

Caries Prevalence Among Five-Year-Old Children Examined by the School Dental Service in Israel in 2007

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Abstract

Aim: To evaluate caries prevalence and treatment needs of Israeli five-year-old children cared for by the School Dental Service by gender, ethnic group, and water fluoridation status. **Methods:** As part of the School Dental Service programme, pre-school children were examined at kindergartens by calibrated examiners according to World Health Organization Oral Health Survey methods. dmft scores were calculated and statistically tested for correlations with gender, ethnic group and water fluoridation status. **Results:** Twenty-eight local authorities (14 Jewish and 14 Arab) participated in the survey. Of the 1647 five-year-olds surveyed, 35.3% were caries-free. The mean dmft±s.d of the study population was 3.31±3.7, dt=2.71±3.48, mt=0.11±0.61, ft=0.49±1.41. Boys had a slightly higher level of caries experience: dmft=3.51±3.83; d=2.89±3.63; m=0.13±0.78; f=0.49±1.45 versus girls: dmft=3.12±3.54; d=2.55±3.33; m=0.08±0.39; f=0.49±1.38. The differences in caries experience by gender were not statistically significant. Arab children had lower percentage of caries-free teeth, higher dt, mt and dmft (14.9%, 4.85±3.83, 0.14±0.58, and 4.38±3.83, respectively), but lower ft=0.33±1.14) than Jewish children who were 49.9% caries-free, 2.21±3.15, 1.53 ±2.66, 0.08±0.63 and 0.6±1.57, respectively. Caries prevalence in local authorities with fluoridated water (0.7 ppm of fluoride in drinking water in previous five years) was significantly lower (42% were caries-free and dmft=2.79±3.49). **Conclusions:** Dental caries was very prevalent among the five-year-old Israeli children examined in this survey. Most of the disease had not been treated. The findings of the survey emphasise the need to treat the affected teeth among school children and to widen the School Dental Service to the whole country. This problem has now been addressed by the government and from 2010 onward children will be eligible for dental care under the National Insurance Law. The findings of the survey emphasise the importance of early intervention by national preventive community dental services for children from birth, targeting pregnant women, infants and their families. Further investigation is indicated to understand the reason for the disturbing difference between the sectors, whether it is economical, social, cultural, or because of different levels of dental awareness.

Key Words: Dental Caries, School Dental Service, Children, Socio-Economic Level, dmft

Introduction

It is well documented that dental caries experience has been decreasing in children in developed western countries. A substantial fall in dental caries experience of 5- and 12-year-old children has been recorded in most European countries between mid 1970s and the early 1980s [1].

In 1997/1998, British Association for the Study of Community Dentistry (BASCD) dental

surveys conducted among five-year-old children in the United Kingdom showed some improvement in dental health in this age group [2].

On the other hand, caries experience of 12-year-olds among some eastern European countries appears to have worsened since 1990 [3]. There is also evidence that in the younger age group in developed countries, the downward trend is beginning to level out [4].

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The last national dental survey of 12-year-old school children conducted in Israel in 2002 showed improvement in caries experience, compared to the previous national study [5]. However, local surveys conducted in Israel among five-year-olds have shown that the caries levels in this age group are not decreasing but increasing.

Since 1995, the Israeli health system has operated under the National Health Insurance Law (NHI). Dental care is not included in the NHI basket of services (except in cases of trauma and cancer). Almost all national spending on dental care is from out-of-pocket payments by patients or their parents.

Additionally, the School Dental Service, a public service, is provided by local authorities (LA), according to the Ministry of Health (MoH) procedures and under its supervision. The MoH provides the major part of the funding for this service.

The role of the School Dental Service is to supplement the effect of water fluoridation and to provide primary and secondary prevention of oral and dental diseases among students in primary and secondary schools. The service can be provided in one of two patterns: Preventive Service I (annual examination and preventive programme in the schools) and Preventive Service II (which includes, additionally, dental treatment in dental clinics).

The provision of the service depends on the willingness of the local governments that participate in its funding and the approval of the parents. In 2007, the service was provided to only 25% of school children and adolescents (approximately 450,000 students in 70 localities). Preventive Service I is funded mainly by MoH and with participation by the LA, Preventive Service II is funded by MoH, the LA, and a levy paid by parents [6].

