

# Use of professionally administered fluoride among Danish children

Dorte Arnbjerg

Department of Oral Epidemiology and Public Health, Royal Dental College, Faculty of Health Sciences, University of Aarhus, Aarhus, Denmark

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The objective of this study was to determine the use of professionally administered fluoride in Denmark in 1991. Of the 275 addressed Danish municipalities 98% returned the questionnaire. Ten per cent of the municipalities with public clinics were using systematic mouthrinses with 0.2% fluoride, compared with 25% of the municipalities without public clinics ( $p < 0.01$ ). In comparison, 93% of the municipalities reported having used mouthrinses in 1985. Fluoride swabbing was used by 69% of the municipalities not using mouthrinses and by 47% of the municipalities still using fluoride mouthrinses ( $p < 0.02$ ). Duraphat lacquer was used in 92% of all municipalities, fluoride gel in 3% and fluoride tablets in 8% of the municipalities. It is concluded that during the past 6 years the use of professionally administered fluoride among Danish children has changed from mass-prophylactic mouthrinses to maneuvers aimed more at the specific needs of the individual. □ *Fluoride; prevention; utilization*

D. Arnbjerg, Department of Oral Epidemiology and Public Health, Royal Dental College, Faculty of Health Sciences, University of Aarhus, DK-8000 Aarhus, Denmark

In many countries a declining caries incidence has been observed in recent years (1, 2). The decline has altered the intraoral disease pattern: at a lower caries prevalence a higher proportion of the caries lesions are located at the occlusal surfaces. Further, the caries progression rate has been lowered. This changing caries pattern has raised the question about which types of prophylactic maneuvers are the most efficient. The use of fluoride as a mass-prophylactic procedure has been debated, since it is well known that fluoride is most effective as a caries-preventive agent on free smooth surfaces and least efficient on fissure surfaces (3).

The methods of fluoride dispersion in populations have been a controversial issue for years (4). In spite of a lower caries activity the disease is not eliminated, and children with a high degree of caries vulnerability are still found. Caries-preventive initiatives from the dental profession must therefore continue, both at an individual and at a group level. The challenge is to meet the obligations of the changed circumstances and modify the preventive programs.

In recent years the appropriateness and/or the quality of delivered oral health care has been debated (5). One of the proposed means of quality assurance in oral health care is utilization reviews, with identification of providers with a much higher or lower utilization pattern than the norm (6, 7).

The aim of the present study was therefore to determine the variation in the use of professionally administered fluoride among Danish children. Further, the aim was to determine whether the use of fluoride mouthrinses had been altered concurrently with the change in the caries pattern.

## Materials and methods

In Denmark oral health care for children is free of charge for individuals under 18 years when they attend the public-supported system. Of all children under 18 years of age 98-99% are treated in this system (8). The free oral health care for children operates under two different scenarios: most of the children live in municipalities running oral

health care for children from public clinics, whereas the remaining approximately 10% of the children belong to municipalities where children are cared for in private clinics.

A questionnaire on the use of fluoride among Danish children was developed. The questionnaire included questions on the use of mass-prophylactic fluoride mouthrinses and on the use of individually based methods such as fluoride swabbing, lacquer, gel, and fluoride tablets.

In October 1991 the questionnaire was mailed to 270 of the 275 Danish municipalities. All 207 municipalities with public clinics run by the municipality were approached. Ten of these were engaged in some kind of intermunicipality oral health care. Only 1 questionnaire was sent to these 10 municipalities, which in the data analysis are treated as 4 independent municipalities, reducing the number of municipalities with public clinics from 207 to 201. Of the 68 municipalities with a private dentist taking care of the oral health care for children, 63 were approached. In the remaining five municipalities, no dental officer was employed at the time of the study.

A covering letter and an envelope with prepaid postage were sent with the questionnaire. On each questionnaire the municipal code (three-digit number) was written for later identification of the respondents. One month after the questionnaire had been sent out, a reminder with a questionnaire and a new envelope with prepaid postage

were mailed to the non-responding municipalities.

The data were processed using the statistical package SPSS/PC+ (9). Simple frequency tables and tables stratified on type of oral health care sector were processed and analyzed. For comparison of the relative use of fluoride swabbing and Duraphat lacquer, the data were recoded. In this recoding each municipality was given a code indicating which of the two fluoride types was used most frequently. The chi-square test was used for comparison of groups.

## Results

Overall 267 of the 270 addressed municipalities returned the questionnaire, yielding a response rate of 99%. Two hundred and forty-six (91%) responded after the first enquiry, and 21 after the reminder had been mailed. All returned questionnaires had been answered. All municipalities with public oral health care clinics answered, compared with a response rate of 95% in municipalities without public clinics.

Of the 201 responding municipalities with public clinics, 89.5% were not using mass-prophylactic fluoride mouthrinses in October 1991. Of the 60 responding municipalities without public clinics 75% were not using fluoride mouthrinses ( $p < 0.01$ ).

