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Dental caries and associated factors in 12-year-old schoolchildren in Thiruvananthapuram, Kerala, India

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Summary. *Objectives.* The aims of the present study were to describe the dental health status of 12-year-old schoolchildren in Thiruvananthapuram, Kerala, India, and to identify sociodemographic factors, oral health behaviours, attitudes and knowledge related to dental caries experience.
Methods. The study took the form of a cross-sectional survey of 838 children in upper primary schools. A two-stage cluster sampling technique was used. Dental caries was measured using World Health Organization criteria. Sociodemographic factors, oral health behaviours, attitudes and knowledge were assessed by a self-administered questionnaire.
Results. The prevalence of dental caries in the permanent dentition was 27%. The mean number of decayed, missing and filled teeth was 0·5 (SD = 0·9). The decayed component (D) constituted 91% of the total number of decayed, missing and filled teeth (DMFT). Multiple logistic regression analysis showed that children had a higher risk of having dental caries if they lived in urban area [OR = 1·5, 95% confidence interval (CI) = 1·1–2·1], had visited a dentist (OR = 1·6, 95% CI = 1·2–2·2), did not use a toothbrush (OR = 1·9, 95% CI = 1·2–2·9), consumed sweets (OR = 1·4, 95% CI = 1·0–1·9) or performed poorly in school (OR = 1·7, 95% CI = 1·0–2·3).
Conclusions. The prevalence of caries in this sample of 12-year-old schoolchildren was low compared to that in other developing countries. The present study indicated that urban living conditions were associated with more dental caries. Since urbanization is rapid in India, oral health promotion at the present time would be valuable to prevent increased caries prevalence.

Introduction

In low-income countries, the most prevalent oral disease of public health concern is dental caries [1]. The increase in the prevalence of dental caries has been attributed to factors such as high sugar consumption, a shift to a westernized diet, socioeconomic status, the rate of urbanization and the mother's level of education [2–7]. These factors may be influenced by economic transition [8]. Economic improvement in a low-income country like India may have an effect on dental health. Kerala, a state in Southern India, is undergoing rapid urbanization, and this can be a risk factor for the increased prevalence of dental caries among the population [9,10].

The prevalence of dental caries in 12-year-old children in India [11] has been reported to be low compared with many other parts of Asia [12]. Studies from Kerala have shown a prevalence of approximately 60%, and caries experience (decayed, missing and filled teeth, DMFT) in 12-year-olds well below the global goal set by the World Health

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Organization (WHO) for the year 2000 (DMFT = 3) [5,13].

Dental services in India, are predominantly provided by private dentists since the government diverts limited resources to finance dental services [7,14]. A major emphasis is placed on curative rather than preventive services and a fee for service is maintained. At present, there are neither community-orientated oral health promotion nor organized preventive programmes.

Epidemiological studies have been carried out on general health status in Kerala, while current information regarding dental health is insufficient for planning and evaluating dental health services. The objective of the present study was to describe the dental health status of 12-year-old schoolchildren in Thiruvananthapuram, and to identify sociodemographic factors, oral health behaviour, attitudes and knowledge associated with dental caries experience.

Subjects and methods

Study area

The study was carried out from September to November 2003 in Thiruvananthapuram district (Fig. 1), which is the capital of Kerala. The state is situated at the south-west corner of India, and while it is one of the smallest states it is the third most populous in India. Kerala has an area of 2192 km^2 and an approximate population of 3·2 million. Its gross domestic product per capita is the lowest when compared with the rest of the country [15].

Study population and sampling procedure

Twelve-year-old schoolchildren in upper primary schools in Thiruvananthapuram were included in the study and a two-stage cluster sampling technique was used. Upper primary schools were the primary sampling unit and individual children the unit of enquiry. Upper primary schools in Thiruvananthapuram are divided into three geographical areas. Seventeen out of 118 private schools and 13 out of 98 government ones were randomly selected with probability proportional to the total number of schools within each area. The sample size was estimated to 738, using a design effect of two, a precision of 0·05 and assuming a caries prevalence of 60% [5,13]. Approximately 15% was added to the sample size in order to oppose loss of sample. Within each of the 30 schools, 28 children were randomly selected from the total number of 12-year-olds present on the day of the survey. The final study population consisted of 838, 12-year-old schoolchildren.