Data regarding dental health of children entering the service at age five years (first grade) are very relevant for planners regarding the dental service for children in general and the School Dental Service in particular. Because the School Dental Service is the only large-scale, public dental service (even though it does not cover all LAs in the country), it provides data for caries prevalence estimation among five-year-old children in Israel. Therefore, in 2007 a caries prevalence survey was carried out among the five-year-old children in the municipalities that provide school dental services (the "School Dental Service").

Aims

To gather up-to-date data regarding caries levels in five-year-old children in LAs that provide School Dental Service, by gender, ethnic group, and water fluoridation status.

Methods

Sampling method

The sampling base was 70 LAs that provided a School Dental Service in 2007, 35 in Jewish sector and 35 in Arab sector. According to Preventive Service I, each student is examined once a year at school and parents are notified in writing about the findings. All 70 LAs were invited to participate in the survey. Twenty-eight LAs agreed; 14 from the Jewish and 14 from the Arab sector, equal distribution between Jewish and Arab sectors as in the sampling base. Sector affiliation was decided by the majority population in the LA and not individually for each child, i.e. towns with a mixed population and Jewish majority were assigned to the Jewish sector.

According to the Central Bureau of Statistics of Israel classification there are 10 socio-economic status (SES) groups [7], 1 is the highest and 10 the lowest. The distribution of local authorities in the sample by SES level was similar to the distribution by SES in School Dental Service: neither included LAs from the 9th and 10th SES levels.

The Ministry of Education's kindergarten's lists were obtained in those authorities, and kindergarten classes were randomly chosen by the District Dental Officers. The sampling took place as follows: in small local authorities (5000 residents or fewer), one class was randomly chosen for the participation in the survey. In the bigger local authorities (10,000 or more residents) on the Department of Education's list, two, four or six classes according to the population size (approximately one class per 5000 residents) were picked randomly by the District Dental Officers.

Examination method

Dental screening examinations in School Dental Service are routinely provided to the students as an integral part of the Service's provision of care and performed after local authorities have notified parents. For this reason, it was deemed unnecessary to seek ethics approval for the study because the data were collected as part of a routine school screening that would have taken place anyway. Parents who refuse to dental screening at school for their child

sign a refusal form. Children were examined as usual in the service, according to World Health Organization (WHO) protocol [8]. In the selected sample, the recording was performed according to the WHO method and dmft (decayed, missing, filled teeth) in primary dentition were recorded. All the classes selected were examined. In these classes, all the children present on the day of examination were examined. No refusals were received from parents.

Training and calibration of examiners

The dental surgeons of the dental service conducted the examinations in the survey. Training and calibration of the examiners were done in two stages: a calibration exercise was performed between Regional Dental Officers (RDO) by an experienced examiner until Cohen’s Kappa=0.85 was reached. Then each RDO organised a training workshop with calibration exercise for the examiners in his region.

Data analysis

The findings were analysed using statistical software (SPSS for Windows; SPSS Inc, Chicago, USA); dmft index and proportion of caries-free children were calculated, and significance was assessed by *t*-test and chi-square as appropriate.

Results

In the survey, 28 of the 70 LAs that provided the service in 2007 participated. In these LAs, there were 233,851 students between the ages 5-14 years, about 50% of all Israeli school children. Exactly 1647 five-year-old children were examined, about 7% of all kindergarten attendees who had care provided by the School Dental Service.

Distribution of the participating LAs by SES is given in *Table 1*. The distribution of local authorities in the sample by SES level was similar to the distribution by SES in School Dental Service: neither included local authorities from 9th and 10th SES levels.

Of the 28 LAs, 14 were from the Jewish sector and the other 14 from the Arab sector, with 962 children and 685 children, respectively; the smaller number of children from the Arab sector is because Arab LAs are made up of smaller, rural communities.

Table 1. Distribution of participating LAs and children by SES

SES	N of LA	N of children	% of total
1	0	0	0
2	6	393	23.9
3	8	398	24.2
4	6	391	23.7
5	2	93	5.6
6	1	24	1.5
7	1	23	1.4
8	4	325	19.7
9	0	0	0
10	0	0	0
Total	28	1647	100

Clinical findings

Of the children, 64.7% suffered from caries, with average dmft of 3.31±3.7. The main component was decayed teeth (d=2.71±3.48). The f component was 0.49±1.41, whereas missing teeth was 0.11±0.61. The proportion of children that were caries-free (dmft=0) was 35.3%.

