National Oral Health Knowledge, Attitudes and Behaviour Survey of Israeli 12-year-olds, 2002

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Objective: To gather epidemiological information on oral health knowledge, attitudes and behaviour of Israeli 12-year-olds.

Materials and Methods: A stratified, cluster, random and convenience sample of 12-year-old children was drawn. Stratification was by size of community, by administrative areas (regions) and by ethnicity (Jewish/other). The representative sample of 12-year-olds was asked to self-complete the questionnaire of ICS II, which was translated into Hebrew. The questions gather information regarding knowledge, attitude and dental health behaviour.

Results: 1294 children completed the questionnaire, of which 84% reported brushing their teeth once or more per day. Girls brushed 1.68 times more frequently than boys. Of the children, 64% had visited a dentist in the last year. The vast majority of the children (90%) expressed satisfaction with their last visit.

Conclusions: Oral health habits of 12-year-old Israeli children are comparable to those of other countries. The dental health education in Israel should focus health messages to different schoolchildren according to the differences found in this survey.

Key words: attitude and behaviour, dental health knowledge, prevalence, survey

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Dental health services have never been an integral part of the general health services provided by the State or the Sick Funds in Israel. The National Inquiry Committee of Health Services (National Inquiry Committee of Health Services in Israel, 1990) addressed the lack of dental epidemiological data in Israel. The Committee recommended to set up a Dental Health Data Bank, and to devote funds for epidemiological surveys.

The last national children's dental health survey was conducted in 1989 (Zadik et al, 1992). Among the 5- to 6-year-olds, 41.3% were caries free, with dift (deciduous decayed, indicated for extraction and filled teeth) = 2.72. Among the 12-year-olds in the national study (Zadik et al, 1992), 21.2% were caries free, with DMFT = 2.99. Therefore, Israel was defined as medium disease level by the World Health Organization (WHO), and was 17th out of 45 European countries (Oral Health Programme, 1995).

There is shortage of up-to-date, accurate data regarding knowledge, attitude and health-related behaviour in general and in dentistry in particular. For the last decade, the Department of Health Education of the Ministry of Health has commissioned yearly adult national surveys of health issues (Ministry of Health, 1995), but they include very few questions regarding dental and periodontal health.

A national survey, carried out by the Israel Institute for Applied Research in 1982, inquired about service

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utilisation, price of dental services, their perception and their effect (Israel Institute of Applied Social Research, 1982). A national telephone survey was also conducted in 1999, funded by the National Institute for Health Policy and Health Services Research (Berg et al, 2001). However, in all these surveys the knowledge, attitude and behaviour of the adult population was researched. There are no data available regarding the knowledge, attitude and dental health behaviour of adolescents.

In 2002, a National Dental Health Survey of 12-year-olds was conducted. The clinical findings were reported previously (Zusman et al, 2005). There was a reported improvement in dental health among the 12-year-olds in Israel, and the average DMFT was found to be 1.66. In the present paper, the findings of the oral health-related knowledge, attitudes and behaviour component of the survey are reported. The aim is to build an up-to-date dental health database of the Israeli population, as advised by the National Inquiry Committee (1990) for the following purposes:

1. To enable informed policy-decision-making regarding the inclusion of a dental component in the range of health services provided by the National Health Insurance Law.
2. To enable planning of dental services relevant to the needs of the population.
3. To provide a baseline that will enable comparative studies in the future.

MATERIALS AND METHODS

Population sample

The sample was selected from an estimated 110,000 12-year-old children in Israel (Central Bureau of Statistics, 1995).

