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ORIGINAL ARTICLE

Tracking of parents' attitudes to their children's oral health-related behavior–Oslo, Norway, 2002–04

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Abstract

Objectives. To investigate dental beliefs and attitudes of a diverse group of parents from their children when they were aged 3 and 5 years old and to identify possible mediators for a group composed of the parents with the most negative dental attitudes. ***Material and methods.*** Data were collected by parental questionnaire when the children were aged 3 years in 2002 and again 2 years later. The inclusion criteria were children with mothers from Norway (N group) or non-Western countries (IM_1 group). Questionnaires were extensive and had previously been used in a multicenter study. Three composite attitudinal variables relating to oral hygiene, diet and parental indulgence were calculated and an "attitudinal risk group" identified. The association between those variables and the assignment to the group was measured by odds ratio (bivariate and multiple logistic regression). ***Results.*** The N parents' dental attitudes were significantly more positive in 2004 when their children were 5 years old than when they were 3 years old ($p < 0.0001$), but this was not the case among immigrant parents. "Education" and "Immigrant status" [odds ratio (OR) 3.3, 95% confidence interval (CI) 1.6–7.0; and OR 2.8, CI 1.1–7.3, respectively] were significantly associated with the defined "attitudinal risk group". ***Conclusions.*** Only dental attitudes among N parents were significantly more positive in 2004 than in 2002. Not having higher education and being of non-Western background were associated with belonging to the "attitudinal risk group". Culturally tailored programs of dental health education are needed to promote more positive attitudes to oral health.

Key Words: *Child, dental health, health behavior, parental dental attitudes*

Introduction

The distribution of young children according to caries experience in the deciduous dentition is skewed in most developed countries [1]. The principal risk factors for caries are diet and oral hygiene. For young children, who do not make independent decisions, these factors are determined by family values, traditions and lifestyle, which in turn are related to their culture and social class [2]. In recent decades and in many societies, family values, traditions and lifestyle have changed [3], changes which may lead to different caries risk factors becoming more or less important. This in turn may necessitate adjustments of established preventive strategies.

Biomedical determinants of dental caries have been more extensively investigated than psychosocial factors and their impact on caries prevalence and incidence. Nevertheless, some authors have studied behavioral and socio-economic factors which influence the likelihood of developing caries [4,5]. Current understanding of the social determinants of caries is important to population caries prevention.

Little up-to-date knowledge about families' preferences and choices concerning young children's dental health is available, especially about families of non-Western background and in subsets of these families with low socio-economic status. Furthermore, we do not know the codes of priorities concerning children's dental health among immigrant families of religious minorities, in which the extended family may be the basic unit.

Cross-sectional studies have documented associations between parental beliefs and attitudes about

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children's dental health and their offspring's caries experience [6,7]. This has also been reported in a longitudinal study of children in the current study [8]. Studies exploring time trends in or stability of dental beliefs and attitudes are rare in the literature. However, a study from New Zealand found that individuals who held favorable oral health-related beliefs over a period of time had better adult oral health than those who did not [9]. As prospective parents, those individuals should also have favorable beliefs for managing good oral health in their offspring.

The situation in pediatric dentistry is that more understanding of and current knowledge about the socio-economic and cultural background and family circumstances of young children is needed to develop new strategies for prevention of caries in the deciduous dentition [10,11].

The aims of the present longitudinal study were (i) to investigate changes in dental beliefs and attitudes of a diverse group of parents from when their children were 3 years of age (in 2002) until 5 years of age (in 2004) and (ii) to identify possible mediators for a group composed of the parents with the most negative dental attitudes.

Material and methods

This study is part of a series of studies with both cross-sectional and prospective, longitudinal designs [6,8,12]. All were undertaken in Oslo-resident children and accompanying caregivers who attended Public Dental Health Service clinics in the period 2002–04. The studies received approval from the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate. The sampling procedure was designed to ensure variation in socio-economic and ethnic backgrounds, as described in previous papers [6,8,12].

