On Dental Health and Related Factors in Finnish Immigrant Children in Sweden

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III Ekman A: Dental caries and related factors – a longitudinal study of Finnish immigrant children in the north of Sweden. Accepted for publication in Swed Dent J.


V Ekman A, Persson B: Effect of early dental health education for Finnish immigrant families. Accepted for publication in Swed Dent J.

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ABSTRACT


In the postwar period Swedish communities have become more multicultural. Although there are about 120,000 Finnish immigrant children below the age of 18 in Sweden, knowledge about their dental health is rather sparse.

Dental health and related factors were studied in Finnish immigrant children aged 5, 8 and 14 years, living in the city of Luleå, northern Sweden. The effect of early dental health education to parents at the Child Health Centres was studied in one age group in Luleå and in one in the municipality of Botkyrka, Stockholm county. All groups of Finnish children were compared to Swedish children matched for age, sex and social class.

At the age of 5 the prevalence of dental caries was higher than in Swedish control children. At the age of 8, this difference persisted, but was less pronounced in the permanent than in the primary dentition. The net mean caries increment between 5 and 8 years of age was 11.2 in the Finnish group compared to 7.4 in the Swedish. The proportion of children selected for individual prophylaxis and the time used between age 5 and 8 did not differ between the Finnish and the Swedish groups.

In the Finnish teenagers, the prevalence of dental caries was higher than in the Swedish teenagers. Periodontal health was equally good in all age groups of Finnish and Swedish children. The difference in caries prevalence between the two groups was mainly explained by a more frequent between-meal eating and a higher intake of sucrose-containing products between meals in the Finnish children. Even though they had been included in organized dental care with individual prophylaxis, this was obviously not enough to guarantee them as good a dental health as in the Swedish children.

Flourides were used to an equal extent in the Finnish and Swedish groups. Toothbrushing was less frequent in all Finnish age groups than in the Swedish controls.

The Finnish parents were less convinced than the Swedish about their ability to influence the child’s dental health, and more Finnish than Swedish parents also found it necessary to visit a dentist only when they had toothache.

The Finnish teenagers who had received almost twice as many hours of individual prophylaxis as the Swedish, knew less about the etiology of dental caries but equally much about the etiology of gingivitis.

The best result of early dental health education to parents, evaluated by comparing prevalence of dental caries of the children at the age of 3, was obtained when information was given three times in Finnish. If information in the mother tongue cannot be offered, an extra session of information in Swedish can also benefit the dental health of the child.

Key words: dental caries, dental health behaviour, dental health education, gingivitis, immigrant children, language, longitudinal.

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In the Finnish teenagers, the prevalence of dental caries was higher than in the Swedish teenagers. Periodontal health was equally good in all age groups of Finnish and Swedish children.

The difference in caries prevalence between the two groups was mainly explained by a more frequent between-meal eating and a higher intake of sucrose-containing products between meals in the Finnish children. Even though they had been included in organized dental care with individual prophylaxis, this was obviously not enough to guarantee them as good a dental health as in the Swedish children.

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PREFACE

This thesis is based on the following papers, which are referred to in the text by their Roman numerals:


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INTRODUCTION

In the postwar period Swedish communities have become more multicultural. The increased immigration which has contributed to this tendency has had a substantial effect on population structures. Industrial labour requirements prompted measures to facilitate migration into Sweden; passports, visas and labour permits ceased to be required for intra-Nordic migration and since 1955 all Nordic citizens have had host-country treatment for some components of social security (Leiniö 1984). This led to a high level of labour immigration from the other Nordic countries, accompanied by an increased flow from other countries in connection with active recruitment (Widgren 1982).

Today, in the late Eighties, more than one million people in Sweden - one person in eight - have an immigrant background. Projections from Statistics Sweden point to a level of one in four by the year 2025. Approximately half of the immigrants come from the Nordic area; other large groups, adding up to a quarter of the total, are from Yugoslavia, West Germany, Poland, Turkey and Iran. "Immigrant children" (0-17 years) number about 300,000 and are mostly second-generation immigrants, though the number born outside Sweden is also sizeable (Statens Invandrarverk 1988). In recent years the composition of migration to Sweden has shifted from job-seekers to refugees and people with family ties. The last of these categories makes up almost one-third of total immigration and consists largely of family reunions (Widgren 1982).

There is no officially established definition of an immigrant. The term usually denotes a foreign citizen who is entered in the population register (Widgren 1982). The term immigrant child is used for all immigrants up to 17 years of age but also for children born in Sweden with at least one parent who is an immigrant (Reinans 1981). Since the spring of 1985 Statistics Sweden employs the following definition of an immigrant child: "a child whose everyday language at home is not Swedish". This definition has been criticised
because it also covers children who belong to indigenous minority language groups, that is, Sami, the Finnish-speaking people of Torneälven and Gypsies (Magnusson 1986). For the present study a third definition has been used, namely that an immigrant child is a child whose native tongue is not Swedish, and who along with one or both parents, is entered as a foreign citizen in the population register.

The objectives of Swedish immigrant and minority policy, which can be summed up as "equality, freedom of choice and cooperation" (Socialdepartementet 1974), presuppose endeavours to promote cultural and linguistic pluralism.