It was decided that the sample would consist of 50 classes; sample size was estimated to be approximately 1500 subjects, slightly larger than in the former national survey. The sample was stratified, cluster, random and convenient. To ensure national representation, stratification was by size of community, by administrative areas (regions) and by ethnicity (Jewish/other: mixed communities were considered to be Jewish). The sampling method and sample size were as previously described (Zusman et al, 2005). In the first stage, a random stratified sampling of communities was carried out. In the second stage, a random sampling of classes in the chosen communities was performed. For convenience, the cluster sample was at least two classes in each urban community. The sampling procedure was as follows:

- The communities were divided into 3 groups:
  urban 10,000 and more;
  urban 10,000 and less;
  rural (according to the Ministry of Interior classification).
- Each group was further divided into Jewish/other, and also divided into six geographical regions.
- In the urban communities in the above 10,000 group, the three biggest cities (Jerusalem, Tel Aviv and Haifa) were included. Further communities were sampled according to the number of students in each region. From each community, two classes were randomly chosen.
- In the other two groups, very small communities were joined together for sampling purposes. In each stratum the number of children aged 12 was estimated and the number of classes was chosen in each region accordingly. The sampling was done from the list of schools that the children attend (not all communities have a school).

Before the survey, the Heads of the department of education in the municipalities were informed that their city had been selected in the sample. Each school Principal received a letter and was told which classes will participate. The parents of the selected classes were notified. A child was excluded from the survey at the parents' request. The surveyor contacted the Principal by phone and set up an appointment to examine the classes in the sample.

The clinical data obtained were coded and processed. Statistical analysis was with SPSS software. The results have been published previously (Zusman et al, 2005).

Before the clinical examination was started, the questionnaire was distributed to the students. They were asked to complete them while the class was examined. According to our survey protocol, the questionnaire was not marked with the name of the child.

The questionnaire

Oral health-related behaviour was collected using the core questionnaire for children used in ICS-II by WHO (Chen et al, 1997), translated to Hebrew. The translation was carried out by a professional translating service, and the translation was double-checked by two investigators fluent in English.

Questions 46 and 47 regarding smoking were omitted at the request of the Religious Education Division of the Ministry of Education. In questions 10, 11, 12b, and 13b, the possible reply regarding orphans or children of single-parent families ('No male/female guardian living with me') was omitted at the request of Ministry of Education. In question 18, the reply: 'I didn't have anybody to take me to the dentist' was omitted for the same reason.

Variables

Personal characteristics were divided into predisposing and enabling variables. The former included sex, level of education and occupation, perceived general health status and health beliefs, such as perceived seriousness of oral disease, importance of oral health, benefits of brushing, flossing, oral health service visits and the number of perceived barriers (fear, being too busy, lack of services) to obtaining oral health care, which influence the individual's likelihood of engaging in various health behaviours.

Enabling variables facilitate or impede oral health behaviour, for example level of income, residence, family size and having a usual source of oral health care (Chen et al, 1997).

Data analysis

The obtained data were coded and analysed by SPSS-win software. As a general rule, we followed the analysis performed in ICS II (Chen et al, 1997). 'Three main levels of analysis were conducted: to describe each of the outcomes; to address the social group differences in outcomes; and to attempt to explain the differences through multivariate analysis using a range of predisposing and enabling predictors' (Chen et al, 1997). The social groups were according to the father's education (low = primary school, 8 classes; medium = high school, 12 classes; and higher = college/university).

Univariate analyses were conducted for oral health behaviours. Bivariate analyses were conducted in order to examine the social group differences (sex, education, having/not having a usual source of care) in oral health outcomes. Chi-square tests (for percentages) and *t*-test (for means) were conducted to examine the statistical significance of social group differences.

Logistic (binary) regression analyses were conducted on the dichotomous outcome variables (e.g. brushing/not brushing more than once a day, flossing once a day and service visiting).

A multivariate logistic regression analysis was conducted for each of the three oral behaviours mentioned above. The odds ratios indicate approximately how much more (or less) likely it is for the outcome to be present among people with one value of a predictor than among those with another.

The regression analysis models were developed systematically on the basis of ICS II theoretical model. The independent variables chosen were selected because they have theoretical and policy relevance, the literature suggested their potential importance, and comparable measures were available from the ICS II study (Chen et al, 1997).

