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ORIGINAL ARTICLE

Caries preventive methods in child dental care reported by dental hygienists, Norway, 1995 and 2004

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Abstract

Dental hygienists are used as first-line personnel in child dental care in Norway, and have an increasing influence on the delivery of preventive dental services. The purpose of this study was to describe: (1) preventive methods reported by hygienists in child dental care in Norway and (2) changes in preventive care during the 9-year period 1995 to 2004. Questionnaires were sent to all dental hygienists in the public dental services in Norway in 1995 and 2004; 70% (199 of 286) were returned in 1995 and 71% (210 of 297) in 2004. The hygienists considered one-third of children to be at risk of caries and spent 45 min of preventive care on these children every 16th month, while the remaining children were given 15 min of prevention every 20th month. One-third of the hygienists provided fluoride varnish for all children and one-fourth placed sealants routinely. Ninety percent of the hygienists reported that all children were given information on diet, hygiene, and fluoride. Most of the preventive practices of dental hygienists reflected limited changes in the period 1995 to 2004. However, the hygienists had reduced the use of fluoride varnishes and less often recommended fluoride tablets. The majority of hygienists reported that they individualized clinical prevention, while individual oral health information was standardized and given to all children. The results indicate that in 2004 a preventive approach combining individual information for all with intensified clinical prevention for children considered at risk was followed in child dental care.

Key Words: *Dental hygiene, fissure sealants, fluoride varnishes, pediatric dentistry, preventive dentistry*

Introduction

The public dental services offer free dental care to all children in Norway and preventive dental care is given priority by law. In child dental care, the policy of the public dental services in recent years has been that dental hygienists perform routine dental examinations and preventive care of children and refer children they are not competent to treat to dentists [1]. Both the number of dental hygienists and the proportion of children given preventive care by a dental hygienist alone are increasing.

The policy in the public dental services changed in the 1990s from being population-based towards a risk-based approach. In 1996, new national recommendations on the use of fluoride were issued emphasizing fluoride toothpaste as the fluoride vehicle for all, while other fluoride methods were to be based on individual evaluation of need for caries prevention [2]. The policy change on the use of fluorides has been heavily criticized and has created confusion among dental personnel and the general population.

A substantial proportion of the children in Norway (70% of 5-year-olds, 66% of 12-year-olds, and 51% of 18-year-olds) needed no restorative dental care at examination in 2003 and most of these children had contact with dental hygienists only. As the number of dental hygienists grows, the opinions and practices of hygienists regarding prevention are increasingly important for preventive services for children.

The purpose of this study was to describe: (1) the preventive methods reportedly used by dental hygienists in child dental care in Norway and (2) the changes in preventive care during the 9-year period 1995 to 2004.

Materials and methods

Questionnaires were sent to all dental hygienists working in the public dental services in Norway in 1995 and 2004. Replies were anonymous.

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Table I. Characteristics of dental hygienists working in the public dental services in Norway in 1995 and 2004

	1995		2004		
	$n=199$		$n=210$		
	Mean	SD	Mean	SD	*p*-value
Age	39.6	9.2	39.6	10.6	ns
Work experience (years)	12.0	7.5	14.0	9.8	0.03
% female	100		98.1		ns
% working full-time	50.3		57.7		ns
% working 50% or more with children	95.9		91.7		ns

In 1995, questionnaires were mailed to all dental hygienists listed by the national association for dental hygienists as working in the public dental services. In 2004, all dental hygienists on the Ministry of Health's register of hygienists received a mailed questionnaire and those who worked in the public dental services were included in the analyses.

Questionnaires were returned by 70% (199 of 286) in 1995 and in 2004 by 71% (210 of 297) of all hygienists in the public services. Preventive strategies and methods used by dental hygienists in 1995 have been reported previously [3, 4].

The questionnaires provided information on background variables: the age and sex of the dental hygienists; the number of years they had been working with children; whether they worked full-time; and what proportion of their working time was spent on child patients.

Information on preventive strategies was collected by questions on methods, settings, and target groups. Information was gathered on preventive methods used in the clinic, including health education (hygiene, diet, and use of fluoride), and on the need for additional visits to the dentist or the hygienist for preventive care. Hygienists were asked to what extent they targeted children considered at risk of dental caries for preventive dental care. Caries risk was assessed by clinical judgments of the hygienists in accordance with the practice in the Norwegian dental services. Questions on routines for use of fluoride varnish and fissure sealants and whether the hygienists performed group-orientated preventive care outside the clinic were posed.

