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A randomised control trial of oral health education provided by a health visitor to parents of pre-school children

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Objectives To determine the effect of oral health education carried out by a specially trained health visitor on the dental health of young children. ***Design and Setting*** Children, who were recruited during their 8-month distraction-hearing test, were randomly allocated to intervention and control groups. A home visit by the health visitor was arranged to parents in the intervention group who were given dental health advice. A second home visit, when the child was about 20 months old, focused on a completed diet record sheet and discussions about what and when the child was eating and drinking. Children in the intervention group received a toothbrush and toothpaste containing 440 ppm fluoride at both visits while those in the control group received the level of care usually provided by health visitors in the area. The children's teeth were examined when they were three years old and two years later as part of a census survey of 5-year-old children in the area. ***Main outcome measures*** The numbers of decayed, missing and filled tooth surfaces. ***Results*** 251 children were recruited to the control group and 250 to the intervention group. At age three, they were examined; the mean dmfs scores were 2.19 (95% Confidence Interval: 1.41-2.97) in the control group (n=171) and 2.03 (CI: 1.39-2.67) in the intervention group (n=181). During the census survey 276 of the children in the study were examined at school. At this age the mean dmfs scores were 4.84 (CI: 3.39-6.29) in the control group (n=129) and 3.99 (CI: 2.54-5.04) in the intervention group (n=147). However, the mean dmfs of the remaining 2,253 children who were examined was 5.94 (CI: 5.55-6.33). ***Conclusions*** No statistically significant differences in mean dmfs scores were found between the control and intervention groups of children, although, as the children grew older, the gap between them widened. However, the mean dmfs score of other 5-year-olds in the area was significantly worse than that of children in the intervention group. Asking the control parents to take part in the study and examining their children at three years may have had an effect on their dental health status and have made it more difficult to detect any differences achieved by the programme.

Key words: Children, dental caries, dental health, paediatric toothpaste, oral health education

Introduction

The mean number of primary teeth with any known caries experience among 5-year-old children in England and Wales fell from 3.3 to 1.6 between 1973 and 1983 but there was no change between 1983 and 1993 (O'Brien, 1994). This finding made it clear that greater efforts were needed to improve the dental health of this age group. Early intervention was necessary since patterns of dental health behaviour are established early in children's lives (Jones *et al.,* 1996), before they attend at a dental surgery.

It has been suggested that health visitors have an important role to play in this process (Court Report, 1976; Ottley, 2002). Health visitors in Britain are part of a multidisciplinary team providing support to parents of young children especially in areas of deprivation. At the time of the research they provided developmental checks of young children at 10-14 days, 7-9 months, 20 months and three years. They also provide health education advice to parents and have been found to have the necessary qualities to act as dental health educators but there is a need to facilitate and improve their knowledge and attitudes to enable them to be effective (Quinn and Freeman, 1991). The majority of health visitors receive their dental knowledge from community dental officers (Quinn and Freeman, 1994) and thus involvement of the community dental service is important (Bentley and Holloway, 1993; Davies and Croucher, 1993).

Health visitors tend to give advice to those parents whom they think will benefit (Quinn and Freeman, 1991). As a result those with problems are more likely to receive advice. Where this occurs it is difficult to assess the effectiveness of dental health education (Davies and Whittle, 1992). A study in the North of England confirmed the findings of a national survey (Todd and Dodd, 1985) in that, although all health visitors reported that they advised mothers to take their children to the dentist, only 19% of mothers remembered this (Bentley, 1994). It was suggested that giving mothers a small gift of a toothbrush and toothpaste may help them remember to register their children.

Research on the effectiveness of health visitors in oral health promotion is lacking although registration rates for 0 to 2-year-old children in the early 1990's were higher in the North Western Region than in England as a whole following a major oral health promotion initiative involving health visitors (Bentley and Holloway, 1993; Fuller, 1994). Whether this had improved their dental health, however, was unknown. Health visitors provided some of the dental advice in a successful programme in Manchester (Davies *et al.,* 2005) but practice nurses and dental staff were also involved.

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Thus the study involved the setting up of a programme to provide oral health education by a health visitor with the aim of assessing its effectiveness in terms of dental health. It was approved by the Burnley, Pendle and Rossendale Local Research Ethics Committee.

Method

A health visitor was recruited for the study and attached to the local community dental service. Following induction, she attended a dental health education course at a local college. General dental practitioners (GDPs) in Burnley, Pendle and Rossendale, where dental health is known to be particularly poor, were notified about the research. The area was chosen as representative of localities where oral health promotion initiatives are most needed and to minimise the numbers required to achieve a statistically significant improvement in oral health. Parents were initially approached during their child's 8-month distraction-hearing test at a health centre, and asked if they would take part in the study. Demographic data as well as social class, ethnic origin and educational qualifications of parents were collected to ensure that test and control groups had similar characteristics. Recruitment took place during 1999 and 2000. The results of this part of the study have already been published (Williams *et al.*, 2002).

