

Caries Prevalence in Korean Children and Adolescents from 2000 to 2012

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Objectives: National oral health data is required to assess a population's oral health needs, monitor oral health, plan effective intervention community programs and health policies, and evaluate progress toward health objectives. The study aimed to estimate the prevalence, severity, and inequality in dental caries distribution among Korean young people. **Study Design:** Trained, calibrated examiners at the Korea Ministry of Health & Welfare conducted epidemiological surveys in 2000, 2006, and 2012 during which dental caries were assessed according to World Health Organization (WHO) diagnostic criteria. Decayed, missing, and filled surface and tooth (DMFS/DMFT) indices were estimated. **Results:** DMFT indices decreased in all regions between 2000 and 2012, with values of 3.3, 2.2, and 1.8 for 12-year-old children in 2000, 2006, and 2012, respectively. The prevalence of caries was higher among female versus male subjects and in rural versus urban areas. **Conclusions:** Despite the observed decrease in caries experience indicators in Korea, the caries prevalence remains considerably higher than that in European countries and than the targets set by WHO within the Health21 policy framework. Therefore, Korea apparently retains further potential for caries reduction. Community-based oral disease prevention programs are urgently needed to promote oral health.

Key words: Dental caries, Dental health surveys, Epidemiology, Evidence-based dentistry, Delivery of health care, Preventive dentistry

INTRODUCTION

Oral health is an essential component of good health, and good oral health is a fundamental human right. In this respect, the role of the FDI World Dental Federation and dental professionals is to assist the public and decision-makers with the achievement of health through good oral hygiene. Accordingly, the dental profession requires an overarching long-term vision of growth in order to make a significant contribution during the next decade.

Historically, approaches to oral health have focused primarily on treatment, rather than disease prevention and oral health promotion. However, these approaches have limitations. Globally, the burden of oral diseases remains high, and the traditional curative model of oral health care is proving costly in terms of the human and financial resources required to remain viable in the face of increasing demand. In particular, oral disease is the fourth-most expensive disease to treat worldwide; in particular, dental caries affects most adults and 60–90% of schoolchildren, leading to millions of lost school days each year and a continued designation of one of the most common chronic diseases. Furthermore, periodontitis is a major cause of tooth loss in adults worldwide, and oral cancer, the eighth-most common type of cancer, is the most

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expensive cancer type to treat.¹ In 1981, the World Health Organization (WHO) released the Alma-Ata “Health for all” declaration in the context of oral health, which stated a target of fewer than three decayed-missing-filled teeth (DMFT) as both the average caries experience index and a health goal for 12-year-old children worldwide.² Consequently, 51% of 107 countries achieved these goals in 1980, and 74% of 139 countries was expected to achieve these goals in 2004.³

According to recent studies,³⁻¹⁰ the incidence of dental caries has decreased among children in Western societies. According to WHO data, the average DMFT indices in 12-year-old children were 4.8–10.1 in the early 1970s and 2.6–4.7 in 1980.¹¹ In Western Europe, the average DMFT index in 12-year-old children ranged from 1.1 to 2.5 between 1990 and 1995. Since the 1960s, information from national health examination surveys has been used to demonstrate a decrease in dental caries among children in the United States, and furthermore, the overall caries incidence has continuously decreased.¹² Nevertheless, recent findings suggest that this decrease in dental caries has not been consistent among all children. For instance, a comparison of the third National Health and Nutrition Examination Surveys (NHANES) conducted in 1988–1994 and in 1999–2004 showed that the prevalence of dental caries in the primary dentition increased from 24% to 28% among children aged 2–5 years, remained unchanged in the mixed dentition among children aged 6–8 years (52–53%), and decreased in the permanent dentition from 57% to 51% among adolescents aged 12–15 years.¹

In Korea, topical surveys were previously limited to private sector studies, such as the Korean Survey of Dental Diseases conducted by the Korean Dental Association in 1981 and

1987. Fortunately, the National Survey of Dental Diseases was initiated and organized by the Ministry of Health & Welfare, and the Oral Act was enacted by the Korean government via Article 9 (dated January 12, 2000). Currently, the National Oral Health Survey (NOHS) is performed every 3 years to assess the national oral health status. In this respect, national oral health data are required to assess the oral health needs of the population, monitor oral health, plan effective community intervention programs and health policies, and evaluate progress toward health objectives. An understanding of dental caries trends in young people is an important first step towards identifying the key factors that promote caries in Korea. The present study aimed to estimate the prevalence, severity, and inequality in the distribution of dental caries among young people in Korea.

