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Original article

Association of caries experience in adolescents with different preventive measures

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Summary

Objectives: To assess the preventive measures which were associated with the striking caries decline observed in Marburg (Germany) between 1982 and 2002 and to investigate the relationship between caries prevalence and the type of educational level.

Methods: 1,237 twelve-year-old children were examined in four different types of schools. D_3MFT and the number of teeth with fissure sealants were registered. Information about preventive measures carried out in the past was collected by structured questionnaires. To compare the mean caries scores of various subgroups, Mann-Whitney U-tests and ANOVA were performed. Variables associated with caries were included in a binary logistic regression analysis.

Results: In 2002 the mean D_3MFT score amounted to 0.78. In 80.7 % of the pupils fissure sealants were observed, on average 3.5 teeth with sealants were recorded per child. There were significant differences between the mean D_3MFT scores and the mean number of teeth with fissure sealants among the various school types.

Conclusions: Use of fluoride supplements in the past, use of fluoridated table salt and fissure sealants were the factors in the binary logistic regression analysis which were significant in preventing caries.

Keywords: Dental caries – Fissure sealants – Duration of tablet fluoridation – Fluoride varnish – Educational level – Germany.

A decline in caries was observed in Europe and elsewhere as early as the beginning of the 1970's (Glass 1982; Marthaler 1990). At this time, the caries prevalence among children and young people in the Federal Republic of Germany was still quite high (Naujoks 1985). This is why Schmidt (1982) introduced regular application of the fluoride varnish Duraphat® to Marburg schools in 1981 ("Marburg Model"). Various studies documented the success of this concept (Schmidt et al. 1986; Schulte et al. 1993).

Beginning in 1989, it became possible to intensify preventive care for school children because changes in the public health insurance system gradually improved the general conditions for preventive dentistry in Germany. From this time on, public health insurance companies were obligated to pay both for preventive action taken in schools (for six- to twelve-year-olds) as well as for individual prevention (for twelve- to eighteen-year-olds).

In 1993, individual prevention was extended to include children six to eleven years of age. In addition, preventive sealing of fissures on molars was also incorporated into the range of services covered by statutory health insurance.

The most recent scientific evaluation of the "Marburg Model" was done in 1992 and yielded an average D_3MFT of 2.1 for 12-year-old children who had received fluoride varnish applications on a regular basis and 2.9 for 12-year-olds who did not participate in such a program (Schulte et al. 1993). Therefore, this study's primary aim was to record the state of dental health among twelve-year-old school children in the district of Marburg-Biedenkopf in 2002. In addition, we studied the association between caries prevalence and the exposure of individual children to collective and individual preventive action. Furthermore, we examined the connection between the type of school system attended and oral health.

	Mean D_3MFT (SD)	95 % CI	
Gymnasium (N = 344)	0.63 (1.3)	0.49–0.76	
Realschule (N = 93)	0.48 (1.07)	0.26–0.7	
Hauptschule (N = 55)	0.6 (1.23)	0.27–0.93	
Gesamtschule (N = 745)	0.9 (1.64)	0.78–1.02	
p-value*	0.005		
Total group (N = 1237)	0.78 (1.50)	0.69–0.86	
p-value**	Gymnasium vs.:	Realschule	0.852
		Hauptschule	0.999
		Gesamtschule	0.026
p-value**	Realschule vs.:	Hauptschule	0.969
		Gesamtschule	0.057
p-value**	Hauptschule vs.:	Gesamtschule	0.481

Table 1 Mean D_3MFT-values, standard deviation and 95 % confidence interval

SD: standard deviation; CI = confidence interval

* One way analysis of variance (ANOVA)

** Post hoc comparisons according to Tukey

Sample and Methods

Study Area and population

The German county of Marburg has a population of about 253,058. A total cohort of 2100 twelve-year-olds was available in 2002. These twelve-year-olds from public schools in Marburg formed the population from which 1237 children agreed to participate. Depending on their academic performance, children attended *Gymnasium* (secondary school with high academic level), *Realschule* (secondary school with medium academic level), *Hauptschule* (secondary school with low academic level) or *Gesamtschule* or *Orientierungsstufe* (integrated secondary school). Only those young people were included in the study whose parents had filled in the questionnaire. Thus the sample represented 58.9 % of the population.

