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Effectiveness of structured comprehensive paediatric oral health education for parents of children less than two years of age in Germany

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Objective To examine the effectiveness of expanding and improving oral health education in a clinical setting. **Research design** Controlled prospective intervention study. **Intervention** Structured comprehensive oral health education (SC-OHE) supported by written information. was performed by 36 clinicians in all of the 30 specialist paediatric practices in the city and the administrative district of Kassel, central Germany. **Participants** Parents of all children attending the practices for health examinations. SC-OHE was tested in two intervention groups (IG), one with a mean child age of seven months and another with a mean child age of 24 months. The SC-OHE content was adapted to the respective age groups. Control group (CG) subjects were recruited in a similar region in northern Germany and received conventional oral health education only. This consisted of comparable topics but was less comprehensive than SC-OHE. The two IGs comprised 2,170 children; the two age-matched CGs 2,040. **Outcome measures** Parental knowledge, attitudes and behaviour relevant to decreasing the risk of early childhood caries (ECC) development. The outcomes were measured by questionnaires sent to the parents. **Results** The response rate was 88%. On average, control group paediatricians provided 2.1 information items at each child examination whereas the intervention group provided 3.8 items. Parental knowledge increased by 23%. Self-efficacy and attitudes remained unchanged. 41% of 7-month-olds in the CG received baby bottles with cariogenic content during daytime as opposed to 32% in the IG ($p<0.001$); however, bottle use at night was unchanged. IG parents were less likely to add sugar to puréed baby food of the 7-month-olds. In 24-month-old children, the frequent consumption of cariogenic beverages in the daytime decreased slightly (CG 66%, IG 61%, $p<0.001$), but five other nutritional behaviours, fluoride use and tooth brushing remained unchanged. **Conclusions** Primary care providers can be trained to perform SC-OHE that improves parental oral health knowledge. SC-OHE provided by clinicians alone will not be capable of influencing crucial oral health behaviours in such a way that prevents ECC.

Key words: Dental caries, early childhood caries, health education, intervention study, nursing bottle caries, paediatric dentistry.

Introduction

According to regional studies in Germany, five to 17% of 2- to 3-year-old children suffer from early childhood caries (ECC). In some kindergartens in deprived areas, 38% of 3- to 5-year-old children are affected (Robke and Buitkamp 2002).

ECC is related to baby bottle feeding with sweet beverages and the frequent consumption of sugary snacks and drinks. A preventive approach, which is popular in the professional and health policy field, is to influence these habits by oral health education.

There is a long-standing paediatric programme of child health examinations in Germany, comprising health screening, medical and dental advice. The programme reaches nearly all children during the first two years of life as a result of seven examinations. A plan was proposed to add further consultations devoted specifically to oral health. The acceptability of these additional consultations was questioned, but there was agreement to expand the existing examinations programme. In 1996, legislation called to intensify oral health education in paediatric, dental and gynaecology practices. The Medical Advisory Service for Social Health Insurance (MDS) argued there was a lack of supporting evidence. Many studies assessing the effectiveness of counselling by primary care clinicians on ECC-related behaviour were hampered by selection, sampling and withdrawal bias as well as small sample size. The Health Insurance Agency commissioned the MDS to evaluate the effectiveness of expanding oral health education. The national committees that decide on regulations for physicians and dentists used the interim report of the study to develop new directives.

The objective of the study was to examine the effectiveness of the programme with respect to knowledge, attitudes and behaviour of parents that was relevant to decreasing the risk of ECC. The programme title was ‘structured comprehensive paediatric oral health education supported by written information (SC-OE)’.

Method

A controlled prospective intervention study was performed. This reflected everyday practice conditions and was intended to cover the entire target population. The intervention took place in the city and administrative district of Kassel in central Germany and ran from July to December 1997. Prior to the study the paediatric association assured a 100 percent participation of the paediatricians in this area. That was the main reason for choosing this region. In all, 30 specialist paediatric practices with 36 paediatricians participated.

