

# **PREVALENCE AND SEVERITY OF DENTAL CARIES BY GENDER, AGE AND EDUCATIONAL LEVELS IN RURAL DOMINICAN REPUBLIC**

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## **ABSTRACT**

### **OBJECTIVE**

To determine prevalence and severity of dental caries using WHO methods by age, gender and educational levels and compare actual DMFT scores to self-reported scores.

### **METHOD**

Cross-sectional study was conducted using face-to-face interviews and oral examinations in La Esquina community, Province Maria Trinidad Sanchez, Dominican Republic (DR) among 104 adult participants. Caries experience was determined using DMFT scores.

### **RESULTS**

Prevalence of caries was high with 94.2% of participants affected by it. Mean DMFT index (11.95±9.67) for participants having ≤ 8 years of school education was significantly higher than the mean score (6.69±4.39) for people with >8 years of education ( $F=9.3$ ;  $p<0.01$ ). Likewise, mean DMFT score for age group ≥55 years was significantly higher than for younger age categories ( $F=5.87$ ;  $p<0.01$ ). Caries severity was found to be statistically significant by age groups ( $\chi^2 =17.42$ ,  $p=.002$ ) with more proportion of participants ≥ 55 years having DMFT score ≥14. Actual mean DMFT score was 4.51 higher than mean self-reported score (9.51 versus 5.08) (Spearman  $r=.27$ ;  $p= .01$ ).

## **CONCLUSIONS**

This study provides preliminary data on caries prevalence and identifies unmet treatment needs in rural DR. While caries experience among adults increased significantly both by age and educational levels, caries severity increased significantly with age alone.

## **KEYWORDS**

Caries experience, DMFT score, oral health, Dominican Republic, rural

## **INTRODUCTION**

Dental caries is considered one of the most prevalent chronic diseases that affects nearly 100% of the population in majority of the countries and contributes to the global burden of diseases (Peterson, 2003; Peterson et al, 2005). Untreated dental caries results in chronic oro-facial pain and compromises the ability to eat and function well. Tooth loss due to caries results in mastication difficulties and decreased swallowing (Guiglia, et al., 2010). With the recent trend in increase of caries experience in developing countries, shortage in dental professionals and the systems' capacity to provide only emergency care or pain relief treatment, more adults experience tooth loss as a result of caries throughout their lifespan (Peterson et al, 2005). To reduce the number of teeth extracted due to caries at ages 18, 35-44 and 65-74 years by 2020 remains one of the global oral health targets developed by World Health Organization, World Dental Federation (FDI) and International Association for Dental Research (IADR) (Hobdel et al, 2003).

The lifetime experience of dental caries in permanent dentition is measured by the Decayed, Missing, and Filled teeth index also known as the DMFT index (WHO, 1987). While the incidence and prevalence of dental caries can be attributed to several factors, such as socio-behavioral and environmental factors (Peterson, 2003), this study assesses the caries prevalence and examines the association between the socio-demographic factors to the prevalence and severity of dental caries in a rural community in the Dominican Republic.

The Dominican Republic (DR) occupies the eastern two-thirds of the island of Hispaniola, which it shares with Haiti. The island is located to the southeast of Cuba, between the Caribbean Sea and the North Atlantic Ocean. The population of DR as of 2014 is 10,378,000 (Population Reference Bureau, 2014). There are 7,000 dentists, 8 per 10,000; however a majority of the dentists are concentrated in the urban areas of the DR. There are several universities for health professionals, recognized by the National Board of Higher Education and 7 of those institutions are for dental education (PAHO Basic Health Indicator Data Base, n.d).

