

Oral health knowledge, attitudes and practice in 12-year-old schoolchildren

Ernesto Smyth¹, Francisco Caamaño², Paula Fernández-Riveiro³

(1) Preventive Dentistry professor

(2) Public Health University teacher

(3) Preventive dentistry Associate teacher. Department of Preventive Medicine and Public Health. University of Santiago de Compostela. Spain

Correspondence:

Dra. Paula Fernández Riveiro.

Departamento de Medicina Preventiva e Saúde Pública.

Facultad de Medicina

cl San Francisco s/n

15782 Santiago de Compostela. A Coruña. Spain

E-mail: mrpaula@usc.es

Received: 5-11-2006

Accepted: 17-06-2007

Indexed in:

-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
-SCOPUS
-Índice Médico Español
-IBECs

Smyth E, Caamaño F, Fernández-Riveiro P. Oral health knowledge, attitudes and practice in 12-year-old schoolchildren. Med Oral Patol Oral Cir Bucal. 2007 Dec 1;12(8):E614-20.

© Medicina Oral S. L. C.I.F. B 96689336 - ISSN 1698-6946

ABSTRACT

Objective: The objective of this study was to assess the association between knowledge, attitudes and practice of oral health in 12-year-old schoolchildren, and to analyse the findings in terms of the conventional KAP health-education model and of the critical approach.

Study design: This study has a cross sectional design. The study participants were 1105 randomly selected 12-year-old children resident in the region of Galicia in Spain. For data collection, five teams of one dentist and one assistant were formed. The dentist carried out the physical examination and the assistant helped the subjects to answer the questionnaire. Knowledge, attitudes and practice were assessed, as well as oral health indicators. Multiple regression analysis was used to identify variables affecting practice (as measured by extent of plaque).

Results: The results of this study show how that there is an important association between oral health knowledge, attitudes, and practice in 12-year-old schoolchildren in this region. However, the results also show that attitude is not totally explained by knowledge, so that attitude cannot be understood simply as an intermediate variable in a knowledge→practice causal chain. Specifically, the results indicate that sociocultural environment modifies the association knowledge, attitudes and practice.

Conclusions: Within oral health education it is clearly important to increase public knowledge of the risk factors for dental disease. However, the efficacy of such education will be limited if health programs do not directly impinge on attitudes, and take into account factors related to the environment, education, social status and economic level of the targeted population.

Key words: Children, dental knowledge, health practice, oral health survey, Spain.

INTRODUCTION

Most oral diseases, like most chronic pathologies in general, are directly related to lifestyle. Oral disease can be considered a public health problem due to its high prevalence and significant social impact. Chronic oral disease typically leads to tooth loss, and in some cases has physical, emotional and economic impacts: physical appearance and diet are often worsened, and the patterns of daily life and social relations are often negatively affected. These impacts lead in turn to reduced welfare and quality of life. To minimize

these negative impacts of chronic oral disease, there is thus a clear need to reduce harmful oral health habits. Such a reduction can be achieved through appropriate health education programmes (1-3).

Tooth decay (dental caries) is a very frequent oral disease. It may be prevented by acting on its basic causes, cariogenic diet and poor oral hygiene. In the last 50 years, the epidemiological profile of dental caries has changed, as a result of oral health promotion programmes, as well as increased use of fluoridated toothpastes and drinking water, which

has been directly related to reductions in caries and tooth extractions (1,4). This declining trend is in clear support of the view that dental caries can be reduced by controlling risk factors.

In addition, it has been observed that risk factors for oral disease are frequently the same as those for the other major chronic diseases. In line with this, programmes for oral health protection clearly need to be developed within the broader framework of general health promotion (2,3).

The oral health problems that are currently most prevalent - dental caries, periodontal diseases, and dental traumas - can be prevented by measures aimed at reducing exposure to risk factors. However, such prevention requires subjects to be adequately informed about causal factors, and studies suggest that a high proportion of the population (including many of the people most immediately relevant for preventive measures of this type, namely parents, teachers and healthcare personnel) have limited understanding of how to prevent oral disease (2).