Gender differences

In the survey, 800 boys and 847 girls were examined. Boys had a higher level of caries experience: dmft=3.51±3.83; d=2.89±3.63; m=0.13±0.78; f=0.49±1.45 versus dmft=3.12 ± 3.54; d=2.55±3.33; m=0.08±0.39; f=0.49±1.38 of girls. Of the boys, 33.6% were caries-free, lower than the girls 36.8%; the difference as assessed by chi-square was not statistically significant.

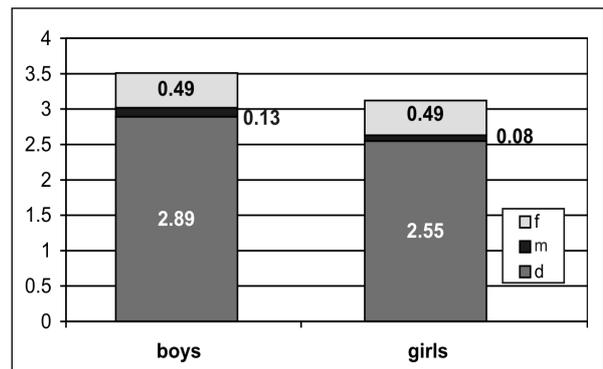


Figure 1. Caries experience by gender.

Sectoral differences

In the survey, 962 children were Jews and 685 were

Table 2. Summary of clinical findings

% caries-free	f(sd)	m(sd)	d(sd)	dmft (sd)	N
35.3	0.49(1.41)	0.11(0.61)	2.71(3.48)	3.31(3.7)	1647

Arabs. dmft was significantly higher among Arab children (4.85 ± 3.83 compared to 2.21 ± 3.15 for the Jews; $p=0.01$). The proportion of caries-free children was higher in the Jewish sector than in the Arab sector (49.9% vs. 14.9%; $p=0.01$). In both groups, decayed teeth were the major component ($d=1.53 \pm 2.66$ in the Jewish and 4.38 ± 3.80 in the Arab sector). Arab children have half as many filled teeth as their Jewish counterparts ($f=0.33 \pm 1.14$ vs $f=0.6 \pm 1.57$) but almost twice as many missing teeth ($m=0.14 \pm 0.58$ vs. $m=0.08 \pm 0.63$).

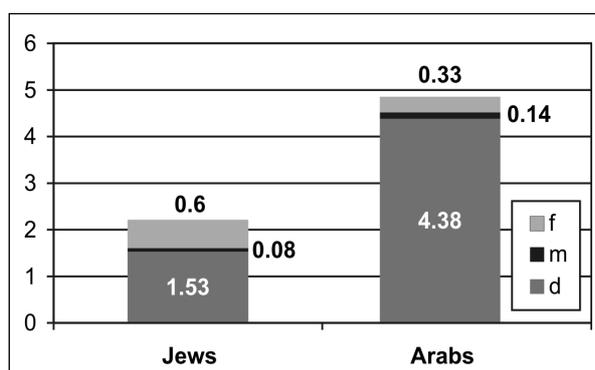


Figure 2. Caries experience by sectors.

Caries experience by fluoride in the water

There were differences in the caries experience between children ($N=957$) living in areas where fluoride levels had been optimal (0.7 ppm) in the previous years ($dmft=2.79 \pm 3.49$; $d=2.23 \pm 3.23$, $m=0.09 \pm 0.43$, $f=0.48 \pm 1.36$) and those children ($N=690$) from areas with low (0.3 ppm) fluoride levels ($dmft=4.03 \pm 3.83$; $d=3.39 \pm 3.70$; $m=0.13 \pm 0.79$; $f=0.51 \pm 1.48$).

Discussion

The survey was performed according to the WHO criteria, used worldwide for epidemiological studies and recommended for use by governments. It has been claimed that using the above methodology enables readers and decision-makers to compare results [9]. However, in reality such surveys rarely obtain completely random and representative samples.

