

Dental caries experience of Kuwaiti kindergarten schoolchildren

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Objective The aim of the present study was to determine the caries free proportions, caries experience and restorative care received in Kuwaiti kindergarten schoolchildren. **Methods** A national epidemiologic survey of the 4- and 5-year-old kindergarten schoolchildren (n = 1,277) was conducted in the five governorates of Kuwait. Five trained and calibrated dentists examined the children. Dental caries was scored using WHO diagnostic criteria. **Results** The percentage of 4- and 5-year-old children with dft = 0 was 32% and 24% respectively. The corresponding mean dft/dfs for 4- and 5-year-olds were 3.7/6.9 and 4.8/9.6. The decayed score was the major component in the mean scores. There was a significant difference in caries experience by governorate, but no difference by gender. The restorative index for 4- and 5-year-olds was 9.4% and 14.1% respectively. **Conclusions** Caries levels are lower or similar to those in neighbouring and other Middle East countries. A high percentage of carious maxillary incisors indicate an early childhood caries pattern in these children. An extensive prevention programme in preschool and kindergarten children is now in place.

Key words: Dental caries, kindergarten schoolchildren, Kuwait

Introduction

Dental caries has shown an overall decline worldwide in developed countries (Holm, 1990). Such changes are observed in parallel to improved socio-economic conditions, changing life-styles, self-care practices, use of fluorides and effective use of preventive oral health services (Bratthall *et al.*, 1996). However, in a review of dental caries prevalence in pre-school children, high prevalence was noted in many countries in Asia, which contrasted with the much-improved situation in developed countries in Europe, North America and Australia (Holm, 1990).

National oral health surveys have been conducted in Kuwait in 1982 (Glass, 1982), in 1985 (Behbehani and Shah, 2002), in 1993 (Vigild *et al.*, 1996) and in 2001 (Al-Mutawa *et al.*, 2006). The School Oral Health Programme in Kuwait is a comprehensive oral health programme with educational, preventive and treatment components serving the oral health needs of Kuwaiti school children. This programme is located at all the six governorates of Kuwait and now covers around 300,000 children, which include about 50,000 kindergarten 4- and 5-year-old children. For the kindergarten children comprehensive educational and preventive services are provided through programme centre based clinics and mobile clinics throughout the country.

Early childhood caries is a devastating form of caries that may affect the primary dentition as soon as infant teeth erupt and has been defined as the presence of any decayed, missing or filled teeth in the dentition of children less than 6 years of age (Drury *et al.*, 1999). The prevalence of infant caries in 4-6 year-olds nationally was 11.5% and 13.8% in Kuwaiti schoolchildren in 1985 (Soparkar *et al.*, 1986). A prevalence rate of 19% was reported from a group of infants (age 18-48 months) in

a health care centre of the Bayan District and born in the national maternity hospital in 1989 (Al Dashti *et al.*, 1995). The national oral health survey in 1993 reported 47% anterior tooth caries in 4-year-olds and 52% in 6-year-olds (Vigild *et al.*, 1996). In a private English school in 1993, the prevalence in primary anterior teeth was 22% and in primary molars 43% (Murtomaa *et al.*, 1995). One study of the feeding practices (Babeely *et al.*, 1989) found that early infant caries was strongly related to inappropriate feeding patterns.

In the Middle East, some studies have been reported on caries in pre-schoolers and kindergarten children including Saudi Arabia (Paul and Maktabi, 1997; Wyne, 2008) and United Arab Emirates (Al-Hosani and Rugg-Gunn, 1998; Hashim *et al.*, 2006).

The objective of this national dental survey was to determine the caries free proportions, caries experience and restorative care in Kuwaiti kindergarten schoolchildren attending government schools in the five different governorates. A second aim was to compare these findings with those reported from previous national and international surveys. A third aim was to aid the planning and evaluation of kindergarten oral health promotion in Kuwait.

