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SHORT COMMUNICATION

Childhood caries is still in force: A 15-year follow-up

MATTILA MARJA-LEENA[1,5], RAUTAVA PÄIVI[1,6], JAAKKOLA SIRKKA[1,5], OJANLATVA ANSA[2,4,6] & SILLANPÄÄ MATTI[1,3]

Departments of [1]Public Health, [2]Teacher Education and, [3]Child Neurology, University of Turku, [4]Institute of Biomedicine, Center for Reproductive and Developmental Medicine, University of Turku, [5]Public Health Center, Dental Healthcare Clinic, and [6]Turku City Hospital, Turku, Finland

Abstract

Objective. To examine changes in caries prevalence among 3 to 15-year-old adolescents. ***Material and methods.*** Of 1582 eligible mothers, 1443 gave informed consent. Participating children and their parents were followed up continuously from 3 to 15 years of age in a pre-planned fashion and at regular intervals. Data on dental health status were obtained from 1066/1287 adolescents (82%) during regular clinical dental examinations. ***Results.*** Dentinal untreated caries (D) was seen among more than 26% of the adolescents at 15 years of age. Altogether, 4.9 carious teeth surfaces were affected in each case (mean). Close to 18% of the adolescents (186/1066) had poor dental health (DMFT was 5 or more) and 26% (271/1066) had DMFS 5 or more. ***Conclusions.*** Dental caries continues to constitute an increasing challenge in dental health care: any caries at 3, 5, 7, or 10 years of age was a predictor of poor dental health at 15 years of age.

Key Words: *Adolescent, caries prevalence, child, dental caries, poor dental health*

Introduction

The presence of dental caries declined among children globally and in the Scandinavian countries, including Finland, between 1970 and 1990 [1–3]. However, this favorable situation changed direction in Finland [4], Denmark, and the United Kingdom [5,6] in the 1990s, and consequently the shifting evidence for dental caries in children needs to be seriously considered once again. The dental health of adolescents in their mid-teens is threatened when recently erupted permanent teeth exist together with simultaneously exfoliating carious primary teeth. In Finland, the caries situation of the primary dentition appears to have been weakened previously [7]. A microbe reservoir of the primary teeth may put general health status at risk. Carious primary teeth may also risk the health of later permanent teeth [8,9]. Even a small amount of caries must be carefully considered because of the indication of transmission of bacteria. Caries, an intensive infection disease that has to be dealt with, leads to emergency room visits, increased costs, and time, and, in addition, diminished oral-related quality of life [10]. Despite annual check-ups, caries continues to occupy the newly erupted teeth of adolescents.

It is now well known that risk factors such as poor diet, poor oral hygiene habits, parents' young age, parents' insufficient competence in child rearing, and previous caries are all associated with caries in childhood [11–14], and discussion of those issues ought to take place during visits to the dentist.

The aims of the present study were to examine how caries prevalence will develop in this child population between 3 and 15 years of age as studied at ages 3, 5, 7, 10, and 15 years in a country where the dental health of children is checked annually. The target is to clarify whether the development of caries may increase, halt, or even decline.

Material and methods

The present study was based on the Finnish Family Competence (FFC) study started by the Department of Public Health, University of Turku, in 1985. The study population originated from a representative sample of nulliparous women expecting their

Correspondence: Marja-Leena Mattila, Department of Public Health, Lemminkäisenkatu 1, FIN-20014 University of Turku, Finland. Tel: +358 2 3338435. Fax: +358 2 3338439. E-mail: malema@utu.fi

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first child in the (then) Province of Turku and Pori in southwestern Finland. Eleven health authority areas, weighted according to degree of urbanization, were randomly selected for the study. Within these authorities, all 67 maternity health-care clinics, 72 well-baby clinics, and 69 dental health care clinics were available and cooperated with the researchers in a pre-planned fashion. Of the 1582 mothers, 1443 gave informed consent. The participating children and their parents were continuously followed up thereafter.

The data collection procedure comprised an assessment of each child's dental health status during the regularly scheduled clinical dental examinations between 3 and 15 years of age. Dental status data were available for 1059 children at 3 years, as well as for 828, 1070, 1074, and 1066 children at 5, 7, 10, and 15 years, respectively. Trained dentists, including two of the authors, carried out clinical dental examinations at the public dental health clinics as part of the annual routine check-ups. At the same check-up points, data on general health and acute and long-term diseases were noted. Recurrent infections were defined as more than five infections treated with antibiotic therapy by the age of 18 months [15]. A total of 8% (88/1059) of this study population had caries at 3 years of age, 28% (230/828) at 5 years, 41% (437/1070) at 7 years, and 55% (593/1074) at 10 years. The extent of caries was recorded for every dental surface by means of a mirror, probe, and, on occasion, fiberoptic light. Inter-examiner variance was checked in two repeat examinations when the children were 15 years of age; the kappa coefficient was 0.54.