Since 1977 all children for whom a language other than Swedish is a vigorous element in the home environment are entitled to home-language training/lessons in the nine-year compulsory school system (7-16 years). Since 1980 immigrant children are entitled from the age of 5 years to home-language training in pre-school groups, as are adult immigrants to 240 hours instruction in Swedish during paid working hours (Kärre 1980).

Immigrants from Finland make up about 35% of all immigrants in Sweden (Statens Invandrarverk 1988) and are largely labour migrants (Leiniö 1984). The group is heterogeneous, comprising Swedish-speaking Finno-Swedes, Finns and a small proportion of Gypsies (Leiniö 1984). Ever since the Forties an average of over 10,000 Finnish immigrants have arrived in Sweden annually, with as many as 40,000 in each of the peak years 1969 and 1970. As a result of economic fluctuations, since 1980 the level of immigration from Finland has fallen and is now little more than 4,000 annually (Statistical Abstract of Sweden 1987). Of all the postwar Finnish immigrants, almost half have returned to Finland (Majava 1981). Except for some years in the late Seventies, the flow of emigrants from the end of the Sixties onwards has mainly come from Finland's northernmost provinces (Leiniö 1984).
The past decade has seen an increase in migration by Finns - either from Finland or from other parts of Sweden - to the county of Norrbotten in northern Sweden, where Finnish-born residents now make up more than 5% of the population. In some municipalities around 20% of the population are Finnish citizens (Majava 1981). Other counties with much the same proportion of Finnish-born residents, around 5%, are Stockholm, Södermanland and Västmanland (Leiniö 1984). Of the ten municipalities in Sweden where the proportion of pupils whose home language is not Swedish exceeds the national average, five are in the county of Norrbotten and two in the county of Stockholm. The home language for a majority of these pupils is Finnish (Magnusson 1986).

In general a higher proportion of Finnish immigrants than Swedes belong to the lower socioeconomic groups but in the county of Norrbotten this difference is negligible (Johansson 1978, Leiniö 1984). Female Finnish immigrants are gainfully employed to a greater extent than other women in both Finland and Sweden (Majava 1981).

There is an extensive literature on the health status and morbidity of immigrants. It has been found, for instance, that long-term illness and impaired work capacity are more prevalent among foreign compared with Swedish residents (Socialdepartementet 1984). Finnish immigrants, however, are lower consumers of health care services than other immigrant groups and only slightly higher than Swedes (Tomson & Lichtenstein 1988).

Concerning the dental health of immigrants in Sweden some twenty studies have been published since the late Seventies and almost all of them deal with adult immigrants from Finland. Widström (1982) and Widström et al (1983) found a higher prevalence of edentulousness, fewer remaining teeth and more untreated dental disease in adult Finnish immigrants than has been shown in epidemiological surveys of Swedish populations. In comparisons based on national health statistics, Finnish immigrants in Sweden were found to visit
a dentist less often than the corresponding Swedish group. However, the Finnish immigrants who were treated had received more restorative treatment than corresponding Swedes, which could indicate a great accumulated need of treatment (Widström & Martinsson 1983). Common reasons for not visiting a dentist were difficulties in getting an appointment, language difficulties, poor knowledge of the Swedish dental care system, indifference and fear of pain (Widström & Martinsson 1980, Widström et al 1983). Compared to other immigrant groups in Sweden, Finnish immigrants utilized dental services to a greater extent (Widström & Martinsson 1985). A questionnaire study among dentists in Stockholm county showed that prophylactic regimens were difficult to carry out in immigrant groups, mainly due to language problems (Widström 1985).

In recent years a number of epidemiological studies have been published on the dental health of Swedish children and adolescents. Although there are about 300,000 immigrants below the age of 18 in Sweden, of whom 120,000 come from Finland (Personal communication, Statens Invandrarverk 1988), only six studies have been published on the dental health of this group; two deal with Turkish (Widström 1983, Mejäre & Mjönes 1989), one with Latin-American (Pulgar Vidal & Schröder 1989) and three with Finnish immigrant children (Aurelius & Lindström 1978, 1980, Widström & Suksis-Jansson 1985). The dental health, oral hygiene and dietary habits of 48 Finnish children and 27 south European children aged 3-15 years are described in two of these studies (Aurelius & Lindström 1978, 1980). On arrival in Sweden the dental health of the Finnish children was less good than in a Swedish control group, and in the next 30 months the Finnish children developed more caries than their Swedish controls and than the immigrant children from southern Europe. The Finnish children brushed their teeth less frequently than the Swedish children both at arrival and after 30 months in Sweden. The paper does not mention whether or not the children were included in organized dental care during the observation period, only that equal proportions of immigrant...
and Swedish children had visited a dentist. In a study by Widström & Suksis-Jansson (1985), a group of nineteen 6-year-old Finnish immigrant children had more caries and fillings, a more frequent consumption of sugary products, and less frequent toothbrushing than a Swedish control group.

Knowledge about the dental health of Finnish immigrant children in Sweden is thus rather sparse and based on studies of small groups. The dental health of larger groups of Finnish immigrant children has not been investigated, neither has it been studied longitudinally in children who have become more permanent residents in Sweden and been incorporated in the organized Swedish dental care system.

