Dental caries profile among 6-8-year old children from Bialystok District, Poland

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ABSTRACT

Purpose: The purpose of this study was to evaluate the status of permanent teeth in children aged 6-8 years from the Bialystok District, Poland.
Material/Methods: 542 children aged between 6 and 8 years from Bialystok and the surrounding area were included in the study. The dental examination was conducted by one calibrated examiner in the school setting with the use of an artificial light, a dental mirror and a periodontal probe in accordance with the WHO guidelines. The Decayed Missed Filled Teeth (DMFT) and the Significant Caries Index (SiC) indices were used to evaluate the status of permanent teeth.
Results: The mean DMFT index for the whole group was 0.33±0.85. It was 0.09±0.39 for 6-year-old children, 0.32±0.77 in 7-year-olds and 0.5±1.07 in 8-year-olds. The highest mean number of decayed teeth (DT) was observed in 7-year-old children (0.14±0.46). In every age group, the FT component was greater than DT. The mean number of teeth with fissure sealant varied from 0.57±1.15 to 1.22±1.59 depending on age. The SiC index was 0.25, 0.95 and 1.48 in 6-, 7- and 8-year-old children, respectively.
Conclusions: The status of permanent teeth in the surveyed population of 6-8-year-old children living in the Bialystok District was better than in the previous studies. The study confirmed that the majority of caries is concentrated in a small group of subjects.
Key words: caries, children, DMFT, SiC index

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INTRODUCTION

The epidemiological studies are necessary for the oral health evaluation in a population [1]. They make it possible to learn the actual state of dentition in individuals living in a particular region, to find out the treatment needs, to plan the therapeutic and preventive activities, including the estimation of required financial resources, and to evaluate the effectiveness of the health care system. The epidemiological studies help make the dental health problems public [2]. The World Health Organization has clearly recommended carrying out such surveillance [1 3].

The Decayed Missed Filled Teeth (DMFT) index is the most commonly used instrument in the epidemiological studies on dental caries [4,5]. It is calculated as a sum of teeth with decay (D), missing due to caries (M) and filled (F), for population evaluation this sum is divisible by the number of evaluated subjects. An important aspect of the evaluation of dental status using the DMFT index is the analysis of its components. In the DMFT index, every recorded situation, e.g. the presence of a cavity, a missing tooth and a tooth with the function restored with a filling, is equivalent. Only by a detailed analysis of the D, M and F components, the information about the actual dental status can be obtained. The DMFT is considered as a simple tool, recognized and accepted worldwide, which provides a meaningful comparison of the caries situation in various populations [4-6]. However, currently DMFT comes in for some criticism because the index omits early non-cavitated lesions and does not recognize stages of caries progression from small cavity to extensive tooth destruction with a pulpal involvement [6].

The World Health Organization has developed Global Oral Health Goals on the basis of the DMFT index. These recommendations include a reduction of the incidence and prevalence of dental caries. The Global Oral Health Goals for 2000 are widely adopted [1]. The WHO recommended that 50% of children aged 5-6 years should be caries-free and the mean DMFT index for 12-year-olds should not exceed 3. In 1993, the goals for 2010 were to increase the percentage of caries-free children aged 5-6 years up to 90% and to reduce the mean DMFT index for the population of 12-year-olds to 1 [7]. A subsequent document introduced in 2003 by the Working Group including representatives of the FDI, WHO and IADR brought a different approach [3]. Those recommendations contained no absolute values, but they were prepared as guidelines for local policy makers to develop detailed, locally relevant and realistic goals for specific regions. With regard to dental caries, recommendations were to increase the proportion of caries free 6-year-olds and to reduce the DMFT, particularly the D component, in 12-year-olds; the range of this improvement should be established locally.

The distribution of caries in a population may also be measured using the Significant Caries Index (SiC). The SiC index is based on the DMFT; in fact, it is the mean DMFT calculated for one third of the subjects with the highest values of the DMFT index. The SiC index was introduced by Brathall [8] who emphasized the necessity to select, in each evaluated population, a group of subjects with the highest values of caries indices. Particularly this group should be the subject of intensive treatment and prevention measures [8,9]. The role of the Significant Caries Index in describing the health status of a society was emphasised by extending the WHO Global Health Goals to include the recommendation that by 2015 its value in the group of 12-year-olds should not exceed 3 [8].