The present study had both a longitudinal design (2002–04) and a time period design giving the possibility to compare differences between children of the same age in 2002 and 2004 (time-lag differences). The total sample of the present study consisted of the following groups: (a) a group of 3- (n = 251) and 5-year-old (n = 345) children who in 2002 participated in a cross-sectional study [12]; (b) a group of 5-year-olds in 2004 who in 2002 participated as 3-year-olds (n = 251) [8]; and (c) a new sample of 3-year-olds in 2004 (n = 392). Collection of completed questionnaires from the respective parents was undertaken both in 2002 and 2004. Active intervention was neither planned nor implemented as part of this study.

In the previous published studies [6,8,12] a child was assigned to either a non-Western immigrant group or to a Western native group. In this study the children's backgrounds were classified as a native Norwegian group (N group) or an immigrant group (IM_1 group). The IM_1 group consisted of children whose mothers were first-generation immigrants of non-Western origin. Non-Western background meant originating from Eastern Europe, Asia, Africa, Turkey, South and Central America [13]. In the longitudinal study, which constituted the main focus (Figure 1), half of the participating children in the IM_1 group originated from countries where the official religion was Islam, and almost three-quarters (74.1%) originated from Asia. Children originating outside Norway but without a non-Western background (IM_2) [8] were excluded due to the small sample size (n = 22). All parents with a non-Western background were offered interpreter assistance.

The questionnaire

The main part of the questionnaire consisted of items from a collaborative international study [7]. This part of the questionnaire was translated into Norwegian and back-translated into English by an independent bilingual person, and had been subjected to reliability and validity tests by the international research team [14]. The total questionnaire, including items tailored for Norwegian conditions, had also been assessed for consistency and validity in a longitudinal perspective [15].

In 2004, items from the international part of the questionnaire were omitted if they had not shown a significant association with caries experience in the multicenter study [7,10]. The belief and attitudinal items were selected based on the theoretical models of the Theory of Planned Behavior [16], the Health Belief Model [17] and the Health Locus of

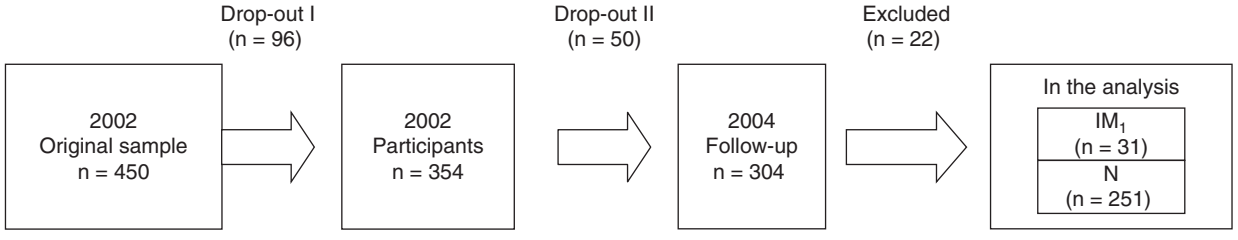

Figure 1. Flow diagram for the longitudinal study. The IM_2 group was excluded from this study due to its heterogeneity and small number size, changing the value of "Drop-out II" from 50, as used in previous publications, to 48.

Control [18]. The explanatory working model was influenced by the hypothesis of Conner and Norman [19], which states that beliefs about and attitudes towards particular behaviors might predict those behaviors. However, they are mediated only by attitudes (Figure 2) [14]. Based on a review of caries risk factors among young children, the behaviors used in the model were oral hygiene and sugar-snacking [20].

Responses to the belief and attitudinal items were registered on a five-point Likert scale (from "strongly disagree" to "strongly agree"). The direction of the scale was determined before analyses were performed.

Constructed variables

Three composite variables, "Attitude to Hygiene", "Attitude to Diet" and "Parental Indulgence", were constructed. The Likert scale responses "agree" and "strongly agree" (scores 4 and 5, respectively) were given a positive value (+1) while the responses "strongly disagree" and "disagree" (scores 1 and 2, respectively) were given a negative score (–1). Score 3 was assigned the value 0. These attitudinal item scores were added to give a total sum score. The items of the 2002 and 2004 composite variables are listed in Table I. For analytical purposes, the 2004 version of the composite attitudinal variables was employed for all sample groups, in both 2002 and 2004. The dichotomies varied according to the number of items used in the composite variables (Table I).