The chosen sample size of 250 in each group was calculated by considering that, allowing for a 30% loss to follow-up, a final sample size of 175 at three years was sufficient to detect a difference in dmft scores between the groups of 0.3 standard deviations. Based on previous work in a comparable locality, Salford (Davies and Whittle, 1992), with a mean$\pm$SD dmft of 1.97$\pm$3.36 this gave a minimum detectable difference of 1.0, roughly a 50% reduction. This was a full-time caseload and thus it was decided to employ a full-time health visitor to carry out the project rather than a number of part-timers because it was felt that the level of commitment would be higher and the oral health education provided more uniform in nature.

The parents were allocated to either the intervention or control group (in balanced blocks, stratified by ethnicity and location, using sealed envelopes prepared by Lancaster University) and an appointment was made for the health visitor/researcher to visit those in the intervention group at their homes.

Dental health advice to parents was based on that recommended by the Health Education Authority (Health Education Authority, 1996). This was re-enforced by giving the parent an appropriate leaflet, a tube of 440 ppm F toothpaste and a child's toothbrush. The leaflets, *Giving teeth a good start* (Fuller, 1994), were available in several languages. The main messages were:

- Avoid sugar right from the start. Don't encourage a sweet tooth.
- Check labels for sugar, syrups, honey, glucose and dextrose, they all cause tooth decay.
- Fresh fruit, vegetables and toast are great for snacks between meals.
- Start brushing every day as soon as the teeth come through.
- Your baby can learn to brush by watching you.
- Choose a small headed toothbrush and fluoride toothpaste.

Parents of the control children received no dental input other than the level of dental advice currently provided by health visitors in the area. This included advice about registering with a dentist, avoiding sugary drinks, sweets and medicine and toothbrushing. No printed material was provided.

The second home visit took place when the child was about 20 months old. A diet record sheet and instructions on how to complete it accompanied the letter, which informed parents about the visit. Discussions, about what and when the child was eating and drinking, were focused on this completed sheet. Tooth brushing with fluoride toothpaste was also highlighted. The parent was again given the leaflet, toothpaste and a toothbrush. In all 169 (67.6%) of the 250 parents in the intervention group received two visits, 47 (18.8%) received the first visit but not the second and 19 (7.6%) parents the second visit only.

When the children were 36 months old, parents of both groups were visited again. An experienced dental examiner (HFW), who had been trained for British Association for the Study of Community Dentistry (BASCD) co-ordinated surveys (Pine, *et al.,* 1997), carried out the dental examinations. This dentist did not know to which group the children belonged. Teeth were examined using the criteria used in the BASCD surveys (Pitts, *et al.,* 1997).

A second trained dental examiner (CMB), who had not been involved in the original programme, carried out the BASCD co-ordinated survey during 2003/04 (Pitts *et al.,* 2005) by visiting all the schools in the study area and examining all 5-year-old children present. Parents of children who had taken part in the project were contacted and asked to consent to the data collected from their children being used for a further analysis.

Ninety-five percent confidence intervals were calculated for ds, ms, fs and dmfs scores and compared to detect statistically significant differences.

Results

501 children were recruited to the study, 251 in the control group and 250 in the intervention group. At three years 171 (68.1%) and 181 (72.4%) children in the respective groups were examined. The mean dmfs score in the control group was 2.19 and that in the intervention group was 2.03 (Table 1). The individual means for decayed, missing and filled surfaces were 1.84, 0.34 and 0.01 respectively for the control group and 1.92, 0.07 and 0.04 for the intervention group. None of the differences were significant.

In the 2003/04 census survey 2,529 children were examined at school. One hundred and twenty nine (51.4%) of these had been in the control group, 147 (58.8%) in the intervention group and 2,253 other children (the census group). The mean ages of the children in the three groups were 5.20, 5.13 and 5.56 years respectively. Table 2 shows that the mean ds scores were 4.12 (95% confidence interval (CI) 2.77-5.47) for the control group, 3.35 (2.35 to 4.35) for the intervention group and 4.71

Table 1. Mean numbers and confidence intervals (CI) of decayed, missing and filled surfaces at three years

	Control Group (n=171)			*Intervention Group (n=181)*		
	Mean	*Lower CI*	*Upper CI*	*Mean*	*Lower CI*	*Upper CI*
ds	1.84	1.25	2.43	1.92	1.31	2.53
ms	0.34	-0.10	0.78	0.07	-0.06	0.20
fs	0.01	0.00	0.20	0.04	-0.03	0.11
dmfs	2.19	1.41	2.97	2.03	1.39	2.67

Table 2. Mean numbers and confidence intervals (CI) of decayed, missing and filled surfaces at five years

	Control Group (n=129)			Intervention Group (n=147)			Census Group (n=2253)		
	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI	Mean	Lower CI	Upper CI
ds	4.12	2.77	5.47	3.35	2.35	4.35	4.71	4.37	5.05
ms	0.40	0.14	0.66	0.37	0.06	0.68	0.87	0.72	1.02
fs	0.33	0.06	0.60	0.27	0.11	0.43	0.36	0.30	0.42
dmfs	4.84	3.39	6.29	3.99	2.94	5.04	5.94	5.55	6.33

(4.37 to 5.05) for the census group. Thus the mean of the intervention group was significantly lower than that of the census group.