In Table 1 the distribution of the time of discontinuation of mass-prophylactic flu-

Table 1. Frequency distribution of the time of discontinuation of mass-prophylactic fluoride rinses

|                           | Municipalities                   |                                   |
|---------------------------|----------------------------------|-----------------------------------|
|                           | With public clinic ( $n = 201$ ) | With private clinics ( $n = 60$ ) |
| Still rinsing             | 10.5                             | 25.0                              |
| Discontinuation           |                                  |                                   |
| After January 1990        | 8.0                              | 11.7                              |
| After January 1988        | 23.9                             | 46.7                              |
| After January 1986        | 24.4                             | 8.3                               |
| Earlier than January 1986 | 24.4                             | 3.3                               |
| Never started             | 8.0                              | 5.0                               |

Table 2. Use of other types of professionally administered fluoride in municipalities with and without public clinics and in accordance with the continuous use of fluoride mouthrinses. Percentage of the number of municipalities in the group

|                   | With public clinics       |                               | Without public clinics    |                              |
|-------------------|---------------------------|-------------------------------|---------------------------|------------------------------|
|                   | Rinsing,<br><i>n</i> = 21 | No rinsing,<br><i>n</i> = 179 | Rinsing,<br><i>n</i> = 15 | No rinsing,<br><i>n</i> = 45 |
| Fluoride swabbing | 43                        | 71                            | 54                        | 63                           |
| Duraphat lacquer  | 100                       | 94                            | 82                        | 84                           |
| Fluoride gel      | 6                         | 1                             | 0                         | 11                           |
| Fluoride tablets  | 10                        | 8                             | 7                         | 3                            |

oride rinses is shown. Of the municipalities with public oral health care clinics, 8% had never used fluoride mouthrinses. For the municipalities without public clinics the corresponding figure was 5%. Further, Table 2 shows that a greater number of the municipalities with public oral health care clinics had discontinued such use, and this discontinuation had taken place earlier than in the municipalities without public clinics.

On the average, fluoride swabbing was used in 66.4% of all responding municipalities. Furthermore, 92.5% of the municipalities used Duraphat lacquer, 2.8% used fluoride gel, and 7.3% were using fluoride tablets. In Table 2 the frequency of these four types of professionally administered fluorides is shown by type of municipality, together with the rinsing status of the municipality. The only statistically significant

difference between municipalities using fluoride mouthrinses and those not using fluoride mouthrinses was found for fluoride swabbing. For all four fluoride methods there was a great variation in the percentage of children receiving the preventive method.

In Table 3 the use of Duraphat lacquer and fluoride swabbing is compared. Most municipalities treat children more frequently with Duraphat lacquer than with fluoride swabbing. This is the case for all municipalities with public clinics and for the municipalities without public clinics that are still using fluoride mouthrinses.

## Discussion

This study has focused on the use of five types of fluorides: mouthrinses, swabbing,

Table 3. The relative use of fluoride swabbing and Duraphat lacquer in municipalities with and without public clinics. Percentage distribution of the total number of municipalities in each category

|  | With public clinics       |                                | Without public clinics    |                               |
|--|---------------------------|--------------------------------|---------------------------|-------------------------------|
|  | Rinsing,<br><i>n</i> = 21 | Not rinsing,<br><i>n</i> = 179 | Rinsing,<br><i>n</i> = 15 | Not rinsing,<br><i>n</i> = 45 |
| Swabbing more used than lacquer              | 17                        | 25                             | 0                         | 22                            |
| Swabbing less used than lacquer              | 50                        | 58                             | 100                       | 33                            |
| Swabbing and lacquer used to an equal extent | 33                        | 17                             | 0                         | 44                            |

Duraphat lacquer, gel, and tablets. In Denmark all these types of fluoride are professionally administered. Other types of fluoride exposures such as fluoride from prepared food, beverages, and toothpaste are not considered in this study. In Denmark the drinking water has never been artificially fluoridated, and in the past fluoride mouthrinses and fluoridated toothpaste have been the two major means of fluoride exposure.

The findings in this study show that the preventive methods involving fluoride in the Danish oral health care sector for children has changed as the caries pattern has changed. Fluoride mouthrinses dispersed to all schoolchildren are still used both in municipalities running oral health care for children from public clinics and in municipalities using private clinics for the same task, but with a significantly higher percentage of the municipalities with private clinics still using mouthrinses. This earlier and more extensive termination of the use of fluoride mouthrinses in the municipalities with public clinics might indicate discrepancies in the decision-making under different structural organizations of the oral health care, as proposed by Donabedian (10).

The mass-prophylactic approach has been changed to a preventive approach, which to a greater extent might be based on an evaluation of the specific need of the individual child. Of the four individual methods covered in this study, Duraphat lacquer was most commonly used, and less than 8% of the municipalities were using fluoride gels and/or tablets. It is interesting to note that the mouthrinsing status of the municipality did not have a significant impact on the frequency of use of other types of fluoride, except for fluoride swabbing, which was more commonly used in municipalities not using fluoride mouthrinses. There was a great variation between the municipalities in the use of the four different types of fluoride. Both these facts indicate that more emphasis should be placed on the indications for the use of these preventive procedures.

Bohannon et al. (11) pointed out, when discussing the future of fluoride mouthrinses, that decisions on implementation, main-

tenance, or cessation of a preventive program should include consideration of the following factors: 1) Can the preventive procedure work; 2) Does the preventive procedure work in practice; and 3) Is the preventive procedure worth doing.

Focusing on the use of fluoride mouthrinses among children, it has earlier been concluded that fluoride mouthrinses are useful in caries prevention (12). Further clinical trials have indicated that the procedure might work in practice (12, 13).

Concerning the third issue, 'Is the preventive procedure worth doing', it is important to realize that resources spent on one project are not available for other purposes; thus the opportunity cost of a given procedure must be determined. For fluoride mouthrinses this still needs thorough investigation in a Danish setting, and further studies on the cost-benefit of fluoride mouthrinses are needed.

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