Although several studies on dental health and the use of dental services in adult Finnish immigrants have been published, little is known about their attitudes to and knowledge of factors affecting dental health. Dental care was not as accessible in all parts of Finland (National Board of Health 1986) as it was in Sweden during their childhood and adolescence. Differences in experience of dental care and in knowledge of the etiology of dental diseases might make Finnish immigrants less able than Swedish parents to promote good dental habits in their children.

The programmes of preventive dentistry in the Swedish dental care system are based to a great extent on information and start early at the Child Health Centres. Communicative misunderstandings from linguistic, cultural and situational interference may make immigrants less responsive to information, and language difficulties have also been singled out as a possible factor behind the differences in dental health between immigrants and Swedes (Aurelius & Lindström 1978). The questions of whether this information to immigrants at the Child Health Centres, to be effective, should be given in their native tongue, and whether language difficulties can be compensated by an extra information session have not been studied.
The aims of this study were:

- to describe the dental health of Finnish immigrant children aged 5 in the north of Sweden as well as parental attitudes to dental health and dental care, and to examine the dental health of the same group of children at the age of 8

- to analyse changes in dental caries and dietary habits of Finnish immigrant children between 5 and 8 years of age, and to identify variables that at age 5 could have predicted caries prevalence at the age of 8

- to describe the dental health of a group of Finnish 14-year-olds from immigrant families, their knowledge of dental disease and their dental health behaviour

- to evaluate the effect of early dental health education, given in Finnish or in Swedish to Finnish immigrant parents at the Child Health Centres, on the dental health of their children, as well as on their own dental health knowledge and behaviour.
MATERIAL

General description


Luleå is the principal city of Norrbotten county, a port and industrial town with around 70,000 inhabitants. Botkyrka municipality is a suburb of Stockholm with a population of the same size as that of Luleå. About 9% of the inhabitants of Botkyrka and 5% in Luleå are of Finnish origin.

Map with studied areas indicated.
The definition "Finnish immigrant child" in these studies was: At the time when the material was selected, one or both of the parents and the child were Finnish citizens, with Finnish as their native tongue.

About 70-75% of the children in all groups belonged to Social Class III and less than 10% to Social Class I (Swedner & Gustafsson 1964). Finnish was the main language in 81-88% of the families in Norrbotten and in 92% in Stockholm county. Of the Finnish teenagers (IV) 44% had attended Finnish-speaking classes earlier and 60% of the 8-year-olds (II,III) were doing so at present. A majority of the Finnish children constituting the material in Papers I-IV and all the children in Paper V were born and brought up in Sweden.

All Swedish parents had had access to annual dental care free of charge, at least from the age of 7. Those Finnish parents who came from the northernmost parts of Finland had had access mainly to emergency dental care, while the parents from central and southern Finland had had access to more regular dental care.

All children, Finnish and Swedish (I-IV), were treated annually in the Public Dental Health Service (PDHS). Mouth rinses with 0.2% sodium fluoride solution were organized weekly in school. The current natural fluoride content of the drinking water was 0.3 mg per litre in Luleå and 0.2 in Botkyrka.

**Statistical methods**

Statistical methods are described in the individual papers (I-V).
RESULTS

PAPER I
The aim of this study was to describe the dental health of Finnish immigrant preschool children. The parents' attitudes to dental health and dental care were also investigated.

Material and methods
The material comprised all Finnish immigrant children born in 1974-1975 residing in the city of Luleå in 1980, a total of 116. Sixteen children had moved out of the area or did not turn up, leaving 100 healthy children with a mean age of 5.0 years as participants. A control group of 100 Swedish children was selected, matched for age, sex and social class (Swedner & Gustafsson 1964) with the Finnish children. The clinical examination included recording of decayed, missing and filled teeth and surfaces (dmft, dmfs) using the criteria suggested by Koch (1967). Two posterior bitewing radiographs were taken when approximal surfaces could not be inspected. Caries that had penetrated more than 2/3 of the enamel on approximal surfaces was recorded as a manifest lesion. Initial caries was not recorded as some of the children were difficult to examine. Gingivitis was assessed at a total of 24 measuring points and GBI% calculated (Ainamo & Bay 1975). The teeth used for registration were: 55, 63, 64, 75, 83 and 84.

A history was taken from the parent about the child's toothbrushing and exposure to fluoride. The frequency of food consumption was registered on a questionnaire, filled in by the parents (Holm et al 1980). A scoring system was used, with scores from 0 to 13 denoting an increasing frequency of intakes. Based on the sum of scores, dietary habits were rated good, not fully satisfactory, poor and bad.

The parents were interviewed about their attitudes to dental
health and dental care as well as their use of dental services. In addition, questions were included about their dental health, e.g. whether or not they had dentures.

Results

The dental health of the Finnish children was considerably poorer than that of a Swedish control group. Eleven per cent of the Finnish children were caries free compared to 31% of the Swedish children. The mean dmfs values were 12.2 and 6.4 for the Finnish and Swedish groups, respectively. A dmfs score >12 was found for 43% of the Finnish children compared to 19% of the Swedish. The mean number of buccal/lingual surfaces with caries or fillings was 2.2 in the Finnish and 0.9 in the Swedish group. Gingival health was equally good in the two groups.

