Caries prevalence and therapy in the deciduous dentition from 3 to 8 years

A longitudinal study

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The onset and prevalence of caries in primary teeth and the rate of failure in conservative caries therapy were followed up for six years in a group of children who were three years old at the start of the study in 1974. All children were offered a basic preventive program which included counselling their parents on dietary habits, oral hygiene and the use of fluoride tablets. During the annual clinical examinations bitewing radiographs were taken in cases with established molar contacts. Operative care was delivered when necessary, combined with topical fluoride applications.

At the age of three years the onset of caries was registered in 26 percent of the children. The corresponding percentages at the ages of 4, 5, 6, 7 and 8 years were 26, 18, 8, 3 and 2, respectively. Consequently, 17 percent were still caries-free at the end of the six-year period. Proximal caries was most often observed on the distal surfaces of the first primary molars, followed by the mesial surfaces of the second primary molars. The overall frequency of class II amalgam restorations requiring replacement was 16 per cent. The highest percentage of failures was noted in lower first primary molars.

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In 1974, a Public Dental Health Service for all children and adolescents up to the age of 19 years was established in Sweden. Epidemiological investigations have hitherto been carried out on children who had not participated in a systematic dental care program (2, 3, 4). Studies of caries increment in pre-school children receiving comprehensive dental care in Denmark have been published recently (7, 8).

The aim of this study was to investigate the onset and prevalence of caries and the rate of success of therapy after six years in a group of Swedish children who had received systematic dental care from the age of three years.

STUDY POPULATION AND METHODS

The study population comprised 194 children from a central district of the city of Göteborg, Sweden. Their socioeconomic conditions were considered to correspond to the average for Swedish urban populations. The children had had dental check-ups at local Child Health Centers at the ages of about 8 and 18 months. On these occasions the parents had received counselling on dietary habits, oral hygiene and the effect of fluoride tablets on dental caries. Fluoride tablets were prescribed at the first check-up. Inquiries about their use were made at subsequent check-ups

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and they were prescribed anew when required. The extent of the use of fluoride tablets has not been determined.

The annual dental examinations started in 1974, when the children were three years old. The teeth were checked by several dentists, either belonging to the staff of the Pedodontic Department, Faculty of Odontology, or working in the adjoining School Dental Clinic. 89 percent of the children participated in all six dental check-ups, eight percent participated in five and three percent in four examinations between 3 and 8 years. The subjects represented 60 percent of the 3-year-old children in the area in 1974. The remaining 40 percent comprised patients who did not show up at the first examination or, more often, subsequently moved out of the district.

The annual dental check-up was followed by topical application of 0.2 % NaF-solution, three times at the age of three and then once a year. Bite-wing radiographs were taken from the age of four in children with established molar contacts. Manifest caries lesions were registered as decayed surfaces (d–s). Incipient and secondary caries were not included in the calculations. Caries on the proximal surfaces was regarded as incipient if the radiolucent area was restricted to the outer part of the enamel (1).

The population observed was divided into six groups according to the age at which the first caries lesion was diagnosed. Tooth designations according to the two-digit system (ISO 3950–1977) were used.

In order to estimate the frequency of failures in the operative caries therapy, the number of replaced class II amalgam restorations and the number of primary molars extracted owing to caries were recorded.

OBSERVATIONS

The distribution of the children according to age at the on-set of caries is shown in Table 1. At the age of four, more than half of the children had dental decay. After this age the proportion of caries-free children decreased at a lower rate. Only 17 percent maintained their deciduous teeth caries-free until the age of eight years.

Table 2 shows the prevalence of caries, calculated in d–s for the whole study population and for the carious children. At the age of 8, the caries prevalence was also measured in def–s and the proportion of occlusal locks, prepared without preceding occlusal caries, in class II cavities was calculated. The proportion of occlusal locks without caries was lowest in group I: 15 percent of the total def–s. The percentages for the other five groups were 21, 31, 43, 37 and 50, and for the whole carious population 23 percent.

The prevalence of caries on occlusal and proximal molar surfaces is depicted graphically in Fig. 1. The children with early caries onset started with a high prevalence of occlusal caries. The later the first caries lesion was diagnosed, the lower was the proportion of occlusal caries.

The prevalence of caries on the proximal surfaces showed a weak tendency to decrease with age at the onset of caries. At the end of the investigation, the distal surfaces of the first primary molars were carious in 51 percent of the surfaces in group I, 49 percent in group II, 47 percent in group III and group IV, 42 percent in group V and 31 percent in group VI. The corresponding figures for the mesial surfaces of the second primary molars were 42, 36, 30 (III and IV), 21 and 25 percent, respectively.

