

Prevalence and Intensity of Dental Caries and its Complications in Children

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Abstract: Dental caries remains the most common disease of humankind, and its prevalence and intensity among children show no tendency to decline. The aim of this study was to analyse and summarise published epidemiological data on the prevalence and intensity of caries and its complications in children, with particular attention to the WHO key age groups of 12 and 15 years. An analytical review of domestic and foreign epidemiological studies was carried out using the methods of comparative analysis, generalisation and systematisation. The analysis showed that the prevalence of caries of permanent teeth ranges from 46% to 92.3% at the age of 12 and from 61% to 93.5% at the age of 15, with DMFT values of 1.66–7.19 and 1.95–5.81, respectively. In the structure of the DMFT index, the decayed component predominates, indicating a high unmet need for treatment. Up to 79% of children have unsatisfactory oral hygiene, and in areas endemic for fluorosis its prevalence reaches 100%. These findings justify the need to study the causes of caries and to introduce effective school-based and community preventive programmes.

Keywords: dental caries, children, prevalence, intensity, DMFT index, oral hygiene, complications of caries, fluorosis, prevention.

Introduction

Dental caries is the most common disease of humankind and a pressing problem of modern dentistry: untreated caries of permanent teeth is the most prevalent condition worldwide [1]. Progressive destruction of the hard tissues of the tooth, complicated by inflammation of the pulp and periapical tissues, often causes severe pain, leads to tooth loss and may become a source of diseases of other organs and systems [2]. The close relationship between the condition of the dental system and quality of life makes the prevention and treatment of caries one of the central tasks of medicine and the basis of a dentist's daily practice. Oral diseases are among the most common non-communicable diseases and represent a major global public health challenge [3].

Despite various preventive measures, the prevalence and intensity of caries do not tend to decrease. The incidence of caries shows an upward trend worldwide, especially among the populations of developing countries [4]. The World Health Organization has proposed the mean caries intensity of permanent teeth among 12-year-old children as the global indicator of the dental health of a country or region [5]. The age groups of 12 and 15 years are the most informative in epidemiological surveys: caries indicators at 12 years and periodontal status at 15 years make it possible to evaluate the effectiveness of preventive measures [6]. At the same time, the burden of caries differs considerably between regions of the world [7], and caries is important not only because of its prevalence and intensity but also as the initiating factor of complicated caries.

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of 12 and 15 years.

Materials and Methods

The study was conducted as an analytical review of domestic and foreign publications presenting the results of epidemiological dental examinations of children. The prevalence of caries (the percentage of children with at least one carious, filled or extracted tooth) and its intensity according to the DMFT index (the mean number of decayed, missing and filled permanent teeth per child) were analysed, together with the structure of the index, the hygienic condition of the oral cavity, the structure of requests for dental care and the prevalence of non-carious lesions. Oral hygiene in the analysed studies was most often assessed using the Simplified Oral Hygiene Index (OHI-S) [8]. The methods of comparative analysis, generalisation and systematisation of scientific data were used.

Results

Global and regional trends

In economically developed countries, the prevalence of caries in the population reaches high values and stabilises at 95–98%, while a sharp increase is observed among the populations of developing countries, especially in areas of intensive urbanisation. Among 15-year-olds, 32% of affected premolars and 35% of affected molars require restorative treatment now or in the near future, and at least one treated carious lesion is found in 78% of adolescents. The need for treatment depends on age and population group: in one survey, all examined 12-year-olds had caries and 56.8% required treatment; the highest need was found among Māori children (37.4%) and the average need among children living on the Pacific coast (32.3%). The mean DMFT at the age of 12 was 1.97, with the decayed component clearly dominating.

Prevalence and intensity of caries at the ages of 12 and 15

Data from epidemiological examinations of 12- and 15-year-old children are summarised in Table 1. In school surveys conducted in different administrative districts of one city, caries intensity varied from low to moderate. In another study, the prevalence of caries among children aged 6–7 years was 88.2%, with permanent teeth affected in 13.2% of cases. In ecologically unfavourable areas, DMFT values were higher than in the comparison area: 4.31 versus 2.7 at the age of 12 and 5.81 versus 4.81 at the age of 15. In a group of adolescents with a caries prevalence of 85.7% and a DMFT of 3.0 ± 0.06 , a compensated form of caries was found in 74% of those examined.