Clinical examination

One researcher (J.D.), assisted by a recorder, examined all the children. The examinations were

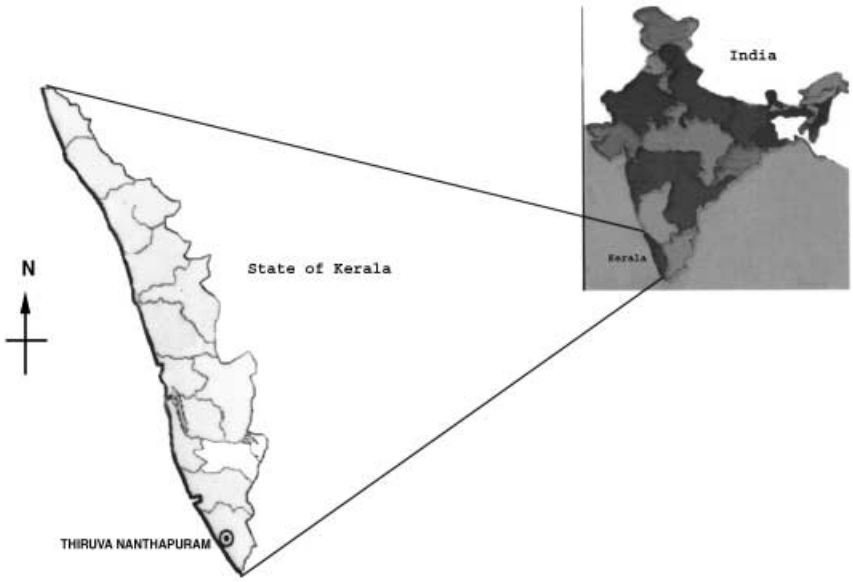

Fig. 1. State of Kerala.

carried out in classrooms using plane mouth mirrors, WHO periodontal probes and torchlight. The batteries in the torchlight were replaced every 2 days. Neither radiographic examination nor drying of teeth was carried out.

Dental health status and need for dental treatment was recorded using the DMFT index, following the WHO criteria for epidemiological studies [16]. A tooth was classified as carious when there was either a cavity, undermined enamel or a softened floor or wall on either the pit or fissure or on one of the smooth tooth surfaces. Training and calibration for examining dental caries was carried out in the Department of Oral Sciences – Pedodontics of the Faculty of Dentistry, University of Bergen, Bergen, Norway. Oral hygiene status was measured using the Oral Hygiene Index – Simplified [17]. In each school, two children were examined twice for intraexaminer reliability. The kappa value for intraexaminer agreement of the tooth status was 0·88.

Questionnaire

A questionnaire was constructed in English and translated into the local language, Malayalam. It was piloted among 12-year-old children in one school and adjustments were made where necessary. The questions were read aloud by the examiner (J.D.), giving time for children to fill in the questionnaire and ask questions. The questionnaire included sections on sociodemographics, oral health behaviour, attitudes and knowledge.

The sociodemographic characteristics included area, mother's education and gender. Oral health behaviours registered included use of toothbrush, use of fluoride toothpaste, frequency of sweet consumption and information on previous dental visits. Attitudes and knowledge were measured by the child's subjective assessment of her or his teeth and self-perceived performance in school. The variable area was dichotomized into urban and rural, with cities (corporations) and towns (municipalities) categorized as urban, and villages (panchayats) as rural.

The questionnaire was reintroduced to 108 students in seven schools. The test–retest time ranged from 7 to 19 days. The kappa agreement for the questions ranged from 56% to 94%, with the highest agreement being for the question on visiting a dentist and the lowest agreement for the question use of toothbrush.