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The control group subjects were recruited in the city of Kiel and the administrative district of Rendsburg-Eckernförde, northern Germany. The region was chosen as it best matched the intervention region with regard to size, distribution of inhabitants in metropolitan and rural areas and socio-demographic variables. Participants in the control region received conventional oral health education only. This is performed routinely during child exminations in the whole country. The paediatricians who provided this service were not trained specifically and received no additional material.

All of the paediatricians in the intervention area attended two all-day SC-OHE training courses. This consisted of lectures and role play by dentists, a physician, a pharmacist and a social scientist. The paediatricians received a carefully designed and phrased model script for each SC-OHE, adapted to the respective child age. They were asked to use the script during the first SC-OHE sessions until they knew it by heart. The aim was to enable them to convey the full scope of information with simple words and in a coherent way. Apart from the items related to breast feeding and supplementary diet, the clinicians were contractually obliged to mention seven to eight oral prevention topics at each appointment and to spend at least 15 minutes for SC-OHE. Verbal information giving in SC-OHE was supposed to be supported by showing and explaining illustrative materials, for instance tooth-brushes and fluoride salt packages. Furthermore, the parents were to be given information leaflets that reflected the contents of the verbal information. The paediatricians were asked to recommend the use of fluoride salt or dispense fluoride supplements. Children were directed to a dentist if diagnosis needed clarification or treatment deemed necessary.

An additional fee was paid for SC-OHE. This amounted to about a third of what was paid for child examinations. The paediatricians in the control group did not receive these payments. All participating practices received a administration fee for motivating the parents to give their informed consent and for returning data to the project team.

SC-OHE was performed for all parents attending the respective child examinations. The intervention was tested in two age groups. One intervention group comprised children with a mean age of seven months, the other with a mean age of 24 months. The mean age of the respective two control groups matched that of the intervention groups.

Additionally to the SC-OHE at the age of 7 months, the parents of the 7-month-olds intervention group had received a SC-OHE at a mean child age of 6 weeks. At this first SC-OHE, the paediatricians were asked to provide specific information on the following topics to the parents: breastfeeding, bottle feeding, drinking, supplementary diet, vitamin D and fluoride supplements. The topics of the second SC-OHE at 7 months were: tooth eruption, importance of deciduous teeth, oral hygiene, fluoride supplements, nursing bottle and thumb sucking. The 24-month-olds group received a single SC-OHE at the mean age of 24 months. The topics were: caries prevention, caries development, oral hygiene, nursing bottle use, beverages in nursing bottles, fluoride supplements, fluoridated salt and thumb sucking.

The outcomes of the interventions and data concerning the parent-physician interaction were measured by self-administered questionnaires. These were sent to the parents by the research team after each child examination. Two reminders and incentives (oral hygiene products, sticking-plasters and a raffle of high-quality children's clothes) were used. The same procedures were followed in the intervention and control groups. On average, the parents completed the questionnaires one month after the examinations.

The activities of the physicians were measured by statements from the parents. Both the intervention and the control groups had to mark which of the listed topics the paediatrician had addressed during the child health examination. The list contained those topics that the intervention group paediatricians had to mention according to the SC-OHE scripts. For instance, the parents could mark the following items: "The paediatrician has told me how caries can be avoided", "… what baby teeth are important for", "… that no sweet liquids should be given by nursing bottle during sleeping times" and "… how fluoride salt can be used." The mean number of information items that the parents reported as having been mentioned served for comparing the amount of information that the intervention and the control groups had received. It also was used for calculating the percentage of the SC-OHE information actually given compared to the information that was supposed to be given.

An additional part of the questionnaire covered information the parents may have received from their respective dentists.

The parents marked how much time the paediatrician spent for the child examination and information relating to oral health (0 – 5, 5 – 10, 10 – 15 and more than 15 minutes). The mean of these categories was used to calculate the mean duration of SC-OHE as compared to conventional oral health education.

Parental knowledge was measured by multiple-choice questions. Self-efficacy was examined by asking whether the parents agreed with the statement that they "could do a lot for oral health" of their children. The general attitude towards caring for their child's teeth was assessed by the statement "Fortunately baby teeth are not that important because new teeth will appear later anyway." Data were analysed by SPSS-Win. Differences between groups were tested by Mann and Whitney U-tests and by t-tests with $\alpha < 0.05$. Multivariate statistics were performed by binary logistic regression.