MATERIALS AND METHOD

Data from NOHS I (held in 2000), NOHS III (2006), and NOHS V (2012) were used in this study. Each survey used a stratified, multistage sampling design to obtain a representative probability sample of the metropolitan, civilian, non-institutionalized population in Korea.

Study population

For this study, we used data from 12,902 and 11,231 children and adolescents aged 2–16 years who participated in NOHS I or NOHS III, respectively. All participants completed a questionnaire and an oral health exam during the surveys. Data from 19,721 children and adolescents who participated in NOHS V were also used in the study analyses (Table 1).

Table 1. Distribution of subjects according to age group and sex per year

Age group	Year: 2000			2006			2012		
	Both sexes	Males (N)	Females (N)	Both sexes	Males (N)	Females (N)	Both sexes	Males (N)	Females (N)
Total	21,829	10,104	11,725	15,777	7,319	8,458	19,721	10,219	9,502
2	231	126	105	167	90	77	-	-	-
3	193	101	92	125	58	67	-	-	-
4	202	102	100	139	67	72	-	-	-
5	329	153	176	151	78	73	4,800	2,381	2,419
6	1,203	601	602	925	470	455	-	-	-
7	1,199	601	598	893	445	448	4,379	2,219	2,160
8	1,194	592	602	875	438	437	-	-	-
9	1,199	604	595	879	436	443	-	-	-
10	1,205	600	605	888	445	443	-	-	-
11	1,191	600	591	882	444	438	5,222	2,719	2,503
12	1,203	604	599	1,755	888	867	-	-	-
13	1,191	594	597	885	449	436	-	-	-
14	1,168	580	588	869	445	424	5,320	2,900	2,420
15	-	-	-	905	447	458	-	-	-
16	1,194	601	593	893	442	451	-	-	-

RESULTS

Although the overall prevalence of dental caries significantly decreased from 2000 to 2006 and 2012 (77.1%, 61.1%, and 57.3%, respectively), the index remained high. The DMFT indices in children and adolescents increased with increasing age in 2000, 2006, and 2012, but decreased over time. In particular, the DMFT index in 12-year-old children decreased to 3.3 in 2000, 2.2 in 2006, and 1.8 in 2012. Figure 1 shows the prevalence of caries experience in the primary dentition of children aged 2–6 years, in the mixed dentition of children aged 7–11 years, and in the permanent dentition of adolescents aged 12–16 years.

Caries experience in the primary dentition decreased in 2000, 2006, and 2012 among boys (82.54, 70.3, and 63.52, respectively) and girls aged 2–6 years (84.14, 64.5, and 60.86, respectively), in mixed dentition in boys (85.0, 77.3, and 72.75, respectively) and girls aged 7–11 years (86.26, 74.0, and 69.09, respectively), and in permanent dentition in boys (74.71, 56.9, and 53.47, respectively) and girls aged 12–16 years (79.81, 65.8, and 61.56, respectively). The caries experience in the permanent dentition was higher among girls than among boys in the 12–16-year age group. However, among children with primary and mixed dentitions, this index was higher among boys than in girls aged 7–11 years (Figure 1).

The decayed and filled teeth (DFT)/DMFT index for the primary dentition decreased in 2000, 2006, and 2012 among boys (5.08, 3.12, and 2.98, respectively) and girls aged 2–6 years (5.93, 2.53, and 2.59, respectively), for mixed dentition

among boys (4.21, 3.09, and 2.90, respectively) and girls aged 7–11 years (3.86, 2.90, and 2.62, respectively), and for permanent dentition among boys (2.85, 1.86, and 1.61, respectively) and girls aged 12–16 years (3.79, 2.52, and 2.09, respectively; Figure 2). Although the prevalence of caries in the permanent dentition was higher among girls than among boys aged 12–16 years, the index for primary and mixed dentitions was higher among boys than among girls aged 7–11 years, except for the primary dentition index in 2000. The DMFT index decreased in all regions of Korea in 2000, 2006, and 2012. However, the prevalence of caries was higher in rural areas compared with urban areas, except in 2000 (Figure 3).