The variable "Education" was dichotomized into "High", indicating that both parents had a university or college education, and "Not High". "Parental Dental Attendance" differentiated between regular attendance (regularly for a check-up or for treatment) and sporadic attendance ("only if I have problems with my teeth or gums, or I do not visit a dentist"). The variable "Birth Order" was defined as firstborn or higher birth order. Whether the child lived with one or both parents determined the variable "Single Parent". "Mother's Age" indicated maternal age at the birth of the child and was dichotomized as ≤ 26 and > 26 years. This cut-off point was chosen since giving birth to a child at a young age has been a characteristic of mothers with low social capital [21], and is therefore considered as a caries predictor. The mean age of mothers based on all childbirths in Norway increased from 29.2 years in 1997 to 29.8 years in 2001 [22].

Risk attitudes

The attitudes significantly related to dentine caries prevalence in 2002 were "Parental Indulgence" and "Attitude to Diet" [6]. Furthermore, the children whose parents reported negative "Attitude to Diet" and "Parental Indulgence" developed more new caries lesions from 2002 to 2004 than those of parents with more positive attitudes [8]. Based on these findings, an "attitudinal risk group" was identified. Parents included in the "attitudinal risk group" were those with a negative "Attitude to Diet" in both 2002 and 2004, and/or who showed "Parental Indulgence" in both 2002 and 2004. Variables hypothesized to be related to the "attitudinal risk group" were demographic variables, such as "Immigrant Status", "Education", "Mother's Age", "Birth Order" and "Single Parent", and behavioral variables, such as "Parental Dental Attendance".

Data management and statistical methods

All data management and analyses were performed using SPSS software, version 15.0 (SPSS Inc, Chicago, IL).

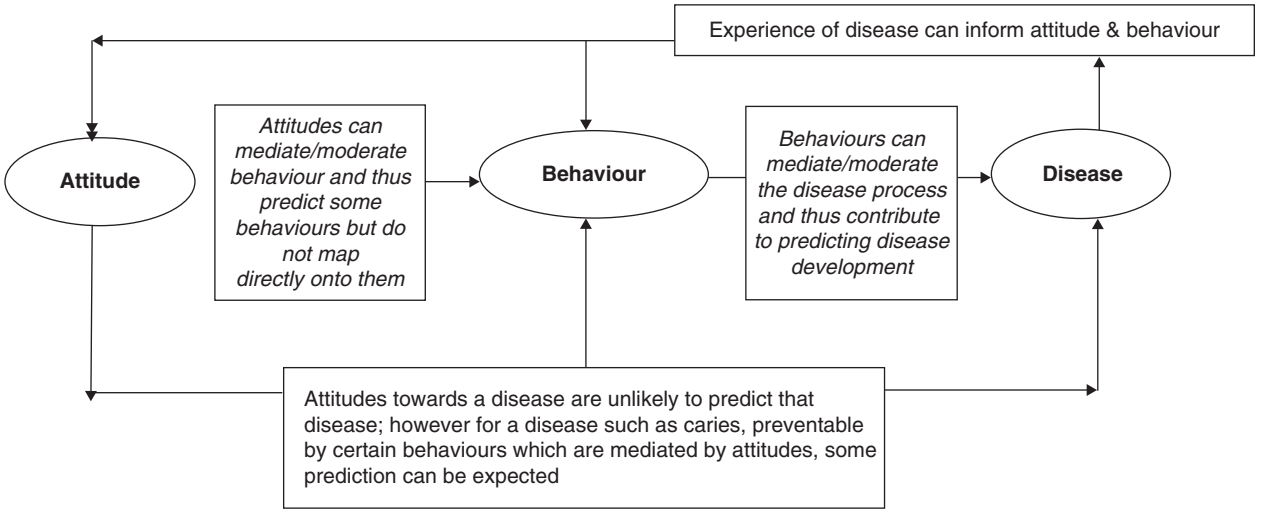

Figure 2. Model describing the relationship between attitudes, behavior and disease. Reproduced with permission from Cynthia Pine, University of Liverpool, Liverpool, UK.

Table I. Items of the composite variables in 2004. "Attitude to Hygiene" (three items fewer than in 2002), "Attitude to Diet" (two items fewer than in 2002), "Parental Indulgence" (same items as in 2002).