This aspect is a starting point for health promotion campaigns. The affected population needs to receive information on oral diseases, risk factors and measures that can be adopted to prevent them. Such campaigns will typically aim not only to impart knowledge, but also to improve attitudes regarding oral health, and to facilitate the transformation of these attitudes into practice. Within the KAP (Knowledge, Attitude and Practice) model (5), the change from an unhealthy attitude to a healthy attitude will occur given adequate information, adequate motivation and adequate practice of the measures to be adopted by the subject. Information means that the subject has all the data necessary to understand what oral disease is and how it arises, as well as to understand the protective measures that need to be adopted (Knowledge). This knowledge will, in theory, lead to changes in attitude, which will in turn lead the subject to make changes in their daily life. Thus in the case of dental caries, the subjects know (for example) that incorrect brushing may cause caries, and this information generates a positive attitude towards daily brushing (i.e. the intention to brush teeth daily in order to have healthier teeth), and thus changes in brushing behaviour.

The KAP model of behavioural changes is in fact solidly embedded within the traditional focus of health education. It is a model with a positive vision of science, treating the behavioural change as a logical individual decision: the individual can be expected to change an unhealthy habit to a healthy habit in the light of information on the health benefits of that change. This theory considers that individual factors are the principal determinants of disease, biological or behavioural (6-10). However, the model must be considered incomplete in terms of practical application in health education, since it does not take into account the subject's environment and sociocultural context.

The critical approach to health education considers that economic, social and cultural factors are the principal determinants of disease. The responsibility for unhealthy behaviour lies with society, not with the individual. Thus

educational programmes targeted at the individual, aiming to change an unhealthy conduct, will be a complete failure if they do not consider the different aspects of the subject's life, both socioeconomic and environmental, that influence their behaviour and are responsible for diverse health problems (9,10). In line with this, the most appropriate design for an oral health education programme in a marginal population with a high proportion of school non-attendance will differ from that for a middle-class district with full school attendance and parents with a greater existing knowledge of oral health.

The aim of the present study was to characterize the association between knowledge, attitudes and practice of oral health in 12-year-old children, and to analyse the findings by means of both the "conventional" and "critical" KAP models.

METHODS

Design and sampling

This was a cross-sectional study. The study population was the 12-year-old school population of the region of Galicia in Spain (n = 28927). From this population a two-phase random sample of 1105 subjects was obtained, stratified by province (Coruña, Lugo, Ourense or Pontevedra) and by "habitat" of residence (urban or rural). In total 95 schools were selected, and sample size from each school was proportional to the total number of 12-year-olds in that school. For estimation of required sample size, we took account of the prevalence of caries in Galicia (64.2% in mixed dentition according to a study of oral health performed in 1995, with 95% confidence level and absolute sampling error 3.5%).

Data collection

Five data collection teams were formed, each comprising a dentist and an assistant. Over the first 2 weeks criteria for diagnosis and questionnaire completion were calibrated in 4 schools. The dentist in each team carried out the physical examination, and the assistant helped with questionnaire completion. Data collection was done during the second trimester of 2000, following coordination of data collection days with the management of each school, and in all cases with prior written authorization from each child's parents or guardian.

The questionnaire used was similar to that used in a 1995 study of oral health in this region, by the regional health department (Consellería de Sanidade, Xunta de Galicia) and the University of Santiago de Compostela (11). The questionnaire collected sociodemographic information potentially related to motivation about oral health, such as parents' educational level and habitat of residence (urban or rural).