The caries prevalence was consistently higher in the lower jaw, except for the proximal surfaces of the first

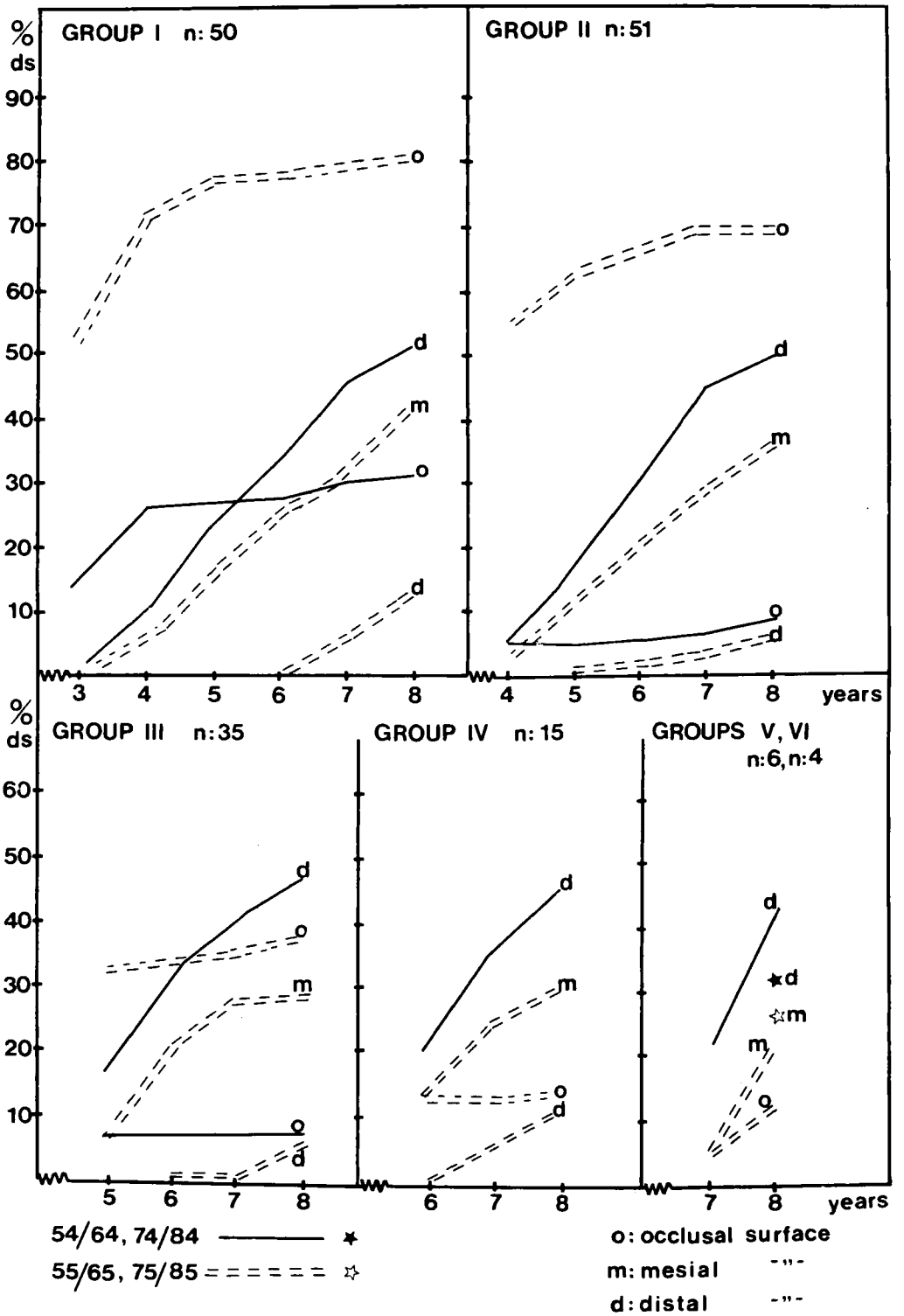

Fig. 1. Caries prevalence on different surfaces of primary molars from 3 to 8 years in groups I to VI.

primary molars, which showed more carious mesial surfaces in the upper than in the lower jaw, whereas the distal surfaces were equally often decayed in both jaws.

The prevalence of caries in incisors was relatively low. When the children were six years old the prevalence of caries in incisors was 16 percent of the total number of d–s in group I, 9 percent in group II and 4 percent in group III.

The caries prevalence in primary teeth at the age of 8 in the different groups is given in Table 3. Group I had almost twice as many decayed surfaces as group III. Likewise, group II had twice as much caries as groups IV and V while group VI had not accumulated many decayed surfaces.

The number of replaced class II silver amalgam restorations and the number of extracted primary molars are shown in Table 4. Although there was no difference in the prevalence of caries on the distal surfaces of the lower and upper first primary molars, the class II restorations had to be replaced more often in the lower jaw. The lower first primary molar was also the tooth which showed the highest number of extractions owing to caries. The number of failures was highest in group I: 50 percent of the extractions and 41 percent of the replacements in class II cavities were performed in this group. In group II the percentage of extractions was 30 and that of replacements 29.