Composite variable: "Attitude to Hygiene". Cronbach's α: 0.76 (2002), 0.73 (2004)
As a family we intend brushing our child's teeth for him/her
We intend brushing our child's teeth for him/her twice a day
The people in my family would feel it was important to help brush our child's teeth twice a day
The people we know well would feel it was important to brush our child's teeth twice a day
We feel able to brush our child's teeth for him/her
I don't know how to brush my child's teeth properly
If we brush our child's teeth twice a day, we can prevent our child getting tooth decay in the future
If our child uses a fluoride toothpaste, it will prevent tooth decay
It would not make any difference to our child getting tooth decay, if we helped him/her brush every day
We don't have time to help brush our child's teeth twice a day
We cannot make our child brush his/her teeth twice a day
Composite variable: "Attitude to Diet". Cronbach's α: 0.82 (2002), 0.75 (2004)
As a family, we intend controlling how often our child has sugary foods or drinks between meals
The people in my family would feel it was important to control how often our child has sugary foods and drinks between meals
Composite variable: "Parental Indulgence". Cronbach's α: 0.62 (2002), 0.72 (2004)
If our child does not want to brush his/her teeth every day we don't feel we should make them
It is worthwhile to give our child sweets/biscuits to behave well
In our family, it would be unfair not to give sweets to our child every day
It is often too stressful to say "no" to my child when he/she wants sweets
It is not worth it to battle with our child to brush his/her teeth twice a day

Cronbach's α was used to assess the internal consistency of belief and attitudinal items. It was found to vary between 0.62 and 0.82 (Table I).

χ^2 statistics (with continuity correction, χ^2_c, as appropriate) were employed to compare the groups. The Wilcoxon signed-rank test for two related samples was used to test the null hypothesis that there had been no change in parental attitudes from 2002 to 2004.

A logistic regression model was constructed to measure the associations between certain independent variables and the odds of belonging to such an "attitudinal risk group" (dichotomous dependent variable). Only statistically significant predictors identified by bivariate regression analyses were included in the final multiple logistic regression model.

The level of statistical significance was set at 5%.

Results

The response rates from baseline to follow-up in the N and IM_1 groups were 86.6% (251/290) and 77.5% (31/40), respectively. The respondents consisted of 172 boys (N: $n = 139$; IM_1: $n = 17$) and 132 girls (N: $n = 112$; IM_1: $n = 14$). In 2002, 82.6% of the responders were mothers, compared with 80.2% in 2004, a statistically non-significant difference. The overall mean age of the mothers when these children were born was 31.8 years. The proportion of IM_1 mothers aged ≤ 26 years at the child's birth (21.4%) was higher than that in the N group (13.8%). The educational level of the IM_1 parents was significantly lower than that of the N group (mother's education: $p < 0.0001$; father's education: $p = 0.003$).

Drop-out

The most common reason for not participating in 2004 ($n = 48$) was relocation (internal migration and emigration). The educational level of the non-participants and participants did not differ significantly (high educational level: mothers: $p = 0.469$; fathers: $p = 0.647$), neither did the proportion of children with an immigrant background ($p = 0.106$) nor the age of the mothers ($p = 0.574$).

Educational background

All children (including the 345 aged 5 years in 2002 and the 392 aged 3 years in 2004) originated from the same area. The proportion of mothers of 3-year-olds in 2002 with high education did not differ significantly from the corresponding value for mothers of 3-year-olds in 2004. Educational differences were not present between either mothers or fathers of the 5-year-old children in 2002 and 2004. However, there was a significantly lower proportion of fathers educated to

Table II. Proportions (%) with 95% CIs and the frequency of negative parental "Attitude to Hygiene", "Attitude to Diet" and "Parental Indulgence". Questionnaires were studied from the parents of 3- and 5-year-old children in 2002 and 2004, respectively.