Children were asked if they considered themselves to have a healthy mouth, or some sort of pathology (pain, bleeding gums, stained teeth, crowded teeth, other problems). They were also asked about knowledge of oral health: whether they knew what caries and gingivitis are, and how they can be avoided (appropriate hygiene, not too many sweets, fluoridated toothpastes, regular visits to the dentist); whether they knew that sugar can provoke caries (scale of 0, nothing, to 3, a lot); and whether they knew about the advantages

of fluoride. Questions were also included about attitudes to oral health, such as whether they considered it important to look after their teeth. Other questions related to oral healthcare practices, such as how often they brushed their teeth (regularly or not, and if regularly how many times a day), whether they had an electric toothbrush, whether they used dental floss, and whether they used fluoridated products (toothpaste, tablets, drops, or mouthwash). The questionnaire also asked about the last time the subject had changed their toothbrush, the last time they had brushed their teeth (today, yesterday, the day before yesterday, or more than two days ago), how much toothpaste they used for each brushing (1/3 of brush, 2/3 of brush, or all of brush), who had taught them to brush their teeth (nobody, parents, dentist, school, or other), and when was the last time they had visited a dentist (less than 3 months ago, between 3 months and a year ago, more than a year ago, or never), and the reason for this visit (check-up, pain, filling, or orthodontic work).

After oral examination of each child, the dentist recorded number of decayed, missing or filled teeth in the permanent dentition (DFMT) and number of decayed or filled teeth in the deciduous dentition (dft). WHO methodology was used for oral health surveys (12). Oral hygiene was evaluated with the index of Silnes & Løe (13), for which a periodontal probe is passed along the gingival margin, and for which plaque revealer is not required. Hygiene score (extent of plaque) was evaluated on the vestibular surfaces of 6 teeth (2 upper molars, 2 lower molars, 1 upper incisor and 1 lower incisor): hygiene scores were between 0 (absolutely correct, no surfaces with plaque) and 18 (absolutely unacceptable, all surfaces with plaque).

Definition of variables

The variable “knowledge” took a value of 0 - 10 depending on the answers to the six questions related to this variable (Table 2): 1) “Sugar causes tooth decay” (1 = “A a lot”, or 0 = other responses, see Table 2); 2) “Tooth decay is a disease that... (1 = “destroys your teeth”, or 0 = other responses); 3) “Gingivitis (gum inflammation) is a disease that...” (1 = “makes your gums bleed”, or 0 = other responses); 4) “I can avoid tooth decay...” (1 = “by good dental hygiene, by eating less sweets, by using fluoride, by going to the dentist regularly”, 0 = these options not selected); 5) “I can avoid gingivitis...” (1 = “by good dental hygiene” and “by going to the dentist regularly”, or 0 = “by eating less sweets” and “by using fluoride”); 6) “Fluoride makes your teeth...” (1 = “stronger”, or 0 = “white” or “shiny”).

The variable “attitude” was measured with a single question: “It is important to look after my teeth” (very important, important, not very important, not at all important).

The variable “practice” was assessed with the following questions: “When did you last brush your teeth?”, “How much toothpaste do you put on your toothbrush?”, and “Do you normally eat sweets?” (no, at home, at school, with friends, in other situations). The response to this latter question is recorded as number of situations in which the subject eats sweets (i.e. 0 = never, or in 1, 2, 3 or 4 situations).

Two socioeconomic variables were included in the analysis: parents’ education, and habitat of residence (urban or rural). Dental health was assessed with the DFMT index, the first-molar DFMT index and the dft index, as defined above.

Data analysis

The analysis aimed to verify the study hypothesis that a higher level of knowledge about oral health will be correlated with greater positive motivation towards brushing and oral health-care. To this end we used stepwise multiple regression analysis with dependent variable hygiene score (as defined above). Variables that did have any significant effect on the dependent variable were successively eliminated from the model.

RESULTS

Table 1 summarizes the basic demographic and oral health characteristics of the subjects in our sample. Mother’s educational level was most frequently primary (52%). Habitat of

Table 1. Basic demographic and oral health characteristics of the sample (n = 1105 subjects).