The examinations were performed between April and July 2002. Mentally or physically disabled adolescents were not included in the study. The study was approved by the ethics committee of our medical faculty and informed consent was given by the parents of the participating children.

Methods

The examinations in the schools were conducted by three examiners specially trained for this purpose (K.P., T.H. and C.B.). During a pre-survey training period, examiners were calibrated by an experienced dental examiner (K.P.) combining theoretical information and preliminary diagnostic training with slides and examination of patients. The theoretical training was followed by practical training in which a sample of twelve-year-old children was examined by each of the examiners, and the diagnoses compared to those recorded by the reference examiner. The inter-examiner reliability of the recordings (kappa) ranged between 0.84 and 0.94, the intra-examiner reliability between 0.8 and 0.91.

WHO criteria were used to record dentine caries (D_3) (WHO, 1987). The letters DMFT stand for D = decayed (carious), M = missing, F = filled, T = tooth/teeth. The dental examinations were performed using plane mirrors, dental probes and artificial light. No radiographs were taken. The presence of sealants was recorded, without taking into account whether they were complete or not.

Ascertaining the exposure to preventive measures

In addition to the clinical examination, specific aspects of the children's exposure to preventive measures were ascertained by having their parents fill in a questionnaire.

The following variables were surveyed: (a) Frequency of tooth brushing at home (once a week/ less than once a day/ once a day/more than once a day; (b) Use of fluoridated toothpaste (don't know/no/yes). (c) Use of fluoride supplements at home in the past (don't know/no/yes) and if so, for how long;

Table 2 Mean number of fissure sealed teeth in relation to the attended school type, proportion of children with at least one fissure sealed tooth

	Mean number of teeth with FS (SD)	95 % CI			p-value*
Gymnasium	4.2 (3.3)	3.84–4.55	Gymnasium vs.:	Realschule	0.999
Realschule	4.01 (3.57)	3.28–4.75		Hauptschule	0.501
Hauptschule	3.44 (2.87)	2.68–4.20		Gesamtschule	<0.001
Gesamtschule	3.12 (2.62)	2.93–3.21			
Total group	3.5 (2.96)	3.34–3.67			

FS: Fissure sealant; SD: standard deviation; CI = confidence interval;