DISCUSSION

Oral health is a basic human right, and its achievement is fundamental to a good quality of life. However, persistent inequalities in access to proper oral healthcare exist, possibly because of the following reasons: unequal geographical distribution of qualified professionals worldwide and within countries, unaffordability of treatments for some segments of the population, lack of utilization of existing oral healthcare programs, and disparity between the offer of oral healthcare services and the real needs of the population.¹³ In the UK, oral health needs and demands have changed dramatically since the early 1970s;¹⁴ at present, the DMFT index among 12-year-olds in the UK is 1.2. In some countries, including Australia, the DMFT index decreased from 9.0 in 1954 to

Figure 1. Prevalence of caries experience(%)

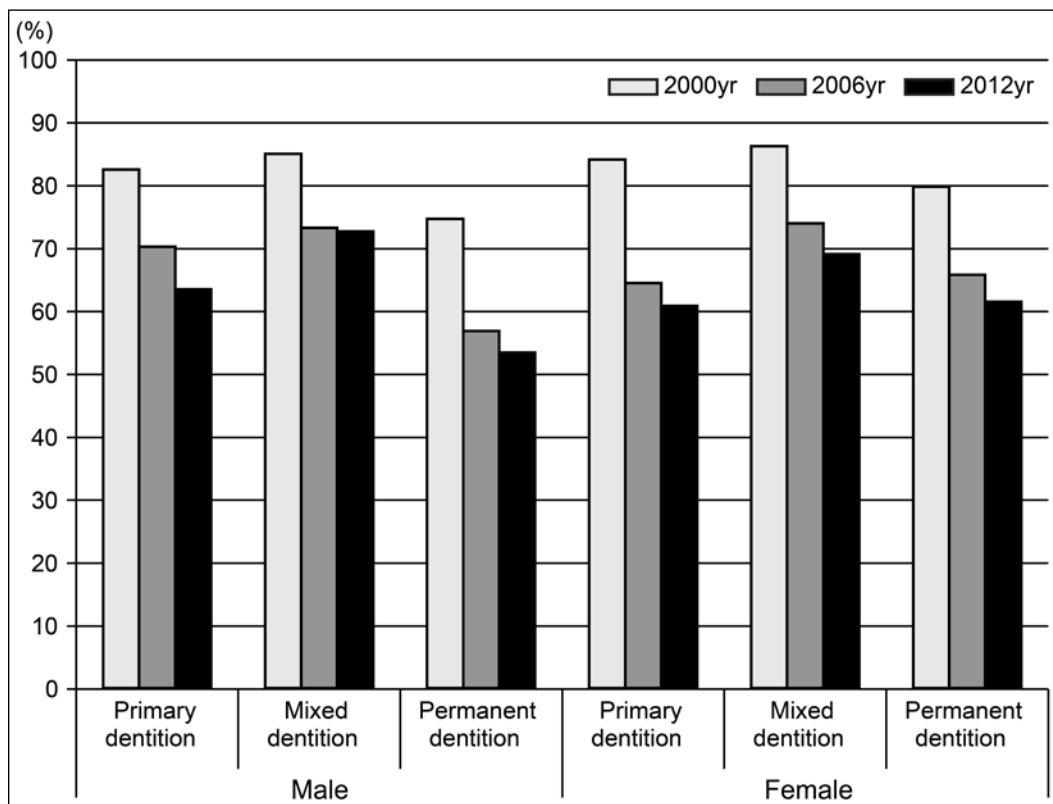


Figure 2. dft index/DMFT index by sex

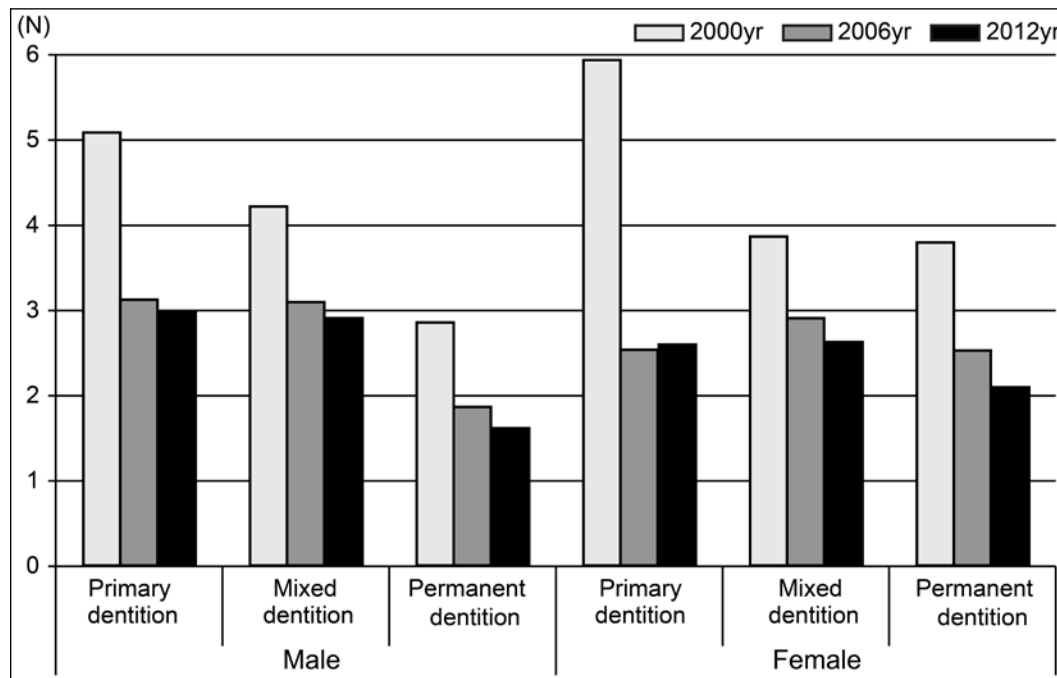
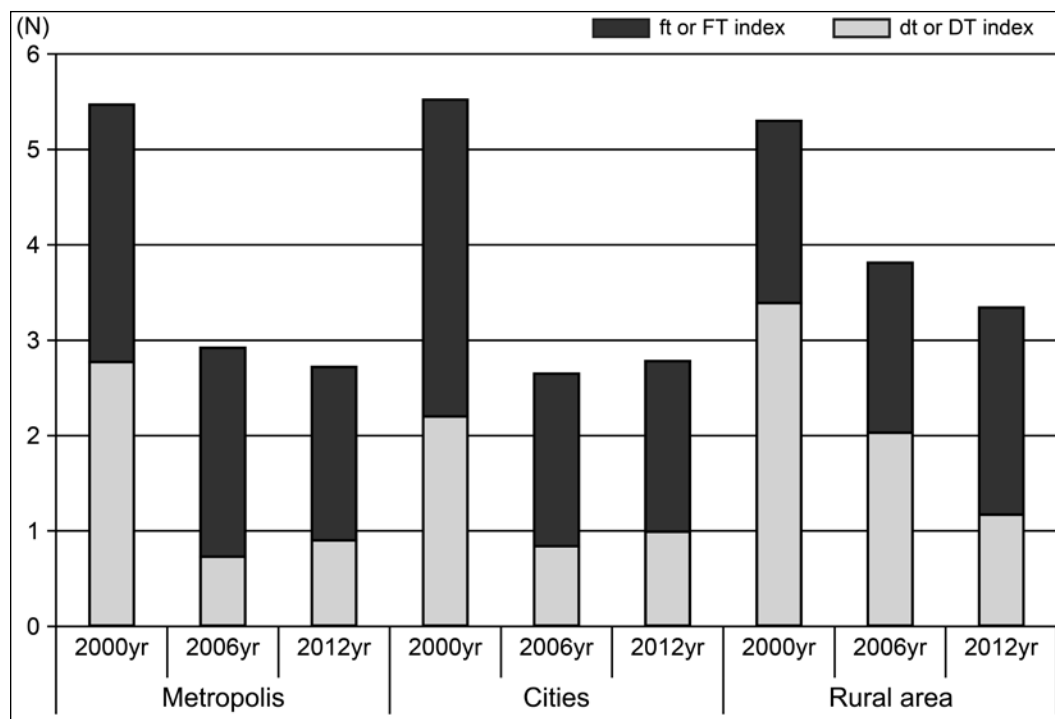