More Swedish than Finnish children brushed their teeth twice a day, the difference being statistically significant. A tendency to more frequent consumption of sucrose-containing products was found in the Finnish group. There were no significant inter-group differences in the use of fluorides.

Full dentures in one or both jaws was more common in the Finnish parent group, 36% compared to 9% in the Swedish. The Finnish parents visited a dentist less frequently and more Finnish than Swedish parents found it necessary to visit a dentist only when they had toothache. The Finnish parents were also less convinced of the ability of parents to influence the child's dental health and more Finnish parents stated that the child's visit to the dentist had been unsatisfactory, mainly due to language difficulties.

Discriminant function analyses showed that the variables "use of fluorides" and "parent's attitudes to dental health and dental care" discriminated between children with high and low dmfs in both groups. "Child's dietary habits" discriminated only in the Swedish group and "whether or not
parent was a denture wearer" discriminated only in the Finnish group. With the variables chosen, about 75% of the children were correctly classified as regards caries prevalence.

**PAPER II**

The aim was to investigate whether the observed difference in dental health between Finnish immigrant children and Swedish children at age 5 persisted at the age of 8.

**Material and methods**

Seventy Finnish and 97 Swedish children with a mean age of 8.0 years could be reached for reexamination. Thus 30 Finnish children were lost between the first and second dental health examinations. The mean dmfs value of this group, calculated from earlier data and records from the PDHS, did not differ significantly from the mean values of the participants and would probably not have influenced the results significantly if they had been included. One Finnish and one Swedish reference group consisting of 80 children each, born in 1972-1973 were also included.

The clinical examination included recording of decayed, missing and filled teeth and surfaces (dmft, dmfs, DMFT, DMFS) using the criteria suggested by Koch (1967). Two posterior bitewing radiographs were taken when approximal surfaces could not be inspected. Caries that had penetrated up to 2/3 of the enamel on approximal surfaces was recorded as an initial lesion; otherwise the lesion was diagnosed as manifest caries. Initial lesions were not included in dmfs/DMFS values. For the children in the reference groups the dmfs/DMFS values at the age of 8 were calculated using clinical data and radiographs from the PDHS. In the 8-year-olds the dmf values were confined to primary molars and canines.

Gingivitis was assessed at a total of 24 measuring points and GBI% calculated (Ainamo & Bay 1975). The teeth used for registration were 16, 21, 64, 36, 41 and 84.
The children were interviewed on their toothbrushing habits, use of fluorides and knowledge of dental health. Questions were asked about the general number of main meals and between-meals per day and how frequently sucrose-containing products were consumed. Dietary habits were assessed using the same scoring system as in Paper I. Data on individual prophylaxis were collected from the records of the PDHS.

The parents were asked to fill in a questionnaire about the child's meal frequency, their own attitudes to dental health and dental care as well as use of dental services. In addition, questions were asked about their dental health, e.g. whether or not they had dentures. The results of this questionnaire are presented in Paper III.

Results

There were no statistically significant differences in caries indices between the Finnish children and the Finnish reference group or between corresponding Swedish groups.

The dental health of the Finnish children was less good than that of the Swedish children, although the difference was less pronounced in the permanent dentition than in the primary. The mean dmfs and DFS values were 13.1 and 3.8 for the Finnish and 8.9 and 2.6 for the Swedish children respectively. Caries in the permanent incisors was more common in the Finnish group. The gingival bleeding index was low in both groups.

Toothbrushing frequency did not differ significantly between the groups, although more Swedish than Finnish children brushed their teeth more than once daily. Use of fluorides was similar in the groups and individual prophylaxis had been given to the Finnish and the Swedish children to about the same extent. More Finnish than Swedish children had less good dietary habits with a more frequent consumption of sucrose-containing products. Between-meal eating was also more frequent in the Finnish group. There were hardly any
inter-group differences in the level of knowledge about the reasons for dental caries.

Regression analyses showed that the regressors "diet" and "soft drinks" could explain about 13% in the variance of D1FS (initial lesions included) in the Swedish group compared to 24% in the Finnish. Adding "use of fluorides" and "toothbrushing habits" increased the explanatory value to 17% and 33% in the Swedish and the Finnish group respectively. When nationality was used as an independent variable, the regressors "diet", "nationality" and "help with toothbrushing" explained 19% of the variance. Inclusion of more variables gave little further explanation.

PAPER III

The aim of the study was to analyse dental caries and dietary factors in a group of Finnish immigrant children between 5 and 8 years of age. Parents' attitudes and dental attendance were studied and variables that at age 5 could predict caries prevalence at age 8 were identified.

Material and methods

The material consisted of data collected from those 70 Finnish children that had been included in the examinations in 1980 and 1983, as well as data from the interviews with the parents.

Results

The net mean caries increment from 5 to 8 years of age was 5.2 dmf-surfaces and 6.0 DF-surfaces (initial lesions included). Corresponding figures for the Swedish group were 3.0 and 4.4, respectively (unpublished results). Children with dmfs values above the median in 1980 had significantly higher DFS and DS values in 1983 than the rest of the group.