On the basis of the surveys conducted in the Podlaskie Province in the last decades it is a well-known fact that both the incidence and the prevalence of caries in children and adolescents living there are considerable [10-17]. The WHO global goals for the years 2000 and 2010 have not been reached. A continuous surveillance of the epidemiological situation is needed and it should be conducted not only in the groups indicated by the WHO, but also in other age groups in order to select the part of the population being at risk of the development of severe caries. Due to the approach proposed as global goals for 2020 the role of locally conducted oral health surveillances undoubtedly increased [3].

The purpose of this study was to evaluate the status of permanent teeth in children aged 6-8 years from the Bialystok District, Poland.

MATERIALS AND METHODS

The survey was conducted with the consent of the Bioethical Committee of the Medical University of Bialystok, Poland, in five randomly selected primary schools in the Bialystok District, Poland. Children were recruited for the study by obtaining a written consent from their parents or guardians. The minimum study sample was assessed to be 315 children based on the number of 6-8-year-old children living in this area estimated at 13,000, with the caries prevalence estimated at 30%, the established measuring error and the confidence level of 5% and 95%, respectively.

The dental examination was conducted by one calibrated examiner in the school setting with the use of an artificial light, a dental mirror and a periodontal WHO probe (LM-Instruments Oy, Finland) in accordance with the WHO guidelines [18]. The DMFT index was used to evaluate the

status of permanent teeth, and the following information was recorded: teeth with decay (D), missing due to caries (M) and filled (F). Additionally the presence of fissure sealants was recorded. The information was statistically analysed using the Kruskal-Wallis test, whereas the significance level was established at $p<0.05$. Additionally, the post hoc Dwass-Steele-Critchlow-Flinger test [19] was adopted to reveal the statistical differences between age groups. The SiC index was calculated to determine the discrepancies in caries distribution in the surveyed population. The intra-examiner reliability was assessed by re-examining 5% of the subjects.

RESULTS

The study population consisted of 542 children, with 140 being 6 years old, 192 being 7 years old and 210 being 8 years old. The mean age of the subjects was 7 years and 7 months. Four hundred and fifty-four children (83.8%) were found to be caries-free with regard to the permanent dentition. The prevalence of the disease increased with age, from 5% in 6-year-old children to 21.9% in 8-year-olds (Fig. 1).

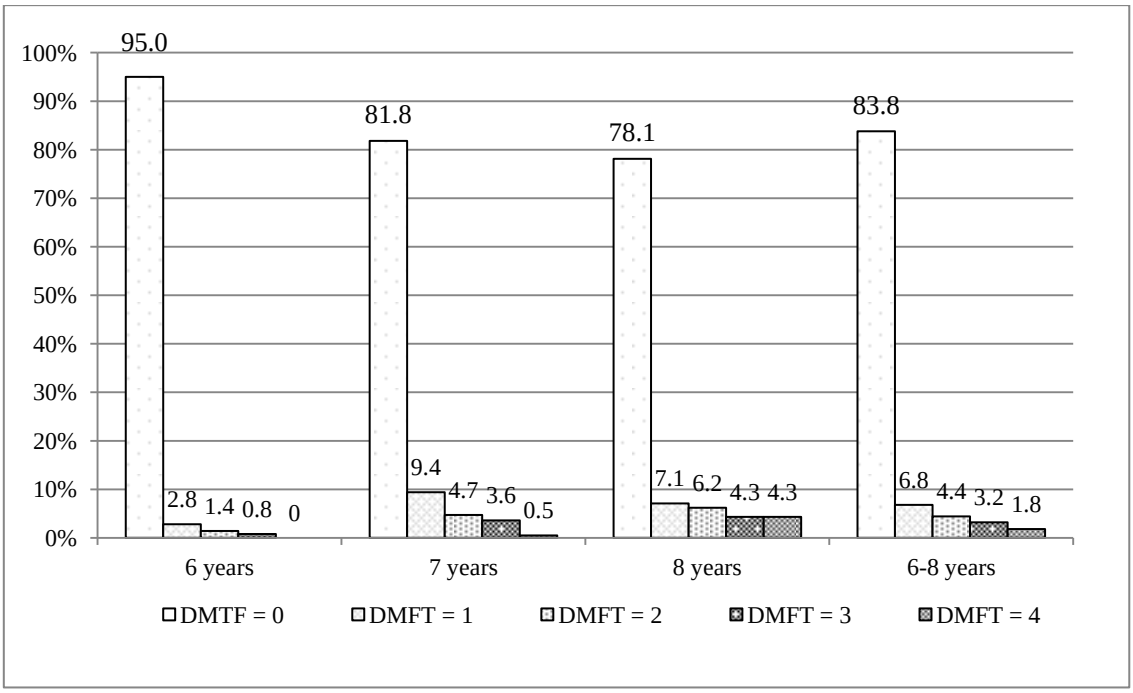

Figure 1. The percentage of children with particular DMFT values.

