeth is the major concern of the dentists. Children should not only visit a dentist regularly, learn about the importance of oral hygiene, but also they should understand the importance of healthy nutrition (18, 19).

However, currently the dental offices have disappeared in Lithuanian schools and kindergartens undergoing the reform, dental offices for children were united with the adult dental care sections in the public health care institutions. Not all parents mostly for financial reasons are able to take children to private dental clinics (20).

One of WHO policies for the prevention of oral diseases is the promotion of simple efficient and effective oral hygiene measures through practical, community-based program (21).

The program of coating the permanent molar with sealants was approved in Lithuania on September 16, 2005 by the order of the Ministry of Health of the Republic of Lithuania No. V-713. Implementation of this program is a very important step in seeking to

prevent caries of permanent molars and reducing the prevalence of dental caries (22).

In recent year the epidemiological studies were performed among preschoolchildren and adolescents (12, 20). There is a lack of data in Lithuania about the condition of school children's oral health. The objectives of this study were to evaluate and compare the changes of the dental caries prevalence and severity of 7 to 8 year old schoolchildren in six Lithuanian regions over the past 26 years (1983-2009) and to propose recommendations based on the results of the study.

MATERIAL AND METHODS

The material of two studies conducted in 1983 and 2009 has been chosen for research. The oral condition of schoolchildren aged from 7 to 8 years old was examined in six regions of Lithuania, namely: Kaunas, Kaišiadorys, Kretinga, Kupiškis, Joniškis and Varėna. The total number of patents in 1983 was 576, and in 2009 – 531 (Table 1).

A random sample was designed on a group basis. A class was selected as group unit of the sample. Thus, all 7-8 year old had an equal probability of entering the sample. The required minimum volume of sample necessary to justify the statistical conclusions was calculated using the statistical formulas. The schools were selected at random.

The calculated sample size in 2009 was from 80 to 95 schoolchildren in each of the chosen regions.

The study was carried out according to advices of the WHO (WHO, the Health Surveys 1997) oral health assessment methodology (23). Four researchers were specially trained (two dentists and two residents odontologists) from Kaunas (Lithuania) University of Medicine (at present Medical Academy, Lithuanian University of Health Sciences) Clinic of Oral Care and Pediatric Dentistry. They participated in a calibration. Examination was performed in medical offices of schools at natural lightening conditions, using mouth mirror and explorer, according to the WHO recommendations. The data were filled in a special questionnaire, which recorded primary and permanent teeth caries, fillings, missing teeth as a result of dental caries or other reasons, etc.

Calculated results have been assessed in dental caries prevalence and severity according to the WHO criteria.

To determine the severity of dental caries the DMF-T index of damaged (D), missed (M) and filled (F) teeth (T) (for permanent teeth) and dmft (for primary teeth) caries was used.

For children older than four years the missed

Table 1. Analysis of DMF-t index and structure

Region	The total number of tested children, n	Males, n (%)	Females, n (%)
Joniškis	83	38 (45.8)	45 (54.2)
Kaišiadorys	93	55 (59.1)	38 (40.9)
Kaunas	94	46 (48.9)	48 (51.1)
Kretinga	84	43 (51.2)	41 (48.8)
Kupiškis	93	50 (53.8)	43 (46.2)
Varėna	84	41 (48.8)	43 (51.2)
Total	531	273	258

