Dental Caries: Social Problem in School Children Aged 5-14 Years from Formal Educational Institutions in Huila, Colombia

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Abstract: Report on the prevalence of dental caries and the social factors related to the presence of the disease in school children in Huila, Colombia. Probability cluster sampling of 1,085 children between the ages of 5 and 14 in official educational institutions in Huila, Colombia. The diagnosis of dental cavities was made using the ICDAS (International Caries Detection and Assessment System) criteria. The prevalence of dental caries was 69%. Age (OR 0.51, 95% CI: 0.30-0.86) (p<0.05) and last visit to the dentist (OR 1.79, 95% CI: 1.08-2.99) (p<0.05) have a significant statistical relationship with dental caries.

Key words: Oral health, dental caries, dentistry in public health, social health, epidemiology (MeSH), disease, cavities

INTRODUCTION

Dental caries is one of the most common chronic diseases in the world which affects people during their early years (Azevedo *et al.*, 2014). It is currently the most common chronic disease in the world, affecting between 90-95% of the population and is responsible for half of all teeth loss (Siqueira *et al.*, 2010). Dental caries is considered a public health issue due to its considerable impact at an individual as well as on a social level. The emergence of this disease in infancy causes frequent pain and difficulties while eating which increases possible health conditions in the development of permanent teeth and can lead to nutritional, physical and psychological issues (Ceron *et al.*, 2011; Mayor *et al.*, 2014). In the last few years, a clear decrease in the indicators of this disease has been observed which is explained by the impact of preventative programs at a community level. However, the decline of these indicators has not been generalized as there are differences between countries, regions and even between population groups. Health planners must take this situation into account as part of their responsibility as the decision-makers for the improvement of the oral health of the population (Siqueira *et al.*, 2010; Ramirez-Puerta *et al.*, 2013). Colombia is committed to promoting the development of children an aim which requires different sectors to work together through plans, programs, projects and actions which must

remain in line with the context and the particular conditions of this population group (Ramirez-Puerta *et al.*, 2015). The department of Huila has shown progress in oral health care through its programs and by prioritizing the early childhood population. However, there is still cause for concern as dental caries is one of the most common chronic diseases in early childhood. Huila has a great responsibility in monitoring indicators in oral health and in the supervision and control of actions which translate into the development of intervention programs. This should make it possible to measure trends and evaluate the programs and interventions which are implemented. Huila is not currently investigating the prevalence of caries. This study therefore identifies the prevalence of dental caries in the school population between 5 and 14 years of age using the DMFT and DFT indexes for permanent and temporary dentition, respectively. The severity of the dental caries is also measured using the International Caries Detection and Assessment System (ICDAS) which allows the early detection of enamel caries and treatment planning of remineralization. This study therefore hopes to aid in building a baseline which allows for the evaluation of caries indicators, raising awareness of this oral health issue, identifying caries in the initial stages and aid in decision making to deliver non-invasive interventions instead of the traditional treatments which are generally used in the treatment of this disease. The study also

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serves as a reference in the monitoring of educational institutions and implementing the social actions and public policies in oral health.

MATERIALS AND METHODS

A cross-sectional, descriptive study was carried out. Epidat version 4.1 and Matlab 2012 were used for calculating the sample size, taking the following criteria into account: the sampling technique used was cluster sampling probability, 60% prevalence of dental caries, 95% confidence interval and a 5% margin of error. Following these criteria, this lead to a sample size of 1,081 children. The investigators carried out clinical examinations of the oral cavity, registering the dental state of each student. The examiners were teachers from the Neiva campus of the University of Antonio Narino, certified by the Federacion Odontologica de Colombia (Colombian Dental Federation). The examiners visited the educational establishments of the various municipalities, taking with them portable dental and instrumental units necessary for the examinations. Prophylaxis was measured and results recorded in odontograms. The International Caries Detection and Assessment System (ICDAS) was used to measure the severity of the caries and registered using the DMFT and DFT indexes to describe the prevalence of caries in permanent and temporary dentition respectively in an individual using the number of teeth that were decayed, missing and filled on account of caries and a community-DMF index. The examiners also measured socio-demographic variables and variables of attitudes and oral health practices. The data was analyzed in STATA-Version 14.0, initially by means of a descriptive analysis, measures of central tendency, finding the median of affected teeth in each criterion classifying the severity of dental caries. The DMFT, DFT, community-DMF indexes and the prevalence of dental caries were obtained. A bivariate analysis was conducted using odds ratio and a 95% confidence interval using dichotomous variables. In order to conduct this type of analysis, the dental caries variable was re-categorized; patients without caries measuring 1b, 1w, 2b and 2w according to the ICDAS criteria and patients with caries measuring 3-6. Finally, a multivariate analysis was made. A logistic regression with the sociodemographic variables and attitudes as well as oral health practices as independent variables and dental caries as a dependent variable was carried out. This study was approved by the Ethics Committee of the University of Antonio Narino, Bogota (Code: 2011239) in compliance with the 1993 Resolution 8430 of the Ministry of Health and Social

Protection. Signed parental or guardian consent and informed approval was given through a meeting with the directors of the educational institutions.