RESULTS

The findings will be reported in the same manner as ICS II, so they can be compared to the findings from the other sites that participated in ICS II (Ehrfurt, Germany; Yamanashi, Japan; New Zealand; Lodz, Poland; Baltimore, USA; HIS Navajo, USA; and HIS Lakota, USA).

Out of the 1327 students of the survey, 1294 filled in the questionnaire. Not all respondents answered all questions, therefore the analysis was carried out as a percentage of respondents.

Study site characteristics

As stated in ICS II, 'the theoretical model of ICS II postulates that an individual's oral health behaviour and oral health outcomes (oral health status and oral quality of life) are influenced by more than individual characteristics. They are also directly or indirectly affected by system-level factors related to socio-environmental characteristics – social, political, and economic characteristics; socio-environmental characteristics specific to oral health; and the general health care system – and the oral health care system' (Chen et al, 1997).

The economy of Israel is a free market economy. The per capita gross domestic product is $23,530, with 91.6% of the population living in urban areas, and 3.5% of the labour force working in agricultural, 29% in industrial and 67.5% in the service sectors. As we can see, the characteristics of Israel are closest to USA, although it is the most urbanised of all the sites (91.6%).

Life expectancy in Israel was 79.2 in 2002, and infant mortality was 5.4 per 1000 live births, close to the situation in Japan. Trend data further demonstrate that Israel's infant mortality has decreased significantly in the last few decades, similarly to Japan.

Few studies have made international comparisons of health inequalities. In Israel, the national health insurance law assures equal access for all citizens to a range of services. This range of services does not include dental care. As in other countries, utilisation of preventive services is generally correlated with socioeconomic status and with education (Shuval, 1990). While the network of primary care facilities in Israel is widespread and generally accessible, it is poorly integrated with the hospital system. Longevity has increased over recent years and is relatively high: 81.8 years for females and 77.6 years for males in 2003 (Ministry of Health, 2005). Nevertheless, there are differences between Jews and non-Jews both among men and women. The same can be said concerning mortality, especially with regard to infant mortality (3.1 per 1000 live births among Jews in 2004 and 8.6 among Muslims).

Sugar consumption per capita in Israel is high and increased until 2000, since when the trend changed, and sugar consumption declined from 62 kg per capita per year to 61 kg in 2002.

In Israel, 95% of toothpaste sold is fluoridated. Water fluoridation started in Israel in 1981, when the first fluoridation plant was built on the pipeline providing water to the capital Jerusalem. Since then, many more plants have been built. In 1988 about a third of the population benefited from appropriate fluoride levels in the drinking water system. This proportion went up to 46% in 1996, and to 52% in 2001. In 2005, 64% of the water of Israel was fluoridated, less than Baltimore (82%) and Lakota (70%).

The National Health Insurance Law was enacted in 1995. Each citizen pays 4.8% of his income to health insurance. The health care is provided by four publicly owned HMOs, and the basket of services is defined by law. The dental component of this basket is meagre. It includes mainly maxillofacial surgery for trauma and oncology but does not include dental treatment per se.

Dental surgeons have to be licensed in Israel. The first dental school was established in 1953, the second in 1975. The disease levels were high due to increased availability and lower price of sugar and other refined carbohydrates. There is a trend of an increasing dentist to population ratio in Israel, which is currently 13.4 to 10,000 inhabitants.

In Israel most of the dental services are privately funded. Households spend about 35% of their health expenses on dental services. Most of the providers are private, their vast majority self-employed. Commercial clinics need a license to operate, but private dentists can open private practices without needing any further license.

Limited public service is available for the indigent. School dental service is operated in 25% of local governments.

Water fluoridation in Israel continues. A major plant was inaugurated in 2005 on the main water supply line in the North of the country. It is planned that in 2–3 years, as much as 77% of the population will enjoy the benefits of appropriate levels of fluoride in the drinking water.