In our survey, we found that it was sufficient to conduct the study in 28 authorities that agreed to participate. The agreement was dependent on the cooperation of the Regional Dental Officer and volunteering of the service delivery staff, and not on the LA characteristics. The sample obtained included an equal number of Jewish and Arab authorities and was similar in terms of Jewish-Arab mix and

SES to the School Dental Service. This survey did not include any children from LAs with SES 9 or 10, because there are no 9th and 10th SES level authorities in the School Dental Service. Thus, the results of this survey may not be representative of all five-year-old children in Israel but they are representative of the School Dental Service.

Children's dental health in Israel has improved in the recent decades. A National Dental Health Survey conducted among 12-year-old children in 2002 has shown that the DMF(T) index declined by 40% in this age group since the previous national survey in 1989 [5]. The 1989 national survey also included five- to six-year-olds, $dmf(t)$ was 2.72, and 41.3% were caries-free. Since then, no national epidemiological data for five- to six-year-olds have been collected in Israel; therefore, analysis of caries trends for this age group is difficult. Local surveys conducted in Israel among five-year-old children have shown various caries levels in different communities. In a caries prevalence survey in Azur, Israel, conducted in 2000, $dmft=2.67 \pm 1.89$ with 49% caries-free [10]. Dental caries findings, recorded in the Tira, Israel, survey in 2000 according to the WHO protocol, were $dmft=3.99 \pm 3.29$ and 19.9% of children were caries-free [11].

The current study's results reveal high disease levels among five-year-old children in LAs that provide the School Dental Service. At age five, more than three teeth were affected by caries, $dmft=3.31 \pm 3.7$. Dental caries trends assessment for five-year-olds is difficult due to lack of systematic national surveys; however, existing local data suggest that the dental disease level in this age group, unlike in 12-year-olds, remains high.

Caries prevalence levels were lower in girls than in boys and treatment levels were low in both genders. Other surveys in Israel and elsewhere to describe similar findings; however, in our survey the differences by gender were not significant.

The high caries levels could be explained by the sample characteristics. More than three-quarters of the children (77.4%) lived in LAs with a low SES (2 to 5). Only 22.6% of the children lived in LAs with SES of 6 to 8. No children from LAs with SES 9 and 10 were examined, because no LA with SES 9 and 10 provides the service.

A significant difference was found in caries experience between the two sectors, Jews and Arabs, as in previous surveys in Israel [12]. Although $dmft$ in the Jewish sector was 2.21 and 49.9% of children were caries-free, $dmft$ in the

Arab sector was 4.85 and only 14.9% of children were caries-free. The last national survey in 2002 among 12-year-old children also found that Arab children had more untreated disease (D), fewer treated teeth, and more extracted teeth compared to Jewish children [4]. Dental caries is closely correlated to lifestyle and is more prevalent in communities with low SES, low education and low income [13,14]. Local surveys performed in Israel among Arab and Jewish children from Ethiopian origin showed similar findings: high disease levels and high untreated dental caries. In Kiryat Gat, Israel, dmft=5.62±4.73 among five-year-old children (16% caries-free) whereas dmft=7.39 ±5.21 (3% caries-free) among five-year-old new immigrant children [15]. A survey in two Arab communities in Israel reported that in Tira, dmft=3.99 whereas in Shfaram, with a lower SES, dmft=5.6 [16].

Our findings are consistent with epidemiological trends from different countries around the world. Caries experience among five-year-olds remains high and no clear trend in caries reduction in this age group has been observed. The results of the United Kingdom Child Dental Health Survey 2003 indicated that there had been no statistically significant changes between the 1993 and 2003 in the proportion of five- and eight-year-olds with obvious decay experience [4].

The WHO targets for the year 2000 were DMF(T) not higher than 3.0 for the 12-year-old group and at least 50% of children caries-free for the five-year-old group [17]. Although the WHO goal was reached in Israel for 12-year-olds, the disease level in the five-year-old group is still high; there are differences in disease prevalence and severity between children in different communities. Most of caries is untreated, d/dmft >80%.

A study in Romania in 2007 [18], reported similar epidemiological findings among six-year-old children, where the dmft(t) index consisted mostly of decayed teeth (91.1%) and the percentage of filled primary teeth was only 3.3%. The increase in caries in primary teeth among young school children has also been described in the U.S.A., where especially high caries rates were recorded in Hispanic children [19].

Caries experience of children from lower SES were higher than caries experience in those from high SES strata. These findings are common for local surveys conducted in Israel in the last two decades.