Percentage of males	52.2%	
Mother's education:		
University.....	16.4%	
Secondary.....	25.8%	
Primary.....	52.4%	
No schooling.....	5.3%	
Habitat of residence:		
Urban.....	55%	
Rural.....	45%	
Mean number of teeth with decay (both deciduous and permanent dentition)	1.03	(0.90 -1.18)
Mean DFMT	1.52	(1.37 - 1.67)
Mean dft	0.31	(0.26 - 0.35)
Mean DFMT-dft	1.82	(1.67 - 1.98)
Mean first-molar DFMT	1.23	(1.12 - 1.34)
Proportion of subjects with tooth decay/caries (D-d)	42.6%	(37.0 - 48.3%)
Proportion of subjects with missing teeth (M)	3.09%	(1.62 - 4.56%)
Proportion of subjects with fillings (F-f)	33.5%	(27.0 - 40.1%)
Prevalence of DFMT-dft	61.1%	(53.4 - 68.1%)

DFMT: number of decayed, filled or missing teeth (permanent dentition). dft: number of decayed or filled teeth (deciduous dentition). Values shown in brackets are 95% confidence intervals.

Table 2. Subject responses to the questions used as measures of the variables “knowledge”, “attitude” and “practice”. For each response, the value shown is the percentage of subjects who gave that response. Also shown in hygiene score, used to measure the variable “practice”.

<i>Knowledge</i>		A lot	Quite a lot	Not much	Not at all	DK/DA^{&}
	Sugar causes tooth decay	47.0*	43.2*	8.4	1.0	0.5
		destroys your teeth	makes your gums bleed	causes bad breath	makes your teeth whiter	DK/DA
	Tooth decay is a disease that... [§]	87.7*	13.5	14.6	1.0	9.3
	Gingivitis is a disease that... [§]	2.7	30.6*	3.1	0.7	63.0
		by good hygiene	by eating less sweets	by using fluoride	by going to the dentist regularly	DK/DA
	I can avoid tooth decay... [§]	79.8*	66.1*	39.8*	35.4*	2.7
	I can avoid gingivitis... [§]	20.5*	12.1	17.9	18.2*	61.0
		stronger	white	shiny		DK/DA
	Fluoride makes your teeth... [§]	75.3*	35.6	11.5		12.7
<i>Attitude</i>		A lot	Quite a lot	Not much	Not at all	DK/DA
	It is important to take care of my teeth.	74.0 [§]	24.6	1.0	0.3	0.1
		today	yesterday	day before yesterday	more than 2 days ago	DK/DA
<i>Practice</i>	The last time I brushed my teeth was...	62.2	26.6	4.2	6.4	0.6
		at school	at home	with my friends	in other situations	never
	I eat sweets... [§]	41.2	47.3	73.8	17.8	6.1
		Excellent (0)	Good (1-5)	Poor (6)	Very poor (7-12)	
	Hygiene score ⁺	11.7	45.8	22.7	19.8	

* Responses considered “correct” for evaluation of knowledge.

& Don't know or didn't answer.

§ Questions with multiple possible responses. Percentages do not add up to 100.

§ Response considered positive in evaluation of attitude.

+ Variable determined by oral examination, with values ranging from (no plaque on any tooth surfaces) to 18 (plaque on all 18 tooth surfaces considered).

Table 3. Relationship between knowledge, attitude and practice in subjects with high and low levels of knowledge (knowledge score 0-4 or 5-10 respectively, based on answers to 6 questions). Values indicate

		<i>Knowledge</i>	
		Low	High
Attitude	It is important to take care of my teeth	68.2% (63.2 - 73.%)	77.0% (70.0 - 84.1%)
Practice	I never eat sweets	3.8% (1.9 - 5.7%)	6.4% (5.6 - 7.2%)
	I brushed my teeth today	60.3% (54.6 - 66.%)	63.8% (57.8 - 69.6%)
	I last brushed my teeth more than 2 days ago	7.5% (5.2 - 9.9%)	5.8% (3.8 - 6.8%)
	Hygiene score ³	5.0 (4.0 - 6.0)	4.4 (3.8 - 5.2)

Table 4. Results of multiple regression to identify factors related to hygiene score+ in the 12-year-old subjects considered in the present study, showing regression coefficients (B), 95% confidence intervals (CI) and statistical significance (p values).