N group	2002 3-year-olds	95% CI	2004 5-year-olds	95% CI	*p*
Attitude to Hygiene	27.9 (70/251)	22.5–33.5	15.1 (38/251)	10.7–19.5	< 0.001
Attitude to Diet	30.9 (77/249*)	25.2–36.6	20.0 (50/250*)	15.0–25.0	< 0.001
Parental Indulgence	13.1 (33/251)	8.9–17.3	5.6 (14/251)	5.4–5.7	< 0.001
IM_1 group	3-year-olds		5-year-olds		
Attitude to Hygiene	33.3 (9/27*)	15.5–51.1	45.2 (14/31)	27.7–62.7	0.405
Attitude to Diet	38.5 (10/26*)	19.8–57.2	29.0 (9/30*)	13.6–46.4	0.480
Parental Indulgence	50.0 (14/28*)	31.5–68.5	58.1 (18/31)	40.6–73.7	0.763

a high level in the 3-year-old group in 2002 compared to that in 2004 ($\chi^2_c = 3.90$; df = 1; $p < 0.048$).

Prevalence of parental attitudes at baseline and follow-up

The distribution of negative attitudes among parents followed longitudinally showed that negative attitudes were consistently more frequent in the IM_1 group compared with the N group (Table II). In 2002, "Parental Indulgence" differed significantly between the two groups ($\chi^2_c = 21.86$; df = 1; $p < 0.0001$), while in 2004 "Parental Indulgence" ($\chi^2_c = 70.43$; df = 1; $p < 0.0001$) and "Attitude to Hygiene" ($\chi^2_c = 14.60$; df = 1; $p < 0.0001$) were significantly different. The proportion of N parents with negative attitudes was lower in 2004 than in 2002 [Wilcoxon signed-ranks test: "Attitude to Hygiene" (Z = –3.76; $p < 0.0001$); "Attitude to Diet" (Z = –3.38; $p = 0.001$); "Parental Indulgence" (Z = –3.53; $p < 0.001$)]. This positive trend was not found among IM_1 parents, except for "Attitude to Diet" (Wilcoxon signed-ranks test: Z = –707; $p = 0.480$). "Parental Indulgence" was high in the IM_1 group in both 2002 and 2004 (Table II).

Tracking of parental attitudes from 2002 to 2004

Parental responses were assessed to test the null hypothesis that their attitudes had not changed during the 2-year period from 2002 to 2004. Fifty (71.4%) of the 70 N parents of 3-year-old children in 2002 who had a negative "Attitude to Hygiene" showed positive attitudes 2 years later. Most parents who reported positive attitudes at baseline retained them in 2004 (90.1%). The number of parents with a negative "Attitude to Diet" was reduced from 77 in 2002 to 31 in 2004, while at the same time only 18 who had a positive attitude in 2002 had a negative attitude in 2004 (10.5% of 172). Nine out of a total of 33 indulgent parents in 2002 remained indulgent in 2004. Among those who were not indulgent in 2002 ($n = 218$), 2.3% had become indulgent by 2004. The small size of the IM_1 group ($n = 31$) did not justify detailed subgroup analyses.

Risk attitudes

Forty-nine parents (17.6%) satisfied the inclusion criteria for the "attitudinal risk group" (negative "Attitude to Diet" in both 2002 and 2004, and/or "Parental Indulgence" in both 2002 and 2004). Bivariate relationships (Table III), measured by the odds ratio (OR) between chosen independent variables and assignment to the group, showed significance for "Immigrant Status" [OR 4.3; 95% confidence interval (CI) 1.9–9.9], "Education" (OR 4.2, CI 2.0–8.7), "Parental Dental Attendance" (OR 3.2, CI 1.4–6.9) and "Birth Order" (OR 2.1, CI 1.0–4.0), but not for "Single Parent" and "Mother's Age". Only "Education" (OR 3.3; CI 1.6–7.0) and "Immigrant Status" (OR 2.8; 1.1–7.3) remained statistically significant after controlling for the effect of bivariately significant predictors by multiple logistic regression analysis (Table III).

Table III. Bivariate and multiple logistic regression models for assignment to the "attitudinal risk group".

Variable	No. of subjects by category (*n*)	OR	CI	*p*
Bivariate				
Immigrant Status	No: 251; Yes: 31	4.3	1.9–9.9	< 0.0001
Education*	High: 140; Not high: 139	4.2	2.0–8.7	< 0.0001
Parental Dental Attendance*	Regular: 246; Irregular: 35	3.2	1.4–6.9	0.004
Birth Order*	Firstborn: 130; Others: 134	2.1	1.0–4.0	0.037
Mother's Age*	≥ 27 years: 234; < 27 years: 40	1.9	0.8–4.2	0.124

*Not all the participants answered all the items.