The hygienists were requested to report on the extent to which they recommended fluoride vehicles (toothpaste, tablets, mouth rinse, and chewing gum) for children, and whether they considered advice on use of fluoride, dental hygiene, or diet as the most important preventive strategy for children with high caries risk.

Resource consumption for prevention was measured by questions on the amount of time used for prevention per child and on length of the most frequently used and maximum recall interval.

Results were cross-tabulated by calendar year, and differences were tested using *t*-tests and chi-square tests. The level of significance was set at $p<0.05$.

Results

Table I summarizes the background information on the dental hygienists working in the public dental services in 1995 and 2004. Work experience was 2 years longer in 2004 than in 1995 ($p=0.03$). The results indicated a trend (not significant) from 1995 to 2004 towards a higher proportion of hygienists working full-time and a decline in the proportion of work time the average hygienist spent on children. The mean age of the hygienists did not change over time, but four male hygienists were working in the public dental services in 2004 compared with none in 1995.

Table II gives the proportions of dental hygienists who used the different preventive methods in 1995 and 2004. Regarding non-risk children, the proportions of hygienists that gave information on diet increased significantly in the period. Significantly fewer of the dental hygienists provided fluoride varnish for non-risk children in 2004 than in 1995. In addition, the results indicated a trend towards fewer hygienists informing children about the use of fluoride ($p=0.053$) (Table II).

Few dental hygienists changed their choice of preventive method for children thought to be at risk of caries, but significantly fewer provided fluoride varnish in 2004 than in 1995 (Table II), and those who did use fluoride varnish did so less frequently (Figure 1).

Both in 1995 and 2004, approximately 20% of the dental hygienists routinely provided fissure sealants, while most of the hygienists seldom provided this type of treatment (Figure 2).

Table II. Proportions (%) of dental hygienists using different preventive methods for at-risk and not at-risk children in 1995 and 2004

	At-risk children			Not at-risk children		
	1995	2004	*p*-value	1995	2004	*p*-value
Application of fluoride varnish	98	87	<0.001	60	37	<0.001
Information on diet	92	89	ns	67	80	0.003
Information on oral hygiene	96	92	ns	87	86	ns
Information on fluoride	92	90	ns	78	71	ns
Additional visits to hygienist	95	91	ns	2	1	ns
Additional visits to dentist	12	8	ns	0.5	0.5	ns

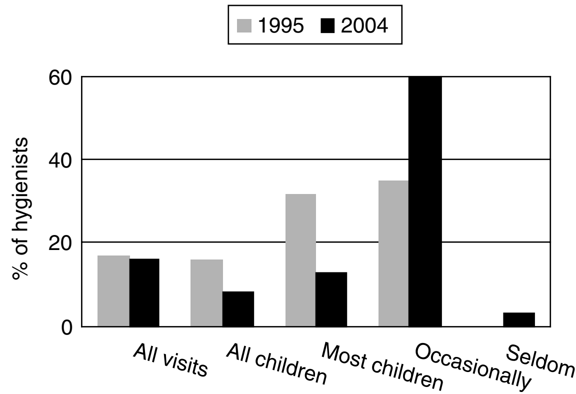

Figure 1. Frequency of providing fluoride varnish in 1995 and 2004. Proportions (%) of dental hygienists.

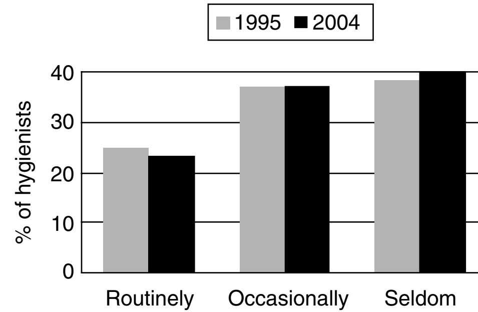

Figure 2. Frequency of fissure sealing by dental hygienists in 1995 and 2004. Proportions (%) of dental hygienists.

Recommendations for the use of fluoride at home are given in Table III. The proportion of children recommended to use fluoride toothpaste increased from 1995 to 2004 and in 2004 fluoride toothpaste was recommended for all children by 97% of the dental hygienists. More dental hygienists recommended fluoride mouth rinse and fewer recommended fluoride tablets in 2004 compared with 1995.