Review of literature shows limited information on caries prevalence among adults in the DR. Among the very few studies that looked at caries prevalence in Latin Caribbean and Central American countries, most of the neither focused on the prevalence of caries among 12 year olds

in the DR (PAHO, 2005) or looked at caries experience among adults of certain age groups in a few Central American countries (Astroth et al, 1998; Dowsett et al, 2001; Smith & Lang, 1993). There is a paucity of data on the caries experience among adults in Dominican Republic. Given the lack of information on oral health status across life span and the limited access to oral care among rural populations, a preliminary study to assess the oral health status is required to identify treatment needs and oral health education programs for rural population in the DR.

The objectives of the study were to:

1. Determine the prevalence of dental caries by assessing the Decayed Missing Filled teeth (DMFT) index
2. Compare the mean DMFT scores by gender, age, educational levels and self-reported caries experience
3. Study the association of the severity of caries experience with the gender, age and educational levels

## **METHOD**

This study was a cross-sectional design that used face-to-face interviews and intra-oral examinations among adults older than 18 years in the community of La Esquina in Province Maria Trinidad Sanchez in July-August 2013. The research protocol was approved by the institutional review board prior to the data collection period. An individual who was older than 18 years and a resident of La Esquina community was eligible for inclusion in the study. Pregnant women, children and people whose conditions did not allow answering questions or oral examinations were excluded from the study. The interview protocol was read aloud to the community members and only after having their permission through a written consent were they allowed to participate in the study. A total of 104 participants aged 18 to 80 years were enrolled in our study. Participants who signed the consent form underwent intra-oral examinations that were done by a single trained dental professional and answered a few questions that were read out to them in Spanish. The professional looked for any tooth affected by caries using a mouth mirror and explorer. Caries prevalence determined by DMFT index for a respondent can vary from 0-32 with 0 representing no evidence of caries and 32 indicating all teeth are affected by caries. Third molars were also included in the examinations (Peterson & Baez, 2013).

Intra-examiner reliability on the caries prevalence using DMFT scores was assessed using kappa statistics. A total of 12 participants were re-examined for consistency and accuracy for DMFT scores and complete agreement was found (kappa statistic=1).

The data were entered into SPSS Statistics 22. Frequency distribution of the various socio-economic demographics was obtained. Spearman correlation coefficient was calculated to compare the actual DMFT score to self-reported DMFT scores, F statistics and chi-square were

obtained to compare and examine the distribution of the demographic variables with the caries prevalence (DMFT scores) respectively.

## RESULTS

The percentage distribution of the socio-demographic variables is shown in Table 1. A fewer number of males (49) than females (55) were included in our study. A majority of participants (60.4%) had less than 8 years of formal education (elementary school) while 39.6% of the sample had higher than 8 years of school education or some form of college education. About 28% of the participants were 55 years or older while people of age groups 18-24 years constituted 22.4% of the sample. The mean age of the sample population was  $42.6 \pm 17.8$  years. We had missing information on age and educational levels for 6 and 13 participants respectively.

Actual DMFT scores are compared with the self-reported DMFT scores (Table 2). The actual mean DMFT score was moderate ( $9.6 \pm 7.8$ ) for the sample and the values ranged from 0 to 32. The mean score for filled teeth was found to be lowest ( $0.6 \pm 1.9$ ) while mean missing teeth score was found to be highest ( $6.0 \pm 8.7$ ). There was a difference between actual and self-reported DMFT scores and the mean DMFT score was 4.51 significantly higher than the mean self-reported DMFT scores (Spearman  $r = .27$ ,  $p$  value = .01), indicating participants under-reported the number of teeth they believed to be decayed, missing or filled. There was no correlation found between the actual Decayed Teeth index versus self-reported decayed teeth (Spearman  $r = .03$ ) implying participants failed to recognize early signs of caries or perceived having no tooth decay unless accompanied with pain.

Table 3 shows the comparison of DMFT scores by age, gender and educational levels. The mean DMFT score was slightly higher among male participants than females (9.94 versus 9.27) but the difference was not statistically significant. Participants who had less years of formal education had significantly higher mean DMFT scores than participants who had high school or some college level education ( $F$  statistic 9.3,  $p$  value .003). Similarly, people in the age category of 55 years and above had significantly higher mean DMFT scores than people in other age categories ( $F$  statistic 5.87,  $p$  value < .001).