Table 1. *Distribution of children according to age at onset of caries*

Group	Age, years	n	%
I	3	50	25.8
II	4	51	26.3
III	5	35	18.0
IV	6	15	7.7
V	7	6	3.1
VI	8	4	2.1
caries-free		33	17.0
TOTAL		194	100

Table 2. *The mean number of decayed surfaces in the primary dentition from 3 to 8 years*

Age, years	3	4	5	6	7	8
Total n = 194						
d–s	1.1	2.5	3.9	4.8	5.6	6.3
def–s						8.1
.....						
With decay n = 161						
d–s	4.1	4.8	5.6	6.2	7.0	7.6
def–s						9.7

Table 3. *Mean number of decayed surfaces (d–s) in the primary canines and molars at the age of 8 years in groups I to VI*

Group	I	II	III	IV	V	VI
d–s	10.4	8.0	5.4	4.3	4.0	2.3

DISCUSSION

Because of the high mobility of the urban population, 40 percent of the original sample was lost during the six years of observation. The influence of this loss on the results could not be controlled. However, a comparable loss in a similar study was shown to have little influence on the results (2). The reason for counting only decayed surfaces was to exclude the increase in def–s caused by occlusal locks in class II restorations. A comparison between the numbers of d–s and the def–s was made at the age of eight. As might have been expected, the early caries groups with predominantly occlusal lesions exhibited the lowest percentage of auxiliary occlusal surfaces. This problem was also studied by Majid *et al* (5), who, after recording the caries-free oc-

Table 4. *Number of decayed surfaces (d–s), number and percentage of replaced class II silver amalgam restorations and number of extracted primary molars at the age of 8*

Tooth, surface	d–s	Replacements n	Replacements %	Extractions n
54/64 m	24	3	13	14
54/64 d	158	24	15	
55/65 m	121	16	13	6
55/65 d	15	2	13	
74/84 m	11	4	36	30
74/84 d	162	34	21	
75/85 m	104	18	17	11
75/85 d	41	5	12	

clusal surfaces involved in class II restorations, corrected the proportion of carious surfaces from 25.5 percent to 20.8 percent.

Early caries onset started with a high proportion of occlusal caries; 65 per cent in group I and 74 percent in group II were occlusal d–s. However, during the six years of follow-up these groups also developed the highest prevalences of proximal caries. At the end of the investigation, the ratio between occlusal and proximal caries had changed to 1:1 in group I and 1:1.5 in group II, while the ratio was 1:5 in groups IV and V, who started with predominantly proximal caries. Group VI had no occlusal caries at all. The mode of the proximal caries development followed that observed by Parfitt (6), i.e. the distal surface of the first primary molar appeared to be the most caries-active of the proximal molar surfaces.

The Swedish studies (2, 4) showed considerable differences in the caries prevalence before the introduction of the Public Dental Service Act in 1974. In the cross-sectional Jönköping study of 1973 (4) three-year-old children had a mean df–s of 3.9 and five-year-olds 11.2, while in the longitudinal Umeå study (2) the three-year-old children, born in 1967, had a mean def–s of 2.47 which increased to 5.95 in two years. If the caries prevalence in the same Umeå children at the age of 8 years, 8.48 def–s (3) is compared with the prevalence in this study, 8.1 def–s, it seems that systematic dental care has had little effect on dental health. However, the majority of the Umeå children had received information on diet, oral hygiene and the effect of fluorides at the Child Health Centers. About half of the Umeå children had also received dental care during the preschool years while the Jönköping children had only had emergency treatment.

Recent Danish studies (7, 8) report a difference in the caries prevalence in two populations receiving comprehensive dental care. In Enghaven, Copenhagen (7), the prevalence of caries in three-year-old children, 6.50 def–s, increased to 11.70 def–s when the children were 6 years old, while the corresponding figures in children living in Hvidovre (8) were 1.04 and 5.15, respectively. The good results in Hvidovre were attributed to longer continuous dental care (8). In order to make a comparison with the Danish studies (7, 8) possible, the caries score of 4.8 d–s at the age of six in this study was corrected by adding 23 percent to the number of occlusal d–s as compensation for the occlusal locks in class II restorations which had been excluded. The corrected prevalence of 5.4 df–s shows that results comparable with those in Hvidovre could be achieved by a basic preventive program and generally high in-

terest in dental care in the population.

The most frequent cause of failure in the class II amalgam restorations was a fracture in the isthmus area. The anatomy of the deciduous teeth seems to be a complicating factor, especially in the first primary molars, with marked occlusal convergence of buccal and lingual surfaces, accentuated by a molar tuberculum.

Extractions were usually the result of unsuccessful operative procedures: necrosis under a deep restoration or internal resorption after pulpotomy, but a few teeth were also lost owing to poor cooperation by the patient, not allowing complicated procedures. When the 194 Göteborg children were six years old, 27 primary molars had been extracted while only 11 molars had been extracted in 373 children in Hvidovre (8).

In the present Swedish dental care program the time gap between the check-ups at 18 months and three years seems to be too long. In order to select the patients at risk, the children should be screened earlier than at the age of three years. The caries-active children should be given an individual preventive program. As proximal caries dominated from the age of six, dental flossing might be introduced in an effort to reduce the incidence of caries on proximal surfaces (9). The intervals between clinical examinations should be set individually. According to this study, annual caries check-ups seem to be sufficient for children with low caries activity.

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