

DENTAL HEALTH OF FIVE-YEAR-OLD CHILDREN IN MAZOWIECKIE PROVINCE AS REVEALED BY MONITORING OF DENTAL HEALTH AND ITS DETERMINANTS IN 2011 AND 2016

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ABSTRACT

INTRODUCTION: Epidemiology surveys conducted periodically in the same age groups allow assessment of the rate of changes in the burden of caries as well as the needs concerning prophylaxis and treatment. They also indicate the necessary course of action with regard to the promotion of oral health.

OBJECTIVES: The aim of the study was to perform a comparative assessment of the dental health and the needs with regard to caries treatment in 5-year-old children in Mazowieckie Province in 2011 and 2016.

MATERIAL AND METHODS: An analysis was conducted of the results of the epidemiological surveys of children aged five years conducted in Mazowieckie Province in 2011 and 2016 within the framework of Monitoring of Dental Health and Its Determinants. The analysis compared the prevalence and severity of caries (dmft/DMFT), the values of care indices and the needs with regard to treatment of caries and its complications. The statistical analysis employed the t-test to compare the means between the groups and the χ^2 test to compare the percentages. The analyses were performed using Statistica 12 software.

RESULTS: Over a period of five years, the percentage of children free from caries in Mazowieckie Province increased from 18.8% to 21.7%. In 2011, the dmft index was 6.02 and decreased in 2016 to the value of 5.33 ± 4.58 . In 2011, the SiC index was 10 and the dmft index for the remaining 2/3 of the study group was 2.2. In 2016, SiC increased slightly, reaching the value of 10.75 ± 2.53 , while dmft for the remaining 2/3 of the study group was 2.61 ± 2.45 . The percentage of children in whom no treatment needs were identified increased from 22.7% in 2011 to 24.3% in 2016.

CONCLUSIONS: Despite the fact that the needs for care due to dental caries in 5-year-old children were satisfied at a similarly low level in 2011 and 2016, the values of indices concerning dental caries in primary and permanent teeth and the needs for treatment of extensive carious cavities and pulp pathology were decreased. The increase in caries polarisation in primary teeth stresses the necessity of continued monitoring of this population in order to develop tools that will enable a systemic approach to distinguishing groups of children that require enhanced preventive and curative measures.

KEY WORDS: 5-year-old children, caries disease, primary teeth, epidemiological surveys.

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INTRODUCTION

The surveys conducted within the framework of Monitoring of Dental Health and Its Determinants reveal significant regional differences in the prevalence and severity of dental caries. Mazowieckie Province belongs to those regions of Poland where the burden of caries disease, especially in the primary dentition, is greater than the average value for the whole country. According to the results of nation-wide studies from 2011 conducted in 16 provinces, the percentage of children aged 5 free from caries in Mazowieckie Province was lower than percentage for the whole of the country (18.8% vs. 20.1%) and lower than the percentage in eight other provinces [1]. The severity of caries in primary teeth was among the highest (dmft = 6.02). A higher value of the dmft index was only found in Warmińsko-Mazurskie Province (7.18). At the same time, Mazowieckie Province was among the three provinces where the needs concerning the care of primary teeth were satisfied to a larger extent than in the majority of provinces and in comparison with the mean for the entire country (16% for Mazowieckie vs. 11% for the whole country) [1]. These data emphasise the importance of children's lifestyles in the aetiology of early childhood caries and the necessity of pro-health education for both the children and their carers. In 2012, the educational programme 'Caries-Free Childhood' was initiated in the area of Mazowieckie Province within the framework of Polish-Swiss collaboration. The programme was aimed at pre-school children, their parents, carers and educators as well as physicians and nurses providing medical care of children. Its first effects can already be seen in the epidemiological survey carried out in 2016.

OBJECTIVES

The aim of the study was to perform a comparative assessment of dental health and treatment needs for dental caries in 5-year-old children in Mazowieckie Province in 2011 and 2016.

MATERIAL AND METHODS

A comparative analysis was conducted on the results of the epidemiological surveys from 2011 and 2016 carried out among 5-year-old children within the framework of Monitoring of Dental Health and Its Determinants in Mazowieckie Province. The study was conducted in compliance with the requirements and based on the diagnostic criteria for clinical conditions according to the WHO guidelines [2, 3]. The study was approved by the Bioethics Committee at the Medical University of Warsaw, No. KB/190/2016 of 06.09.2016 and No. KBO/36/11 of 20.09.2011, and was conducted in compliance with the Declaration of Helsinki.