At group level dietary habits changed markedly for the worse between the two examinations. About half the children who
had good or not fully satisfactory habits in 1980 had poor or bad dietary habits in 1983. Eleven per cent had a poorer rating in 1980 than in 1983.

At both examinations, 30% of the parents had full dentures in one or both jaws. Forty-six per cent of the parents were regular dental attenders in 1983 compared to 25% in 1980. In 1980, none of the parents had seen a dental hygienist, compared to 35% in 1983. The parents were not more convinced in 1983 than three years earlier that they could influence the dental health of their children.

The selection of children for individual prophylaxis in the three preceding years was not related to their dental health situation at the first examination. In all, 48% of the children had been given an individualized prevention programme, on average 0.6 hours in the last 36 months.

Using parent's dental status (full dentures) as the predictor for caries prevalence at the age of 8, a higher proportion was correctly classified than when dmfs at the age of 5 was used.

**PAPER IV**

The aim of this study was to compare dental health, knowledge of dental disease and dental health behaviour between a group of Finnish teenagers from immigrant families and a group of Swedish teenagers.

**Material and methods**

All 95 Finnish immigrant children born in 1969-1970 residing in Luleå in 1984, were invited to take part, of whom 77 agreed to participate. Their mean age was 14.2 years. The Swedish control group comprised 85 children, matched for age, sex and social class (Swedner & Gustafsson 1964) with the Finnish children. All participants were healthy.
The clinical examination included recording of decayed, missing and filled teeth and surfaces (DMFT, DMFS) using the criteria suggested by Koch (1967). Radiolucencies on approximal surfaces extending into the dentine were diagnosed as manifest lesions and those in the enamel as initial lesions.

Gingivitis was assessed at a total of 24 measuring points and GBI% calculated (Ainamo & Bay 1975). The teeth used for registration were 16, 21, 24, 36, 41 and 44.

Gingival pockets exceeding 3 mm were recorded on all first permanent molars and incisors, using a graded probe. Subgingival calculus in the molar and premolar regions was recorded on the radiographs. Subgingival calculus in the anterior regions and supragingival calculus were recorded at the clinical examination.

Notes were taken on toothbrushing habits, use of fluorides and knowledge of dental health. Smoking and snuffing habits were recorded. Data on individual prophylaxis were collected from the records of the PDHS.

The children were interviewed about the number of regular meals per day as well as about between-meal consumption, consumption of sweets and soft drinks.

**Results**

The mean DFS value (initial lesions included) was 17.4 in the Finnish and 13.8 in the Swedish group. Mean values for initial lesions on approximal as well as on buccal and lingual surfaces were significantly higher in the Finnish group. Periodontal health was equally good, and sub- and supragingival calculus was found to about the same extent in both groups.

No statistically significant inter-group differences were found for oral hygiene habits or use of fluorides. Smoking and snuff taking was more common in the Finnish group. The Finnish teenagers had more frequent intakes of sweets, soft
drinks or coffee and bakery goods and a more frequent use of sweet chewing-gum than the Swedish teenagers.

The teenagers in the two groups had equally good knowledge about the etiology of gingivitis, but the Finnish teenagers had less good knowledge than the Swedish about the reasons for dental caries and the effect of fluorides.

The Finnish children had had an average of 1.4 hours of individual prophylaxis in the last 36 months compared to 0.8 hours in the Swedish group. Of those 71% in the Finnish group who met the selection criteria for a caries risk programme, only 36% had been selected. Corresponding figures in the Swedish group were 45% and 24% respectively. For 65% of the children in each group the individual prophylaxis given was considered adequate.

**PAPER V**

The aim of the study was to evaluate if the dental health of Finnish immigrant 3-year-old children would benefit from an extra session of early dental health information to the parents at the Child Health Centre, and whether this information, to be effective, should be given in Finnish. A further aim was to study the effect of this information on the parent's dental health knowledge and behaviour.

**Material and methods**

Two groups of children of Finnish immigrants were included, one comprising all 109 children born in the city of Luleå, county of Norrbotten, between July 1981 and June 1983, and the other all 66 children born in the municipality of Botkyrka, county of Stockholm, between June 1983 and May 1986. In Luleå 18 families left the area, leaving 91 Finnish children. The corresponding figure in Botkyrka was 7 families, leaving 59 children. The mean age at the dental health examination was 3.0 years. The control groups of Swedish chil-
dren matched for age, sex, social class (Swedner & Gustafsson 1964) and residential area with the Finnish children amounted to 80 children in the city of Luleå and to 51 children in Botkyrka.

The Finnish children were randomly divided into two test groups and one control group at 6 months of age. Dental health information was given to the parents of the test groups in Finnish and Swedish respectively at 6, 18 and 27 months. To the Finnish and Swedish control groups, information was given in Swedish at 6 and 18 months in accordance with routines in Sweden (National Board of Health and Welfare 1978).