Caries trends worldwide have been and still

remain variable; changes often occur in opposite directions. Commenting on this situation, Petersen *et al.* (2005) noted that the “current pattern of disease reflects distinct risk profiles across countries related to living conditions, lifestyles and environmental factors, and the implementation of preventive oral health schemes” [20].

The differences between population subgroups are attracting the attention of dental public health professionals. As stated by Peterson and Lennon (2004) [21]:

“Despite great improvements in the oral health of populations across the world, problems still persist particularly among poor and disadvantaged groups in both developed and developing countries.”

The differences in oral health behaviour, diet and exposure to fluoride might determine the disparities in caries levels between different socio-economic strata within a country.

In the present survey, larger differences were found in disease levels between fluoridated and non-fluoridated communities than those recently reported in the scientific literature [5]. Also in the study, the distribution of children between fluoridated and non-fluoridated areas was not equal, 72% of Jewish children versus 39% of Arab children, because of the population size of the LAs (water suppliers are obliged to fluoridate localities with more than 5000 inhabitants). It may be assumed that two independent factors have contributed to the large difference between these two groups: the socio-economic situation and exposure to water fluoridation.

A very high percentage of dmft found in the study related to untreated disease (d/dmft >80%), a finding in common with most previous surveys in Israel. The fact that dental treatment is mainly private and not included in the National Health Insurance Law may provide an explanation for this finding. Other countries' experience shows this correlation between low public investments in oral health care and high untreated disease level [18].

In the last three years, the public Health Maintenance Organizations (HMOs) have started to include free dental treatment for children in their additional health services (AHS) programme. LAs with higher SES can afford to purchase AHS, so this development does not solve the inequality problem.

The Ministry of Health prepared a plan to include dental treatment for children in the basket

of services of the National Health Insurance Law and the government has announced implementation of this scheme starting in 2010. The plan emphasises primary prevention for young children in order to prevent the development of caries. Implementation of this plan can contribute to lowering untreated dental caries in children. In countries where children are entitled to free dental treatment, active caries is less common and the treatment fraction (f) is higher [22].

In Israel, Family Health Centers (“Tipat Halav”) are most suitable for providing primary health care for toddlers and children in the community. Emphasising examination of toddlers’ teeth and dental health education to pregnant women and mothers in the primary health care provided in these centres can lower dental caries prevalence in children. Another important factor is cooperation between health visitors, paediatricians, family doctors and dental surgeons. It is important that examination of toddlers’ teeth becomes a routine action of paediatricians and family doctors to enable early detection of children with a high risk of caries.

Health promotion in schools and kindergartens, with emphasis on healthy diet, low sugar consumption and promoting tooth-brushing habits with fluoridated toothpaste, will aid building a dental health supportive environment in the community.

In summary, it can be said that the fact that children from only 28 out of a possible 70 LAs and none from LAs with SES of 9 or 10 means that the results of this survey cannot be seen as representative of all five-year-old children in Israel. In the five-year-old children studied in this survey, dental caries was still the most prevalent chronic disease.

Disparities in caries experience between Jews and Arabs and the rich and the poor have to be addressed. Most of the caries that was found was untreated.

Conclusions

- The findings of the survey emphasise the need to treat the affected teeth among school

References

1. Downer MC, Drugan CS, Blinkhorn AS. Correlates of dental caries in 12-year-old children in Europe: a cross-sectional analysis. *Community Dental Health* 2008; **24**: 70-78.
2. Pitts NB, Evans DJ, Nugent ZJ. The dental caries experience of 5-year-old children in the United Kingdom. Surveys coordinated by the British Association for the Study of Community Dentistry in 1997/1998. *Community Dental Health* 1999; **16**: 50-56.
3. Downer MC, Drugan CS, Blinkhorn AS. Dental caries experience of British children in an international context. *Community Dental Health* 2005; **22**: 86-93.

children and to widen the School Dental Service to the whole country.

- This problem has now been addressed by the government and from 2010 onward children will be eligible for dental care under the National Insurance Law.
- The findings of the survey emphasise the importance of early intervention by national preventive community dental services for children from birth, targeting pregnant women, infants, and their families.
- Further investigation is indicated to understand the reason for the disturbing difference between the sectors, whether it is economic, social, cultural or because of different levels of dental awareness.