About a fifth of the schoolchildren participate in the school dental service, passing an annual examination, and receiving 3 hours of dental health education. The number of local governments providing this service is increasing.

The dentist population ratio has grown rapidly in Israel the last two decades, and is today one of the highest in the world (European HFA, 2005). In Israel, the dental health care system consists mostly of private practice. The number of clinics owned by commercial companies is on the rise.

The National Health Insurance Law provides a wide range of services in general health care, but does not include dental treatments for the general population. Only about 10% of the population has private dental insurance (Berg et al, 2001).

Oral health behaviour results

Relatively few children (3%) reported never brushing their teeth, and 84% reported brushing their teeth once or more per day. Regular flossing is not as common as brushing. Only 18% reported using the floss more than once a week and 59% never used it. Israeli children floss less than children in all other countries in the survey. About half of the children use toothpicks, a similar percentage to Japan and USA Native Americans. Use was less widespread among children in Baltimore (39%), New Zealand (34%) and Lodz (23%).

In terms of the utilisation of health services, a visit was considered to be any occasion in the year prior to the study on which an individual travelled to an office, clinic, health centre or hospital to obtain oral health prophylaxis or treatment provided by dentist or hygienist. The majority of the children (64%) had visited a dentist in the last year. The utilisation rate is similar to Baltimore, but the pattern is different. In Israel only 28% reported 1–2 visits per year (less preventive visits) and 3 or more visits for (restorative) treatment (36%). As in New Zealand, 18% of the children reported having had orthodontic treatment.

Subjects who had reported a visit to a dentist or orthodontist in the previous 2 years were asked to in-

Table 1 Proportion of children who reported brushing more than once a day, flossing and oral health care visits by gender, father's education, and usual source of care, expressed as a percentage of the sample.

Site	Total	Sex			Education			Usual source of care	
		Male	Female	no reply	Low	Medium	High	Yes	No
Brushing	54	47	60*	47	35	50	62*	58*	54
Flossing	10.8	10	12	52	14	12	10	11	8.2
OHC visits	76	78	76	54	61	74	86*	84*	60

* p<0.001

dicate how satisfied they were with various aspects of the most recent visit. 'Respondents expressing satisfaction in regard to the visit as a whole, the amount of information given to them about the treatment, travel time, and waiting time were designated as satisfied with access to care' (Chen et al, 1997). Overall, large proportions of children were satisfied with dental care, although many wanted to know more than they were told about the treatment they received (49%). Only 17.5% waited too long to be seen and only 7.2% felt it took too long to get to the oral health care site. The vast majority of the children expressed satisfaction with the last visit (90%).

Oral health behaviour by social group

The findings presented in Table 1 show that girls brush their teeth more often than boys as the situation in all sites. The higher the father's education, the better the chances of brushing their teeth more than once a day, similar to Baltimore.

Very few children reported flossing every day (Table 1); therefore no statistical analysis could be performed.

Only 76% of the children reported visiting a practitioner last year (Table 1), a lower figure than in the other sites of the ICS II except Japan. The father's education has a large influence: the higher the education, the higher the likelihood of visiting a dentist.

Out of those who visited a dentist last year, 84% have a usual source of care.

Oral health behaviour: multivariate analysis

Table 2 shows the odd ratios of brushing more than once a day for children in Israel. These ratios approximate the likelihood that an outcome will occur among those with one value of a predictor, compared to those with another value.

Brushing behaviour is slightly more than twice as frequent for girls than for boys. Gender and father's education were the strongest predictors of brushing behaviour in children. Children with highly educated fathers were 5 times more likely to brush more than twice a day than those with low levels of education. The father's occupation did not predict frequency of brushing by the children. Children with good general health brush their teeth three times more often than children with poor general health.

Oral health beliefs were not a significant predictor of frequency of brushing in Israel. Health behaviour is related to health beliefs, especially to the belief that brushing prevents gum diseases.