In the city of Luleå the information in Finnish was given by a dental hygienist and by the author, as was information at the 27-month appointment. In Botkyrka the information was given by a Finnish and Swedish speaking chair-side assistant. The information included advice on diet, use of fluorides and oral hygiene. The clinical examination at 3 years of age included recording of decayed, missing and filled teeth and surfaces (Koch 1967). Dmfs and dmft were calculated. Initial lesions were not recorded. The parents in Luleå were interviewed about the child's dietary habits and oral hygiene habits as well as about their own dental health behaviour and knowledge of factors affecting dental health. In Botkyrka a precoded questionnaire was used.

Results

At three years of age, 71% of the children in both test groups where information had been given three times in Finnish were caries free compared to 80% and 82% in the Swedish control groups respectively. In the groups where information had been given three times in Swedish the proportion of caries free children was 53% in Norrbotten and 58% in Stockholm county. Corresponding figures for the Finnish control groups informed twice in Swedish were 30% and 32%, respectively.
In Norrbotten the mean dfs values were 1.7 and 2.7 for the Finnish test groups given information three times in Finnish and in Swedish, respectively, whereas for the Finnish and Swedish control groups the values were 6.0 and 0.9. Corresponding figures for the groups in Stockholm were 1.2, 2.1, 4.5 and 0.7, respectively.

Better dental health knowledge and behaviour was found when information had been given to the Finnish parents in Finnish than when it had been given in Swedish. In the Finnish groups where information was given three times in Swedish, dental health knowledge and behaviour was almost as good as when it was given in Finnish.

The toothbrushing habits of the parents were very similar to those of the children. More Swedish than Finnish parents were regular dental attenders and considerably more Swedish parents had visited a dental hygienist. Common reasons in the Finnish group for not visiting a dentist regularly were no perceived treatment need and the cost.
GENERAL DISCUSSION

The studies were carried out in the city of Luleå in northern Sweden and in the municipality of Botkyrka in Stockholm county. The majority of the parents of the children born in 1974-1975 came from the two northernmost counties in Finland, while about 50% of the parents in the other groups came from central and southern Finland. This reflects the immigration pattern from Finland to Sweden, as from the late 1960s to the middle of the 1970s most immigrants came from the northern parts (Leiniö 1984). The distribution by Social Class is also in accordance with that of Finnish-speaking Finnish immigrants in general (Leiniö 1984). The majority of the children in the present studies are living in a medium-sized town in the north of Sweden. Their habits, attitudes and behaviour might differ from those of immigrant children in larger cities in Sweden. However, in the study where children from Norrbotten and Stockholm were included, the dental health behaviour and attitudes of the parents were fairly similar, indicating that the differences in dental health and related factors identified between immigrant children and Swedish children in Luleå probably exist also in other parts of Sweden.

In the present studies, caries was more prevalent in all Finnish groups than in the Swedish control groups. In the Swedish groups the prevalence of caries was close to that reported from other parts of Sweden (Persson et al 1985, Stecksén-Blicks et al 1985, Hugoson et al 1988). To find as high dmfs/DMFS figures in Swedish children as were recorded in the Finnish groups, one has to go back 10-15 years (Holm 1978, Månsson et al 1979, Hugoson et al 1980).

A high prevalence of dental caries has been reported earlier in Finnish immigrant children in Sweden (Aurelius & Lindström 1978, 1980, Widström & Suksis-Jansson 1985). Dental health in various groups of immigrant children in other Nordic countries has also been found to be less good than in

Migration itself has been linked to an increased incidence of both physical and psychosomatic manifestations and to mental disease (Socialdepartementet 1984, Simoes 1986). Such a link could also apply to oral/dental disease. The impact of migration on oral health is difficult to determine as groups of immigrants, even from the same country, are not sociodemographically homogeneous. However, in studies of 13-15-year-olds in a low fluoride area in Finland (Parviainen et al 1985) and of 8-year-olds of "low social class" also living in a low fluoride area in Finland (Hausen et al 1982), the mean DMFS/dmfs values were similar to those in the Finnish children in the present studies. In rural 5-year-olds in low fluoride areas in Finland, the dmfs values were somewhat higher (Kleemola-Kujala 1978) than in Finnish children of corresponding age in Luleå. Although a comparison between these data can only be tentative, due to methodological differences, there seem to be no great differences in caries prevalence between Finnish children of similar socio-economic background living in Finland and Sweden.

Dental caries is a multifactorial disease. Acids, formed by plaque bacteria through metabolism of dietary carbohydrates, cause demineralization of dental tissues. A series of buffer systems in plaque and saliva influence the process. In addition, the composition and intake pattern of food, the quality and quantity of dental plaque and of saliva, the age and composition of the tooth and the fluoride concentration of plaque and saliva are factors of importance for the outcome of the disease in the individual.

In the present studies, differences in dental health behaviour and attitudes in children and in their parents were used to explain differences in the prevalence of dental caries
between Finnish immigrant children in Sweden and Swedish children. Dental health behaviour and attitudes influence the diet, the quantity and quality of dental plaque and the level of fluoride in plaque and saliva.

Common for all Finnish age groups in the present study was the more frequent between-meal eating and the more frequent intake of sugary products than in the Swedish children, which is in accordance with reports from other groups of Finnish immigrant children (Aurelius & Lindström 1980, Widström & Suksis-Jansson 1985).