Data analysis

Data were entered and analysed using the SPSS, Version 11·0, computer software package. Chi-square tests were used for the comparison of proportions. Multiple logistic regression analysis was conducted to determine the independent contribution of sociodemographic factors, dental health behaviours, attitudes and knowledge on caries prevalence. The level of significance was set at 5%.

Ethical clearance

Ethical approval was obtained from the Norwegian Ethical Committee, the Ethical Committee at the Thiruvananthapuram Medical College and the Directorate of Public Instruction, Kerala. Written consent was given by the leader of each school and the children who participated in the study. The names of children who needed dental treatment were given to the class teachers who informed the parents. Oral health education and a demonstration of how to brush teeth were conducted after the examinations. All children involved in the study were given toothpaste, a toothbrush and an oral health pamphlet.

Fluoride analysis

Water samples were collected from 30 schools and analysed at the University of Bergen laboratory. The fluoride levels ranged from 0·02 to 0·4 mg/L.

Results

Out of the examined children, 43% were girls and 13% had mothers who had not gone to school (Table 1). Sixty per cent of the children had never visited the dentist, 12% did not use a toothbrush, 19% had fair oral hygiene, 50% ate sweets and 27% did not use fluoride toothpaste. One-fifth of the children were dissatisfied with their teeth and assessed their school performance as poor. Table 1 also shows the sociodemographic factors, oral health behaviours, attitudes and knowledge of the children according to area.

Dental health status

The dental health status of the children according to area is shown in Table 2. On average, the children had 25 erupted permanent teeth. Thirty-one

Table 1. Sociodemographic factors, oral health behaviours, attitudes and knowledge of 12-year-old children according to area ($n = 838$).

Variable	Children		Location		*P*-value
	Number	Percentage	Rural (%)	Urban (%)	
Sociodemographic factors					
Mother's education (years):					
0	106	13	12	14	0·33
1–10	562	67	69	63	
≥ 11	170	20	19	23	
Gender:					
female	359	43	44	41	0·41
male	479	57	56	59	
Oral health behaviour					
Dental visits:					
never	504	60	62	55	0·04*
yes	334	40	38	45	
Use toothbrush:					
yes	737	88	88	91	0·29
no	99	12	12	9	
Oral hygiene status:					
good	681	81	79	87	0·01*
fair	157	19	21	13	
Consumption of sweets:					
never	417	50	50	49	0·94
more often	421	50	50	51	
Use of fluoridated toothpaste:					
no	224	27	28	22	0·06
yes	614	73	72	78	
Attitudes and knowledge					
Subjective assessment:					
satisfied	672	80	81	78	0·32
dissatisfied	166	20	19	22	
School performance:					
good	681	81	80	84	0·18
poor	157	19	20	16	

*Chi-square test; $P < 0·05$.

per cent of the second molars, 2% of the premolars, 2% of the canines and 0·2% of lateral incisors were not present in the oral cavity. Eight-four children (10%) had one or more decayed primary teeth.

Twenty-seven per cent ($n = 226$) of the children had caries experience (DMFT) in the permanent dentition. The mean DMFT was 0·5 (SD = 0·9). The major portion, 91%, of the caries experience was decayed teeth, while missing and filled teeth accounted for 5% and 4%, respectively.

The percentage of children with decayed teeth was 26% ($n = 219$). Sixteen per cent ($n = 136$) had one decayed tooth and 10% ($n = 83$) had two or more decayed teeth. The percentages of children with missing and filled permanent teeth were 2% and 1%, respectively. Twenty per cent of the children had decayed teeth in the lower jaw and 11% had decayed teeth in the upper jaw. Twenty-three per cent of the children had caries in the first molars and 5% had caries in the second molars. Sixty-eight per cent of the decayed teeth were in the lower jaw. Seventy-three per cent of the decayed first molars were assessed to need one surface filling, 10% two or more surface fillings, 10% extraction and 7% pulp therapy with restoration.