RESULTS AND DISCUSSION

The sample was of 1,085 children from official educational institutions. In terms of attitudes and oral health practices, 945 members (88%) of the sample population stated that their parents remind and help them to brush their teeth. The 880 (81%) children stated that teachers in their educational institution remind them that they must brush their teeth. Total 675 (62%) of the students periodically visit the dentist and 91% check their brushing technique. Total 912 (84%) children believe they cleaned their teeth correctly and 74% brush their teeth after every meal. The prevalence of dental caries was 69%. The DMFT index was 2.24, the DFT index was 3.8 and the community-DMF was 5%. Furthermore, according to the ICDAS criteria, there was a loss of surface integrity (ICDAS index of 3) with a median of three teeth affected and a prevalence of 47%. It is important to point out that the classification 6, according to ICDAS, showed a median of 2 teeth affected and a prevalence of 11% in the student population. According to the bivariate analysis of sociodemographic characteristics and caries, substantial statistical evidence was found between age and caries (OR 0.41, 95% CI: 0.25-0.68) ($p<0.05$), indicating that the chance of caries in children aged 10-14 is 59% less, compared with the chance of caries in children aged between 5 and 9 (Table 1). For the variables of attitudes and oral health practices (Table 2), sufficient statistical evidence was found between reminding children to brush their teeth at home (OR: 1.76, 95% CI: 1.06-2.91) ($p<0.05$) that the dentist checks their brushing technique (OR 1.97, 95% CI: 1.15-3.38) ($p<0.05$) and the last visit to the dentist (OR 2.79, 95% IC: 1.83-4.25) ($p<0.00$). A model of logistic regression (Table 3) was used for the presence of caries. Sufficient statistical evidence was found between age

Table 1: Distribution of socio demographic variables by odd ratio and confidence interval

Socio demographic variables/Categories	Caries		OR	IC 95%	p-value
	No	Si			
Age					
10-14	21	325			
5-9	99	640	0.41	0.25-0.68	0.000
Total	120	965			
Gender					
Female	60	488			
Male	60	477	0.97	0.66-1.42	0.900
Total	120	965			

$p<0.005$

Table 2: Distribution of attitudes and practices variables in oral health by odd ratio and confidence intervals

| Actitudes and practices in oral health | Categories | Caries | | OR | IC 95% | p-values |
		No	Yes			
You are reminded and helped to brush at home	No	22	109			
	Yes	98	856	1.76	1.06-2.91	0.020
	Total	120	965			
The teacher reminds you to brush at school	No	28	177			
	Yes	92	788	1.35	0.86-2.13	0.180
	Total	120	965			
Consultation to the dentist regularly	No	50	360			
	Yes	70	605	1.20	0.81-1.76	0.350
	Total	120	965			
Last visit to the dentist	Every year	39	142			
	Every 6 moths	81	823	2.79	1.83-4.25	0.000
	Total	120	965			
The dentist checks your tooth brushing techniques	No	19	84			
	Yes	101	881	1.97	1.15-3.38	0.010
	Total	120	965			
When brushing you clean your teeth correctly	No	12	161			
	Yes	108	804	0.55	0.29-1.03	0.050
	Total	120	965			
Brushing after every meal	No	34	251			
	Yes	86	714	1.12	0.73-1.71	0.580
	Total	120	965			
Tongue brushing	No	8	56			
	Yes	112	909	1.15	0.23-2.49	0.700
	Total	120	965			

$p < 0.005$

Table 3: Logistic regression models by socio demographic, attitudes and practices variables in oral health by caries

Variables	Odds ratio	CI 95%	Coefficient	SE	p-values
Age	0.5106	0.3019-0.8636	-0.6721	0.2681	0.0122
Genre	0.9622	0.643-1.4397	-0.0385	0.2056	0.8513
You are reminded and helped to brush at home	1.3219	0.746-2.3421	0.2790	0.2918	0.3390
The teacher reminds you to brush at school	1.4608	0.8946-2.3852	0.3790	0.2502	0.1298
Consultation to the dentist regularly	0.8776	0.5239-1.4703	-0.1305	0.2633	0.6200
Last visit to the dentist	1.7993	1.0803-2.9969	0.5874	0.2603	0.0240
The dentist checks your brushing technique	1.1665	0.6059-2.246	0.1540	0.3343	0.6449
When brushing you clean your teeth correctly	0.6281	0.325-1.214	-0.4651	0.3362	0.1666
Brushing after every meal	0.7835	0.4711-1.3031	-0.2440	0.2595	0.3472
Tongue brushing	0.9820	0.4155-2.3213	-0.0181	0.4389	0.9671

$p < 0.005$

(OR 0.51, 95%: 0.30-0.86) (p<0.05) and the last visit to the dentist (OR 1.79, 95% CI: 1.08-2.99) (p<0.05) and dental caries. The variables of age and the last visit to the dentist explain the presence of caries in children of official educational institutions when the rest of the variables of the study are adjusted (p<0.05).