* One way analysis of variance (ANOVA)/ Post hoc comparison according to Tukey

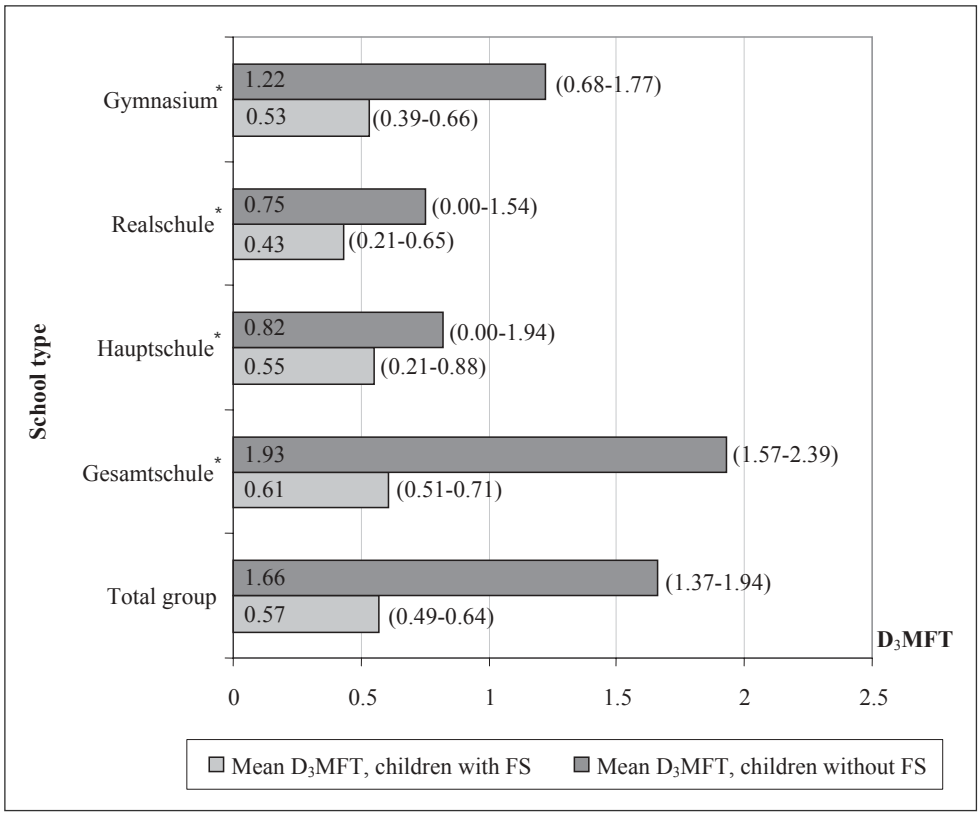

Figure 1 Mean D_3MFT scores for children with and without fissure sealants in relation to the attended school type- 95 % confidence intervals are given in parentheses.
* Gymnasium = secondary school with high academie level
Realschule = secondary school with medium academie level
Hauptschule = secondary school with low academie level
Gesamtschule = integrated secondary school

(d) Use of fluoridated salt at home (don't know/no/yes) and if so, since when.

The records of the Marburg county dental public health service were used to investigate which preventive measures had been applied to the individual child during their school careers. The frequency of oral hygiene instructions, dietary counselling and topical fluoridation with Duraphat-varnish were recorded.

Data collection and Statistical Analysis

The findings were recorded during the examinations on a documentation form noting type of school, sex and the date of examination. A special documentation form was available for determining the group prevention measures. At the end of the dental examination, the documentation form for the findings, the parents' questionnaire and the documentation form for the group prevention measures were collated.

The findings and the data collected on the questionnaires were entered into an Excel database. Then a statistical analysis was performed using SPSS, Version 12.0. Mann-Whitney U-tests and ANOVA (one-way analysis of variance) were used to test the significance of the averages, with the significance level set to $p < 0.05$. To evaluate potential correlations between D_3MFT and different preventive measures, adjustments were made for

Table 3 Bivariate Analysis: Relation of different preventive measures to oral health of twelve-year-old children (total group). The Dichotomisation for the OR refers to $D_3MFT = 0$ as opposed to $D_3MFT > 0$.

Variables		N (%)	D_3MFT (CI)	OR (CI)
Frequency of tooth brushing	1× daily or more	1169 (94.5)	0.76 (0.67–0.84)	2.012 (1.133–3.575)
	<1× daily	49 (4)	1.39 (0.77–2.01)	
	missing value	19 (1.5)		
	p-value*		0.005	
Use of fluoridated toothpaste	yes	1040 (84.1)	0.71 (0.62–0.80)	1.24 (0.801–1.918)
	no	98 (7.9)	1.24 (0.72–1.52)	
	missing value	99 (8)		
	p-value*		0.07	
Use of fluoride tablets in the past	yes	942 (76.2)	0.64 (0.55–0.72)	2.046 (1.486–2.817)
	no	190 (15.3)	1.35 (1.06–1.64)	
	missing value	105 (8.5)		
	p-value*		<0.0005	
Use of fluoridated table salt	yes	627 (50.7)	0.63 (0.53–0.74)	1.531 (1.197–1.959)
	no	571 (46.2)	0.92 (0.78–1.05)	
	missing value	39 (3.1)		
	p-value*		<0.0005	
Fluoride varnish (Duraphat®)	regularly (10–12×)	397 (32.1)	0.57 (0.45–0.68)	1.259 (0.956–1.657)
	others	706 (57.1)	0.76 (0.66–0.87)	
	missing value	134 (10.8)		
	p-value*		0.034	
Fissure sealant	with	998 (80.7)	0.57 (0.49–0.64)	2.291 (1.715–3.061)
	without	239 (19.3)	1.66 (1.37–1.94)	
	p-value*		<0.0005	

OR = Odds ratio; CI = 95 % confidence interval

* Mann-Whitney-U-Test

the most important confounders by using a binary logistic regression model. The children were dichotomised into groups with $D_3MFT = 0$ and $D_3MFT > 0$. Table 3 shows how the dichotomies of the independent variables were performed. Adjusted odds ratios (OR) and 95 % confidence intervals (CI) were calculated.