Hygienists' opinions about the relative importance of advice on preventive strategies for children at risk of caries changed significantly from 1995 to 2004. In 2004 compared with 1995, fewer dental hygienists advised on the use of fluoride as the most important preventive strategy ($p<0.05$) (Figure 3). In 2004, nearly 60% ranked advice on oral hygiene as being most important compared with 40% in 1995.

Table IV gives the routines related to preventive dental care practiced by hygienists in 1995 and 2004. Hygienists considered more children (29%) at risk of caries in 2004 than in 1995 (14%). In the same period, the time spent by hygienists on dental care of an at-risk child decreased significantly, and the recall intervals, both the maximum and most used interval, that they spent on children increased, too. Group-orientated preventive care outside the dental clinic was performed by fewer dental hygienists in 2004 than in 1995 (82% vs 90%).

Discussion

Of the dental hygienists working in the public dental services in 1995 and 2004, 70% participated in this study. Age and geographical localization of the respondents were no different from those of all dental hygienists working in the public dental services in Norway, so it is reasonable to conclude that their opinions and practices were representative of dental hygienists giving preventive care to children in Norway.

The proportion of dental hygienists to dentists in the public dental services in Norway was 1 : 4.5 in 1995 and 1 : 3.0 in 2004. The absolute number of dentists decreased in the period, while the number of hygienists increased slightly. As a consequence, a growing proportion of children in Norway are examined and given preventive care by dental hygienists.

Preventive care 2004

This study indicates that dental hygienists delivered a substantial amount of preventive care to their child patients in 2004. Since the 1980s, total resources allocated to the public dental services have been reduced and, according to both administrators and personnel in the dental services, preventive care has been downgraded. The dental hygienists considered one-third of the children to be at risk of caries and spent 45 min of oral preventive care on these children every 16th month, while the remaining children were given 15 min of prevention every 20th month. It can be calculated from the present results that children received on average 25 min of preventive care from the dental hygienist in 2004. If all Norwegian children were treated by dental hygienists, the dental services would require 250 hygienist person-years to provide this care.

Dental hygienists spent three times as much time on preventive care on risk children than they did on

Table III. Recommendations for fluoride use given to all, most, some or few children in 1995 and 2004. Proportions (%) of dental hygienists

	1995				2004				
	All >90%	Most 90–50%	Some 49–10%	Few <10%	All >90%	Most 90–50%	Some 49–10%	Few <10%	*p*-value
Toothpaste	81	19	0	0	97	3	0	0	0.00
Tablets	24	56	19	0.5	14	53	31	1.5	0.006
Mouth rinse	2	19	58	21	3	28	57	11	0.032
Chewing gum	1	3	18	78	1	4	20	75	ns

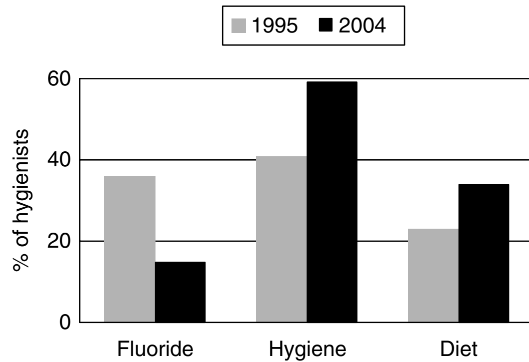

Figure 3. The most important preventive advice for at-risk children in the opinion of dental hygienists in 1995 and 2004. Proportions (%) of dental hygienists.

non-risk children. This practice has to be re-evaluated, because recent studies conclude that intensified prevention for children considered at risk of caries has little effect and is costly [5–7].

The majority of hygienists reported using a risk strategy based on individualized preventive care. Only one-third of the hygienists provided fluoride varnish for all children and one-fourth placed fissure sealants routinely. This concurs with national preventive policy in Norway in the 1990s, when a risk-based approach was recommended.

Practices regarding chair-side information for children seem to be standardized. More than 90% of hygienists reported that nearly all children (those considered to be at risk and those not so) were given information on diet, hygiene, and fluoride. This suggested that they combine risk-based clinical prevention with a general safety net consisting of information directed at the total child population. This practice has been questioned; the effect of health education on oral health is poorly documented [8].