Parental attitudes related to comparison groups in 2002 and 2004 (time-lag differences)

The dental attitudes of parents of 5-year-old N group children in 2004 were more favorable than those of 5-year-old N children in 2002. The same favorable tendency was found for the parents of the 3-year-olds from 2002 to 2004. These differences were statistically significant with respect to "Attitude to Hygiene" (χ^2_c = 5.96; df = 1; $p < 0.015$), "Attitude to Diet" (χ^2_c=4.64; df=1; p=0.031) and "Parental Indulgence" (χ^2_c = 5.72; df = 1; p = 0.017) in 5-year-olds, and "Attitude to Hygiene" (χ^2_c = 7.05; df = 1; p = 0.008) and "Attitude to Diet" (χ^2_c=4.16; df=1; p=0.041) for the 3-year-olds. Conversely, the proportion of negative parental dental attitudes of IM_1 parents in the respective age groups tended to be higher in 2004 than in 2002, but not significantly so ($p > 0.05$). It was found in the IM_1 group of 3-year-olds in 2004 that 43/71 parents (60.6%) were indulgent, while in the respective age group in 2002, 14/28 parents (50.0%) were indulgent.

Discussion

A multitude of variables, including attitudes, contribute to specific behaviors. If behaviors are learnt and established before age 5 years, they are likely to become deeply ingrained [23]. Early childhood thus constitutes an important period for future oral health [24]. It follows that if behaviors are mediated by attitudes [14], then it will be essential to influence parents' negative dental attitudes and behaviors in a positive direction while the children are young, when they have neither acquired wide experience nor been extensively exposed to socializing influences outside the immediate family [25]. Consequently, they are dependent on the preferences and choices of their parents.

In this study it was found that parents' dental attitudes towards children's oral health differed between N and IM_1 parents. While the N parents' dental attitudes were significantly more positive in 2004 when their children were 5 years of age than when they were 3 years, the same did not apply to IM_1 parents. This finding is consistent with literature suggesting that, due to culturally inappropriate services/programs, it seems very difficult to influence dental attitudes positively among individuals with immigrant backgrounds [26]. The results also showed that the prevalence of negative dental attitudes at both ages was highest among parents in the IM_1 group. These findings are in agreement with a review focusing on transcultural oral healthcare [27]. Furthermore, N parents with positive attitudes at baseline tended to persist in their attitudes during the next 2 years, but, among immigrant parents, negative attitudes persisted or tended to increase. Unfortunately, the limited group size of immigrant parents did not allow detailed analyses.

When changes in attitudes to dental health are observed during a relatively short interval, as in this study, the reasons might be multi-faceted. Therefore reasons involving both random and real effects should be considered. Due to the different backgrounds of the groups, the findings are discussed separately.

N parents

Fostering behavioral change is more complex than merely changing attitudes [19]. Behind a behavioral change there are stages and processes in which attitudes are more or less important. One explanation for the positive change in attitudes among N parents might be that attitudinal items could be remembered; also, a desire to give answers that accord with accepted and widely held social norms may have influenced findings [28]. The use of a number of items in the composite attitudinal variables (Table I) and the 2-year interval between data collections would tend to reduce possible bias due to memory and social desirability [29].

Both the longitudinal and time set designs of the present study revealed more positive N parents' dental attitudes in 2004 compared to 2002. As Norwegian children are entitled to free dental care from the Public Dental Services from birth to 18 years of age and preventive services are prioritized according to perceived risk, it cannot be precluded that the dental hygienists who participated in the study may have influenced the outcome by becoming more engaged and enthusiastic. The positive changes in dental attitudes reported may be due to preventive messages from the hygienist at the 3-year visit, or to subsequent information received through the media or from staff at other institutions (teachers at day-care institutions, peers or friends). In Norway in about 2002 there was a concern about increasing caries experience among preschool children [30] and it became a topic of discussion in the Norwegian parliament. Dental health problems among young children were also covered by newspapers, television and professional journals. Consequently, it is reasonable to believe that all this attention made parents more aware of dental caries among young children.