Results

A total of 1,237 children twelve years of age were examined. Of these twelve-year-olds, 68.9 % had $D_3MFT = 0$, e. g., dentition without decayed, filled or missing teeth. The mean D_3MFT score amounted to 0.78 (Tab. 1). The mean D_3MFT score of pupils attending *Realschule* was lowest at 0.48, although this difference was not significant when compared to those attending *Gymnasium*. The mean D_3MFT score of pupils attending *Gesamtschule* was significantly poorer than that of pupils attending *Gymnasium* ($p = 0.026$).

Fissure sealants were observed in 80.7 % of the pupils, and an average of 3.5 teeth with sealants was recorded per child. Table 2 clearly shows that differences existed in the average number of sealed teeth. The difference in the average number of sealed teeth between pupils in *Gymnasium* and in *Gesamtschule* was $p < 0.001$ (ANOVA) and thus significant. Figure 1 shows the mean D_3MFT scores for children with and without fissure sealants in relation to the type of school they attended. There were no statistical differences between the mean D_3MFT values of children attending *Gymnasium* and *Gesamtschule*, neither with nor without fissure sealants.

Table 3 shows the association of different independent variables to the caries experience of twelve-year-old children in Marburg. Children who brushed their teeth at least once each day exhibited significantly lower D_3MFT scores than children who did not brush regularly. The mean D_3MFT of children who had received fluoride tablets was significantly lower than the caries scores of those children who had not taken fluoride supplements. These values were lower, the longer the

Table 4 Mean D_3MFT scores (total group) in relation to how long fluoride tablets were taken (with and without using fluoridated table salt)

	Fluoride tablets taken, no fluoridated table salt used		Fluoride tablets taken, and fluoridated table salt used	
Length of time Fluoride tablets were taken	**Mean D_3MFT (SD)**	**N**	**Mean D_3MFT (SD)**	**N**
Never	1.33 (2.06)	118	1.25 (1.67)	65
Up to 1st year of life	0.89 (1.53)	108	0.74 (1.44)	117
Up to 2nd year of life	0.74 (1.28)	133	0.51 (1.25)	182
Up to 3rd year of life	0.6 (1.27)	92	0.51 (1.17)	145
Up to 6th year of life or longer	0.65 (1.22)	65	0.51 (1.07)	91
p-value[a]	0.004		0.001	

		p-value[b]	**p-value**[b]
Never vs.:	Up to 1st year of life	0.197	0.091
	Up to 2nd year of life	0.022	0.001
	Up to between 3rd and 5th year of life	0.006	0.002
	Up to 6th year of life or longer	0.033	0.004

[a] One-way analysis of variance (ANOVA)

[b] Post hoc comparisons according to Tukey

Table 5 Distribution of different preventive measures according to the attended school type

		Gymnasium	Realschule	Hauptschule	Gesamtschule
Variables		**N (%)**	**N (%)**	**N (%)**	**N (%)**
Frequency of tooth brushing	1× daily or more	329 (95.6)	86 (92.5)	50 (90.9)	703 (94.4)
	<1× daily	8 (2.3)	5 (5.4)	4 (7.3)	32 (4.3)
	missing value	7 (2.1)	2 (2.1)	1 (1.8)	10 (1.3)
Use of fluoridated toothpaste	yes	295 (85.8)	72 (77.4)	40 (72.7)	632 (84.8)
	no	20 (5.8)	11 (11.8)	8 (14.5)	59 (7.9)
	missing value	29 (8.4)	10 (10.8)	7 (12.8)	54 (7.3)
Use of fluoride tablets in the past	yes	256 (74.4)	68 (73.1)	40 (72.7)	577 (77.4)
	no	55 (16)	16 (17.2)	9 (16.4)	110 (14.8)
	missing value	33 (9.6)	9 (9.7)	6 (10.9)	58 (7.8)
Use of fluoridated table salt	yes	183 (53.2)	41 (44.1)	20 (36.4)	382 (51.2)
	no	148 (43)	48 (51.6)	33 (60)	342 (46)
	missing value	13 (3.8)	4 (4.3)	2 (3.6)	21 (2.8)
Fluoride varnish (Duraphat®)	regularly (10–12×)	145 (42.2)	21 (22.6)	18 (32.7)	213 (28.6)
	others	171 (49.7)	68 (73.1)	35 (63.6)	431 (57.9)
	missing value	28 (8.1)	4 (4.3)	2 (3.7)	101 (13.5)
Fissure sealant	with	295 (85.8)	77 (82.8)	44 (80)	582 (78.1)
	without	49 (14.2)	16 (17.2)	11 (20)	163 (21.9)