Dental caries status was measured using the DMFT and DMFS indices defined as follows: D = decayed, M = missing, F = filled, T = teeth considering permanent teeth, and S correspondingly the tooth surface and DMFT/DMFS considering primary teeth [16,17]: 1) DMFT/DMFS index (dental health: good = 0, fairly good = 1–4, poor $\geq$5). 2) Occurrence of caries (DMFT = 0 and DMFS = 0), no dentinal caries, or only enamel caries on permanent teeth or tooth surfaces (which means no manifested caries lesions) and DMFT $>$0 and DMFS $>$0 dentinal caries exists (manifested lesions or cavities present), correspondingly on primary teeth.

Statistics

Univariate analyses of associations were carried out between poor dental health, DMFT $\geq$5 at the age of 15 years, and the potential predictor variables dmft/DMFT $>$0 at 3, 5, 7, and 10 years of age, as well as between dental caries D $\geq$5 at 15 years of age and the potential predictor variables dmft/DMFT $>$0 at 3, 5, 7, and 10 years of age by applying Pearson's chi-squared test. Multivariate modeling of the statistically significant associations was continued with cumulative logistic regression analyses with cumulative odds ratios (COR) and 95% confidence intervals (95% CI) [18]. Computations were performed using the BMDP Statistical Software. A p-value of <0.05 was considered statistically significant. The Ethics Review Committee of the Medical Faculty at Turku University approved the study design.

Results

Of the participating adolescents, 35% (377/1066) had no caries (DMFT, DMFS = 0) at 15 years of age. A total of 47% (503/1066) had DMFT 1–4 and 39% (418/1066) DMFS 1–4 in the permanent teeth or tooth surfaces. Close to 18% of the adolescents (186/1066) displayed poor dental health with DMFT $\geq$5 and 26% (271/1066) with DMFS $\geq$5. Figure 1 displays the proportions of the caries-free children and children with caries at each age.

At 15 years of age, the mean score of carious teeth (DMFT) was 2.3 (SD 2.8), and of carious teeth surfaces (DMFS) 3.2 (SD 4.6). Untreated dental caries (D) was seen among 26% of the children. However, 4.9 (the mean) carious teeth surfaces were affected. No significant differences were observed in the DMFT scores between boys and girls or between healthy children and children with recurrent previous infections in infancy, allergies, or other long-term diseases. Any caries with manifested caries lesions at any age was a predictor of poor dental health DMFT $\geq$5 (Table I) in an increasing manner. The COR of having many additional caries compared to the former examination point caries (D $\geq$5) at 15 years was 1.6 when the children had caries at 3 years (95% CI 0.97–2.6; $p<0.066$), 1.7 at 5 years (95% CI 1.6–2.4; $p<0.006$), 1.8 at 7 years

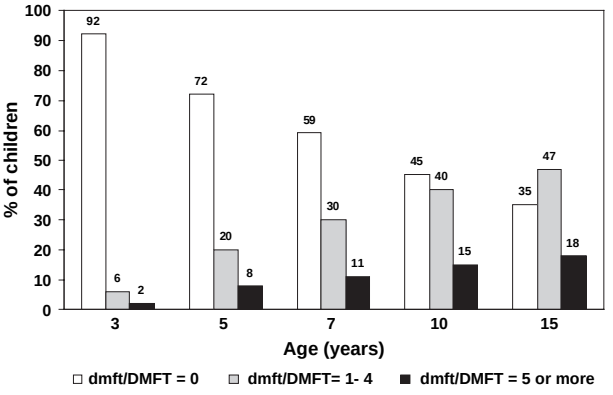

Figure 1. The same children were examined at ages 3, 5, 7, 10, and 15, depending on their dental health status; the proportions of the children with healthy teeth, dmft = 0 at 3 and 5 years of age and dmft/DMFT = 0 at 7, 10, and 15 years of age, dmft 1–4 at 3 and 5 years of age and dmft/DMFT 1–4 at 7, 10, and 15 years of age, dmft $\geq$5 at 3 and 5 years of age and dmft/DMFT $\geq$5 at 7, 10, and 15 years of age.