The prevalence of caries within each severity category is shown in Table 4. According to the WHO severity criteria established for permanent dentition (Peterson and Baez, 2013), about 45.2% of the sample had moderate to high degree of caries severity while 54.8% had very low to low degree of caries severity.

The DMFT scores (caries experience) were categorized by severity levels into  $DMFT \leq 13.9$  (low-to-moderate) caries severity and  $DMFT > 14$  (High) caries severity. Participants with DMFT score of 13.9 or less were grouped into one category and participants with DMFT score of 14 or more were categorized into high caries severity group. About 18% of the sample had high degree of caries severity while 81% had low-moderate level of caries severity (Table 5). Males had slightly higher severity of caries although there was no statistical significant difference between

groups with respect to gender ( $\chi^2 = .28, p = .59$ ). People with 8 years or less of formal education had higher caries severity than their counterparts who had some high school or college education. However, the difference between the educational levels was also not statistically significant. The proportion of older people who had DMFT score of 14 and above was higher than younger groups and caries severity was found to be statistically significant by age groups ( $\chi^2 = 17.42, p = .002$ )

## **DISCUSSION**

The present study is one of the first studies that looked at the epidemiology of dental caries among adults in this rural region of Dominican Republic. The prevalence of caries was high with 94.2% of the sample population affected by it and 74% of the participants in need of restorative treatment in at least one tooth.

### *COMPARISON WITH OTHER STUDIES*

The mean DMFT ( $15.2 \pm 11.6$ ) above the age 55 years was nearly equal to the DMFT scores of  $16.5 \pm 7.0$  reported among indigenous rural population in Guatemala (Dowsett et al, 2001). In another study in Nicaraguan population, a higher mean DMFT score of  $14.6 \pm 5.8$  was found among urban and rural adults aged 35-64 years not presenting for dental care (Smith & Lang, 1993). Higher DMFT scores were observed with increase in age with mean DMFT scores  $13.20 \pm 7.67$  for the 35-44 age group, and  $18.88 \pm 7.40$  for the 65-74 age group in a study conducted in rural Chiriqui Province, Panama (Astroth et al, 1998). It should be noted, however, that the results of this study cannot be compared directly with most of the Central American or Latin Caribbean studies by age groups because the studies employed WHO pathfinder methodology and presented data differently.

### *DENTAL CARIES IS AGE-RELATED*

Like most of the dental diseases, the severity of dental caries increases with age (Estupiñán-Day, 2005; Guiglia, et al., 2010). The burden of oral diseases is high among older people and affects their quality of life (Peterson & Yamamoto, 2005). In this study population, the mean DMFT score and the severity of caries increased with an increase in the participants' age (Pearson correlation coefficient,  $r = .40$ ) and missing teeth (MT) accounted for higher proportion of DMFT score among older people. About 8% of the participants were edentulous and all of them wore complete dentures replacing their natural teeth. Like elsewhere in the world, losing teeth is seen by many people in this community as a natural consequence of ageing.

### *LOW FILLED TEETH INDEX (FT)*

While the mean DMFT score representing caries prevalence was  $9.6 \pm 8.0$ , the mean filled teeth index for this sample was  $0.6 \pm 1.9$  indicating that seeking restorative treatment for decayed teeth was uncommon and an existing unmet need in the treatment of dental caries. Teeth affected by

caries were either extracted due to pain or discomfort or left untreated. In such a rural community, restorative and preventive treatments are given low priority as opposed to seeking emergency treatment at advanced stages of caries progression where teeth extractions remain the only option. Either members fail to identify early signs of caries or perceive it to be less serious in the initial stages. Most of the people perceive no need for treatment unless caries has progressed to more severe stages with associated pain. Preventive or restorative treatments, if available, are usually provided in regional public hospitals or private clinics. The nearest dental clinic or hospital available is 20 minutes away either in Cabrera or Nagua with limited public mode of transportation that is cost prohibitive to a majority of community members.