young people had been taking fluoride supplements (Tab. 4). Children who had received fluoride tablets at least up to their second year of life had significantly better D_3MFT scores than those children who had never had fluoride tablets.

Fluoridated domestic salt was used by 50.7 % of the families of the twelve-year-olds in Marburg (Tab. 3). Children living in families who used fluoridated salt at home exhibited significantly lower D_3MFT scores than those coming from families who did not use this kind of salt.

Table 6 Binary logistic regression analysis: Relationship between D_3MFT and the most essential variables (total group)

Variables	β	SE	Wald	p-value	OR (CI)
Frequency of tooth brushing (1x daily or more)	0.568	0.411	1.908	0.167	1.765 (0.788–3.955)
Use of fluoridated toothpaste	–0.031	0.267	0.013	0.908	0.970 (0.575–1.636)
Use of fluoride tablets in the past	0.532	0.198	7.212	0.007	1.703 (1.155–2.511)
Use of fluoridated table salt	0.335	0.151	4.933	0.026	1.398 (1.040–1.880)
Fluoride varnish regularly (10-12x)	0.217	0.156	1.926	0.165	1.242 (0.914–1.688)
Fissure sealants	0.582	0.183	10.155	0.001	1.789 (1.251–2.558)
Type of school (Gymnasium/Realschule vs. Hauptschule/Gesamtschule)	0.276	0.159	3.026	0.082	1.318 (0.966–1.799)

β = adjusted coefficient of the regression; SE = standard error of estimate; OR = Odds ratio; CI = 95 % confidence interval

During their first six years of school, 32.1 % of the children had been given fluoride varnish on a regular basis (i. e., at least ten times). Their average D_3MFT was 0.57 and thus significantly lower than the average D_3MFT of children who didn't receive fluoride varnish in school on regular basis (average D_3MFT of 0.76) (Tab. 3).

The mean D_3MFT value found in children without fissure sealants was nearly three times that recorded for children with at least one fissure sealant (Tab. 3).

Table 5 clearly shows that nearly all parameters related to preventive behaviour were better for *Gymnasium* pupils than for those attending other types of schools.

The binary logistic regression incorporating all the registered prevention variables revealed that use of fluoride tablets in the past, use of fluoridated table salt and fissure sealants were negatively associated with D_3MFT = 0 (Tab. 6).

Discussion

The study conducted in 2002 showed that children who regularly took part in the "Marburg Model" had a mean D_3MF-T score of 0.57, compared to the D_3MFT score of 2.1 observed in the Marburg-Biedenkopf district in 1992 (Schulte et al. 1993) this implies a reduction in caries experience by 72.9 %.

Young people who didn't receive fluoride varnish on a regular basis had a D_3MFT score of 0.76. Compared to the corresponding score in 1992 (DMFT = 2.9), a distinct caries reduction of 73.8 % was observed here, as well.

