



# Caries prevalence of preschool age children in community homes of the Cauca Valle and related social factors

## *Prevalencia de caries en preescolares de hogares comunitarios en el Valle del Cauca y factores sociales relacionados*

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### ABSTRACT

Dental caries represents a public health problem due to its high frequency in population and the cost it represents for society. Studies conducted in recent decades in children under the age of six have found prevalence in a 20 to 70% range. **Objective:** The aim of the present study was to describe caries indicators such as DMF index and degree, caries history and caries prevalence found in children living in some community homes of six municipalities of Valle del Cauca in Colombia. **Material and methods:** A cross-sectioned study was conducted in 982 children lodged in community homes of six municipalities. Classic index of DMF and modified DMF were recorded according to a clinical instrument provided by the Social Protection Ministry of Colombia. Estimators were calculated bearing in mind the design and using statistical program SPSS, Version 19. **Results:** A 45.6% caries prevalence was found (caries with or without cavitation). Classic DMF was 1.7 (95% CI: 1.5-1.9) in the two to five year old population and increased to 2.3 when including the modification of caries without cavitation. In the simple regression analysis, type of social security, ethnicity and age were correlated to DMF teeth. **Conclusion:** The present study found lesser prevalence and history of caries in pre-school age children than that reported in the third national oral health study in five year old population, as well as results reported in the fourth study for population aged 3-5 years.

### RESUMEN

La caries dental es un problema de salud pública debido a su alta frecuencia en la población y los costos que implican para la sociedad. Los estudios realizados en las últimas décadas en la población menor de seis años de edad han encontrado una prevalencia en un rango entre 20 y 70%. **Objetivo:** El objetivo del estudio fue describir los indicadores de caries como índice y nivel de COP, antecedentes de caries y prevalencia de caries dental en niños en algunos hogares comunitarios de seis municipios del Valle del Cauca, Colombia. **Material y métodos:** Se realizó un estudio transversal en 982 niños de hogares comunitarios de seis municipios. El índice clásico de la COP y la COP modificada se registraron de acuerdo con un instrumento clínico proporcionado por el Ministerio de Protección Social de Colombia. Los estimadores se calcularon teniendo en cuenta el diseño, utilizando el programa estadístico SPSS versión 19. **Resultados:** Se encontró una prevalencia de caries del 45.6% (caries con o sin cavitación). El COP clásico fue de 1.7 (IC del 95%: 1.5-1.9) en la población de dos a cinco años y aumentó a 2.3 incluyendo la modificación de la caries sin cavitación. En el análisis de regresión simple, el tipo de seguridad social, la condición étnica y la edad se correlacionaron con el nivel de COP. **Conclusión:** Este estudio encontró una prevalencia y antecedentes de caries en la población preescolar menor que la reportada en el Tercer Estudio Nacional de Salud Oral en la población de cinco años y los resultados reportados en el estudio IV a los tres y cinco años.

**Key words:** Prevalence, dental caries, dental plaque index, DMF index, socioeconomic factors.

**Palabras clave:** Prevalencia, caries dental, índice de placa dental, índice COP, factores socioeconómicos.

### INTRODUCTION

Studies conducted during the last decade show presence of caries at early ages. Caries is found in a range of 20 to 70% in population under six years of age.<sup>1-6</sup> Dental caries is a public health issue due to its high prevalence in the population, conditions and sequels it elicits and the possible association with certain systemic diseases, cost their represent for society<sup>7</sup> and impact on population's quality of life.<sup>8</sup> Recently, the panorama has been extended incorporating study of health social determinants in problems related to dental public health.<sup>9,10</sup> A

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study applying multivariate analysis of logistic regression found that only oral hygiene techniques and socioeconomic level would be significantly associated in caries risk prediction.<sup>11</sup> Recent studies in a preschool population of a Mexican region found that caries experience was high, and associated to poor oral hygiene.<sup>12</sup> Other studies, such as that effected in the city of Chongqing, corroborate the proposition that dental caries prevalence and DMF mean gradually increased as the children grew.<sup>13</sup>

In view of the oral morbidity exhibited by their populations and new findings which systemically compromise people's health, different governments of the world have promoted policies to guarantee that pregnant females receive counseling in oral and dental health that include information related to prevention of early caries, as well as some recommendations on oral and dental health, including the purpose of bringing their child to the dental office before he is one year old.