### *HIGHER DMFT SCORE WITH LOW EDUCATIONAL LEVELS*

Participants in this rural area lived in relative poverty and were disproportionately affected by dental caries. In this community of cattle raisers, small business owners and subsistence farmers, a majority had the same income level except for one or two families who were economically well placed over the rest. There was no association between higher educational levels with higher income levels that could explain the lower DMFT scores among people with more years of formal education. It was found out that most of the people who had less than 8 years of school education were older people with higher DMFT score. The mean age for participants who had lesser educational level was 51.5 years indicating the increase in decayed and missing teeth (caries experience) as they grew older. With younger people attaining higher levels of education in the recent years than previously, there was a significantly lower DMFT score among such participants.

### *COMPARISON OF SELF-REPORTED ORAL HEALTH STATUS TO ACTUAL CARIES EXPERIENCE*

The self-perceived oral health needs were under-reported compared to the results of the professional oral health assessment. The actual DMFT score was 4.51 points significantly higher than the reported oral health status, indicating participants were either not completely aware of their oral health status or failed to recognize early signs of caries or may have answered in a socially desirable way.

### *CONTRIBUTING FACTORS TO HIGH MISSING TEETH (MT) AND DECAYED TEETH (DT) INDICES*

It can be speculated that the prevalence of high DMT scores in this rural community may be due to:

Dietary habits and oral hygiene behaviors: The traditional rural Dominican diet, high in carbohydrates and sugar, consists mainly of whole grain rice, plantains, tubers, and dry beans with consumption of sugary drinks in the form of coffee or fruit juices (Tisone, 2004). About

42.3% of the sample drank sweet beverages at least once a day and 20% consumed sweets once or more than once a day. Self-reported brushing frequency was high in this sample with 94.2% brushing twice or more than twice a day. However, such oral hygiene behavior seems questionable given 40.4% of the sample population had soft deposits on their teeth and about 18% had bleeding on probing.

Inadequate access to dental health care: Professional oral care is currently sought only when symptoms associated with caries increased in severity. People opted for teeth extractions to relieve excruciating pain quickly and avoid high costs associated with restorative or endodontic treatment. This rural community of economically marginalized people has fewer resources and social capital to seek regular preventive or restorative treatment for dental diseases. Furthermore, despite professional dental care being available in nearby towns, barriers such as fear of dental instruments also prevent people from seeking timely professional care.

Fluoridation: Salt and water fluoridation programs within the country are still in the initial stages (Estupiñán-Day, 2005). While fluoride levels in potable water are relatively low in most of the regions in the DR (Milner, 1998), fluoride content in food products such as salt or milk are unknown in this community. However, a majority of participants self-reported using fluoridated toothpaste for brushing.

### *STRENGTHS, LIMITATIONS AND FUTURE RECOMMENDATIONS*

Recent data on oral health status among adults in the DR is limited. This study provides preliminary data on caries prevalence and unmet treatment needs in the rural population of North Dominican Republic. While this baseline information will provide health care planners with understanding caries prevalence among age cohorts and identifying the treatment needs for rural Dominicans, the sample size is small restricting some of the inferences that can be drawn from this data. More studies with large sample sizes in different geographical locations or nation-wide surveys are needed to corroborate the study findings.

The use of DMF Teeth index is known to under estimate the caries prevalence and treatment needs (Becker et al, 2007). Self-reporting bias was also one of the limitations of this study. Participants on being asked about their oral health status and oral hygiene behaviors may have answered in a way that was socially desirable, potentially incorporating some information bias into the study (Fadnes et al, 2008).