There are considerable difficulties in obtaining valid dietary data as most assessment techniques seem to suffer from some weakness (Persson & Carlgren 1984). In the present study the children were interviewed about their dietary habits mainly with short questions on the frequency of consumption of sucrose-containing products. As the interviews were carried out in Finnish as well, it was assumed that misunderstandings could be avoided and fairly valid data obtained even though this method has been shown to underestimate the intake frequency of some of the common sweet snacks in comparison with a food diary (Persson & Carlgren 1984).

Except for the 5-year-olds (I), the differences in caries prevalence between Finnish immigrant children in Sweden and Swedish children were, in the present studies, mainly explained by differences in dietary factors.

The relationship between consumption of sugars and caries is well established from a large number of studies (e.g. Gustafsson et al 1954, Holm et al 1975, Samuelson et al 1975, Clancy et al 1977, 1978, Kleemola-Kujala & Räsänen 1979). In recent studies this relationship has been more difficult to demonstrate, probably because the effect of fluorides, extensively used in organized dental care, outweighs the effects on dental caries of differences in the consumption of

Another reason for the generally weak relationships could be a low caries prevalence compared to earlier studies (Rugg-Gunn et al 1984). In a three-year longitudinal study, Burt et al (1988) found a relationship for the increment of approximal caries in children with an above-average daily consumption and between-meal consumption of sugars, while no such relationship was obtained for pit-and-fissure caries. In the Finnish children, where actual cavitation or fillings on smooth surfaces were more prevalent, the importance of the dietary variables for the occurrence of caries was evident from the regression analyses (II). The regressors "diet" and "soft drinks" to caries prevalence revealed rather high explanatory values, while they offered little explanation in the Swedish group, where smooth surface caries was less prevalent and the exposure to fluoride higher due to more frequent brushing with a fluoride toothpaste.

In the preschool children, an underestimation of the children's between-meal consumption by the Finnish parents compared to the Swedish cannot be ruled out. From a socio-anthropological point of view food is a cultural concept, and the interpretation of what counts as "food" varies (Sachs 1980), which might partly explain differences in answers by the Finnish and the Swedish parents.

The frequent soft drink/coffee-cookie habit found in the Finnish 14-year-olds (IV), which may reflect family behaviour, agrees with findings in teenage groups in Finland (Eskola et al 1981, Honkala et al 1982). Dietary habits in immigrants are known to change rather slowly compared to other habits (Nyyssönen et al 1973), and retention of dietary habits is one way of maintaining a cultural background and ties to the home country (Neiderud 1986). Dietary change presumably involves breaking down long traditions of practice and thinking; both the socio-anthropological aspect and
the socio-cultural background of the patient should be considered in dietary counseling to immigrant patients.

Of the various microorganisms which colonize the oral cavity it is mainly lactobacilli and mutans streptococci, which have been associated with the development of caries (Krasse 1954, Hamada & Slade 1980, Bowden et al 1984, Loesche 1986). Salivary counts of S. mutans and lactobacilli have also been used to predict caries activity (e.g. Crossner 1981, Newbrun et al 1984, Stecksén-Blicks 1985, Sullivan & Schröder 1989). In the present studies, neither salivary levels of S. mutans and lactobacilli nor salivary flow and composition were determined. It might be, that assessment of these parameters could have helped to explain the differences in caries prevalence and incidence between the Finnish and Swedish groups, as variations due to for instance ethnic background of the children cannot be ruled out. In studies carried out in Finland (Seppä et al 1988) and in Sweden (Kristoffersson et al 1986) the proportions of children with non-detectable S. mutans and with high numbers of S. mutans (>10^6) in saliva were, however, largely the same in groups of the same age and a similar caries prevalence.

In the Finnish children in the present study (III), whose caries prevalence resembled that of Swedish children 10-15 years ago, toothlessness of parent in one of both jaws was found to be an efficient predictor of caries development between 5 and 8 years of age. This finding is similar to results obtained in earlier correlation studies of parent's dental status and children's caries experience (Martinsson & Petersson 1972, Friis-Hasché 1981).

It has been shown that parental behaviour, the mother's in particular, is important in forming the dental habits of children (Søgaard 1986) and that behavioural change is more easily attainable in childhood and adolescence than later in life (Richards 1975). Parents' dental health behaviour and attitudes to dentistry are largely products of experience of dentistry and dental health education during childhood and
adolescence (Nilsson & Faresjö 1977). The attitudes of the parents in the present study probably reflect experience from the late 1940s to the late 1960s, which is likely to differ between Finnish and Swedish parents. Dental care at that time was less or not at all accessible in Finland (National Board of Health 1986) compared to Sweden. More frequent contacts with dentistry and dental health education after arrival in Sweden would presumably make the Finnish parents gradually more interested in the dental health behaviour of their child, but this could not be demonstrated in the present study (III). Differences in cultural background cannot be ruled out. More than half of the parents stated that their last visit to the dentist had been for emergency treatment (III), which might indicate that the idea of prevention and of seeking help when not ill is strange.