In contrast, structural changes in society and current lifestyle factors have been claimed to work in the opposite direction and lead to detrimental dental health behaviors [2,31]. Possible explanations include a hectic parental life, irregular meal patterns, parental indulgence, sugar-sweetened drinks at bedtime and intake of snacks and soft drinks, as well as an institutionalized childhood (kindergartens) with parents unavailable to control children's diet. However, others claim that modern families devote much leisure time to their children and have greater interest in them [3]. Norwegian parents are well educated: in 2004, Statistics Norway reported that 36.8% of the population in the age group 25–39 years had

university or college level education, and in Oslo this figure was 54.1% [32]. Although "authoritarian parenting" is no longer the norm and negotiations between the parent and child have taken over, this does not mean that the child always gets its way.

IM_1 parents

Except for the "Attitude to Diet" in the longitudinal study, the frequencies of negative dental attitudes among IM_1 parents were not statistically significantly lower in 2004 than in 2002, but the small sample size precludes firm conclusions. It seems that dental information given to IM_1 parents at the 3-year visit had little or no effect. One explanation might be that, while settling in a new country, the parents have other priorities than the dental health of their children. Another explanation may be that the dental health information was standardized and not adjusted for cultural diversity [27]. As diversity in cultural and religious backgrounds is closely related to family life, information about dietary choices should preferably be adapted to immigrant groups' own traditional diet and, in the case of extended families, also influential members such as grandmothers should be invited into the counseling. Another important background factor for disparities between N and IM_1 groups is that the poor language abilities of some IM_1 parents constitute a barrier to mutual understanding.

Risk group

Parents not highly educated or with a non-Western background were most likely to be assigned to the "attitudinal risk group". However, 87% of the IM_1 group did not have a higher education. In a study of caries prevalence among 2.5-year-old children living in a suburb of Stockholm, Grindefjord et al. [33] found that children with an immigrant background often came from families from a lower socio-economic strata. The association between low educational level/socio-economic status and poor dental attitudes is well documented [26], as is the prevalence of negative dental attitudes among immigrant parents [34].

Methodological considerations

The response rate from baseline to follow-up after 2 years was high [35], and the values of Cronbach's α regarding belief and attitudinal items were consistent, with good reliability [36]. All belief and attitudinal items used in this study had been found to relate to caries [7,8] and to be consistent and valid in a longitudinal perspective [15]. Furthermore, the observed trend in N group parental attitudes was similar regardless of longitudinal or cross-sectional design. Thus it is unlikely that the findings of this study are seriously affected by drop-out or by inconsistent answers to the questionnaires.

As regards sampling, the clinics were selected first to secure variation in socio-economic status and ethnic background but, at the clinic level, the children were randomly selected. Precautions should therefore be taken in generalizing the findings of the study to the corresponding Oslo child population. However, some background information tends towards representativeness. The mean educational background of the parents corresponded to the parental educational level of 35-year-olds who participated in a random sample survey in Oslo in 2003 [37]. Also, the mean age of the mothers when giving birth to these children corresponded to the mean age at birth in the Norwegian population.

Conclusions

Norway has only recently become a multicultural society [12], and the Public Dental Health Service will need time to cope effectively with the oral health needs of the new ethnic minority groups. This longitudinal study in Oslo showed that while the dental attitudes among N parents improved significantly from 2002 to 2004, this was not the case among IM_1 parents. Not having higher education and being of non-Western background predicted belonging to the "attitudinal risk group". Thus this study provides evidence of a need for culturally tailored efforts to promote oral health behavioral change, especially in the immigrant group.

Implications

Intervention studies with a prospective design taking cultural diversity into account should be prioritized. New mothers in disadvantaged groups have been shown to be open to information and strategies designed to reduce the prevalence of early childhood caries [38]. An outreach intervention program among non-Western immigrants in Sweden [39] and "Motivational Interviewing" treatment among South Asian immigrant children in British Columbia [40] have shown promising results. Such strategies should receive further attention because negative parental dental attitudes impact negatively on children's dental health.

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