Table 2. Caries experience in 12-year-old children according to area: (DMFT) decayed, missing and filled teeth: (SD) standard deviation.

Type of caries	Caries experience (mean ± SD)		
	Rural	Urban	Total
DT	0·40 ± 0·84	0·43 ± 0·75	0·41 ± 0·82
MT	0·01 ± 0·09	0·06 ± 0·33	0·02 ± 0·19
FT	0·01 ± 0·09	0·04 ± 0·30	0·02 ± 0·17
DMFT	0·42 ± 0·87	0·53 ± 0·93	0·45 ± 0·89

Table 3. Percentage of 12-year-old schoolchildren without (decayed, missing and filled teeth, DMFT = 0) and with (DMFT > 0) caries experience according to sociodemographic factors, oral health behaviours, attitudes and knowledge: (OR) bivariate odds ratio; (95% CI) 95% confidence interval; and (NS) not significant.

Variable	Percentage of children with DMFT = 0	Percentage of children with DMFT > 0	OR	95% CI
Sociodemographic factor				
Area:				
rural	75	25	1·5	1·1–2·1*
urban	67	33		
Mother's education (years):				
0	68	32		NS
1–10	74	26		
≥ 11	72	28		
Gender:				
female	72	28		NS
male	74	26		
Oral health behaviour				
Dental visits:				
never	77	23	1·6	1·2–2·2*
yes	67	33		
Use toothbrush:				
yes	74	26	1·6	1·1–2·6*
no	64	36		
Oral hygiene status:				
good	73	27		NS
fair	72	28		
Consumption of sweets:				
never	76	24	1·4	1·0–1·9*
more often	70	30		
Use of fluoridated toothpaste:				
no	72	28		NS
yes	73	27		
Attitude and knowledge				
Subjective assessment:				
satisfied	75	25	1·6	1·2–2·4*
dissatisfied	65	35		
School performance:				
good	75	25	1·7	1·2–2·5*
poor	64	36		

*Chi-square test; $P < 0{\cdot}05$.

Univariate analysis

The prevalence of dental caries according to the independent variables and the bivariate odds ratios are shown in Table 3. The probability of having caries experience (DMFT > 0) was statistically significantly associated with area, whether the child had visited a dentist, the use of a toothbrush, consumption of sweets, subjective assessment of teeth and school performance. The proportion of children with caries experience (DMFT > 0) was statistically significantly higher in the children who lived in urban areas (33%), visited the dentist (33%), did not use toothbrush (36%), had sweets more often (30%), were dissatisfied with their teeth (35%) and who thought they performed poorly in school (36%) compared to their counterparts within the same variable.

The mother's level of education, gender, oral hygiene status and use of fluoridated toothpaste were not significantly associated with the caries experience of the children.

Multivariate analysis

Multiple logistic regression analysis (Table 4) showed that children who lived in urban areas, who visited a dentist, who did not use a toothbrush, who consumed sweets and who performed poorly in

Table 4. Caries prevalence in 12-year-old schoolchildren (multiple logistic regression analysis): (OR) multivariate odds ratio; and (95% CI) 95% confidence interval. References categories: rural, mother had no education, male, did not visit the dentist, used toothbrush, good oral hygiene, did not consume sweets, did not use fluoride toothpaste, satisfied with teeth, and good school performance.

Independent variable	*P*-value	OR	95% CI
Urban residence	0·02	1·5	1·1–2·1*
Mother's education:			
1–10 years	0·24	0·8	0·5–1·2
> 10 years	0·71	0·9	0·5–1·5
Female	0·22	1·2	0·8–1·6
Visited the dentist	0·003	1·6	1·1–2·2*
Did not use toothbrush	0·01	1·9	1·1–2·9*
Fair oral hygiene	0·81	1·1	0·7–1·5
Consumed sweets	0·04	1·4	1·0–1·9*
Used fluoride toothpaste	0·85	1·0	0·7–1·5
Dissatisfied with teeth	0·06	1·4	0·9–2·1
Poor school performance	0·02	1·7	1·0–2·3*

*$P < 0·05$.

school had statistically significantly higher caries prevalence than other children.