A comparison was made of the number of children in the study and their teeth, the prevalence of early childhood caries and permanent teeth caries, the values of the dmft/DMFT indices, the Care Index for caries as well as the needs concerning treatment of caries and its complications. The values of the above-mentioned parameters of oral health obtained in the surveys in 2011 and 2016 were compared with reference to whole study groups, and in 2016 also taking into account the place of residence (urban area/rural area) and the gender of the subjects.

The statistical analysis was conducted using the t-test to compare the means between the groups and the χ^2 test to compare the percentages. The analyses were performed using Statistica 12 software.

RESULTS

In 2011, the size of the study group of children in Mazowieckie Province was 128, and in 2016 it was 223. The characteristics of the study groups are presented in Table 1. The results of the survey conducted in 2011 did not take into account the distribution of the children's gender and places of residence.

In five years, the percentage of children free from caries in Mazowieckie Province increased from 18.8% in 2011 to 21.7% in 2016 (Figure 1). In 2011, 55.5% of children had four or more decayed teeth ($dt \geq 4$). In 2016, $dmft \geq 4$ was found in 132 of 230 children (57.4%).

The indicator of caries severity in primary teeth, expressed as the mean dmft score, in Mazowieckie Province in 2011 was 6.02 and in 2016 it decreased to 5.33 ± 4.58 . The percentage distribution for the individual dmft component indices also changed over the years 2011-2016 (Figure 2).

These changes were, however, not statistically significant ($p > 0.05$). The main component of the dmft index

TABLE 1. Characteristics of examined groups of children in 2011 and 2016

	2011	2016	
Number of examined children	128	223	
Place of residence	No data	City 116 (52.0%)	Village 107 (48.0%)
Sex	No data	Girls 110 (49.3%)	Boys 113 (50.7%)
Number of children with at least one permanent tooth exfoliated	40 (31.3%)	59 (25.7%)	
Average number of deciduous teeth	19.21	19.34 \pm 1.21	
Average number of permanent teeth	No data	0.78 \pm 1.58	