Methods

The target population included 4- and 5- year-old Kuwaiti schoolchildren attending the kindergarten schools. The survey was conducted in 2004. Informed consent was signed by the parents/guardians of the children. A stratified, multistage, probability sample of 2.5% of the target population was drawn from each census region (Table 1). In total 1,277 schoolchildren (642 boys and 635 girls) were clinically examined. The percentage of

Table 1. The sample according to governorate.

<i>Governorate</i>	<i>Region total</i>	<i>Region weight (%)</i>	<i>Region sample size 2.5% sample)</i>
Ahmadi	8280	16.3	207
Farwaniya	7880	15.5	197
Hawally	17480	34.5	437
Jahra	8040	15.9	201
Capital	9040	17.8	226
Total	50720	100.0	1277

Table 2 The percentage of 4- and 5-year-old children with dft=0 and the mean dft/dfs and their components in the primary dentition.

<i>Age (years)</i>	<i>n</i>	<i>dft=0</i>	<i>dt</i>	<i>ft</i>	<i>dft</i>	<i>ds</i>	<i>fs</i>	<i>dfs</i>
4	678	32	3.4	0.3	3.7	6.0	0.9	6.9
5	578	24	4.2	0.6	4.8	7.6	2.0	9.6

Table 3. The percentage of 4- and 5-year-old children with dft=0, the mean caries indices, and restorative care index in each governorate.

<i>Governorate</i>	<i>Age (years)</i>	<i>n</i>	<i>dft=0</i>	<i>dt</i>	<i>ft</i>	<i>dft</i>	<i>ds</i>	<i>fs</i>	<i>dfs</i>	<i>f/dft%</i>
Ahmadi	4	119	24	4.3	0.2	4.5	7.7	0.6	8.4	5.3
	5	88	17	5.2	0.4	5.6	9.2	1.1	10.3	8.2
Farwaniya	4	118	36	2.8	0.2	3.1	5.2	0.5	5.8	6.9
	5	78	40	2.7	0.2	2.9	5.4	0.4	5.8	8.0
Hawally	4	231	45	2.0	0.3	2.3	3.4	1.2	4.6	12.6
	5	203	32	2.6	0.8	3.4	4.1	2.8	7.0	25.6
Jahra	4	102	35	3.0	0.3	3.3	6.0	0.6	6.6	9.8
	5	99	14	4.9	0.4	5.2	9.7	1.4	11.1	6.4
Capital	4	113	10	5.9	0.5	6.4	10.2	1.5	11.7	9.9
	5	110	9	6.7	0.9	7.5	12.7	2.9	15.6	14.6

subjects drawn from each governorate ranged from 15.5% in Farwaniya to 34.5% in Hawally, depending upon the number of children in each governorate.

The field staff consisted of five teams and a coordinator. Each team included an examining dentist, a recorder who was a dental hygienist, and a dental assistant. Each examination team worked independently in the various schools. The clinical examinations were carried out by the examiners in the school health room utilizing portable equipment. Diagnosis of dental caries was made according to the criteria recommended by WHO (WHO, 1997) utilising a WHO ball tip probe and a mouth mirror. The tooth and surface based indices were recorded for the primary dentition (dft and dfs). The restorative care index was measured as the percentage of the filled teeth and surfaces from all caries affected and filled teeth and surfaces. No radiographs were taken.

Five calibrated, experienced dentists conducted all of the examinations together with assistants trained in survey methods. The examiners and recorders were calibrated and standardized through a series of training exercises by a consultant examiner from the Forsyth Institute (PS) according to WHO criteria (WHO, 1997). Initial training and calibration exercises were carried out on children prior to the survey. Intra and inter-examiner reproducibility of the caries diagnoses measured by the kappa statistic was 0.85. Duplicate examinations were systematically carried by each examiner on about 10 percent of their subjects during the survey and the kappa statistic was 0.85.

The data were analysed using the statistical soft ware SPSS, Windows version 14.0. Descriptive statistics including means and standard deviations were calculated for the caries indices. Kruskal Wallis test was used to test the differences in caries levels between the governorates.