	B*	95% CI	p-value
<i>Knowledgeⁱ</i>	-0.132	(-0.233; -0.032)	0.010
It is important to take care of my teeth [§]	0.503	(0.125; 0.880)	0.009
Mother's education ^{&}	-0.316	(-0.543; -0.089)	0.007
Habitat [§]	0.429	(0.052; 0.806)	0.026

* Adjusted for other variables included in the table.
 + Hygiene score: 0 = excellent to 18 = completely unacceptable.
 i Knowledge: 0 = zero a 10 = full.
 § 1 = "a lot"; 2 = "quite a lot"; 3 = "not much"; 4 = "not at all".
 & 1 = no schooling; 2 = primary; 3 = secondary; 4 = university.
 § 1 = urban; 2 = rural

residence was roughly equally split between urban and rural (56% urban, 44% rural). DFMT was on average 1.52 teeth (95% confidence interval 1.37 - 1.67), while the dft index (deciduous dentition) was 0.31 teeth (95% CI 0.26 - 0.35). Overall, 61.1% of subjects (95% CI 53.4 - 68.1%) showed at least one decayed, filled or missing tooth.

Table 2 shows the distribution of subjects in the different categories of the variables "knowledge", "attitude" and "practice". Only 2.5% of subjects replied correctly to all

knowledge-related questions. Half of the subjects knew that sugar provokes caries to great extent ("a lot"). Most (74 - 87%) responded correctly to the questions about what caries is, how it can be avoided, the effect of fluoride on teeth, and the importance of looking after your teeth. In contrast, the level of awareness of gingivitis and how it can be avoided was poor: only a third of subjects responded correctly to this question.

As regards attitude to oral healthcare, 74% of subjects reported that it was very important to them to look after their teeth, and only 1.3% reported that looking after their teeth was unimportant.

As regards oral healthcare practice, 62% reported that they had brushed their teeth that day, 26% the previous day, and 6.4% more than 2 days previously. The level of hygiene observed by the dentist was incorrect (i.e. non-zero hygiene score) in 88% of subjects. Only 6% of subjects reported that they never ate sweets, while 74% ate sweets with friends.

Table 3 summarizes the relationship between attitude and practice in subjects with strong knowledge (knowledge score 5 - 10) and subjects with weak knowledge (knowledge score 0 - 5). Of the subjects with strong knowledge, 77.0% (95% CI 70.0 - 84.1%) showed a positive attitude to oral healthcare, versus 68.2% (95% CI 63.2 - 73.2%) of the subjects with weak healthcare knowledge. Subjects with strong knowledge likewise showed better oral healthcare practice. However, neither the attitude nor the practice variables differed significantly between the strong- and weak-knowledge groups. Table 4 summarizes the results of multiple regression with hygiene score (extent of plaque) as dependent variable, showing significant effects of several factors. According to the coefficients shown in the table, greater knowledge was associated with better hygiene (i.e. lower plaque score) and also with a more positive attitude towards oral health (it is

very important to look after your teeth). The model was adjusted for mother's educational level (higher maternal educational level associated with lower plaque score) and for habitat of residence (urban associated with lower plaque score than rural).

DISCUSSION

The results of this study indicate a relationship, in 12-year-old subjects, between knowledge about oral health, attitudes to oral health, and oral health practice. However, the results also show that attitude is not fully explained by knowledge, and thus that it cannot be understood simply as an intermediate variable in a putative causal relationship between knowledge and practice. The variable hygiene score (i.e. extent of plaque, a measure of good oral healthcare practice) is influenced by socioeconomic factors, notably mother's educational level and the type of location in which the child lives (urban or rural).