### *CONCLUSIONS*

This study is one among the first studies to look at the caries prevalence in this rural region of north Dominican Republic. The moderate to high levels of caries with high number of missing teeth followed by decayed teeth in the overall caries experience indicate unmet treatment needs in this community. There is a need for both prevention and treatment programs in this rural area. While attending to restorative needs or replacement of natural teeth may be difficult in this

community with limited resources, adults can be targeted for oral health education and promotion programs. Youth and adults should be made aware of caries prevention, optimal oral hygiene behaviors and timely dental care that will reduce the burden of dental caries both in terms of cost and quality of life.

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## **REFERENCES**

1. Astroth, J., Berg, R., Berkey, D., McDowell, J., & Hamman, R. (1998). Dental caries prevalence and treatment need in Chiriqui Province, Panama. *International Dental Journal*, 48, 203-209.
2. Becker, T., Levin, L., Shochat, T., & Einy, S. (2007, May). How much does the DMFT index underestimate the need for restorative care? *Journal of Dental Education*, 71(5).
3. *Dominican Republic Population Mid-2014*. (2014). Retrieved from Population Reference Bureau: <http://www.prb.org/DataFinder/Geography/Data.aspx?loc=329>
4. Dowsett, S. A., Archila, L., & Kowolik, M. J. (2001). Oral health status of an indigenous adult population of Central America. *Community Dental Health*, 18, 162-166.
5. Estupiñán-Day, S. (2005). *Promoting oral health: the use of salt fluoridation to prevent dental caries*. Washington D C: Pan American Health Organization.
6. Fadnes, L. T., Taube, A., & Tylleskär, T. (2008). How to identify information bias due to self-reporting in epidemiological research. 7.
7. Guiglia, R., Musciotto, A., Compilato, D., Procaccini, M., Russo, L. L., Ciavarella, D., ... Campisi, G. (2010). Aging and Oral Health: Effects in Hard and Soft tissues. *Current Pharmaceutical Design*, 16(6), 619-630.
8. Hobdell, M., Peterson, P. E., Clarkson, J., & Johnson, N. (2003). Global goals for oral health 2020. *International Dental Journal*, 5, 285-288.
9. Milner, T. A. (1998). *The salt industry of the Dominican Republic- An Assessment*. Pan American Health Organization.

10. (2005). *Opportunity and strategy for improving general health in the Americas through Critical advancements in Oral Health, The way forward 2005-2015*. Washington DC: Pan American Health Organization. Retrieved from World Health Organization.
11. *Oral Health Surveys. Basic methods* (Third ed.). (1987). Geneva: World Health Organization.
12. *PAHO Basic Health Indicator Data Base*. (n.d.). Retrieved from World Health Organization: [http://www1.paho.org/english/dd/ais/cp\\_214.htm](http://www1.paho.org/english/dd/ais/cp_214.htm)
13. Peterson, P. E. (2003). *The World Oral Health Report*. Retrieved from World Health Organization: [http://www.who.int/oral\\_health/media/en/orh\\_report03\\_en.pdf?ua=1](http://www.who.int/oral_health/media/en/orh_report03_en.pdf?ua=1)
14. Peterson, P. E., & Baez, R. J. (2013). *Oral Health Surveys. Basic Methods* (Fifth ed.). France: World Health Organization.
15. Peterson, P. E., & Yamamoto, T. (2005). Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology*, 33, 81-92.
16. Peterson, P. E., Bourgeois, D., Ogawa, H., Estupinan-Day, S., & Ndiaye, C. (2005). The global burden of oral diseases and risks to oral health. *Bulletin of the World Health Organization*, 83, 661-669.
17. Smith, A. C., & Lang, W. P. (1993). CPITN, DMFT, and treatment requirements in a Nicaraguan population. *Community Dental Oral Epidemiology*, 21, 190-193.
18. Tisone, C. (2004). *The relationship between family health care practices and child growth in the Dominican Republic, Thesis*. Indiana University, Department of Anthropology.