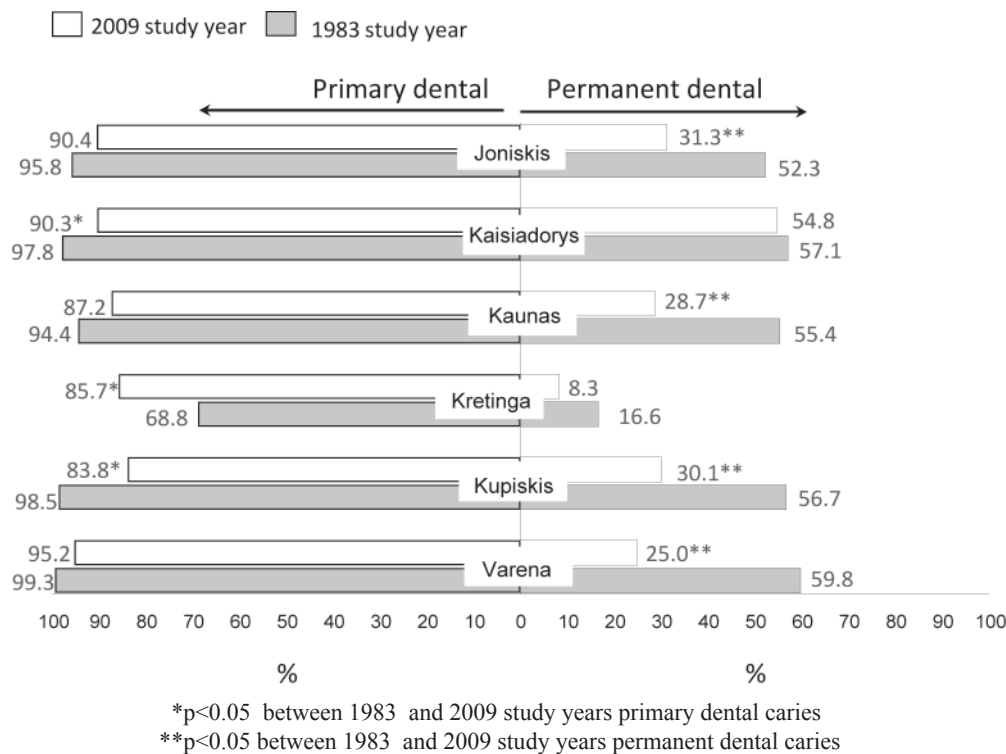


Figure. Caries prevalence (%) between the children aged 7 to 8 years living in various regions of Lithuania in 1983 and 2009

teeth (m) are not counted because of the natural physiological change of teeth.

Caries prevalence and severity were calculated for all subjects and sorted by gender. It was also compared between the different regions of Lithuania. Oral hygiene status was evaluated by applying the simplified Green-Vermilion index – OHI-S (1964).

Fluoride amount in the drinking water was made more precise. In Kretinga was found 2.0-2.2 mg/l, it is higher than recommended concentration, in other regions were found 0.2-0.32 mg/l, it is lower than recommended amount.

Statistical analysis was performed using Statistical Program for Social Science (SPSS version 16.0). The data was shown in absolute numbers and in percentage in order to show the data distribution by percent.

Table 2. The average of DMF-T and df-t index of 7-8 year-olds living in six Lithuanian regions (1983 to 2009)

Region	1983 yr			2009 yr		
	n	df-t±SD	DMF-T±SD	n	df-t±SD	DMF-T±SD
Joniškis		5.1±3.5	0.9±1.3**	83	4.2±2.6	0.5±0.8
Kaišiadorys	80	4.9±2.9	1.2±1.5	93	4.4±2.8	1.1±1.3
Kaunas	100	6.1±4.2*	1.1±1.7**	94	4.3±2.9	0.5±1.0
Kretinga	97	2.1±2.2*	0.4±1.0**	84	2.8±1.9	0.1±0.4
Kupiškis	100	4.7±3.1*	1.0±1.3**	93	3.6±2.5	0.6±1.1
Varėna	100	6.3±3.5*	1.7±1.8**	84	5.2±3.1	0.3±0.6
Total:	576	4.9±3.4*	1.1±1.7**	531	4.1±2.7	0.5±1.0

*df-t; **DMF-T – statistically significant difference (p <0.05) compared with years.

The difference between proportions was assessed using Chi-square (χ^2) criteria. To assess signs of the relationship, the data is presented in tables in which the rows are divided according to the first and columns to the second element groups. This criterion was used to verify assumptions of qualitative variables. Quantitative data were compared by using Student's (t) criteria. Data are presented as mean and SD (Standard Deviation). These criteria are applied to check two or more groups of averages. The difference was considered statistically significant when p<0.05.

The inter-examiner agreement of DMF-T, dmft scores was measured by applying the kappa index. A kappa index value of 0.8 for the inter-examiner agreement was considered satisfactory.

The study was performed with the Health and Educations Committees of all regions. Approval for the Ethics Committee of Kaunas University of Medicine was obtained prior to starting of the study.

RESULTS

The statistical analysis of the data has revealed the prevalence of dental caries in children aged 7 to 8 years, living in different regions of Lithuania in 2009.