The Finnish teenagers had had almost twice as many hours of individual prophylaxis, including information on the etiology of caries and gingivitis, as the Swedish, but knew less about the etiology of dental caries and the effect of fluorides (IV). Knowledge about the etiology of gingivitis, as well as the mean values for GBI%, was similar in the two groups, which might imply that dental health information in recent years had focused on the prevention of gingival disease at the expense of information about the prevention of dental caries. Periodontal pockets exceeding 3 mm were not found in any of the Finnish or Swedish teenagers. This is in contrast to what has been found in other Scandinavian studies of children of corresponding ages (Hoover et al 1981, Hugoson et al 1986).

Information to immigrant children is complicated by language barriers. Dental health personnel may not always be aware of this because many immigrant children speak fairly fluent Swedish. It has been shown that it takes 4-7 years for the second language to function on the same level as the native tongue (Laukkanen & Östnäs 1986). As Finnish was the main language at home in most Finnish families and almost 40% of
the teenagers had attended Finnish-speaking classes in primary and secondary school, their real comprehension of Swedish might be limited.

The study concerning effects of early dental health education (V) was carried out as a controlled field experiment, a method that entails certain difficulties. Larger groups and groups where information was given twice in Finnish would of course have been valuable but could not be achieved. The results may, however, indicate that the routines for dental health information to immigrants at the Child Health Centres, not least the appropriate time for information, should be reconsidered.

Early dental health education in the parent's native tongue had the best effect on the dental health of the child. Besides conveying a verbal message, the human voice transmits other, paralinguistic information that determines how the words are interpreted, and active command of a language also includes an ability to use the body language (Tingbjörn 1981). The Dental Health Act (Svensk Författningssamling 1985) sets out the necessity of an interpreter service or multilingual dental personnel for immigrant patients. Still it is often left to the immigrant to decide whether or not an interpreter should be used (Järtelius 1985). According to Savolainen (1987), the ability to speak Swedish confers status. It is therefore conceivable that both Finnish parents and Finnish teenagers exaggerated their command of Swedish. The risk of faulty learning or misunderstanding is also bound to be great if knowledge of the subject in question is uncertain or inadequate in the first language.

After the 27 months appointment, when the information was adapted to the parent's knowledge of factors affecting dental health and to the dental health situation of the child, the behaviour of the parents changed in all groups. Regular and more frequent toothbrushing was carried out and the children were more often helped with toothbrushing. Dietary changes, e.g. less frequent between-meal consumption of
sucrose containing products and fewer between-meals, were also noted. The parents' own dental health behaviour was, however, largely unchanged (V), which confirms that knowledge alone is not the instigator of change (Richards 1975).

The Swedish system of dental health education may already have reached the stage where results cannot be improved by just increasing the time spent on preventive programmes. The results of the present study may indicate that the "individual prophylaxis" is not always individualized in the full sense of this word. For true individualization, personnel trained in health education need not only an understanding of the educational process and desired change but also of the social, psychological, cultural, economic, political and organizational aspects of life (Richards 1975). It is easy to forget that adjustment difficulties in a foreign environment, including the language handicap, interact in the adoption of health-promoting procedures. As dental health, dental care habits and attitudes to dental health have also been shown to differ from the Swedish norm in other immigrant groups (Widström 1983, Stenman et al 1985, Zimmerman et al 1988, Mejàre & Mjönes 1989), it is important that dental health information is adapted to the needs of the increasing number of immigrants in our country.

Ethnic minorities may need special attention in dental health care policy but only insofar as their problems are greater than those of comparable majority groups. Removal of the language barrier could, for a start, be the main issue. Not until the dental health personnel have gained competence in other cultures will the aim of access to services that meet the needs of immigrants be fulfilled.
CONCLUSIONS

In all age groups, dental caries was more prevalent in Finnish immigrant children than in the Swedish controls. Caries lesions and fillings on approximal, buccal and lingual surfaces were more prevalent in the Finnish groups than in the Swedish.

Finnish children with higher than median dmfs values at the age of 5 had higher DFS and DS values at the age of 8. Parents' dental status (full dentures) was more efficient than the dmfs value at the age of 5 as predictor of the prevalence of dental caries at the age of 8.

Periodontal health was equally good in Finnish and Swedish children in all age groups.

The difference in caries prevalence between Finnish and Swedish children was mainly explained by differences in dietary habits. In all Finnish age groups, between-meal eating and intake of sucrose-containing products was more frequent than in the Swedish controls. At group level, the dietary habits changed markedly for the worse between 5 and 8 years of age.

Fluorides were used to an equal extent in Finnish and Swedish children. Finnish children of all age groups brushed their teeth less frequently than the Swedish controls.

The Finnish parents made less use of dental services and a higher proportion had dentures. In spite of frequent contacts with dentistry, they were not convinced of their ability to influence the dental health of their child.

Even though the Finnish children had been included in organized dental care in Sweden with individual information and prophylaxis, this had obviously not been designed to meet the actual needs of these immigrant children and their parents and was therefore not effective.
Early information on dental health, tailored to the needs of the family was shown to reduce the frequency of caries in immigrant preschool children. The best result was obtained when information was given to the parents three times in Finnish. A lower prevalence of caries than in the Finnish control groups was also obtained if an extra session of information in Swedish was given when the child was 27 months of age.
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