**Table 1 Distribution of study population by gender, educational level and age**

Variable	Number (Percentage)
<b>Gender</b>	
Male	49(47.1)
Female	55(52.9)
Total	104(100)
<b>Educational Level</b>	
8 years and less	55(60.4)
More than 8 years	36(39.6)
Total	91(100)
<b>Age</b>	
18-24 years	22(22.4)
25-34 years	18(18.4)

35-44 years	15(15.3)
45-54 years	16(16.3)
55 years and above	27(27.6)
Total	98(100)

**Table 2 Comparison between self-reported oral health status and Actual DMFT scores**

	<b>DMFT score Mean (Standard deviation)</b>	<b>DT (Decayed teeth) index</b>	<b>MT (Missing teeth) index</b>	<b>FT (Filled teeth) index</b>
<b>Self-reported DMFT</b>	5.08(6.5)	1.03(1.1)	3.7(6.4)	0.4(1.2)
<b>Actual DMFT</b>	9.59(7.8)	3.0(2.7)	6.0(8.7)	0.6(1.9)
<b>Spearman correlation coefficient</b>	.27*	.03	.34*	.21**

\*correlation is significant at the 0.01 level

\*\*correlation is significant at the 0.05 level

**Table 3 Comparison of mean DMFT scores by age, gender and educational levels**

<b>Variable</b>		<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>F</b>	<b>p-value</b>	<b>Significance</b>
<b>Gender</b>	<b>Male</b>	49	9.94	9.34	.18	.672	NS
	<b>Female</b>	55	9.27	6.58			
	<b>Total</b>	104	9.59	7.97			
<b>Education al level</b>	<b>Elementary school and below</b>	55	11.95	9.67	9.331	.003	S
	<b>High school and higher than high school</b>	36	6.69	4.39			
	<b>Total</b>	91	9.87	8.38			
<b>Age</b>	<b>18-24 years</b>	22	5.73	2.95	5.87	<.001	S

	<b>25-34 years</b>	18	7.0	4.64			
	<b>35-44 years</b>	15	9.73	7.6			
	<b>45-54 years</b>	16	8.94	4.3			
	<b>55 and above</b>	27	15.19	11.64			
	<b>Total</b>	98	9.7	8.16			

**Table 4 Distribution of study population by caries severity categories**

<b>Degree of caries experience:</b>	<b>Adults N (%)</b>
Very low <5.0	23(22.1)
Low 5.0-8.9	34(32.7)
Moderate 9.0-13.9	28(26.9)
High >13.9	19(18.3)

**Table 5 Percentage distribution of study population according to severity of caries experience (DMFT≤13.9 versus DMFT>13.9) and demographic variables**

<b>Variable</b>		<b>DMFT≤13.9 N (%)</b>	<b>DMFT&gt;14.0 N (%)</b>	<b>Total N (%)</b>	<b>X<sup>2</sup> (p value)</b>
<b>Gender</b>	<b>Male</b>	39(45.9)	10(52.6)	49(47.1)	.28(.59)
	<b>Female</b>	46(54.1)	9(47.4)	55(52.9)	
<b>Educational level</b>	<b>Elementary school and below</b>	40(55.6)	15(78.9)	55(60.4)	3.4(.06)
	<b>High school and higher than high school</b>	32(44.4)	4(21.1)	36(39.6)	
<b>Age</b>	<b>18-24 years</b>	22(27.8)	0(0.0)	22(22.4)	17.42(.002)*
	<b>25-34 years</b>	16(20.3)	2(10.5)	18(18.4)	

	<b>35-44 years</b>	12(15.2)	3(15.8)	15(15.3)	
	<b>45-54 years</b>	14(17.7)	2(10.5)	16(16.3)	
	<b>≥ 55 years</b>	15(19.0)	12(63.2)	27(27.6)	

\*Significant at .05 level