The mean ms scores were 0.40 (CI 0.14-0.66) for the control group, 0.37 (0.06-0.68) for the intervention group and 0.87 (0.72-1.02) for the census group. Again the mean for the intervention group was significantly lower than that of the census group. For this variable the means of the control group and census group were also significantly different.

No significant differences were detected among the three groups for filled surfaces but the mean dmfs score for the intervention group was significantly lower than that of the census group. The means (and confidence intervals) were 4.84 (3.39-6.29) for the control group, 3.99 (2.94-5.04) for the intervention group and 5.94 (5.55-6.33) for the census group.

Discussion

The dental examination results at three years were very disappointing with no significant differences between the two groups. The mean dmfs score was lower in the intervention group but the mean number of decayed surfaces was higher (Table 1). The largest difference was in the mean number of missing surfaces (0.34 in the control group compared with 0.07 in the intervention group).

Although most of the advice was given to mothers, some fathers were also involved. However, the number of the latter was so small that it was not possible to determine if the gender of the parent had any influence on the results.

Of course not all children/parents in the intervention group received the two home visits. Twenty-five (10.0%) received no visit at all and 66 (26.4%) received only one visit. This has inevitably diluted the effect of the intervention but reflects the real life situation. If the programme was to be rolled out across the area some parents, despite everyone's best efforts, would not be contacted.

Another study, which was carried out at about the same time but in general dental practice, also involved counselling of mothers of pre-school children, but in this case by dental health educators (Blinkhorn *et al*., 2003). It also failed to detect any significant difference between test and control children. Parents received up to eight one-to-one counselling sessions held at the child's general dental practice. The authors reported that three-quarters of the mothers attended at least five of these sessions. It was argued that two years was too short a period to reap the benefits of this concentrated educational programme. However, the results, taken together with those of the present study, would tend to confirm the conclusion of a systematic review of the effectiveness of oral health promotion that a cost effective method for reliably promoting behaviour to improve oral health has not yet been established (Kay and Locker, 1998). This contrasts with the results of a study in Leeds, which demonstrated statistically significant reductions in caries levels at three years where the dental health education was provided three-monthly or annually (Kowash *et al*., 2000). In this dental health educators provided the education in the homes of the parents of the children.

A different way of allocating children to intervention and control groups was tried in Manchester where two primary care group areas were chosen for study (Davies *et al*., 2005). In one area parents and children were recruited into the programme, in the other they were not. A staged intervention dental health promotion programme began in the intervention area when the children were eight months old. The control parents were not contacted at the beginning of the programme so that there was no opportunity for cross contamina-

tion. When they were examined at 3-4 years, children in the intervention group had significantly lower dmft and dmfs scores than children in the control group. The intervention children received regular postings of toothpaste containing 1450 ppm fluoride may have been the main factor in the success of the programme. Since it has been found that the mean dmft score of children, who received such toothpaste through the post every 12 weeks from 12 months to 5.5 years, was significantly lower than the mean of those in a control group while the mean of those who received toothpaste containing 440 ppm F was not (Davies *et al*., 2002).

The setting for the intervention, whether at home, at the dental practice or receiving toothpaste through the post would be expected to make a difference to the results. This study was looking at providing information at an age before most children are currently visiting a dentist. Thus, providing the programme at dental practices was not feasible. However, posting toothpaste, if as successful, is less labour intensive and therefore likely to be more cost effective.

At five years no statistically significant difference was found between the intervention and control groups of children although, as the children had grown older, the gap between them had widened. The dental examination of children at three years may have contributed to this by focusing attention on dental care in families in both groups and therefore diluting the effect of the intervention. However, the mean dmfs score of children of 5-year-olds in the area was significantly worse than that of children in the intervention group. Asking control parents to take part in the study and examining their children at three years may have had an effect on their dental health and have made it more difficult to detect any differences achieved by the programme. Control groups have been found to have improved significantly from baseline in studies which aimed to improve oral hygiene (Feil *et al.,* 2002), periodontal health (Owens *et al.,* 1997) and sensitivity (Yates *et al.,* 2004) but this result appears to be unique in a caries reduction intervention.

The study indicated that the randomised control trial might not be the best way to evaluate oral health promotion programmes because it is not possible to restrict information to the intervention group. It may be best to randomise localities so that the control group is not alerted to the intervention and changes its behaviour. This was the procedure adopted in the Manchester study (Davies *et al*., 2005).

Future studies, therefore, should use toothpaste with the higher concentration of fluoride and more frequent visits, at least annually as in the Leeds study. These would seem to be necessary to make an impact on levels of dental caries. In addition care needs to be taken in selecting the control group so that the potential for cross contamination is avoided.

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