An independent- samples t-test was used to test the differences in gender and age. Chi-square test was used to assess the association between the caries-free children by age, gender and governorate.

Results

The percentage of children with dft = 0 amongst 4- and 5-year-olds was 32% and 24% respectively (Table 2). Considerable variation was observed between the governorates (Table 3). Amongst 4-year-olds, these percentages varied from 10% in Capital to 45% in Hawally (p<0.001) (Table 3) and in the 5-year-olds varied from 9% in Capital to 40% in Farwaniya (p<0.001) (Table 3). There was no difference in relation to gender of the children.

The mean dft was 3.7 among 4-year-olds and 4.8 among the 5-year-olds (p<0.001). The corresponding median dft was 2.0 and 4.0 respectively. The mean dfs was 6.9 among 4-year-olds and 9.6 among the 5-year-olds (p<0.001). The corresponding median dfs was 3.0 and 6.0 respectively. In the 4-year-olds, the caries experience was highest in Capital (6.4/11.7) and lowest in Hawally (2.3/4.6) (p<0.001) and in the 5-year-olds it was highest in Capital (7.5/15.6) and lowest in Farwaniya (2.9/5.8) (p<0.001) (Table 3). There was no difference in mean dft in the gender.

The restorative index (RI) was 9.4% for 4-year-olds and 14.1% for the 5-year-olds. The RI was highest in Hawally, 12.6% for 4-year-olds and lowest in Ahmadi, 5.3%. The RI was highest in Hawally at 25.6% for 5-year-olds and lowest in Jahra, 6.4% (Table 3).

The tooth-specific caries prevalence is shown in Figure 1. The maxillary central incisors (37.3%) were the most affected by caries followed by mandibular second molars (31.1%), maxillary second molars (30%), mandibular first molars (28.4%), maxillary first molars (27.6%), maxillary lateral incisors (22.4%), maxillary canines (11.1%), mandibular canines (5.9%), mandibular central incisors (4.2%) and the mandibular lateral incisors (3.5%) were the least affected teeth.

Discussion

Epidemiological oral health surveys with nationally representative data are relatively rare because they are expensive and time-consuming to conduct. The present national dental epidemiological survey has provided important baseline data on caries prevalence and caries experience of 4- and 5-year-old Kuwaiti kindergarten schoolchildren and is an important prerequisite for planning and development of the oral health care system.