Results

9% of the parents refused to be questioned. Among the participants, the response rate was 88%. The control and intervention groups were similar with regard to socio-demographic variables except a mean income difference in the 7-month-olds survey that was felt unlikely to influence the results (Table 1).

The control and intervention groups did not differ with respect to the information they received from dentists. There were no oral health campaigns or interventions from other sources such as day-care facilities apart from their usual activities.

Table 1. Comparison of control groups (CG) and intervention groups (IG) with regard to socio-demographic variables.

	7-month-olds			*24-months olds*		
	CG	*IG*	*p*	*CG*	*IG*	*p*
Numbers of children	1181	1015	–	989	1025	–
Mean child age	6.6	6.6	0.105	24.3	24.4	0.060
Mean parent's age (yrs.)	30.0	30.0	0.923	31.1	30.8	0.140
School education (A-levels or university)	35.1%	33.7%	0.502	30.7%	32.8%	0.313
Mean net income (Euro)	1,711	1,605	0,002	1,703	1,704	0.973
Subjects whose main source of income were state transfer payments (benefits)	7.4%	7.0%	0.690	8.3%	9.2%	0.493
Immigrant status	4.3%	4.7%	0.593	4.8%	6.2%	0.169

Table 2. Percentage of children receiving nursing bottles with cariogenic content. CG: control groups, IG: intervention groups after two SC-OHE interventions (7-month-olds) or a single intervention (24-month-olds).

	CG	*IG*	*Total*	*p-value*
7-month-olds				
Baby bottle at daytime				
Every day	41	32	37	
Several times a week	22	24	23	
Once a week or fewer	13	11	12	
Never	24	33	28	< 0.001
Baby bottle at night/in bed				
Every night	4	3	3	
Several times a week	4	4	4	
Once a week or fewer	7	5	6	
Never	86	88	87	0.111
24-month-olds				
Frequent administration of the baby bottle				
At daytime	25	25	25	0.947
At sleeping time/in bed	11	11	11	0.807

Table 3. Percentage of children receiving cariogenic food items or cariogenic beverages. CG: control groups, IG: intervention groups after two SC-OHE interventions (7-month-olds) or a single intervention (24-month-olds).

	CG	*IG*	*Total*	*p-value*
7-month-olds				
Sometimes or always sugars added to puréed baby food	32	24	28	< 0.001
24-month-olds				
Frequently cariogenic beverages at daytime	66	61	63	0.013
Frequently cariogenic food items at daytime	79	82	80	0.075
Frequently cariogenic beverages at sleeping time/in bed	24	21	23	0.076
Frequently cariogenic food items at sleeping time/in bed	8	9	8	0.306

Table 4. Variables associated with the administration of a nursing bottle at night in the 7-month-olds group according to logistic regression analysis.

Variable	*P*	*OR*
1. Breastfeeding (full vs. none or partial)	<0.001	3.551
2. Knowledge: juice given by nursing bottle is bad for teeth	0.007	1.990
3. School education level (6 levels)	0.029	1.177
Not significant: SC-OHE	0.120	0.297

Also not significant: information about bottle use given by the paediatrician, recommendation by the paediatrician not to give sweet drinks at night, child's age, birth weight, health status, parent's age, sources of income, poverty, household size, region, urban/rural, nationality.

The control group paediatricians mentioned 1.9 oral health topics during the child examination of the 7-month-olds, the paediatricians of the intervention group 3.3 topics (SD: 1.7, 2.1, p<0.001). The respective figures in the 24-month-olds were 2.4 and 4.2 topics (SD: 1.7; 2.2, p<0.001). The mean for both examinations was 2.1 topics in the control groups and 3.8 in the intervention groups. These results can be interpreted as an average increase in information by 78% through SC-OHE.