In the case of Colombia, the Social Protection Ministry (*Ministerio de Protección Social*) presented in 2009 a report on how to determine a baseline for the follow-up of oral health goals in the National Plan of Public Health (*Plan Nacional de Salud Pública*)<sup>14</sup> and requested that territorial divisions harvest information on DMF teeth; this enabled acquiring information on the 2010-2011 period.<sup>15</sup> Constant results keep showing that caries are still a public health issue.

Children under six years of age represent a vulnerable, highly affected group.<sup>16</sup>

The dental caries situation of children living in community homes in the Valle del Cauca is unknown; knowledge of which factors might be related to their prevalence is equally not documented.

The aim of the present study was to describe caries indicators such as DMF levels and index, caries history and dental caries prevalence in the child population of some community homes of six municipalities of the Valle de Cauca department in Colombia.

## METHODS

The database of the study «Oral Health Baseline for Cauca Valley 2009-2012» was analyzed. This study comprised data on pre-school population in 11 community homes located in six municipalities of the Valle del Cauca, counting with 982 entries. Studied homes had been selected by means of simple random sampling, by raffling through a list of 31 homes. To execute contract number 0526 (2010) between Cartago Hospital and Department Health Ministry, the project's operator counted with approval of the Cartago Hospital's ethics committee. Community mothers of

these homes were briefed on the study's objectives, and they were requested to provide informed consent forms, in which parents authorized their children's participation in the acquisition of an oral health baseline in community homes. Parents were informed that data and results harvested during research would be kept strictly confidential. Children not included were those who exhibited general health systemic compromise (leukemia, cancer, respiratory infection and others) as well as those presenting acute lesions in the mouth (abscesses, toothache, herpes etc.).

Classic DMF index was recorded (index encompassing teeth with caries and cavitation, teeth filled due to caries and teeth missing due to caries) and modified DMF modified according the clinical instrument supplied by the Colombia Social Protection Ministry.<sup>14</sup>

A 9% inter-examiner discrepancy was obtained for standardization of this index. An 80% concordance with kappa values was observed in community plaque index (CPI) community bacterial plaque standard.<sup>17</sup> Dental plaque recording was the last activity of the clinical examination, the patient was requested to rinse for 30 seconds with a disclosing substance preparation; after this, surfaces of present teeth were examined according to index established for community plaque.

Sociodemographic variables included in the format provided by the examining dentist were the following: age, population group, type of social security, gender, geographical area, number of teeth to be examined, teeth with caries and cavitation, teeth with caries lacking cavitation, filled teeth, teeth lost due to caries, teeth lost due to other causes, and healthy teeth.

## Statistical analysis

Acceptable community plaque index was considered when dental plaque indexes were 25% or less. A DMF lesser than 2.3 was taken as reference for adequate DMF, this was the measurement provided by ENSAB III<sup>18</sup> for five year old population. Factors related to caries history, caries prevalence and DMF level were determined by means of a bivariate analysis through an odds ratio (OR) with 95% CI estimation. Multivariate analysis was conducted with logistic regression, only including significant associations with  $p \leq 0.05$ . No significant interactions were identified during the exploration of hypothesis-generating associations, regression crude and adjusted estimators were taken into account.<sup>19</sup> Estimators were calculated taking into account design, using SPSS® version 17 and Epi Info 3.5.1 statistical programs.

**Table I.** Caries distribution by age prevalence in preschool children of six municipalities of the Valle del Cauca, Colombia.

Age	n	Caries prevalence with and without cavitation	CI 95%	Caries prevalence with cavitation	CI 95%
2	50	34.0	20.4 - 47.6	24.0	11.7 - 36.2
3	344	45.6	40.3 - 50.9	34.8	29.8 - 39.9
4	539	45.8	41.6 - 50.0	35.4	31.3 - 39.4
5	36	52.8	35.6 - 69.9	36.1	19.6 - 52.5
Total	982*	45.6	42.5 - 48.7	35.0	32.0 - 38.0

\*Children aged 2-5 years who did not record age were included.