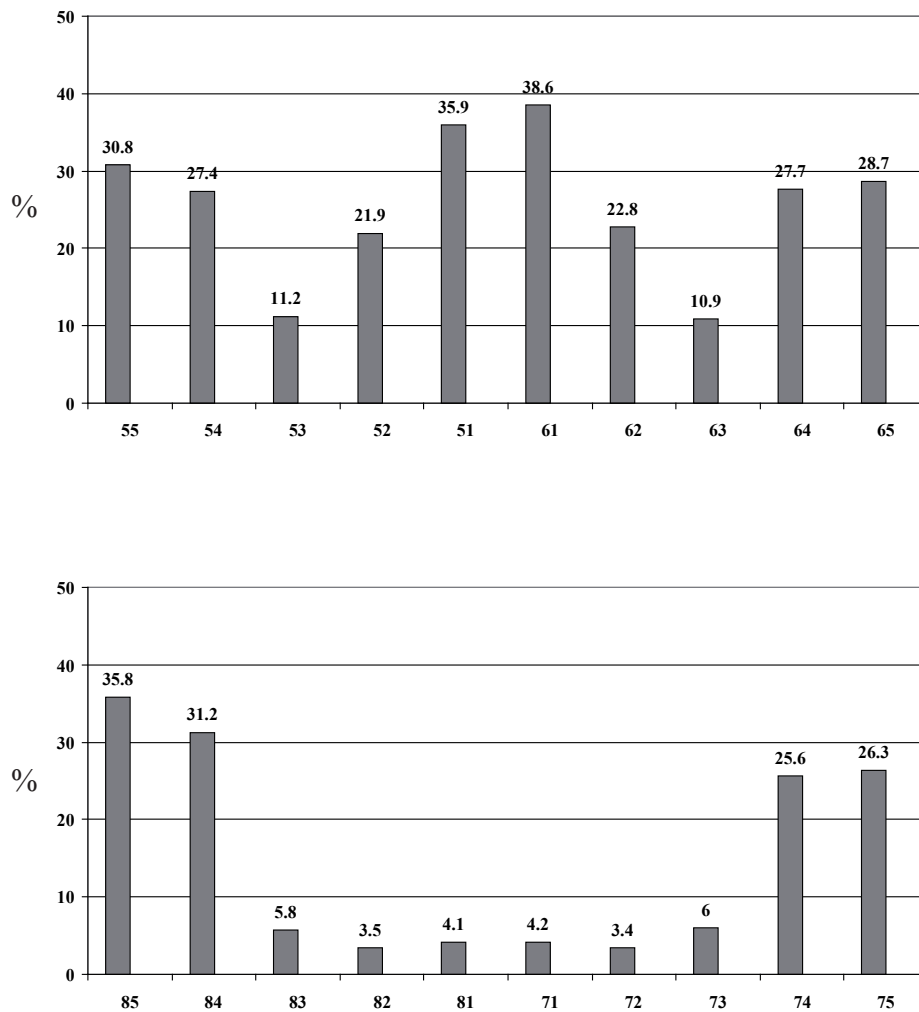


Figure 1. Tooth-specific caries prevalence in primary teeth.

There is always concern about the validity and reliability of the findings in large epidemiological studies. In this study, all the clinical examiners had detailed training and calibration exercises before the survey. Dental caries was scored using WHO diagnostic criteria (WHO, 1997) in this survey and the limitation is that only cavitated caries lesions are recorded which could be an underestimation of caries.

Caries levels recorded in this study can be compared with similar national studies conducted in the past twenty years. Higher percentages of children were caries-free in this study compared to the earlier national surveys. About 32% of 4-year-olds and 24% of 5-year-olds were caries-free in this study. Only 20.6% of 5-year-olds were caries-free in 1982 (Glass, 1982). In the national survey of 1993 only 19% of 4-year-olds were caries-free (Vigild *et al.*, 1996). On the other hand, Murtomaa *et al.*, (1995) in a study carried out in an English language private school where children would be considered from the higher socioeconomic and educational levels, demonstrated higher percentages of caries-free children, 63% for 4-year-olds and 39% for the 5-year-olds.

The mean dft recorded in this study among 4- and 5-year-olds were 3.7 and 4.8 respectively. The caries experience for 5-year-olds recorded by Glass (1982) revealed a lower figure 4.2. The mean dmft for 4-year-olds recorded by Vigild *et al.*, (1996) conducted in 1993 was 4.6 considerably higher than the figure reported in this study. However, the study undertaken by Behbehani and Shah in 1985 revealed a lower figure for the 4- and 5-year-olds (Behbehani and Shah, 2002), 2.8 and 3.3. Study conducted by Murtomaa *et al.*, (1995) in one private school in 1993 reported substantially lower mean dmft figures 1.4 and 2.9 respectively. The tooth-specific caries prevalence with a high percentage of carious maxillary incisors showed a clear indication of early childhood caries.

The caries levels in Kuwait are comparable with results obtained from other studies in the Middle East. The Emirati children had a higher caries experience as compared to the Kuwaiti children. A higher value of mean dmft of 5.7, and 8.2 for 4, and 5-year-old children, respectively, has been reported from Abu Dhabi, UAE (Al-Hosani and Rugg-Gunn, 1998). More recently, Hashim *et al.*, 2006 reported dmfs score 10.2 in 5- and 6-year-olds in Ajman, UAE. In Saudi Arabia, a higher mean dmft of 7.1 for 5-year-old children has been reported (Paul and Maktabi, 1997). Wyne (2008) has also reported a higher caries experience of 6.1 for the children ranging from three to five years in their study.