At the same time, enabling factors such as number of people in household, urban versus rural residence, and usual, steady source of dental care are predictors of this health behaviour.

Table 2 shows the odds ratios for logistic analyses of flossing once a day or more. Girls were more likely to floss daily, similar to IHS Navajo, USA. Health beliefs were significant predictors, similar to Baltimore. Children's perceived seriousness of oral diseases are 3 times more likely to use dental floss once a day or more.

Table 2 presents predisposing and enabling factors associated with oral health service utilisation by children. The difference between girls and boys is not significant. Fathers' education is significant.

DISCUSSION

The data were gathered using a self-answered questionnaire. The questionnaire was distributed in the

Table 2 Odds ratios for oral health behaviour: brushing and flossing more than once a day and oral service visits.

	Brushing				Flossing				Service visit			
	Significance	S.E.	CI	-2log likelihood	Significance	S.E.	CI	-2log likelihood	Significance	S.E.	CI	-2log likelihood
Gender												
Female vs male	2.11***	0.158	1.553–2.879	1101.754	NS				NS			
Father's education level												
High vs low	4.56***	0.283	2.615–7.941	1095.95	NS				2.69***	0.26	1.614–4.479	1502.073
Medium vs low	2.26**	0.278	1.313–3.903		NS				NS			
no reply vs. low	3.34***	0.26	2.010–5.56		NS				NS			
Father's occupation												
Professional vs. un/semi-skilled	NS				NS				NS			
Manager/low professional vs. un/semi-skilled	NS				NS				NS			
Skilled vs. un/semi-skilled	NS				NS				NS			
Unemployed vs. un/semi-skilled	NS				NS				NS			
No father vs. unskilled	NA				NA				NA			
General health												
Excellent/very good vs. good	1.58*	0.193	1.084–2.311	1060.117	NS				1.51*	0.162	1.098–2.07	1465.065
Fair/poor/very poor vs. good	NS				NS				NS			
Oral health beliefs												
Perceived seriousness of oral disease	NS				NS				1.89*	0.251	1.159,3.099	1280.019
Perceived importance of oral health	NS				2.86*	0.494	1.085–7.53	644.038	NS			
Brushing prevents gum trouble												
- disagree vs. agree	0.40***	0.244	0.248–0.645	1098.098					0.56**	0.214	0.369–0.853	1537.689
- don't know vs. agree	0.45***	0.169	0.322–0.623						0.65**	0.139	0.491–0.847	
Oral health care visits prevents trouble												
- disagree vs. agree												
- don't know vs. agree												
Number of barriers perceived												
Enabling												
Residence												
Number in house	0.76***	0.033	0.716–0.814	983.296	NS				0.94*	0.028	0.889,0.992	1466.322
More urban v. less urban	1.87***	0.18	1.314–2.656	1115.69	NS				NS			
Usual source of care												
No vs. yes	0.43***	0.172	0.304–0.597	963.97	NS				0.40***	0.15	0.298,0.538	1319.549

*p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

classroom, while the clinical examinations were done. It is possible that the clinical activity caused some distraction to the children.

As reported in ISS II for other countries, most of the children (84%) reported brushing once or more daily, the same percentage as for Navajo. In all other sites of ISC II, an even lower percentage reported never brushing their teeth, and the present answers were similar to those reported from Baltimore and New Zealand. In Germany and Japan, daily tooth brushing is practiced by more children (95% and 93% respectively), but this is much less among the Native-Americans (76% and 67%). At the age of 12, this basic oral health hygiene method is not universally practised in Israel in 2002.

Flossing is rarer than in other countries: the majority of Israeli children never flossed (59%) and 13% did not even know about it. Only 18% reported using floss more than once a week, higher than in Japan and Poland, but lower than in the other sites. In New Zealand, Baltimore, Navajo and Lakota, children were more aware of dental floss than the Israeli children, while a much higher percentage of the children in Yamanashi and Lodz were unaware of dental floss. Israeli children floss less than children in all other countries in the survey.