## RESULTS

In the present study 982 children from community homes were evaluated. Homes were located in six municipalities of the Valle del Cauca; the study was conducted during 2010-2011. Children's average age was 3.58 years ( $\pm 0.3$ ). Found caries prevalence was 45.6% (CI 95% 42.5-48.7) including caries with and without cavitation (*Table I*). History of caries with and without cavitation at examination time was 49.3% (CI 95%, 46.4-52.6), with frequency of 47.7% at age three years (CI 95% 42.3-52.9), and 66.7% at age five years (CI 95% 50.4-82.8) caries history, considering only caries with cavitation, was 36.3% (CI 95% 31.2-41.4) at three years of age and 58.3% (CI 41.4-75.2) at five years of age. DMF measured in the classical way as caries with cavity, was 1.7 (CI 95% 1.5-1.9) in the two to five years population, and increases to 2.3, including the modification of including caries without cavitation.

Assessed subjects were affiliated to contributive regime in a 52% proportion (including special regime), the rest corresponded to low income population affiliated to subsidized regime and those not insured. Population with African ethnic roots, representing 7% of assessed subjects, was affiliated to the contributive regime.

Prevalence of caries measured as only caries with cavitation was 35% (CI 95% 32.0-38.0). Caries prevalence, caries history and DMF teeth (decayed, missing, filled) index increased with age (*Tables I to III*). Reported bacterial plaque index was 41.4% (CI 95% 40.4-42.5). Level of plaque considered as acceptable was found in 88.4% of cases, with lesser caries prevalence (odds ratio = 7.9); CI 95% 4.6-13.7). Dental plaque level was also found to be related to caries history and DFM level (*Tables III and IV*) and with DMF index (*Figure 1*). Oral hygiene levels were different for boys than for girls (U Mann-Whitney = 107,982, value  $p = 0.7\%$ ) (*Figure 2*).

When exploring possible associations related to caries presence, it was found that the fact of belonging to a certain population, such as that of African ascent,

**Table II.** Age distribution of classic DMF and modified DMF (caries with and without cavitation) of preschool children in six municipalities of the Valle del Cauca, Colombia.

Age	n	DMF	CI 95%	Modified DMF	CI 95%
2	50	0.5	0.2 - 0.7	0.9	0.5 - 1.3
3	344	1.6	1.3 - 2.0	2.2	1.8 - 2.6
4	539	1.8	1.5 - 2.1	2.3	2.1 - 2.6
5	36	2.3	1.4 - 3.3	2.7	1.7 - 3.7
Total	982*	1.7	1.5 - 1.9	2.3	2.1 - 2.5

\*Children aged 2-5 years who did not record age were included.

presence of poor oral hygiene and age can be related to greater caries history (*Table IV*). Exploration of which factors are related to an acceptable DMF teeth, revealed that factors related were gender, age, hygiene level measured through community bacterial plaque index and social security affiliation (*Table III*).

## DISCUSSION

This is the first study published based on the oral health baseline for the Valle del Cauca which reveals the caries situation of pre-school children of community homes in six municipalities; lesser caries history and prevalence was found in the present study when compared to that reported in the two last national studies of oral health.<sup>18,20</sup> Caries differences were found according to ethnicity, age, and bacterial plaque. Results obtained in the present study could lead to improvement in dental care programs offered to preschool children.

The third national study of oral health ENSAB III could have found caries with cavity prevalence in primary dentition at five years of age in a proportion of 54.8% at national level and of 62.6% in the region of Valle del Cauca (omitting Cali and the Pacific platform). In the fourth national study for oral health ENSAB IV, this measurement was 52.2% at national level, and 33.6% for the region. Increase of caries prevalence

**Table III.** Factors related to DMF level according to age, type of social security and gender in preschool children of six municipalities of the Valle del Cauca, Colombia.