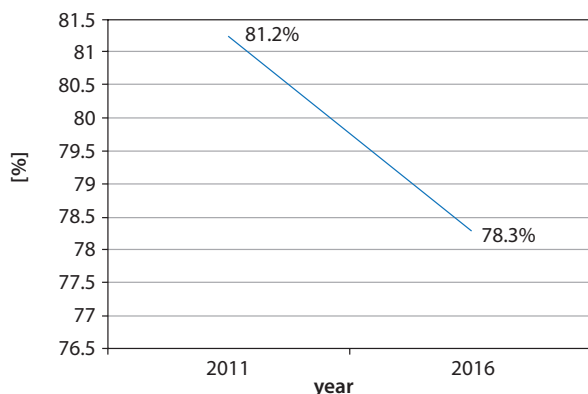


FIGURE 1. Percentage of children with DMFT > 0 in 2011 and 2016

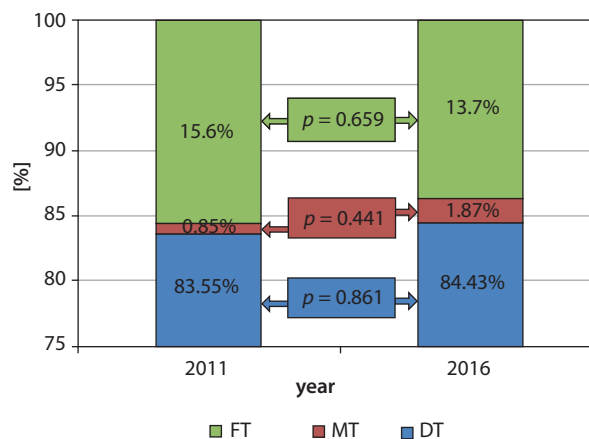


FIGURE 2. Components of DMFT index in 2011 and 2016

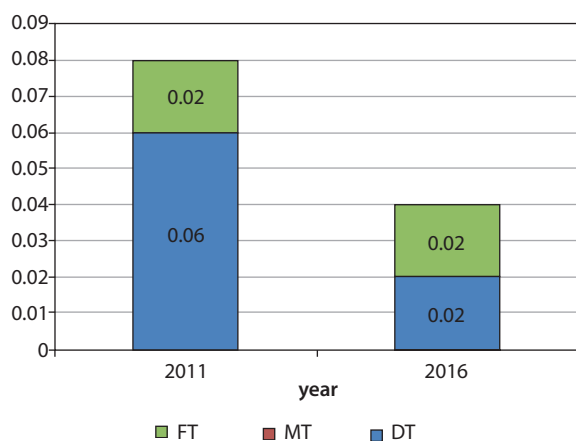


FIGURE 3. DMFT index and its components in 2011 and 2016 in Mazovia Province

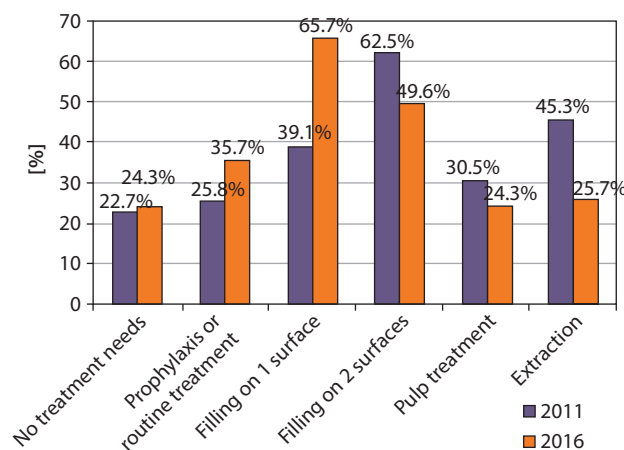


FIGURE 4. Treatment needs in 5-year-old children in Mazovia Province in 2011 and 2016

in both studies was the dt component (5.03 in 2011 and 4.50 ± 4.38 in 2016, respectively). An increase was also observed in the percentage of children with at least one primary tooth missing due to caries, from 4.7% in 2011 to 7.0% in 2016. However, the Care Index value for primary teeth did not change and was 0.16 in both 2011 and 2016.

In 2016, no statistically significant differences were found in the dmft index comparing either gender (girls vs. boys: 4.89 ± 4.55 vs. 5.75 ± 4.58, *p* = 0.157) or the place of residence (urban vs. rural: 5.05 ± 4.44 vs. 5.70 ± 4.74, *p* = 0.286). However, higher values can be observed in boys and in rural dwellers.

The values of the significant caries index were also similar. In 2011, it was 10, and the dmft index for the remaining 2/3 of the study group was 2.2. In 2016, it rose slightly, reaching the value of 10.75 ± 2.53, while the dmft for the remaining 2/3 of the study group was 2.61 ± 2.45.

In 2016, a statistically significantly greater number of permanent teeth was observed in girls than in boys (0.99 ± 1.79 vs. 0.58 ± 1.33; *p* = 0.048), irrespec-

tive of the place of residence (0.68 ± 1.44 urban vs. 0.90 ± 1.74 rural; *p* = 0.290). The percentages of children with at least one permanent tooth in urban areas (27.5%) and in girls (30.6%) were higher than in the urban areas (24.2%) and in boys (21.0%) but the differences were not statistically significant.

Over the period of five years, the rate of severity of dental caries in permanent teeth decreased two-fold among 5-year-old children in Mazowieckie Province. The value of the DMFT index in 2011 was assessed at 0.08 (DT = 0.06, FT = 0.02) and in 2016 at 0.04 ± 0.31 (DT = 0.02 ± 0.16, FT = 0.02 ± 0.17) (Figure 3).

The analysis of the needs concerning prophylaxis and treatment revealed a slight increase in the percentage of children without such needs and with needs concerning prophylaxis and making a filling on one tooth surface (Figure 4). On the other hand, as many as 62.5% of children in 2011 and 49.6% in 2016 needed fillings on two surfaces. The percentages of children requiring treatment of pulpal diseases and extraction of at least one tooth also decreased (Figure 4).

DISCUSSION

The year 2011 was the first in which children aged 5 were included in the nationwide epidemiology survey [1]. The inclusion of 5-year-old children in index age groups enables observation of the prevalence of dental caries in primary teeth in the whole population since permanent teeth are found in only a small number of children at this age in contrast to 6- and 7-year-olds. Thus far, 5-year-old children have been included in epidemiology surveys twice, but even this number of studies allows for a comparison and drawing conclusions concerning dental health in small children in our country.

The percentage of 5-year-old children free from dental caries slightly increased in Mazowieckie Province over the past five years, from 18.8% to 21.7%; nevertheless, this is still a very low figure as compared with the majority of European countries [1, 4]. For instance, in Scotland the percentage of 5- and 6-year-old children free from dental caries in 2014 was as high as 68% [5]. In England, Wales and Northern Ireland, in a 2013 survey, the percentage of 5-year-old children free from dental caries reached 40% [6]. Percentages of children free from dental caries comparable with that for Poland were observed in Kuwait in 2010, where $dmf = 0$ was observed in 24% of 5-year-olds, and in Albania in 2017, where absence of decayed teeth ($d = 0$) was found in 20.1% of small children [7, 8]. Higher prevalence of dental caries disease was found in Kosovo in 2011, in 91.2% of children aged 2 to 6 [9]. An example for other countries may be Sweden, where a very large increase in the percentage of 5-year-old children free from dental caries was observed over 40 years, from 9% in 1973 to 69% in 2013 [10].