The scripts of the two SC-OHEs at 7 and 24 months stated that a total of 15 topics were to be mentioned. Actually, a mean 50% of topics were addressed.
SC-OHE lasted on average 8.1 minutes. This was 1.8 minutes or 29% more than oral health education in the control groups. According to reimbursement data, 4.4 SC-OHE examinations per week were performed. This corresponds to a total of 7.5 additional minutes per week for expanding the scope of oral health education.

Only 28% of the parents of the 24-month-olds control group were aware that the 'tooth-friendly' symbol could be found both on sweets and on chewing gum. Compared to other knowledge items this was a particularly low knowledge level. The intervention group answered 44% of the respective questions correctly. This implies a large knowledge increase. But there was no such improvement with regard to two further questions with which the knowledge level in the control group was intermediate. These questions related to the cariogenicity of apple juice and muesli bars. The control group answered 51% of these questions correctly, the intervention group 52% (p= 0.526). Referring to all questions with low or intermediate knowledge level the knowledge increase was 23%.
The self-efficacy of the parents remained unchanged in the 7-month-old group with 76% unreservedly positive responses ("I agree completely") in the control group and 76% in the intervention group (p=0.799).

9% of the control and 8% of the intervention group subjects agreed with the negative attitude statement that cast doubt on the value of deciduous teeth (p=0.236).
Tables 2 and 3 present the data with regard to sugar consumption at sleeping and waking times. The use of the baby bottle at daytime decreased significantly and less mothers added sugar to puréed baby food in the 7-month-olds intervention group. On the other hand, the use of the baby bottle at night or in bed did not change. The 24-month-olds intervention group was drinking cariogenic beverages from drinking vessels other than the baby bottle less frequently at daytime, but no such improvement was noted with regard to the frequent administration of the baby bottle, neither at daytime nor at sleeping times. The frequent consumption of cariogenic beverages at sleeping times and the consumption of cariogenic food items at any time were not affected by the intervention either.

Among the 24-month-old children, 36% of the control group and 38% of the intervention group still had a nursing bottle (p=0.265). The use of plastic bottles remained unchanged. 32% of the control group and 33% in the intervention group used them (p=0.627).

Multivariate statistics confirmed that the night-time use of a bottle was not influenced by SC-OHE, but that it was associated most closely (negatively) with breastfeeding (table 4). Only 5% of the breastfeeding women administered cariogenic liquids with the bottle during the night at least once a week, whereas 15% of those not breastfeeding did. 12% of those who knew about the dangers of feeding juice at night with the bottle did not administer the bottle, whereas 24% without that knowledge did. This also applied to 10% of those with A-levels or university degree and to 15% of those with lower educational attainment.

The proportion of mothers not using any source of systemic fluoride was 10% in the control group and 12% in the intervention group (p=0.223). 28% versus 34% used both supplements and salt (p=0.002).

The proportion of 24-month-olds with tooth brushing only every other day or less was 12% in the control and 11% in the intervention group (p=0.433). The proportion of those brushing at least twice daily was 50% in both groups (p=0.822).

Discussion

The effectiveness of dental primary prevention is difficult to evaluate in infants and young children, because it is not easy to gain access to this age group. For this reason most studies use convenience samples, which may not represent the entire community of interest (Chadwick and Treasure 2005). The present large field trial did not use samples. According to common evaluation standards (Rossi *et al*. 2004), it achieved a complete coverage of the target population in an urban/rural region. It reflects what can be realistically expected under practice conditions and demonstrates the extent of dilution effects in comparison to a clinically controlled efficacy study. The paediatricians spent only about half the time that was agreed by contract and covered only half of the designated information items.

SC-OHE had a positive effect on mothers' oral health knowledge. This is an important outcome. A systematic review of the literature showed that a knowledge gain can nearly always be expected if oral health education is provided (Kay and Locker 1997). Blinkhorn *et al*. (2003) confirmed that this is also valid for parents of young children.

Oral health education for adults or children does not usually result in changes of attitude (Kay and Locker 1997). The same was found in the present investigation after two SC-OHE sessions within half a year. But this result is in contrast with the study by Blinkhorn *et al*. (2003), in which a favourable change of attitude was noted.