Associated factors	DMF level adequate (%)		Bivariate		Multivariate	
	Yes	No	OR	CI 95%	OR	CI 95%
Gender						
Female	74.0	26.0	1.5*	1.2 - 2.1	0.6*	0.4 - 0.8
Male	64.4	35.6	1.0			
Grouped age						
Two years	82.0	18.0	2.1**	1.0 - 4.4	2.5**	1.2 - 5.4
Three to five years	67.9	32.1	1.0		1.0	
Oral hygiene						
Bacterial plaque ≤ 25%	97.1	2.9	18.8*	6.9 - 51.4	19.0*	6.9 - 52.0
Bacterial plaque > 25%	64.0	36.0	1.0		1.0	
Social security						
Contributory regime	73.0	27.0	1.5*	1.2 - 2.0	1.4**	1.0 - 1.8
Subsidized regime and uninsured population	63.9	36.1	1.0		1.0	

\*p < 0.01; \*\*p < 0.05 (Fisher exact statistic).

OR = odds ratio.

**Table IV.** Factors related to caries history of preschool children in six municipalities of the Valle del Cauca, Colombia.

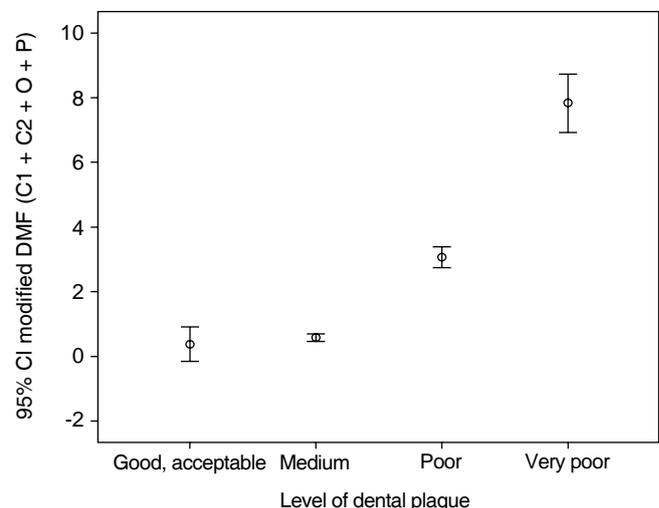
Associated factors	% Caries history		OR	CI 95%
	Yes	No		
Ethnic vulnerability				
African ancestry	65.2	34.8	2.0*	1.2 - 3.3
Rest of population	48.3	51.7	1.0	
Grouped age				
Two years	36	64	1.0	
Three to five years	50.2	49.8	1.2**	1.0 - 1.5
Oral hygiene				
Bacterial plaque ≤ 25%	17.4	82.6	5.7*	3.6 - 9.1
Bacterial plaque > 25%	54.7	45.3	1.0	

\*p < 0.01; \*\*p < 0.05 (Fisher exact statistic).

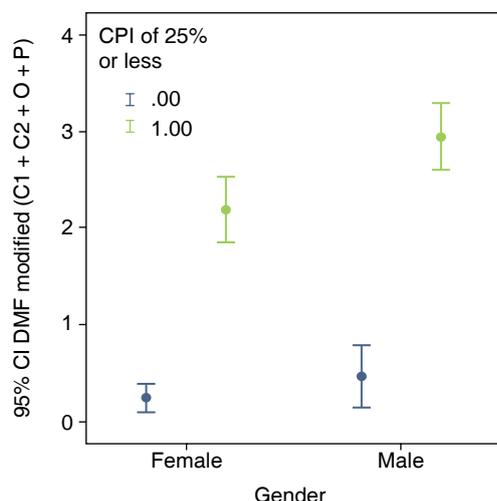
OR = odds ratio.

measured as teeth with caries (with or without cavity), reflected in the last study of oral health, shows national caries prevalence of 81.8%, and 38.6% (30.5-46.6%) in the region corresponding to Valle del Cauca (omitting Cali and the Pacific platform). When these results are compared to the situation observed in three to five year old children of assessed community homes, a decrease of prevalence between third study and this last national study can be ascertained, which corroborates findings of our study.