This study assessed the presence of caries in a representative sample of 1,085 children from official institutions in the department of Huila, Colombia. In this context, this investigation could provide accurate estimates about the population of the study as it was obtained through probabilistic sampling. The study provides sufficient statistical evidence between age and last visit to the dentist with dental caries. The prevalence of dental caries was 69% a rate comparable to those of the departments of Valle de Cauca and the municipality of Andes in Colombia where the prevalence is 64.3% (Corchuelo, 2012) and 60.4%

(Ramirez-Puerta *et al.*, 2013), respectively. In comparison to other countries in Latin America, the prevalence of caries in Brazil is 62.9% (Goncalves *et al.*, 2015), similar to that of the study whereas the situation is different in Chile (83.03%) (Ceron *et al.*, 2011), Peru (89%) and Ecuador (95%) (Mayor *et al.*, 2014) where there are high rates of caries in the early childhood population. Worldwide, other studies report similar levels of caries as found in this study including China with 68.2% (Hu *et al.*, 2015) Australia with 67% (Quach *et al.*, 2015) and a marked difference in Switzerland with 24.8% (Irvine *et al.*, 2011). In addressing the factors which influence the oral health of children, it was found that developing and implementing complementary public health actions focused on children and improving parent's knowledge of oral health are essential in order to provide them with good oral health and an improved quality of life (Castilho *et al.*, 2013). Another important

indicator is the DMFT and DFT index for permanent and temporary dentition, respectively. The DMFT index (Ceron *et al.*, 2011; Ramirez-Puerta *et al.*, 2015) at 12 years of age at a national level was found to be 8.3 in 2011 by the Subsistema de Vigilancia Epidemiologica de la Salud Oral (Subsystem of Epidemiological Monitoring on Oral Health). However, this study, conducted in the department of Huila, found a marked decline in comparison with the national average. It is suggested that this could be due to the impact of dental exfoliation. Medellin has a DMFT of 4.9 (Ramirez-Puerta *et al.*, 2013). This can be compared to the figure obtained in the department of Huila by Fernandes *et al.* (2015) which shows a DMFT index of 1.3, above Peru's DMFT of 4.98 (Ortiz-Leon, 2014). However, the situation in children with 5 years of age is different. In this population study, the DFT was 3.8 which is high for the early ages in the department of Huila. This is therefore interpreted as a risk status, being above Medellin with a DFT index of 1.9 (Ramirez-Puerta *et al.*, 2015) and Brazil with 2.86 (Azevedo *et al.*, 2014). In Venezuela, a study about the prevalence of caries (Garay and Alberto, 2015) where the ICDAS criteria was used as diagnosis criteria, determined that indicators 2 and 4 are the most prevalent whereas this study found the most prevalent to be 3. It is important to note that the ICDAS criteria is a good choice when aiming to comprehensively detect the progress of lesions and therefore rely on efficient monitoring of the severity of dental caries. In terms of using the ICDAS system to detect dental caries in a population it is noted that although there are limitations in terms of the possibility of drawing comparisons, it is a sound choice when aiming to comprehensively detect the progress of lesions and therefore rely on efficient monitoring of the severity of dental caries. The bivariate analysis found significant statistical correlation between the variables of age and reminding and helping children to brush their teeth at home. An association was found between parents and the state of the oral health of their children as well as that the dentist checks their brushing technique and the last visit to the dentist. However, once the model of logistical regression was designed with the aim of reducing bias and confounding variables, the statistically significant correlation remained between age and the last visit to the dentist. In line with this, Castilho *et al.* (2013) mentions that parent's habits and the behavior of children is related to the children teeth brushing. In addition to this is the frequency of visits to the dentist which is similar to the link found in this study. With respect to the link between age and caries there are differences between other authors with reference to a multivariate analysis which shows that age is associated

with higher rates of dental caries in permanent dentition as children have a higher probability of suffering from caries as their age increases. This could be due to the fact that as age increases, a greater number of teeth are found in the oral cavity (Goncalves *et al.*, 2015; Costa *et al.*, 2013; Jain *et al.*, 2015; Rodriguez and Pinilla, 2015). Another systematic analysis showed that the combined prevalence of dental caries in children of 15 years of age was greater, followed by 5 and 12 years of age (Kundu *et al.*, 2015). However, although dental caries has been decreasing on a global scale in the general population, especially among older children, the prevalence of caries in younger children has not significantly reduced (Singh *et al.*, 2011). China presents a similar picture; Xuan shows independently from the presence or absence of the signs that dental caries is increasing in young children (Irvine *et al.*, 2011).

CONCLUSION

A high prevalence of caries was found in the population. This raises the urgent need to change oral health strategies in order to achieve a social impact in the prevention of oral diseases which especially in infancy, constitute a major challenge for the state and society.

RECOMMENDATIONS

A transversal study is recommended, differentiating students hailing from urban school areas from those in rural areas. Also recommended is a prospective investigation which measures the oral health of children at the point of entering an educational institution and continuing for 3 or more years by dentists trained in the process of monitoring caries according to ICDAS criteria.

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