Various behaviours can be linked to the development of ECC. A caries distribution pattern in which only the labial or palatal surfaces of upper front teeth are affected has frequently been found to be associated with the use of nursing bottles containing sweet liquids, particularly at night (Hallett and O'Rourke 2006). Up to an age of approximately two years this caries pattern dominates (Douglass *et al*. 2001). After this age, fissure and posterior approximal caries develop progressively. ECC also develops when sweet snacks or sweet drinks are consumed in between meals three or more times a day (Creedon and O'Mullane 2001).

Both day and night-time on demand use of a nursing bottle are related to ECC. However, it appears that leaving a nursing bottle with the child while sleeping is linked to more severe caries (Tiberia *et al*. 2007). Anatomic and physiologic conditions can explain why bedtime use is more hazardous. If the child keeps the feeding bottle teat in the mouth during sleep for some time (which can easily be accomplished with light plastic bottles), the teat will obstruct the access of saliva to the upper front teeth while at the same time these teeth remain immersed in liquids which are not swallowed.

In the present study, four behaviours related to day or night-time use of the bottle in two age groups were investigated. One of these variables, bottle use during day-time in 7-month-olds, improved (Table 3). The clinical relevance of this outcome is limited because the programme failed to decrease the night-time bottle use.

The frequency of sugar intake has considerable influence on caries development. If nursing bottles are filled with sugar-containing liquids, the frequency of consumption is greatly increased by the use of plastic bottles because children can handle them themselves, as opposed to glass bottles. The present programme failed to influence consumer behaviour towards buying glass bottles instead of plastic ones.

The finding that the administration of a bottle with cariogenic content was inversely related to breastfeeding theoretically supports the recommendation to breastfeed. However, there is no evidence of beneficial or harmful effects of exclusive and prolonged breastfeeding on the development of dental caries (Kramer *et al*. 2007). The recommendation to continue breastfeeding for up to two years of age or beyond ought to be amended from a dental point of view. Prolonged, on demand bedtime breastfeeding may pose risks to the dentition and should not be recommended.

SC-OHE was able to reduce the number of parents who added sugar to soft puréed baby foods in 7-month-old children by 25% and the consumption of cariogenic beverages at daytime by 8% in 24-month-old children. However, about a quarter of the parents still added sugar, and a majority of the parents still administered cariogenic beverages frequently. Three other non-bottle-related nutritional behaviours did not improve at all (table 3).

The presence of visible plaque is related to ECC (Mohebbi *et al*. 2006). The introduction of SC-OHE did not increase the frequency of tooth brushing in the target population. It may therefore have failed to improve plaque removal.

It has been found that different modes of home fluoride use are usually not linked to ECC (Tiberia el al. 2007). An increase in the use of toothbrushes and fluoridated toothpaste was shown to be insufficient to prevent the development of ECC as long as sugar consumption was not changed (Vachirarojpisan *et al*. 2005). It is therefore less relevant that the present intervention did not increase the frequency of tooth brushing with fluoridated toothpaste. The result that more clients used both fluoridated salt and fluoride supplements is unwelcome because this may increase the risk of fluorosis. Only one source of systemic fluoride should be used (WHO 1994)

In summary, SC-OHE did not change parental behaviour to a clinically relevant extent. This result is in line with the results of a small randomized study by Franco *et al*. (2008) that also used paediatric well-baby visits. This research group tested the effects of four times scripted, standardized counselling within eight months in an inner-city, predominantly Afro-American population. The intervention did not succeed to motivate parents to wean their babies from the bottle by 12 months of age. Other studies have tried to employ other professions and educational methods, but the results were similar. 20-minute-consultations with dentists of a university paedodontic department for parents of 1½-year-old children neither reduced the number of cariogenic snacks and drinks nor improved oral hygiene practices or reduce plaque levels on upper front teeth. Within eleven months, the caries prevalence rose from 5% to 13% (Hetzer *et al*. 1999). Counselling parents of four-year-olds by a dental hygienist in dental practices and scheduling follow-up consultations every four months over a 2-year-period also had no significant effect on dmft or plaque levels (Blinkhorn *et al*. 2003). Another programme with small

group discussions at 3 months intervals was also unsuccessful in modifying bottle drinking practices of infants and only minimally effective with respect to tooth brushing (Vachirarojpisan *et al*. 2005).