Caries history or experience with and without cavity in five year old children was 88.8% in ENSAB IV when compared to 66.7% found in the community

**Figure 1.** Distribution if dental plaque and DMF index in community homes of six municipalities of Valle del Cauca, Colombia 2012.

homes of the present study. Decrease observed in caries prevalence and history in both national studies could be the result of specific caries protection and promotion actions resulting from greater accessibility to insurance coverage achieved in the whole country, especially in the region, where coverage is above 90%. It is of certain concern to consider that at two years of age, caries history already reaches 36%, and in the two to five year group, average number of teeth with caries and cavitation are 1.42 teeth versus 0.38 filled teeth, these facts reflect existing limitations to dental caries treatment.



Color blue corresponds to dental plaque of 25% or less, green corresponds to dental plaque above 25%. DMF index includes caries with and without cavitation

**Figure 2.** Relationship of dental plaque with DMF index according to gender in community homes of six municipalities of the Valle del Cauca, Colombia.

Studies have reported that caries indicators such as DMF index, caries history and caries prevalence increase with age.<sup>1,13,20-23</sup>

In the present study, it can be observed that from a classic 0.5 DFM at two years of age, a 320% increase was observed at three years, and 460% at five years. When modified DMF is assessed (including caries lacking cavity) DFM increase at age 2-5 years is 300%. The fact of finding caries without cavity at early ages, should encourage health insurance agencies and their net of service providers to forestall actions, not only promotion activities but rather specific protection such as fluoride application, and involving participation of subjects caring for these children (parents, family, community mothers, teachers etc.) where they foment the acquisition of healthy habits such as suitable oral hygiene in the first stages of life and this will generate learning processes which will allow control of dental caries risk factors.<sup>6,24,25</sup>

Oral hygiene purports to control bacterial plaque level. It is a very significant risk along with frequency of non-dairy, extrinsic sugar consumption. Although it continually forms in the mouth, bacterial plaque can be prevented with regular adherence to tooth-brushing,<sup>26</sup> use of toothpaste, dental floss, dental rinses and oral and dental health education. This study corroborates relationships between bacterial plaque and caries, measured through DMF and caries history. With respect to DMF, subjects exhibiting bacterial plaque levels of 25% or more exhibited occurrence probability

18.8 times to those cases with DMF greater than 2.3 without adjusted rates, with adjusted rates this figure increased to 19 times (*Table III*). This exploration leads us to generate the hypothesis that better plaque control leads to dental caries reduction.

Some research projects have reported an association between socioeconomic inequalities and experience and distribution of dental caries, in pre-school and school age children.<sup>27,28</sup> In the present study existence of sociodemographic and biological variables was found, related to caries history and DMF teeth index, corroborating thus findings of Miriam-Ortega et al 2007.<sup>29</sup> Oral hygiene measured through plaque index and age appear as variables which must include all different hypotheses seeking biological and social determinants for caries onset.

Social variables such as ethnicity, and financial variables such as counting with social security program according to payment ability have been related to access to pre-natal control and dental care<sup>30,31</sup> in the present study, when compared to the rest of population, the fact of belonging to African ascent exhibited significant differences in caries history. Moreover, the fact of being poor and vulnerable such as is the case of subjects enjoying subsidized regime, translated into greater DMF indexes than those of preschool children affiliated to the contributive regime; this highlights existence of social inequalities in the assessed pre-school population. Vulnerability of certain ethnic groups is conditioned by social determinants; some recent studies on pregnant mothers 'access to medical care found a relationship between ethnicity and life style variables such as suitable oral health practices, favorable health beliefs, acceptable oral health knowledge and frequent consumption of beverages and snacks rich in non -dairy extrinsic sugars.<sup>32</sup>

One of the limitations of the present study was the fact that assessed community homes did not include the totality of the region's community homes, therefore, stratification per municipality was not possible.

To conclude, it can be proposed that in the present study lesser caries prevalence and history was found in pre-school population than that reported in the third national study of oral health in five year old population, and results reported in the fourth study at three and five years of age. The present study additionally found caries differences according to ethnicity, age and bacterial plaque level.

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