Discussion

The present study provides information on dental health status and associated factors in a representative sample ($n = 838$) of 12-year-old schoolchildren from urban and rural areas in Thiruvananthapuram.

In India [5–7,13,18], some epidemiological studies on caries in 12-year-old children have been carried out. Nevertheless, very few of these studies provide information pertaining to Kerala [5,13]. Previous studies on 12-year-old schoolchildren in Kerala have reported a caries prevalence ranging from 55% to 65%, and caries experience of 2 DMFT [5,13]. In the present study, the prevalence of dental caries (27%) and mean DMFT (0·5) was substantially lower than in former studies [5,13]. Variation in the methods used between the studies and lack of randomness in the sampling procedures may account for the differences. The present study sample consisted of children attending school. In the study area, 95% of children attend schools, with a drop out rate of 1%. The low caries prevalence seen in this study population may be partly a result of loss of this 6% of children not attending schools, who may have high caries prevalence [18].

Data were collected by clinical examination using WHO criteria [16]. This method underestimates caries prevalence, but makes the results comparable to other studies using the same criteria in the region and the world [19]. The use of torchlight in the present study may help in detecting dental caries, as compared with using natural daylight, where there is increased chance of variation. Data collected by questionnaires have limitations [20]. Over-reporting can be expected regarding desirable outcomes like the frequency of dental visits and the use of a toothbrush, while consumption of sweets and poor school performance can be under-reported.

The decayed component of the caries experience was 90% in 12-year-old schoolchildren. This high proportion of unrestored teeth is consistent with findings from other developing and underdeveloped countries [21,22]. Because dental services in Kerala are not free, children have to seek care from private dentists, which are considered expensive. Furthermore, a low perception of the need for treatment and the low priority placed on oral healthcare compared with other needs could be reasons for not restoring teeth [22]. A child's economic background has also been shown to influence the probability of seeking dental care [23].

As in previous studies, the present authors have shown that the caries prevalence of children in urban areas is higher than in children in less urbanized areas [10,24]. Living in urban areas has implications for lifestyle, including dietary pattern, and has been shown to be associated with an increased prevalence of dental caries [24]. Ismail *et al*. [2], reported that the residents of urban areas consume sugary products more often than people living in other areas in developing countries.

The reported consumption of sweets was lower in the present study than in other studies from India [6] and Thailand [25]. Roberts *et al*. [26] reported that access to money by children had a direct influence on sweet snacking. The majority of the children in Kerala lack money to spend and this could explain the low rate of sweet consumption. In accordance with other studies [27,28], the present study showed that children who consumed sweets had higher caries prevalence than children who did not consume sweets (30% vs. 24%). Diehnelt and Kiyak [29] found that the prevalence of dental caries was higher in high and middle income nations, where there is greater availability of cariogenic foods, than in low-income nations. In a low-income state like Kerala [15], there has not been a drastic change in the dietary pattern and traditional diet is still maintained.

Sixty per cent of the children in the present study had never visited a dentist, compared with 11% in Jordan [30] and 42% in China [28]. One explanation for fewer dental visits could be that a high proportion of children were satisfied with their teeth. This is in accordance with the study done by Al-Hussaini *et al*. [31], which reported that children did not recognize the need for regular dental visits when they were satisfied with their own dental health. Another possible explanation may be that there is no tradition of visiting a dentist and only children who have problems with their teeth seek dental care [32]. In the present study, caries prevalence was higher in children who had visited a dentist than those who had not, which could indicate that visits by the children were symptom-orientated [28].

In the present study, nearly 90% of the children used a toothbrush. Other possibilities for cleaning the teeth could be the use of a chewing stick (Neem) or a finger. The probability of having dental caries was almost twice as high in children who did not use a toothbrush compared to children who did use one.