The children in seven-eight years-old have a mixed dentition i.e. they have already a lot of deciduous teeth, but still they have permanent teeth. So an overall prevalence of dental caries is 90.4%: 91.21% for boys and 89.53% for girls p=0.5.

Having compared the data from 1983 with the recent data, we have found that the caries prevalence in 1983 was 92.4% in primary, and 49.6% in permanent dentition. In 2009 year

the caries prevalence in primary dentition was 88.7%, in permanent – 29.7% ($p < 0.001$) between 1983 and 2009 study.

The results of dental caries prevalence in primary and permanent dentition between the children aged 7 to 8 years living in various regions of Lithuania in 2009 and 1983 are displayed in Figure.

The changes are significantly different in various regions between 1983 and 2009.

The results of severity children's dental caries for primary and permanent dentition in 1983-2009 are displayed in Table 2.

The data of Table 2 shows differences between significance of *df-t* index in four regions at 1983 comparing with 2009 ($p < 0.05$). The analogous data presents DMF-T index results during analysis. There is decreasing of caries severity in 5 investigated regions.

In 2009 the vulnerability indicators of dental caries for 7-8 year olds living in different Lithuanian regions was also calculated: i.e. we estimated the total number of children who had no damaged teeth, who had one, two, three, etc. filled or missed teeth. Vulnerability indicators of decay are shown in Table 3.

The data of Table 3 shows that the highest amount of caries damaged is 3-8 teeth in children.

In summary Joniškis and Kaišiadorys from all analyzed cases the healthy teeth were found in eight children, in Kaunas – ten, Kretinga and Kupiškis –

eleven and Varėna just four children. It should also be emphasized that about 10-15 damaged teeth were found in five from six cities under research.

The results of OHI-S index analysis are displayed in Table 4. The data shows that differences of OHI-S index results were between girls and boys in various regions (Table 4) in 1983. The data collected in 2009 shows that oral hygiene stayed almost without change comparing the result in 1983, expecting girls in Kupiškis and Kretinga, where significance of OHI-S index increased in 2009 ($p < 0.05$). Schoolchildren with good oral hygiene had lower DMF-T scores.

DISCUSSION

The results of this study shows that the dental caries prevalence and severity is sufficiently high, this condition can have influence in the general health care system of the young people (3, 12, 20).

The surveys of oral health condition of children as well as prevention of oral diseases were carried out in 1983. It was interesting to compare and evaluate the variation of oral health condition of children after 26 years (1983-2009), as the general awareness of dental care importance as well as the eating habits have changed, the medical technology has developed and the quality of materials has improved. Dental care of children, organized in schools, nurseries and specialized polyclinics stopped to exist. Private sector was establishing and dental care became a charged

Table 3. Distribution of dental caries *df-t* in 2009 of 7 - 8 year olds living in various Lithuanian regions

Number of decayed teeth	Joniškis		Kaišiadorys		Kaunas		Kretinga		Kupiškis		Varėna	
	n	%	n	%	n	%	n	%	n	%	n	%
0	8	9.6	8	8.6	10	10.6	11	13.1	11	11.8	4	4.8
1	2	2.4	5	5.4	6	6.4	7	8.3	4	4.3	8	9.5
2	9	10.8	4	4.3	9	9.6	21	25.0	11	11.8	6	7.1
3	15	18.1	10	10.8	9	9.6	15	17.9	13	14.0	5	6.0
4	10	12.0	12	12.9	10	10.6	16	19.0	16	17.2	8	9.5
5	4	4.8	7	7.5	10	10.6	5	6.0	10	10.8	12	14.3
6	9	10.8	9	9.7	15	16.0	5	6.0	6	6.6	12	14.3
7	8	9.6	12	12.9	6	6.4	3	3.6	7	7.5	4	4.8
8	10	12.0	9	9.7	9	9.6	1	1.2	10	10.8	7	8.3
9	5	6.0	6	6.5	4	4.3	0	0	4	4.3	8	9.5
10	2	2.4	4	4.3	1	1.1	0	0	1	1.1	5	6.0
11	0	0	3	3.2	0	0	0	0	0	0	2	2.4
12	0	0	2	2.2	3	3.2	0	0	0	0	2	2.4
13	1	1.2	2	2.2	1	1.1	0	0	0	0	0	0
14	0	0	0	0	1	1.1	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	1	1.2
Total:	83	100	93	100	94	100	84	100	93	100	84	100

service. Social risk factors – unemployment, lack of preventive programmes in kindergartens and schools, low incomes, lack of paediatric specialists in dentistry – are reasons of high prevalence of dental caries in Lithuania and in all Baltic countries. Oral health problem among children in all Baltic countries are similar – poor oral hygiene, insufficient amount fluorides in drinking water, irregular tooth brushing (12-14, 18).