These findings support the "critical approach" to health education, since they indicate that social factors (notably family educational level and urban or rural habitat) need to be taken into account in public education programmes aimed at improving oral health practices. Tewari (14,15) observed that daily tooth brushing became more frequent after a community education programme about oral hygiene. In other studies based on the KAP model as applied in health education, the educational intervention significantly improved oral health practice (16).

In our sample 97.5% of children had limited knowledge of oral health issues, and reported suboptimal oral healthcare practice. Only 2.5% replied correctly to all question assessing knowledge about oral health, and only 12% showed good oral hygiene. About 75% of children were aware of the beneficial effect of fluoride.

According to the traditional approach to health education using the KAP model, the knowledge acquired by the subject generates as a direct result attitudes that in turn give rise to changes in practice (i.e. the causal concept of attitude) (7).

In the context of oral health, however much knowledge the subject already has about healthcare and associated preventive measures, better positive attitudes can always be achieved (9), and these will generate healthier habits (eating fewer sweets, brushing your teeth daily, using mouthwashes and fluoridated toothpaste). This relationship is seen in the present study (see Table 3). Subjects with strong and weak knowledge of oral health issues did not show statistically significant differences in the responses to the question used to assess attitude, or in responses to the three questions used to assess practice. However, average "attitude" score and average "practice" score were both higher in subjects with better knowledge of oral health.

Although psychologists and health educators have maintained the KAP model for many years, in recent years it has become increasingly clear that there is no direct relationship between knowledge, attitudes and practice (9,10). This lack of direct relationship is supported by the results of the pre-

sent study. Multiple regression analysis to identify factors affecting oral hygiene (i.e. extent of plaque) indicated significant effects not only of knowledge and attitude, but also of mother's educational level and urban or rural habitat: a higher level of maternal education, and residence in an urban environment, were associated with better oral hygiene (i.e. less plaque). These results are in line with previous reports (4,9,10,17). Different authors have explained effects of this type in terms of inequality of access to oral healthcare services (9,10). In the present study, however, the dependent variable considered, hygiene, was independent of visits to the dentist (at any rate, if we do not take into account the education and motivation of the dentist).

The variable "attitude" ("It is important to take care of my teeth") was likewise included in our model. If the knowledge-attitude-practice relationship were a direct relation, introduction of the variable attitude would lead to excellent fit, and the attitude and knowledge would be correlated. In fact, however, the results of this study show that attitude has an effect in its own right, such that subjects with the same knowledge and more positive attitudes have healthier habits. The principal reason put forward to explain phenomena of this type is that subjects can develop mechanisms of selective perception and retention of information, such that they do not readily accept those aspects that they might at first reject (9). This would explain why, with the same degree of knowledge, different attitudes are generated in subjects from different environments and with different beliefs and different social, educational and economic levels. These sociodemographic factors act on the subject, modulating the information perceived and retained.

In this way, once the model has been adjusted for knowledge and attitudes, the effect of socioeconomic and cultural level on hygiene is probably attributable to two causes. First, there is a residual effect of confusion that cannot be ignored (9), due to defects in the classification arising in the establishment of the variables knowledge and attitude: these variables in all probability do not classify subjects perfectly. The observed effects on oral hygiene of mother's educational level and habitat (urban or rural) are probably residual effects. In addition, we have seen (2) that the concept of attitude as direct cause of practice is not always valid, since some changes in attitude are not followed by changes in behavioural patterns: attitude is only one factor determining behaviour. Thus a subject with a highly positive attitude to tooth brushing, but with constraints that hinder daily brushing (for example, the child does not have a toothbrush, or no-one else in the family brushes their teeth), may not show straightforward translation of attitude to practice.