The caries preventive effect of fluoride toothpaste has been well documented [33]. The only source of fluoride for the present study sample was toothpaste, since the level of fluoride in drinking water was negligible. Seventy-three per cent of the children used fluoridated toothpaste, but use of fluoride toothpaste was not significantly associated with caries prevalence in the present study. This may be because of a rapid turnover of types of toothpaste and a change of fluoride content in existing brands. In the past few years, more brands with fluoride added have been introduced into the market (Colgate/Palmolive – India, personal communication) and the duration of use of fluoridated toothpaste in children is not known.

Children who assessed their school performance to be poor had a higher probability of having dental caries than those who performed well. Petridou *et al*. [34] and Weissenbach *et al*. [35] found that children who received higher grades in school had less caries experience than children who got lower grades. It can be assumed that children who report poor school performance are likely to have less knowledge, and thus, may make unhealthy lifestyle choices, like eating more sweets, resulting in higher caries prevalence.

The mother's education, which was used as a proxy for socioeconomic status, did not show any association with caries experience in the present study. This is in conflict with the results of other studies in developing countries [7,36]. Other indicators of socioeconomic status should be included in future studies of this population.

The present authors have shown that the prevalence of dental caries in 12-year-old schoolchildren in Thiruvananthapuram is low. The results indicate that urban living conditions are associated with more dental caries. Since urbanization is rapid in India, dental caries prevalence can be expected to increase in coming years. Despite being a low-income state, Kerala has a well-developed public health care and school system. Efforts should be made at all levels to increase dental disease awareness and improve oral hygiene practices by using the existing public system. Integration of oral health with other services need not be costly and would reward the effort if it can prevent an increase in the prevalence of dental caries [29].

What this paper adds

- The mean DMFT in 12-year old children in Thiruvananthapuram, Kerala, India was 0.5 ± 0.9.
- In a multivariate analysis: living in urban areas visiting a dentist, no use of toothbrush, consumption of sweets and poor school performance was associated with higher caries prevalence.

Why this paper is important to paediatric dentists

- Urban living conditions are associated with more dental caries. Since urbanisation is rapid in India, dental caries prevalence can be expected to increase in coming years.
- Efforts should be made at all levels to increase oral health awareness and improve oral hygiene practices by utilizing the well-established existing public health and educational system.

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Résumé. *Objectifs*. Décrire l'état de santé dentaire des écoliers de 12 ans et identifier les facteurs socio-démographiques, les comportements de santé buccale, l'attitude et les connaissances par rapport aux caries dentaires.

Matériels et méthodes. Enquête transversale chez 838 enfants en écoles primaires. Deux techniques d'échantillonnage de groupe ont été utilisées. Les caries ont été mesurées par les critères de l'OMS. Les facteurs socio-démographiques, les comportements de santé buccale, l'attitude et les connaissances ont été évalués par questionnaire auto-administré.
Résultats. La prévalence des caries en denture permanente était de 27%. Le nombre moyen de dents cariées, absentes et obturées était de 0,5 (SD = 0,9). La composante caries C représentait 91% du total CAOD. L'analyse par régression logistique multiple a montré que les enfants présentait un plus grand risque carieux si il vivaient en zone urbaine (OR = 1,5, 95% CI 1,1–2,1), avaient vu un dentiste (OR = 1,6, 95% CI 1,2–2,2), n'utilisaient pas de brosse à dents (OR = 1,9, 95% CI 1,2–2,9), consommaient des sucreries (OR = 1,4, 95% CI 1,0-1,9) et s'ils n'avaient pas de bons résultats scolaires (OR = 1,7, 95% CI 1,0–2,3).
Conclusions. La prévalence des caries chez les écoliers de 12 ans était faible, comparée à celle de pays en voie de développement. L'étude a indiqué que les conditions de vie urbaine ont été associées à plus de caries. Comme l'urbanisation est rapide en Inde, la promotion actuelle de la santé buccale serait valable pour prévenir une augmentation de la prévalence des caries.