Thus the recent survey (in 2009) was conducted in the same six regions of Lithuania, using the same methodology and the similar sample of respondents (children).

Analyzing and comparing the prevalence of primary teeth caries, we have found the decrease from 92.4% in 1983 to 88.7% in 2009. Permanent teeth caries prevalence has also significantly decreased from 49.6% in 1983 year to 29.7% – 2009 year ($p < 0.001$).

The total means score of primary teeth – df-t (d – decayed, f – filled teeth) in 2009 was 4.1 ± 2.75 : i.e., each investigated child had an average of 4 caries damaged teeth. 26 years ago the severity index of deciduous teeth (df-t) was 4.9 ± 3.36 . Comparing data of permanent dental occlusion, we can say that the current results are much better than it was in 1983. DMF-T index now is only 0.5 ± 0.99 , whereas more than two decades ago it was 1.1 ± 1.68 ($p < 0.001$) The other researches present similar data in Lithuania (24, 25).

In order to assess the variation of dental caries more carefully, oral condition surveys of children were carried out in 1999 (24, 25). The obtained results showed the downward trend of dental caries prevalence and severity index. After statistical analysis of the data, it was found that the prevalence of dental caries in primary teeth is nearly the same as in 2009 – 88.5%. But the prevalence of dental caries for permanent teeth was higher. It reached 33.7%. The severity of dental caries has slightly altered: for pri-

mary teeth – 4.2, and for permanent teeth – 0.7. Thus the decline of dental caries prevalence and intensity was observed already 10 years ago, and comparing with the current data of 2009, the situation has even more improved (25).

In 2004 research results show that Latvian similar age year old children's dmf-t index was 3.6 (SD – 3.4) and the prevalence of caries – 55%. Prevalence of dental caries among boys was higher than among girls (13, 15). Berzinia et al. show that in the age of 7 year olds dmf-t index increased from 1.25 to 4.59 in 2008. It is explained that data achieved in 2000 refer to mixed dentition. Investigation of caries risk factors revealed that children with poor oral hygiene irregular tooth brushing suffered from caries more frequently (14, 27). Our data about relation of OHI-S and DMF-T shows the same results.

The different amount of fluorides in drinking water accounts for difference in caries experience in different regions of Estonia. In Tallin prevalence in dental caries were higher, than in Tartu. DMF-T in Tallin among 12 years old children was 4.1, in Tartu among 12 years children DMF-T was 1.99, among 7 year old children 0.3 (14). Our data was the same. Cross-sectional surveys in Estonia and Denmark, clinical oral examinations of children were conducted in 1997. Results: at age 7 – 83.8% of Estonian children had dental caries against 62.1% of Danish children (16).

Cross-sectional oral health surveys of children aged 6 and 12 years were carried out in 1995, 1997, 1999 and 2000 in Polish schoolchildren. Results: the proportions of 6 year old children being caries-free were 13% in 1995, 17% in 1997, 18% in 1999 and 12% in 2000. The mean DMF-T of children aged 12 years was 4.2 in 1995, 4.0 in 1997, 4.0 in 1999 and 3.8 in 2000; the D-component was particularly high for rural children (26).