While the drop in the prevalence of dental caries disease among 5-year-old children in Mazowieckie Province is a positive trend, the increase in the SiC index value over 5 years, from 10 in 2011 to 10.75 ± 2.53 in 2016, is certainly a negative phenomenon [1, 4]. This points to a growing polarisation of caries; there are fewer children affected by dental caries disease but its intensity is higher in those in whom it occurs.

In 2016, the $dmft$ index reached 5.33 ± 4.58 in Mazowieckie Province, one of the highest values among all the provinces in the survey (mean $dmft$ for the entire study population in four provinces was 4.70 ± 4.33) [4]. This can be compared with neighbouring Germany, where a survey conducted in 2015 on 496 five-year-old children revealed the mean $dmft$ index for the entire population at 0.9 ± 2.0 [11]. In 5-year-olds in the United Arab Emirates in 2010, the mean $dmft$ index was 4.0 ± 4.1 ; likewise, in Saudi Arabia in 2003, in pre-school children it was 4.80 ± 4.87 , but this increased to 6.1 ± 3.9 in 2008 [12-14]. Lower $dmft$ index was found in India, in 5-year-old children in retrospective surveys in 2000-2015 – 2.49 ± 7.78 [15]. The $dmft$ index similar to that for Mazowieckie Province was found among children

aged 5-6 in 2006-2015 in the territory of South-East Asia – 5.1 [16].

Also the percentage of 5-year-old children with at least one primary tooth missing due to caries in 2016 was the highest in Mazowieckie Province of all the provinces in the survey, and reached 7%, while in Dolnośląskie Province it was twice as low (3.2%). The percentage was the lowest in the Lubelskie and Małopolskie provinces – 1.8% [4].

The two-fold decrease in the level of caries severity in permanent teeth in 5-year-old children is a positive phenomenon. In our province, 25.7% of 5-year-olds have at least one erupted permanent tooth. In 2016, it was only in Mazowieckie Province that the index of permanent teeth filled due to dental caries was higher than zero ($FT = 0.02 \pm 0.17$), while in the other provinces (Małopolskie, Dolnośląskie and Lubelskie) the only DMFT component was that of permanent teeth manifesting caries [1, 4].

The high treatment needs among 5-year-old children in Mazowieckie Province were not satisfied either five years ago or at present. A positive phenomenon, however, is the drop in the rate of needs concerning extensive fillings and treatment of dental caries complications. Nevertheless, in 2016 as many as 65.7% of children needed a filling on one tooth surface and 49.6% on two surfaces. In Mazowieckie Province, in 2016, the ft component index was 0.7 ± 1.5 , while in Bosnia and Herzegovina it was 1.3 ± 2.4 [17]. The care index (CI) for primary teeth in Mazowieckie Province, expressed as a percentage, was 16% in 2016, which is a score comparable with Scottish 5-year-olds, where the CI was 14.2% in 2014 [6]. A twice as high value of the care index (29.7%) was noted in Germany in 2016 [11].

Untreated dental caries disease in primary teeth causes cariogenic infection of permanent teeth and its spread to other healthy primary teeth [18, 19]. Many researchers emphasise that the occurrence of cariogenic flora in primary dentition in a child is considered to be a factor predicting occurrence of lesions in the first permanent molars, which erupt at around the age of 5-6 years. The health condition of the first permanent molars may reflect the future condition of the whole permanent dentition. Permanent dentition in children with dental caries in primary dentition is several times more vulnerable to disease than in healthy children [20].

It is therefore essential to monitor oral health in order to increase awareness among the public with regard to the prevalence and severity of dental caries disease in this age group and to promote educational activities for a future of children free from caries, in accordance with the assumptions of the Alliance for a Cavity-Free Future (ACFF).

CONCLUSIONS

In the group of 5-year-old children from Mazowieckie Province, in the period from 2011 to 2016, despite the fact that the needs for care were satisfied at

a similarly low level, the values of indices concerning dental caries and the needs for treatment of extensive carious cavities and complications related to dental pulp were decreased, which may be the effects of the measures taken in order to promote oral health. At the same time, the increase in caries polarisation in primary teeth stresses the necessity of continued monitoring of this population in order to develop tools that will enable a systemic approach distinguishing groups of children that require enhanced preventive and curative measures.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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