The following factors may, according to Künzel et al. (2000) be responsible for the improvement in dental health (in Germany): Increased use of fluoride toothpastes, availability of fluoridated salt, fluoride supplements, greater utilisation of dental services and the adoption of a preventive approach by dental practitioners. A systematic survey summarises the significance of local fluoridation (toothpastes, mouthrinses, gels or varnishes) within the scope of caries prevention among five- to sixteen-year-olds (regardless of drinking water fluoridation) (Marinho et al. 2006). Our study confirms some of these above-mentioned factors. For instance, our study suggests that fissure sealants may have been the most important factor associated with low DMFT in 2002. If we look at the results of the bivariate analysis (Tab. 3), we see that children with sealed teeth are more than twice as likely (OR = 2.291) to have healthy dentition as are those without fissure sealant. Schulte et al. (2001) found in their study of twelve-year-olds in Heidelberg that children with sealed teeth had only half as many DMF teeth as those without sealants. Thus developments in Germany were very similar to those in Slovenia, where sealants played a major part in caries decline between 1987 and 1998 (Vrbic, 2000). Allowing dentists to charge for individual preventive measures led those in private practice to increase preventive care. Our study further showed that the average number of sealed teeth varied from one type of school to another (Tab. 2). Children attending *Gymnasium* had on average significantly more sealed teeth than children attending *Gesamtschule*. Klemme et al. (2004) likewise observed significantly more sealed teeth among pupils in *Gymnasium* than among children visiting *Hauptschule*.

As the binary logistic regression shows, having used fluoride tablets in the past helped decisively in preventing caries. The caries preventive effect of fluoride tablets has been amply studied (Stephen 1994). A study in Sweden showed that young people who regularly received fluoride tablets up to between their fifth and seventh year of life had significantly fewer filled teeth than those who had received no fluoride tablets as children (Widenheim and Birkhed 1991). We were able to show that administering fluoride tablets up to the second year of life can significantly improve dental health (Tab. 4).

Current use of fluoridated salt at home also seems to have a favourable effect on dental health (Tab. 6). There are a number of scientific studies available which demonstrate the positive

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effect of fluoridated table salt in preventing caries. These studies were done in a wide variety of countries (Menghini et al. 1995; Fabien et al. 1996; Irigoyen and Sánchez-Hinojosa 2000; Meyer-Lueckel et al. 2002). In a study by Schulte et al. (2001), 38.8 % of the families of twelve-year-olds in Heidelberg, Germany used fluoridated table salt. The DMFT and DMFS scores of these children were significantly lower than those of twelve-year-olds who did not use fluoridated table salt.

The fluoride varnish applied in Marburg schools may also have contributed to the improvement of oral health. For instance, the average D_3MFT score of children who had received regular applications of fluoride varnish in school was 25 % lower than that of children who did not receive fluoride application on a regular basis (Tab. 3). Helfenstein and Steiner (1994) published a meta-analysis on fluoride varnish application (Duraphat). The authors were able to incorporate a total of eight experimental studies with control groups (none of whom had been treated with fluoride varnish) and found an average reduction in caries of 38 %. When interpreting these figures, however, it is important to bear in mind that all these studies were performed between 1973 and 1987, that is to say, during a period of time in which caries prevalence among children was roughly five times as high as it is today. Nowadays most children enjoy the benefits of a wide spectrum of caries preventive measures (e. g. fluoride toothpaste, tablets or salt, fissure sealants and fluoride gels), so that any one of these measures alone may perhaps turn out to be less effective.

The importance of regular use of fluoridated toothpaste when caring for teeth is also documented (Schiffner and Reich 1999). A randomised clinical study (Al-Jundi et al. 2006) showed that supervised daily brushing of teeth with fluoride toothpaste had a significant effect on the oral health of children. Our study also showed that brushing teeth daily influenced D_3MFT scores (Tab. 3) ($p = 0.005$, OR = 2.012). In Germany, using (children's) fluoride toothpaste is recommended as soon as the first tooth appears (Gülzow et al. 2000), and the new, evidence-based recommendations on fluoridation also state that its caries-protective effect on permanent teeth increases when the toothpaste has a higher fluoride concentration and is used more often (Gülzow et al. 2006). Presumably, the most effective way to prevent caries is to brush teeth daily with fluoride toothpaste.

Caries prevalence seen in relation to various types of schools exhibited a significant difference between pupils attending *Gymnasium* and pupils attending *Gesamtschule* (Tab. 1). This was confirmed by the results of the last evaluation of the Marburg Model (Schulte 1993). Klemme et al. (2004) detected a similar tendency: the average DMFT scores of pupils attending *Gymnasium* were considerably better than those attending *Realschule* or *Hauptschule*. In Germany, pupils attending *Gymnasium* usually tend to come from families with a higher social status, while children attending other types of schools generally tend to come from mid-range or lower social strata (Manz et al. 2001; Klemme et al. 2004). As already shown (Tab. 5), comparatively more preventive measures were carried out on those attending *Gymnasium* than on those children attending other types of school, although this difference was not crucial.