Table 1 presents the values of the DMFT index in the evaluated population. The mean DMFT index for the whole group was 0.33±0.85. A constant, statistically significant increase in caries experience was observed, and at the age of 8 years the DMFT index reached 0.5±1.07. A similar trend was found for the mean value of filled teeth (FT), and in every age group this component was greater than DT. The highest mean number of decayed teeth (DT) was observed in 7-year-old children (0.14±0.46), but the post-hoc test did not reveal any statistical differences between age groups with regard to the means of decayed teeth. There was no tooth extracted due to caries. The mean number of teeth with fissure sealants varied from 0.57±1.15 to 1.21±1.59 depending on age, and the value was lower in 8-year-olds than in their 7-year-old schoolmates, 0.99±1.41 and 1.21±1.59, respectively (Table 1).

The severity of caries in one child ranged from 1 to 4. Figure 1 presents the percentage of children with particular DMFT values. We observed that caries concerned a small group of surveyed children. The increase of the number of teeth with caries in one child had the highest influence on the value of the mean DMFT index; the occurrence of the disease in new subjects was less significant. Between the ages of 7 and 8 the percentage of children with DMFT=1 slightly decreased, but the number of children with the DMFT index from 2 to 4 increased. This observation was also proven by the Significant Caries Index (Fig. 2). Its value was almost 3 times higher than the DMFT index in each of the evaluated groups. The SiC index in 8-year-old children was 1.48.

The intra-examiner reliability was calculated using the Cohen's kappa coefficient and was assessed as excellent (0.87).

Table 1. The mean DMFT and mean number of teeth with fissure sealant in the evaluated population (*Kruskal-Wallis test, ** post hoc Dwass-Steele-Critchlow-Fligner test).

	DMF	D	M	F	Fissure sealant
6-8 years	0.33 ± 0.85	0.08 ± 0.34	0	0.25 ± 0.78	0.97 ± 1.44
6 years	0.09 ± 0.39	0.04 ± 0.22	0	0.05 ± 0.32	0.57 ±1.15
7 years	0.32 ± 0.77	0.14 ± 0.46	0	0.18 ± 0.62	1.22 ± 1.59
8 years	0.5 ± 1.07	0.05 ± 0.25	0	0.45 ± 1.05	0.99 ± 1.41
p*	**< 0.001**	**0.023**	-	**<0.001**	**< 0.001**
p** 6v7	**0.002**	0.065	-	**0.017**	**< 0.001**
p** 7v8	**0.475**	0.084	-	**0.037**	0.482
p** 6v8	**<0.001**	0.881	-	**<0.001**	**0.006**

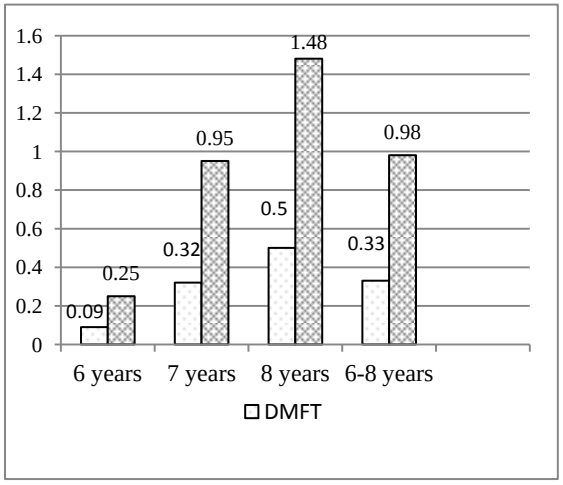

Figure 2. The mean DMFT and the SiC index in the evaluated population.

DISCUSSION

The research studies conducted in the last years showed that the prevalence and experience of caries in children and adolescents living in the Podlaskie region were among the highest in Poland [1,10-12]. This situation has been explained by a low awareness of caries risk factors, a worse socioeconomic status of people living in north-eastern Poland compared to other parts of the country and the limited access to dental treatment, especially in the rural areas [13,20,21].