Zusammenfassung. *Ziele.* Beschreibung des Zahngesundheitsstatus 12jähriger Schulkinder sowie Identifikation soziodemographischer Faktoren, Mundgesundheitsgewohnheiten, Einstellungen und Kenntnisse mit Bezug zur Karieserfahrung.
Materias and Methoden. Querschnittstudie an 838 Kindern aus Regelschulen. Es wurde eine zweistufige Technik der geclusterten Stichprobengewinnung eingesetzt. Die Karieserfahrung wurde unter Anwendung von WHO Kriterien gemessen. Soziodemographische Faktoren, Mundgesundheitsgewohnheiten, Einstellungen und Kenntnisse wurden mittels eines selbstausgefüllten Fragebogens ermittelt.
Ergebnisse. Die Mundprävalenz von Karies in der bleibenden Dentition lag bei 27%. Die mittlere Zahl von kariösen, fehlenden oder gefüllten Zähnen lag bei 0.5 +/– 0.9). Die "d" Komponente (Karies) machte dabei 91% des gesamt DMFT-Wertes aus. Eine multiple logistische Regressionsanalyse zeigte, dass Kinder dann ein höheres Kariesrisiko aufwiesen, wenn sie in einer urbanen Umgebung lebten (OR = 1.5; 95% CI 1.1–2.1) einen Zahnarzt besucht hatten (OR 1.6; 95% CI 1.2–2.2) keine Zahnbürste benutzten (OR = 1.9; 95% CI = 1.2–2.9), Süßigkeiten konsumierten (OR = 1.4; 95% CI 1.0–1.9) und schwächerer Schulleistungen zeigten (OR = 1.7; 95% CI = 1.0–2.3).
Schlussfolgerungen. Im Vergleich zu anderen Entwicklungsländern war die hier ermittelte Kariesprävalenz bei 12jährigen Schulkindern niedrig. Die Ergebnisse zeigen, dass das Leben in urbaner Umgebung mit erhöhter Karieserfahrung assoziiert ist. Da die Urbanisierung in Indien rasch fortschreitet, erscheint eine gezielte Mundgesundheitsförderung erforderlich, um eine Zunahme der Karies zu verhindern.

Resumen. *Objetivos.* Describir el estado de la salud dental de escolares de 12 años e identificar factores socio-demográficos, comportamientos de higiene bucal, actitud y conocimientos relacionados con los antecedentes de caries.
Material y métodos. Examen transversal de 838 niños de escuelas primarias superiores. Se usó una técnica de muestreo cluster de dos estadíos. La caries se midió usando los criterios de la OMS. Los factores socio-demográficos, los comportamientos de higiene bucal, la actitud y conociminetos se valoraron por un cuestionario auto-administrado.
Resultados. La prevalencia de caries en la dentición permanente fue del 27%. La media de dientes con caries, ausentes y obturados fue de 0.5 (DS = 0.9). El componente "C"con caries, constituyó el 91% del total CAOD (dientes con caries, ausentes, obturados). Los análisis de regresión logística múltiple mostraron que los niños tenían un riesgo más alto de tener caries si vivían en áreas urbanas (OR = 1,5, 95% CI 1,1–2,1), habían visitado a un dentista (OR = 1,6, 95% CI 1,2–2,2), no usaban cepillo dental (OR = 1.9, 95% CI 1,2–2,9), consumían dulces (OR = 1,4, 95% CI 1,0–1,9) y si ellos cumplían poco en la escuela (OR = 1,7, 95% CI 1,0–2,3).
Conclusiones. La prevalencia de caries en escolares de 12 años fue baja comparada con la prevalencia en otros países desarrollados. El estudio indicó que las condiciones de vida urbanas estaban asociadas con más caries. Como la urbanización es rápida en la India, debería evaluarse la promoción de la salud bucal en el momento presente, para prevenir el aumento de la prevalencia de caries.

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