The research carried out in the province of

Table 4. OHI-S among 7-8 year old schoolchildren living in different regions of Lithuania 1983-2009

Region	1983 yr				2009 yr			
	Males		Females		Males		Females	
	n	$\bar{x} \pm SD$	n	$\bar{x} \pm SD$	n	$\bar{x} \pm SD$	n	$\bar{x} \pm SD$
Joniškis	47	1.63 ± 1.17	52	1.4 ± 1.08	38	1.82 ± 1.11	45	1.49 ± 1.04
Kaišiadorys	45	1.53 ± 1.01	35	1.25 ± 0.77	55	1.13 ± 1.07	38	1.03 ± 1.1
Kaunas	50	1.55 ± 0.92	50	1.31 ± 1.06	46	1.22 ± 1.03	48	0.92 ± 1.09
Kretinga	58	$1.41 \pm 1.29^*$	39	1.37 ± 1.12	43	1.81 ± 1.0	41	1.63 ± 1.04
Kupiškis	41	1.58 ± 1.15	59	$1.34 \pm 1.15^{**}$	50	2.14 ± 1.13	43	2.07 ± 1.0
Varėna	52	1.61 ± 0.94	48	$1.33 \pm 0.63^{**}$	41	1.76 ± 1.04	43	1.88 ± 1.07
Total:	293	1.55 ± 1.61	283	1.34 ± 1.35	273	1.63 ± 1.12	258	1.5 ± 1.31

*males; **females – statistically significant difference ($p < 0.05$) compared between years.

Poznań in 1987 for establishing the prevalence of dental caries in children aged 7 years has showed that dental caries prevalence was 90%, the intensity of caries measured by the index DMF-T+dmf-t (mixed teeth) was high – 4.99. The intensity of caries was higher in children from rural areas (5.43) than in those from urban areas (27).

In Northern Poland during the 16 year period covered by the surveys, the mean DMF-T of 7 year old children decreased from 0.73 to 0.31 ($p<0.001$). A fissure-sealing program of first permanent molars in 6-7 year old children was started in Poland in 1993, and the result of this program was decreasing of DMF-T index among children in Poland (28). In Belarus caries prevention program using fluoride varnish on permanent molars in primary school showed good results. The caries incidence reduction was 39.7-87.9% (29).

In recent years the same changes are observed in Lithuania as the program of coating permanent molar teeth fissures with sealants is taking place. The using of sealants reduces the risk of dental carries in molars (30, 31).

Recently the WHO experts accent the importance of oral health prophylaxis, because in latest year we can observe significant caries growth tendency. That's why it's very important to apply preventive measures, to decrease dental caries diseases. A new commitment of the global dental profession in return to the basics of prevention that many populations are not receiving. Efforts should be directed to fluorides, oral hygiene, dietary counseling, dental sealants and other methods (17, 21, 32).

Looking at the variation of dental caries over the years from 1983 (9) to 2009, it emerged that both dental caries prevalence and severity index has decreased, there are comparatively high. The decrease can be potential for a variety of reasons. First, over the past 20 years consumption of different toothpaste with fluorine has significantly grown up the dental caries prevention program has been implemented and the outlook of parents towards oral health condition

has changed (32). Insufficient amount of fluoride in drinking water, lack information and knowledge about caries prevention, oral hygiene and caries risk factors of children leads to high prevalence of dental caries. The main reasons for comparatively high prevalence and severity of dental caries in Lithuania and other Baltic States are poor oral hygiene. OHI-S among schoolchildren in the course of time have not changed and a lot of them clean their teeth once a day (14, 18, 24, 33).

It shows that it is still necessary to improve preventive measures in Lithuania.

It's the possible to introduce national preventive programme at the state level, to resume health lessons at schools, to give information to children and their parents on children oral health status and preventive measures.

It is important to promote dentistry health education that would help children and their parents understand the importance of oral health, importance good oral hygiene knowledge.

CONCLUSION

Based on the results of the surveys of children aged 7 to 8, the decreasing tendency of prevalence and severity of primary dental caries from 1983 to 2009 has been observed, from 92.4% to 88.7% respectively ($p=0.43$). Dental caries prevalence of permanent teeth has decreased from 49.6% to 29,7% respectively ($p<0.001$). The df-t has decreased from 4.9 ± 3.4 in 1983 to 4.1 ± 2.7 in 2009. DMF-T index has decreased from 1.1 ± 1.7 in 1983 to 0.5 ± 1.0 in 2009 ($p<0.001$). Changes in oral hygiene were insignificant. The usage of toothpaste with fluoride had influence in decreasing of DMF-T index well as the program of coating permanent molar fissures with sealants. In order to improve the oral health of children it is necessary to establish prophylactic programs on national level, to teach children basics of oral hygiene, to give more information for parents about the possibilities how to avoid dental carries.

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