Respondents were not asked about frequency of use or purpose, only whether they did or did not use toothpicks. Toothpicks were used by about half of the children, a similar percentage to Japan and USA Native Americans. Use was less widespread among children in Baltimore (39%), New Zealand (34%) and Lodz (23%).

The oral health habit is very much gender related. Girls brush their teeth more often than boys in Israel, as they do all over the world. Only in Japan and Germany do boys brush more often than in Israel. The frequency of girls brushing was similar to Lodz and Baltimore, less than in Germany and Japan, and higher than for Native Americans and New Zealand.

The higher the level of the father's education, the better the chances of brushing teeth more than once a day, as was reported for all other sites. However, the Israelis with low father education brush less than in other sites. Israeli children with highly educated fathers brush more than in Lodz and Native Americans, similar to Baltimore but less than Germany and Japan. Usual source of care has the same effect as the father's education. Children with a usual source of care brush their teeth the same number of times as in Baltimore, less than Japan and Germany but more than the other sites. This habit is dependent on father's education and oral health beliefs. It is clear that dental health education has to be attitude-oriented, to strengthen the health beliefs of children.

Regarding utilisation of oral health services, only 20% did not visit a dentist, higher than all the other sites except Japan. About two thirds visited a dentist once or more in the previous year. It is not clear how to interpret the 15% that answered 'don't know' to this question. It seems that they did not visit a dentist in the previous year. In former surveys, about 35% reported not visiting a dentist in the previous year (Zusman and Ramon, 2002), so the reported un-attendance confirms that finding.

The utilisation rate is similar to Baltimore, but the pattern is different. In Israel there are less '1–2 visits' per year (less preventive visits) and more '3 or more' visits for (restorative) treatment. In Israel, 36% reported 3 or more visits compared with 34% in Baltimore. In all other sites higher percentages had 3 or more visits.

Orthodontic treatment is not as widespread as in Germany and the USA, but similar to New Zealand. Poland and Japan reported lower percentages, while in all other sites higher percentages visited an orthodontist.

Regarding satisfaction with the last oral health visit, the children are satisfied, in the same way as generally throughout the world. A higher percentage was satisfied in Baltimore and New Zealand, while at other sites satisfaction was lower, being lowest in Japan (81%).

As expected, the percentage of children who thought the travel time was too long is low (7.2%), as the proportion of dentists to population is very high in Israel. About half reported they wanted to know more about the treatment, similar to Baltimore. Israeli children are interested in dental treatment far more than their Japanese or German counterparts. This interest should be harnessed for dental health education.

Only 76% of the children reported visiting a practitioner in the previous year (Table 1), a lower figure than in the other sites of the ICS II except Japan. Father's education had a large influence: the higher the education, the more likely the children were to visit a dentist. Compared with the other sites, Israeli children with low father education visit the dentist less often than in other sites; for those with high education, only Japan reported less dental visits. Out of those who visited a dentist last year, 84% had a usual source of care, higher only than Japan.

CONCLUSIONS

Tooth brushing once or twice a day was reported by 84% of 12 year-olds, daily flossing by only 9%.

About two-thirds of the children visited a dentist in the last year. Higher utilisation of services is related to father's education and to a usual source of care.

Children were satisfied with the dental care but would like to know more about the treatment they received.

Implications

1. The dental health education in Israel should focus the health messages to schoolchildren according to the differences found in this survey. For example, tooth brushing should be stressed more in boys than in girls. Health promotion programmes in indigent and lower socioeconomic populations should be implemented. Free toothbrush and dentifrice distribution might be considered as a way to lower the barrier for daily brushing.
2. Service utilisation is connected to father's education, so barriers should be lowered for these children (outreach of the dental service for these children). Dentists should explain more the nature of the treatment in a language the children comprehend.

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