It appears that, by international standards, caries prevalence is high among young Arab children and these Middle East estimates are much higher than those reported for the 5-year-olds from eight European countries, which range from 0.8 dmft in Sweden to 3.1 dmft in Scotland (Bolin *et al.*, 1996). The mean dmft has been remarkably lower in Ireland, Scandinavian and Nordic countries, United Kingdom, countries of Western Europe and United States (Downer *et al.*, 2005; Whelton *et al.*, 2006). The mean dmft has been similar in Slovenia, Romania and Hungary and higher in Poland (Downer *et al.*, 2005). The percentage of caries-free 5-year-old children is very low compared to the WHO goal of 50% by the year 2000

and in Europe, United Kingdom, Nordic countries and United States (Downer *et al.*, 2005; Whelton *et al.*, 2006).

The majority of caries experience was in the form of untreated decay in this study indicating high level of restorative treatment need as in other Middle East surveys (Paul and Maktabi, 1997; Al-Hosani and Rugg-Gunn, 1998; Hashim *et al.*, 2006; Wyne, 2008). Caries experience was high in some governorates and there are variations in the caries experience and in the delivery of restorative care between the governorates. The observed inter-governorate differences are unclear and further research is indicated.

Kuwait has clearly dramatically changed its cultural habits since the 1970s rise in oil prices and with increasing modernization and affluence there is rapid change in life style. Bottle-feeding is a frequently practiced method of feeding infants and the bottle as pacifier is considered a common habit (Babeely *et al.*, 1989). Toothbrushing is not common or routinely practiced in schoolchildren in Kuwait. Routine dental visits are not a habit for the children in Kuwait. In the Kuwait Health survey conducted in 1985, only 6.8% of the children below five years had visited a dentist during the previous 12 months (Behbehani and Shah, 2002).

High consumption of sugar products was common among schoolchildren in Kuwait (Petersen *et al.*, 1990). About 66% of first-grade children consumed chocolate bars and soft drinks several times a day and 83% ate chocolate, 63% biscuit, 57% cakes/pastries and 76% drank soft drinks every day (Petersen *et al.*, 1990). Sucrose use is increasing, particularly in Middle Eastern countries where consumption seems to be higher than in other developing areas. The high prevalence of dental caries in the primary dentition in South-East Asia has been explained partly by the increased consumption of foods containing sugar (Holm, 1990).

The high caries prevalence and severity in primary dentition in young children of Kuwait in this study is of great concern since they are more likely to develop caries in their permanent teeth. Public health efforts are needed to improve the dental health of Kuwaiti children. Water fluoridation is an automatic source of fluoride and found to be highly effective in preventing dental caries in the primary dentition. Re-introduction of the community water fluoridation programme, discontinued in 1980 due to technical problems associated with distribution of potable water, should be reconsidered in Kuwait. Oral health care and prevention-oriented educational programmes must reach prospective parents in their prenatal counselling classes.

To achieve optimum oral health, the school oral health programme's main goal is to increase the proportion of schoolchildren receiving preventive oral health care every year to cover 90% of the children by 2010 in Kuwait. Preventive services are given high priority and at an earlier age to target the primary dentition and future caries in permanent dentition. Oral health education is an important aspect of this programme and is presented by well trained teams who provide education sessions to schoolchildren and to parents. Toothbrushing with fluoridated toothpaste is promoted at all levels, with special emphasis on supervised toothbrushing in schools. Currently, twice a year application of topical fluoride varnish

(Duraphat) is provided for the kindergarten and primary schoolchildren. The coverage of sealant applications is targeting newly erupted permanent molars and premolars and the use in younger children is encouraged. The results reported in this survey can be used as a baseline to monitor the effectiveness of the preventive programme now in place and have implication for the planning of future dental services.

In conclusion, the present study showed that the caries levels of Kuwaiti kindergarten schoolchildren are lower or similar to those in neighbouring or Middle East countries but high as compared with children from developed countries. A high percentage of carious maxillary incisors indicate an early childhood caries pattern in these children. An extensive prevention programme at an early age such as in preschool and kindergarten children is now in place to prevent caries.

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