Table I. Caries at ages 3, 5, 7, and 10 years (dmft/DMFT ≥0) explaining poor dental health DMFT ≥5 at age 15 years. Cumulative logistic regression.

Explaining variables	COR	95% CI	*p*
dmft at 3 years >0 vs 0	3.8	2.4–6.1	<0.001
dmft at 5 years >0 vs 0	3.4	2.5–4.8	<0.001
dmft/DMFT at 7 years >0 vs 0	4.5	3.4–5.8	<0.001
dmft/DMFT at 10 years >0 vs 0	5.4	4.1–7.0	<0.001

Variable to be explained: DMFT ≥5 at 15 years.

(95% CI 1.4–2.4; $p<0.001$), and 2.1 at 10 years (95% 1.5–2.8 CI; $p<0.001$).

Discussion

There was an apparent trend of increasing caries from the time of the former period of dental examination among children at ages 5, 7, 10, and 15 years. While nearly 20% of the 15-year-old adolescents had poor dental health, only 35% had healthy teeth. Untreated dental caries was present among 1/4 of the adolescents. Caries continues to occupy the situation and cannot be controlled. A delay in caries occurrence would be expected when the permanent teeth are about to erupt in the mouth. The situation seemed to be independent of the recent eruption before the age of 15 years, however. Any caries at ages of 3, 5, 7, and 10 years was a predictor of increasingly poor dental health and new caries.

The study population was representative of the entire Finnish population, but generalizations may also be made to cover other Scandinavian people, because the population structures, service organizations, and living conditions are similar. At the time of the 15-year follow-up, participation of the study population was still at a good level. This kind of setting is of value in follow-up of one and the same cohort over a long period of time.

Considering the caries situation in Europe, Finland and The Netherlands were at the top of the list of countries with healthy teeth among 12-year-olds in the 1990s [1], but this has now changed, and documentations of the other Nordic countries have reached the same level. The caries situation of 10 European countries is observed to be slightly better than that of Finland [19]. The means of the DMFT indices are already showing a declining trend among 12-year-old Finnish children. In the year 2000, these indices were 0.6 in The Netherlands [20], 0.9 in the United Kingdom [21], 0.9 in Denmark [19], 1.0 in Sweden [19], and 1.2 in Finland [19]. In the present study, however, the prevalence rate of 15-year-old Finnish adolescents has increased to 2.3 in 2002. The DMFT was 1.78 among 12 to 15-year-old adolescents in the United States during the period 1999–2004 [22]. Comparable prevalence rates of 14-year-olds in the UK were 1.35 in southwestern England and 2.75 in Scotland [2], whereas it was 7.0 for 15-year-old Lithuanian adolescents [23,24] and 8.1 for Latvian children [24]. Nearly 2/3 of the present study children had caries despite visiting a dentist each year. The present trends in public dental health care and check-ups involve fewer and fewer calls to visit the dentist. It is therefore essential to find the children at risk of caries and to include them in a more frequent follow-up cycle of visits. Caries as early as at 3 years of age seems to be associated with poor dental health and increasing new caries at puberty at 15 years of age. At least those with caries at 3 years and those who have plaque on their teeth at that age should be included in more frequent follow-up cycles of visits [25]. Early initiation of preventive programs will be needed [8,26], as will motivation of the child's family for dental health education in early childhood [12]. For the dentist, supporting a family means intervening in family life, which may be too much to ask for as far as professional skills and courage of dentist are concerned. The discussion on supporting issues should have taken place as directed during the dental health-care visit. It is known, however, that this will not happen every time. For instance, in a study of smoking prevention the various phases of the brief intervention were carried out only in part during dental visits and that part could be improved by raising self-motivation for health counseling among the staff.

Evidence-based dentistry (EBD) has commenced. A classification of caries risk factors has been introduced along with several new tools and technologies augmenting current diagnostic and treatment applications. In the latest paradigm, caries detection and restoration are integrated in the examination of risk factors rather than being separate foci on their own. And, more recently, new tools have been incorporated to facilitate both prevention and early detection or repair of caries lesions [27]. Any previous caries experience is known to have a strong predisposition in future dental health [28–30]. Target groups can easily be found, but the individuals in those groups have to see their dentists during the personally scheduled control visits arranged more frequently than before, and with check-ups run effectively and efficiently. Comprehensive children's dental health care entails multiprofessional teamwork and close cooperation with the family. Families will first be asked to join in this prevention work, and then it will be essential that adolescents gradually grow into committing themselves to taking care of their own teeth.

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