All respondents recommended fluoride toothpaste for all children in 2004 and 90% used fluoride varnish for at-risk children. These methods of fluoride delivery are in accordance with current advice [9]. The effectiveness of fluoride toothpaste is widely accepted [9]; evidence of the caries-preventive effect of fluoride varnish is fair for risk individuals [10] and limited for others [11].

The dental hygienists seemed to emphasize home care, because nearly all provided the children with information on diet, hygiene, and fluoride, while few provided clinical preventive measures. This is contrary to findings reported from public dental clinics in Finland, which stated that clinical preventive measures dominated [12]. However, the results of the present study were not surprising, taking into account that in the training of dental hygienists, communication, health education, community dentistry and behavioral sciences are major topics [13].

Preventive care from 1995 to 2004

Although the changes in preventive care from 1995 to 2004 were limited, significant changes occurred regarding the use of fluoride after explicit national recommendations on fluoride use were issued in 1996 [2]. The essentials of the changes introduced by the 1996 recommendations were: to discourage the systematic ingestion of fluoride (particularly fluoride supplements), to encourage the use of fluoride toothpaste by everyone, and to limit other uses of fluoride to special cases [2]. Fewer dental hygienists provided non-risk children with fluoride varnish (60% in 1995, 37% in 2004) and the proportion of respondents who reported using varnish only occasionally increased significantly. These changes indicate a transition from population-based to risk-based use of fluoride by professionals.

In 1995, Norwegian dentists and hygienists reportedly considered use of fluoride more importantly than did dental personnel in the other Nordic countries [3, 4]. In 2004, the proportion who considered advice on fluoride as being more important than advice on diet or oral hygiene for children declined (Figure 3), and the opinions of Norwegian hygienists were more in line with opinions on preventive strategies reported in other countries.

The subjective opinions of dental hygienists regarding the size of the risk group changed from 1995 to 2004, with the proportion of children reported as at risk increasing from 15% to 29%. The national statistics showed that in this period the dental health of children in Norway was fairly stable. This may indicate

Table IV. Routines related to preventive dental care practiced by dental hygienists in 1995 and 2004

	1995		2004		
	Mean	SD	Mean	SD	*p*-value
% children considered at risk	14.3	7.6	29.0	20.0	<0.001
Minutes used for prevention					
Risk children	55.2	30.6	46.1	35.8	0.008
Non-risk children	16.2	11.1	16.0	8.8	ns
Maximal recall interval	17.3	3.3	19.8	3.7	<0.001
Most usual recall interval	13.9	2.5	16.3	3.3	<0.001
% hygienists performing group-orientated preventive care outside the clinic	90		82		0.019

a tendency towards a changed understanding of the concept caries risk child. Approximately one-third of the children visiting the dental service in 2004 needed restorative care, and the estimated size of the risk group (29%) may be interpreted as dental hygienists considering all children with one or more decayed tooth needing restorative care as risk children. It has to be borne in mind that the sample of children seen by any hygienist in a 12-month period is biased towards caries-prone children owing to their shorter recall interval.

Dental hygienists reduced the time they spent on each at-risk child in the period 1995 to 2004. As the subjectively assessed size of the risk group was larger in 2004 than in 1995, preventive resources were divided between more children. This may be interpreted as a step towards a broader risk approach, resulting in intensified preventive care being given to a larger proportion of the children.

The study showed that the recall intervals for all children lengthened from 1995 to 2004, which is a trend previously documented [1] and in accordance with the recommendations of the health authorities. Longer recall intervals indicated that preventive care was given less frequently. Taking into account the larger risk group and the changes in time spent with each child, it can be calculated that there was an increase in time used on preventive care per child from 20 to 25 min in the study period.

The high-risk approach that has been advocated for the past 20 years in the public dental services in Norway has limitations [14–17]. This study showed that dental hygienists in 2004 individualized their clinical preventive care for children. Resource consumption on the 30% of the child population that they considered to be at risk of caries was triple that of other children. The respondents placed sealants and applied fluoride varnish in these at-risk children. However, they combined the risk strategy with individual information on hygiene, diet, and fluoride directed at all children. The results of this study indicate that, in 2004, a preventive approach combining individual information for all with intensified clinical prevention for children considered at risk of caries was being followed in the child dental care system.

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