Gussy *et al*. (2006) assumed that anticipatory advice by primary care providers will reduce the incidence of ECC. The results of the present and other studies illustrate that this expectation is unlikely to be fulfilled. Behavioural change research has shown that clinician-centred information of individuals has little chance of success. Behaviours should not be regarded as isolated acts under the autonomous control of the individual, but rather as socially conditioned, culturally embedded and economically constrained patterns of living.

There have been studies on oral health education given outside of a clinical setting. Interestingly, the success of these seems to depend a great deal on the environment in which it is delivered. Regular home visits by dental health educators or home visits by fieldworkers giving dietary advice to families predominantly of low socio-economic background proved effective with respect to ECC prevention (Kowash *et al*. 2000, Feldens *et al*. 2008). Frequently performed parent oral health education in an outreach facility including the provision of fluoride tablets lowered the caries prevalence, too (Wennhall *et al*. 2005). Another approach that seems to be effective is to combine oral health education with clinical interventions. Fluoride varnish applications proved to be efficacious in the prevention of ECC (Weintraub *et al*. 2006). 45-minutes counselling sessions for immigrant mothers including motivational interviewing by trained lay health care workers from the same community and follow-up telephone calls lead to a large increase in the number of fluoride varnish applications and to a 32% difference in caries levels between the control and the intervention group (Weinstein *et al*. 2006).

Ideally, interventions should be targeted at the main determinants of disease (Sheiham and Watt 2003). There is a strong case for arguing that a major determinant is the range of commercially available goods. A kind of natural experiment points at this direction: After the unification with West Germany, the former German Democratic Republic was suddenly flooded with a large supply of sugary snacks and plastic nursing bottles that were not available before. Subsequently, the prevalence of ECC quadrupled (Hetzer *et al*. 1995). Considering this experience, it seems essential to integrate oral health education into initiatives aiming at creating an environment that is conducive to oral health. This strategy may include programmes to strengthen the resources of families with young children as well as public policy interventions towards better oral health.

Conclusions and recommendations

Training enables and reimbursement motivated primary care providers to perform oral health education in a more comprehensive and structured way. Through that, clinicians were able to give more advice in an efficient manner, which leads to an increase in parental knowledge. Nevertheless, this does not stimulate changes of attitudes or crucial oral health behaviours to an extent that early childhood caries prevention would be likely.

The difference between the planned extent of health education and what was actually put into practice in a real-life setting was substantial. The attrition with regard to activities and time amounted to about 50%.

In order to prevent ECC it is recommended to implement effective interventions such as wider oral health promotion approaches or clinical fluoride applications.

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References

Blinkhorn, A.S., Gratrix, D., Holloway, P.J., Wainwright-Stringer, Y.M., Ward, S.J. and Worthington, H.V. (2003): A cluster randomised, controlled trial of the value of dental health educators in general dental practice. *Br Dent J* **195**, 395–400.

Chadwick, B.L. and Treasure, E.T. (2005): Primary care research: difficulties recruiting preschool children to clinical trials. *Int J Paediatr* Dent **15,** 197–204.

Creedon, M.I. and O'Mullane, D.M. (2001): Factors affecting caries levels amongst 5-year-old children in County Kerry, Ireland. *Community Dent Health* **18,** 72–78.

Douglass, J.M., Tinanoff, N., Tang, J.M.W. and Altman, D.S. (2001): Dental caries patterns and oral health behaviors in Arizona infants and toddlers. *Community Dent Oral Epidemiol* **29,** 14–22.

Feldens, C.A., Vítolo, M.D. and Drachler, M.L. (2008): A randomized trial of the effectiveness of home visits in preventing early childhood caries. *Community Dent Oral Epidemiol* **35,** 215–223.