The present study shows that an increase in knowledge about risk factors for oral disease is important in oral health campaigns that aim to promote healthy habits; however, the efficacy of these campaigns will be limited if we do not take into account key determinants of attitude and of the putting into practice of these healthy habits (economic status, family and social environment, educational level, etc.) in the population in which we are trying to change behaviour.

REFERENCES

1. La evidencia de la eficacia de la promoción de la salud. In "La evidencia de la eficacia de la promoción de la salud" edited and translated by the Spanish Ministerio de Sanidad y Consumo. RCOE 2002; 7:537-45.
2. Kwan SY, Petersen PE, Pine CM, Borutta A. Health-promoting schools: an opportunity for oral health promotion. Bull World Health Organ. 2005 Sep;83(9):677-85.
3. Petersen PE, Kwan S. Evaluation of community-based oral health promotion and oral disease prevention--WHO recommendations for improved evidence in public health practice. Community Dent Health. 2004 Dec;21(4 Suppl):319-29.
4. Zhu L, Petersen PE, Wang HY, Bian JY, Zhang BX. Oral health knowledge, attitudes and behaviour of adults in China. Int Dent J. 2005 Aug;55(4):231-41.
5. Bratos Calvo E. Odontología Preventiva y Odontología Comunitaria. Madrid: Avances; 2002.
6. Breslow L. From disease prevention to health promotion. JAMA. 1999 Mar 17;281(11):1030-3.
7. O'Neil M. La modification des comportements reliés a la Santé I. Revue de la littérature theorique. Union Med 1980;109:733-42.
8. Buischi YA, Axelsson P, Oliveira LB, Mayer MP, Gjermo P. Effect of two preventive programs on oral health knowledge and habits among Brazilian schoolchildren. Community Dent Oral Epidemiol. 1994 Feb;22(1):41-6.
9. Redmond CA, Blinkhorn FA, Kay EJ, Davies RM, Worthington HV, Blinkhorn AS. A cluster randomized controlled trial testing the effectiveness of a school-based dental health education program for adolescents. J Public Health Dent. 1999 Winter;59(1):12-7.
10. Worthington HV, Hill KB, Mooney J, Hamilton FA, Blinkhorn AS. A cluster randomized controlled trial of a dental health education program for 10-year-old children. J Public Health Dent. 2001 Winter;61(1):22-7.
11. Lorenzo García V, Smyth Chamosa E, Hervada Vidal X, Fernández Casal R, Alonso Meijide JM, Amigo Quintana M, et al. Oral health in Galician schoolchildren. 1995. Rev Esp Salud Publica. 1998 Nov-Dec;72(6):539-46.
12. OMS. Encuestas de salud bucodental. Metodos básicos. 4th ed. Geneva: OMS; 1997.
13. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand. 1964 Feb;22:121-35.
14. Tewari A, Gauba K, Goyal A. Evaluation of existing status of knowledge, practice and attitude towards oral health of rural communities of Haryana-India. J Indian Soc Pedod Prev Dent. 1991 Mar;9(1):21-30.
15. Tewari A, Gauba K, Goyal A. Evaluation of Kap of oral hygiene measures following oral health education through existing health and educational infrastructure. J Indian Soc Pedod Prev Dent. 1992 Mar;10(1):7-17.
16. Luevswanij S, Nittayananta W, Robison VA. Changing knowledge, attitudes, and practices of Thai oral health personnel with regard to Aids: an evaluation of an educational intervention. Community Dent Health. 2000 Sep;17(3):165-71.
17. Almerich Silla JM, Montiel Company JM. Oral health survey of the child population in the Valencia Region of Spain (2004). Med Oral Patol Oral Cir Bucal. 2006 Jul 1;11(4):E369-81.

Acknowledgements

This study was made possible with funding from the Dirección Xeral de Saúde Pública, Consellería de Sanidade, Xunta de Galicia. We thank the Dirección Xeral de Saúde Pública and María Jesús Cebro for her contributions to this manuscript.