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Conflict of interest

None.

Who did what?

Authors 3, 4, 5, and 6 participated in planning, recruiting, calibrating, and conducting the survey, gathering the data, and preparing it for analysis. Statistical analysis was performed by author 7. Authors 1, 2, and 7 wrote the first draft of the paper, which was reviewed by the other authors. Reviewer comments were addressed by authors 1, 4, and 7.

4. National Statistics (2004). Decline in obvious decay in children’s permanent teeth. Children’s Dental Health Survey 2003. Preliminary Findings. London: National Statistics. Accessed (2009 Dec 21) at: <http://www.statistics.gov.uk/children/dentalhealth>

5. Zusman SP, Ramon T, Natapov L, Kooby E., Dental health of 12-year-olds in Israel-2002. *Community Dental Health* 2005; **22**(3): 175-179

6. Division of Dental Health. Guideline number 8.1. School Dental Service by Local Authorities. Jerusalem: Ministry of Health; 2003. [Publication in Hebrew]

7. Central Bureau of Statistics. Characterization and classification of local authorities by the socio-economic level of the population 2003. Accessed (2009 Dec 21) at: http://www.cbs.gov.il/publications/local_authorities2003/local_authorities_e.htm
8. World Health Organization. *Oral Health Surveys: Basic Methods*. 4th ed. Geneva, Switzerland: WHO; 1997.
9. World Health Organization. Oral Health Country/Area Profile Programme. Accessed (2009 Dec 21) at: <http://www.whocollab.od.mah.se/>
10. Kooby E, Verba I, Vered Y, Zusman SP. Caries and dental trauma prevalence and treatment needs in 5 and 12 years old children in Azur, Israel. International Association for Dental Research Israeli Division Annual Meeting; 2001 June 7-8; Jerusalem, Israel; abstract 69. Abstract in *Journal of Dental Research* 2002; **81**.
11. Kooby E, Adut R, Zusman SP, Shbita A, Sultan W. Caries prevalence and anterior teeth trauma in 5 and 12 year old children in Tira, Israel. International Association for Dental Research Israeli Division Annual Meeting; 2001 June 7-8; Jerusalem, Israel; abstract 68. Abstract in *Journal of Dental Research* 2002; **81**.
12. Zadik D, Zusman SP, Kelman AM: Caries prevalence in 5- and 12-year-old children in Israel. *Community Dentistry and Oral Epidemiology* 1992; **20**: 54-55.
13. Slade GD, Sanders AE, Bill CJ, Do LG. Risk factors for dental caries in the five-year-old South Australian population. *Australian Dental Journal* 2006; **51**(2): 130-139.
14. Oliveira LB, Sheiham A, Bonecker M. Exploring the association of dental caries with social factors and nutritional status in Brazilian preschool children. *European Journal of Oral Science* 2008; **116**(1): 37-43.
15. Kooby E, Zusman SP, Natapov L. Caries prevalence in Kiryat Gat children, 1996. International Association for Dental Research Israeli Division Annual Meeting; 1997 Jun 19-20; Netania, Israel; abstract 56. *Journal of Dental Research* 1997; **76**(5): 1166.
16. Khoury G, Zusman SP. Caries prevalence in 6 and 12 years old in Shfaram. *Journal of Dental Research* (Special Issue B) 2002; **81**: 312 [abstract 65].
17. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. *International Dental Journal* 2003; **53**: 285-288.
18. Nuca C, Amariei C, Borutta A, Petcu L. Prevalence and severity of dental caries in 6- and 12-year-old children in Constanta District (Urban Area), Romania. *Oral Health and Dental Management in Black Sea Countries* 2009; **3**(3): 19-24.
19. Edelstein BL. The dental caries pandemic and disparities problem. *BMC Oral Health* 2006; **6**(Suppl 1): S2
20. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndaye C. The global burden of oral disease and risks to oral health. *Bulletin of the World Health Organization* 2005; **3**: 661-669.
21. Petersen PE, Lennon MA. Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach. *Community Dentistry and Oral Epidemiology* 2004; **32**: 319-321.
22. Evans RW, Edward CM. Effects of school dental care service in Hong Kong-primary teeth. *Community Dentistry and Oral Epidemiology* 1992; **20**: 193-195.