Franco, S., Theriot, J. and Greenwell, A. (2008): The influence of early counselling on weaning from a bottle. *Community Dent Health* **25,** 115–118.

Gussy, M.G., Waters, E.G., Walsh, O. and Kilpatrick, N.M. (2006): Early childhood caries: Current evidence for aetiology and prevention. *J Paediatr Child Health* **42**, 37–43.

Hallett, K.B. and O'Rourke, P.K. (2006): Pattern and severity of early childhood caries. *Community Dent Oral Epidemiol* **34,** 25–35.

Hetzer, G., Irmisch, B., Geiger, L. and Kinze, H. (1995): Zur Entwicklung des Kariesbefalls bei 2- bis 16jährigen Dresdener Kindern und Jugendlichen. *Oralprophylaxe* **17,** 142–146.

Hetzer, G. (ed.), Deketh, M., Gräßler, G., Hetzer, G., Irmisch, B., Kinze, H., Viergutz, G. and Wilczek, S. (1999): Zahngesundheit bei Dresdner Klein- und Vorschulkindern. Regensburg: S. Roderer Verlag.

Kay, E. and Locker, D. (1997): Effectiveness of oral health promotion: a review. London: Health Education Authority.

Kowash, M.B., Pinfield, A., Smith, J. and Curzon, M.E.J. (2000): Effectiveness on oral health of a long-term health education programme for mothers with young children. *Br Dent J* **188,** 201–205.

Kramer, M.S., Vanilovich, I., Matush, L., Bogdanovich, N., Zhang, X., Shishko, G., Muller-Bolla, M., Platt, R.W. (2007): The Effect of Prolonged and Exclusive Breastfeeding on Dental Caries in Early School-Age Children. New Evidence from a Large Randomized Trial. *Caries Res* **18,** 484–488.

Mohebbi, S.Z., Virtanen, J.I., Vahid-Golpayegani, M., Vehkalahti, M.M. (2006): Early childhood caries and dental plaque among 1-3-year-olds in Tehran, Iran. *J Indian Soc Pedod Prev Dent* **24**,177–181.

Robke, F.J. and Buitkamp, M. (2002): Häufigkeit der Nuckelflaschenkaries bei Vorschulkindern in einer westdeutschen Großstadt. *Oralprophylaxe* **24,** 59–65.

Rossi, P.H., Lipsey, M.W. and Freeman, H.E. (2004): Evaluation: A Systematic Approach. 7th ed. London: Sage.

Sheiham, A. and Watt, R. (2003): Oral health promotion and policy. In: The prevention of oral disease, 4th edn.; ed. Murray, J.J., Nunn, J.H. and Steele, J.G. pp 241–257. Oxford: Oxford Medical Publications.

Tiberia, M.J., Milnes, A.R., Feigal, R.J., Morley, K.R., Richardson, D.S., Croft, W.G. and Cheung, W.S. (2007): Risk factors for early childhood caries in Canadian preschool children seeking care. *Pediatr Dent* **29**, 201–208.

Vachirarojpisan, T., Shinada, K. and Kawaguchi, Y. (2005): The process and outcome of a programme for preventing early childhood caries in Thailand. *Community Dental Health* **22,** 253–259.

Weinstein, P., Harrison, R. and Benton, T. (2006): Motivating mothers to prevent caries: confirming the beneficial effect of counseling. *J Am Dent Assoc* **137,** 789–93.

Weintraub, J.A., Ramos-Gomez, F., Jue, B., Shain, S., Hoover, CI., Featherstone, J.D. and Gansky, S.A. (2006): Fluoride Varnish Efficacy in Preventing Early Childhood Caries. *J Dent Res* **85,** 172–176.

Wennhall, I., Martensson, EM., Sjunnesson, I., Matsson, L., Schröder, U. and Twetman, S. (2005): Caries-preventive effect of an oral health program for preschool children in a low socio-economic, multicultural area in Sweden: results after one year. *Acta Odontol Scand* **63,** 163–167.

WHO (1994). Fluorides and oral health. WHO Technical Report Series 846. Geneva: World Health Organization.