The data obtained in the present study revealed an improvement of the condition of permanent teeth in children living in the Bialystok District in comparison to the previously published data. Recently, a decline in dental caries among children from different European countries was reported [9,21-24]. In an epidemiological survey conducted in the 1995, 6-year-old children from Bialystok showed the highest caries indices throughout Poland, with the mean DMFT index of 0.41, whereas the mean for the whole country was 0.21 [1]. In the survey of Milewska and Łuczaj-Cepowicz [15] conducted in 2004, the percentage of 6-year-old subjects with caries in permanent teeth was 17.7% in comparison to 5% in our study. The DMFT index in their study was 0.34 compared to 0.09 in our survey. The highest prevalence and experience was observed by Rodakowska et al. [16]. In the article published in 2008 they reported the caries prevalence in permanent teeth of 6-year-olds at the level of 48.78% with the mean DMFT index of 0.78.

The data for 7-year-old children are more ambiguous. Jańczuk and Ciągło [1] reported the DMFT index in this group for the year 1995 at the level of 1.06 and it was the highest value in Poland compared to other big cities. Over last two decades a decrease in the caries level like in 6-year-olds should be found in 7-year-old children as well. But in 2008 the mean DMFT index in the 1th grade schoolchildren from Bialystok was determined at 1.35, which was higher than thirteen years before [14]. The explanation may be the large number of examiners involved in the abovementioned survey; it is a well-known fact that dentists adopt different thresholds for caries detection [25]. Our findings are in agreement with the study conducted by Chłapowska et al. [26]. In the years 2010-2011 they found the mean DMFT index in 6- and 7-year-olds from the Lubuskie region to be at the level of 0.08 and 0.33, respectively.

No reports on caries prevalence and experience in 8-year-old children from the Bialystok District are available in the literature. Children at this age are rarely involved in epidemiological surveys, because they are not listed as the WHO reference group. However, the status of dentition of 8-year-olds was reported by other authors, e.g. such data are available from Italy and Estonia [27,28]. In the present study, the inclusion

of children at this age allowed to show a gradual development of the caries process with the years of life.

The data obtained herein showed that the majority of carious teeth had been already treated, which is in contrast to previous studies [10-16]. In all evaluated groups the F component was greater than the D component. The conclusion might be reached that the dental care for schoolchildren from the Bialystok District is at a satisfactory level. On the other hand, we found a low mean number of first permanent molars with a fissure sealant. It seems that dentists in the Bialystok District tend to provide treatment rather than caries prevention; the reason might also be the parents' low awareness of the role of fissure sealants in caries reduction. It was previously found that only a small percentage of 6-7-year-old children from the Podlaskie region and from other parts of Poland had fissure sealants [29]. Pits and fissures are very prone to caries development and a delay in covering the occlusal surfaces of permanent teeth with a sealant substantially increased the likelihood of dental caries in these teeth [30]. The lack of a proper prevention of caries in first permanent molars may predispose them to caries development.

We noticed a growing, statistically significant, tendency of caries experience with years of life, which is in agreement with the findings reported by other authors [26-28,31]. Chłapowska et al. [26], in their prospective study, found that between 6th and 7th year of life the mean DMFT rose by 0.24, which was similar to our findings. The increase of caries was observed by other authors even despite the fact that in some studies the children were covered by extensive preventive programmes [31]. We also found that the distribution of caries in the evaluated population was irregular. Our results proved the thesis introduced by Brathall [6] that, in every population, a part of it is seriously affected by caries. In our study this group was small because the percentage of subjects with DMFT>0 ranged between 5% and 21.9%, depending on age. However, the severity of the disease in this group was high, e.g. the Significant Caries Index obtained for 8-year-old children was 1.48. One of the WHO objectives recommended for the year 2020 is to reduce inequalities in oral health across populations [3]. For that purpose, extensive caries prevention and treatment actions directed at the group of children most affected by caries should be undertaken.

An advantage of the present study is that the examination was conducted by a dentist experienced in the epidemiology and high intra-examiner reliability was obtained. On the other hand, the fact that only one examiner was involved and the intra-examiner reliability was not calculated has to be considered as a limitation of our survey. Another limitation is that we obtained no information on the oral hygiene practices, the kind of diet and the access to the fluoride prophylaxis. They are well-known caries risk factors and the future caries development in the evaluated population is strongly dependent on them.

CONCLUSIONS

The status of permanent teeth in the surveyed population of 6-8-year-old children living in the Bialystok District was better than in the previous studies. The study confirmed that the majority of caries is concentrated in a small group of subjects.

Conflicts of interest

We declare no conflicts of interest.

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