The caries experience of children in Marburg is extremely low today. In the German state of Hessen, in which the Marburg-Biedenkopf district is located, the average D_3MFT score was 1.08 for twelve-year-olds in 2000 (Pieper 2001) and 0.89 in 2004 (Pieper 2005).

The improvement of dental health in recent years in Marburg-Biedenkopf has also been substantially greater than in other western European countries. Pitts et al. (2002) calculated an average D_3MFT score for twelve-year-old children of 0.89 in England and Wales in 2000–01. Compared to the D_3MFT scores found by these authors in 1996–97, this shows a reduction in caries of 11 %. In Norway, the average D_3MFT score for twelve-year-olds fell from 1.7 to 1.5 between 1997 and 2000 (Haugejorden and Birkeland 2002). A study in Portugal conducted from 1984-99 disclosed a drop in average DMFT scores for twelve-year-olds from 3.7 to 1.5 (Almeida et al. 2003). Twelve-year-olds in The Hague (Netherlands) have a very low caries prevalence. Truin et al. (2005) discovered an average D_3MFT score of 0.2 for this population in 2002, although the mean score six years earlier was only 0.7 (Truin et al. 1998). In France, the caries experience of twelve-year-olds dropped from 4.2 to 1.9 between 1987 and 1998 (Bourgeois et al. 2004).

Conclusions

Although the goals set by the "German Dental Association" for 2020 (average DMFT score <1 for twelve-year-olds) (Oesterreich and Ziller 2005), have already been reached in Marburg, the DMFT scores documented for the various types of school still reveal substantial inequalities in caries experience.

As the mean sealant figures show, these differences may possibly be due to members of the lower class taking less frequent advantage of sealants.

Therefore, fissure sealing should be encouraged in addition to other measures, especially in prevention programmes for lower-class children.

Zusammenfassung

Zusammenhang zwischen Kariesprävalenz und verschiedenen Prophylaxemaßnahmen bei Jugendlichen

Ziel: Die vorliegenden Studie zielte darauf ab zu untersuchen, welche Prophylaxevariablen mit dem deutlichen Kariesrückgang in Marburg (Deutschland) in den Jahren 1982–2002 verknüpft waren. Auch sollte der Zusammenhang zwischen der Kariesprävalenz und verschiedenen Schultypen überprüft werden.

Methode: An den Untersuchungen nahmen 1237 12-Jährige teil, die vier unterschiedliche Schultypen besuchten. Der D_3MFT-Wert und die Anzahl versiegelter Zähne wurden registriert. Mit Hilfe von Fragebögen wurden Informationen über die durchgeführten präventiven Maßnahmen erhoben. Um die mittleren Karieswerte der verschiedenen Untergruppen zu vergleichen, wurden Mann-Whitney U-Tests und ANOVA eingesetzt. Binäre logistische Regressionsanalysen dienten dazu, den potentiellen Zusammenhang zwischen der Zahnkaries und verschiedenen Prophylaxe-Variablen zu ermitteln.

Ergebnisse: Im Jahr 2002 betrug der mittlere D_3MFT-Wert 0,78. 80,7 % der Schülerinnen und Schüler hatten versiegelte Zähne, im Durchschnitt waren bei jedem Jugendlichen 3,5 Zähne versiegelt. Die mittleren D_3MFT-Werte sowie die mittlere Anzahl der Zähne mit Fissurenversiegelung unterschieden sich in den verschiedenen Schultypen signifikant voneinander.

Schlussfolgerung: Eine Tablettenfluoridierung in der Vergangenheit, die Verwendung von fluoridiertem Speisesalz und die Fissurenversiegelung zeigten in der binären logistischen Regression einen positiven Einfluss auf die Prävention der Zahnkaries.

Schlüsselwörter: Zahnkaries – Fissurenversiegelung – Dauer der Tablettenfluoridierung – Fluoridlack – Bildungsniveau – Deutschland.

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