Table 1. Prevalence and intensity (DMFT) of caries of permanent teeth in 12- and 15-year-old children according to epidemiological studies

Data set	Age 12: prevalence, %	Age 12: DMFT	Age 15: prevalence, %	Age 15: DMFT
1	65.0	1.42–5.31*	80.2	1.42–5.31*
2	84.0	–	86.3	–
3	83.4	3.75 ± 0.25	88.7	5.73 ± 0.35
4	86.11	3.32	93.52	4.52

5	92.3	7.19 ± 0.30	–	–
6	46.0	1.66	61.0	1.95
7	80.0	–	91.5	4.85 ± 0.44

Note: * – range across administrative districts of the city for the 12- and 15-year-old groups combined; “–” – not reported. Source: compiled by the author from published data.

Thus, the prevalence of caries of permanent teeth ranged from 46% to 92.3% at the age of 12 and from 61% to 93.5% at the age of 15, and, where reported separately by age, DMFT values ranged from 1.66 to 7.19 and from 1.95 to 5.81, respectively. In all studies, both indicators increased with age.

Structure of the DMFT index

In the structure of the index, the decayed component predominated. At the age of 12, the mean number of decayed teeth was 2.32 ± 0.21 , filled teeth 1.41 ± 0.16 and extracted teeth 0.02 ± 0.01 ; at the age of 15, the corresponding values were 2.89 ± 0.26 , 2.77 ± 0.28 and 0.07 ± 0.03 . In another study, the decayed component was 1.94 and 2.64 at the ages of 12 and 15, respectively, indicating a high need for treatment. In a region with a DMFT of 7.19 at the age of 12, the number of filled teeth was low (0.12 ± 0.01 at 12 years and 0.39 ± 0.03 at 15 years), while the number of extracted permanent teeth was considerable (0.41 ± 0.01 and 0.50 ± 0.03 , respectively), and the need for oral sanitation among children aged 12–15 reached 100%.

Oral hygiene, caries activity and requests for care

Socio-hygienic studies show a low level of dental health awareness: 79% of children have unsatisfactory oral hygiene because of irregular care and incorrect toothbrushing. In such children the carious process is more active, and subcompensated and decompensated forms of caries are more common. More than 50% of all outpatient visits are related to dental diseases, mainly caries and its complications. Among 15-year-olds attending a school dental office during a calendar year, caries was the leading reason for seeking care (51.75%), while disorders of tooth development and diseases of the pulp and periapical tissues each accounted for 5.04% of cases.

Non-carious lesions

Dental fluorosis develops as a result of excessive fluoride intake during the period of enamel formation [9]. In an area endemic for fluorosis, its prevalence among 12- and 15-year-olds was 100%. Among 12-year-old children, very mild fluorosis was found in 19.5%, mild in 25.0%, moderate in 33.3% and severe in 22.2% of cases.

Discussion

The analysed data show that caries of permanent teeth affects the majority of children by the age of 12–15 years, and that its intensity varies widely between regions. This variation reflects differences in environmental conditions, fluoride exposure, oral hygiene, dental health awareness and access to dental care, and is consistent with the understanding of caries as a multifactorial, largely preventable disease [10]. The predominance of the decayed component and the small number of filled teeth in several regions indicate that a considerable proportion of carious lesions remains untreated, which

creates the conditions for the development of pulpitis and periodontitis, as confirmed by the structure of requests for dental care. Among the modifiable risk factors, the intake of free sugars plays a leading role [11], and children from socioeconomically disadvantaged families have a higher caries experience [12]. In contrast, in many industrialised countries caries in children declined markedly during the second half of the twentieth century, largely owing to the widespread use of fluorides [13].

The high proportion of children with unsatisfactory hygiene and with subcompensated and decompensated forms of caries shows that treatment alone cannot reduce the burden of the disease. Regular toothbrushing with fluoride toothpaste reduces caries increment in children and adolescents [14], and sealing the pits and fissures of permanent molars is an effective measure for preventing occlusal caries [15]; the school setting is convenient for implementing these measures as well as for early detection of caries and sanitation of the oral cavity. The limitations of this review include the heterogeneity of the analysed studies in terms of sample size, region and examination methods, which makes direct comparison difficult; future surveys should therefore follow the standardised WHO methodology and, in addition to the mean DMFT, report the Significant Caries Index, which identifies the third of the group with the highest caries experience [16].

Conclusion

Published epidemiological data indicate a high prevalence and intensity of caries and its complications in children: the prevalence of caries of permanent teeth reaches 92.3% at the age of 12 and 93.5% at the age of 15, the DMFT index reaches 7.19 and 5.81, respectively, and the decayed component predominates in its structure. Unsatisfactory oral hygiene, low dental health awareness and environmental factors, including endemic fluorosis, contribute to this situation. These findings justify the need to study the causes of caries in children of different regions, to conduct regular epidemiological surveys using standardised methods, and to introduce effective school-based preventive and treatment programmes.

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