Figure 3. DMFT index by residence



5.0 in 1977, 1.4 in 1990, and 1.0 in 1995.¹⁵ Similarly, in New Zealand, the DMFT index decreased from 7.0 in 1977 to 3.5 in 1983, 2.8 in 1990, and 1.7 in 1993.¹⁶ In the United Arab Emirates, the DMFT index for primary teeth was 5.1–8.4 among children aged 4–6 years, and the index for permanent teeth was 1.6–3.24 among children aged 12 years between 1991 and 2011.¹⁷

In a recent study of the prevalence of and trends in dental caries among adults older than 18 years in Korea, Yang (unpublished master’s thesis, Yonsei University Graduate School of Public Health, 2003) observed a decrease in the mean DMFT index in 2000 (except for those aged 18–24 years), compared with the indices in 1981 and 1987. Furthermore, the DT index decreased significantly in 2000. Among individuals aged 18–43 years, the mean FT index increased

dramatically and decreased gradually with age in 2000. The mean DMFT index, DT index (except for those aged ≥ 55 years in 2000), MT index (except for those aged ≥ 65 years in 1981), and FT index (except for those aged ≥ 75 years in 2000) were higher among women than in men in both 1981 and 2000.¹⁸ According to Yoo (unpublished master's thesis, Yonsei University Graduate School of Public Health, 2009), the caries prevalence rate for permanent teeth decreased significantly in Korea between 2000 and 2006. However, some age groups, particularly 18–49-year-olds, were still considered high risk when compared with the same age group in other industrialized countries. Notably, a gender analysis indicated that female subjects experienced significantly more cases of caries than did their male counterparts in both 2000 and 2006 ($p < 0.01$ and $p < 0.001$, respectively) (Yoo).

A survey of the oral health status in Turkey, conducted by Gökalp and colleagues in 2004–2005, yielded results similar to those of our study; specifically, only 30.2% of children aged 5 years were caries-free, and the mean DMFT was 3.7, with mean subgroup DMFT values of 1.9 among 12-year-olds, 2.3 among 15-year-olds, 10.8 among those aged 35–44 years, and 25.8 among those aged 65–74 years. In both adolescents and adults, the prevalence of caries was higher among female than among male subjects. In rural areas, the prevalence of caries was higher among 5-year-old children, whereas the DMFT was higher among older people. However, the prevalence of dental caries was similar for 12- and 15-year-old individuals in urban and rural areas. In addition, 48.0% of those aged 65–74 years were edentulous. Healthy periodontal tissues were noted in 56.2% of 15-year-olds. Among those aged 35–44 years, the prevalence of calculus problems was high (62.6%), and 1.2% had attachment losses of 6 mm or greater. Individuals living in rural areas had more severe periodontal problems than their urban counterparts.¹⁸

Dental caries continues to be the most common chronic pediatric disease in the USA. Whereas asthma, a common chronic medical condition afflicting children in the USA, affected 6% of children aged 0–4 years and 10% of children aged 11–17 years in 2003–2005, the prevalence of dental caries from 1999 to 2004 was 24% in children aged 2–4 years and 51% in children aged 12–15 years.¹ In contrast, oral health has improved and patient demands have increased in a population that is living longer and retaining an increasing number of teeth into older age. Moreover, the polarization of oral healthcare into areas of increased demand and decreased supply is growing and is associated with areas of social deprivation versus areas of increased demand and increased supply associated with prosperity across all age groups.¹⁹

Many challenges that have arisen from changes such as an increased emphasis on skill-mix within the healthcare workforce and feminization of the profession are not unique to dentistry and have had an impact on other health professions, including medicine. Another challenge to oral health is the preventive approach to healthcare, which promotes the full involvement of individuals in their own oral health.^{10,20,21} Accordingly, many barriers to the improvement of oral health among Korean children must be overcome, and our findings suggest that future caries research should be expanded to elucidate factors that promote pediatric dental caries among both traditionally high-risk children and those once considered at low-risk for tooth decay. Dental diseases have become increasingly prevalent among children, and more dentists in the state are required to provide essential preventive and restorative services. To reverse these trends, we will need to mobilize resources, including public and private oral healthcare providers.

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