The Prevalence of Pit and Fissure Sealants among Twelve Year Olds Living in Puerto Rico during 1997

AUGUSTO R. ELÍAS-BONETA, DMD, MSD*; ROSANA HANKE HERRERO, DMD, MSD*;
KEVIN PSOTER, BS, MPA*; CARLOS E. TORO VIZCARRONDO, PhD*; WALTER J. PSOTER, DMD, PhD*†

Objective: **to estimate the prevalence of pit and fissure sealants on first permanent molars in twelve year olds living in Puerto Rico and to further evaluate dental sealant prevalence by 1) urban/rural and public/ private school status as well as 2) gender;**

Design: **population-based, cross-sectional study;**

Setting: **public and private schools encompassing the 11 health regions of Puerto Rico.**

Subjects: **a probabilistic sample of 12-year old school attendees in Puerto Rico representing a population of approximately 70,000.**

Method: **during April through December 1997, the first permanent molars of 1435 subjects were evaluated by visual and tactile methods for the presence of dental sealants.**

Results: **the data collected revealed that 4.3% of 12 years olds presented at least one permanent first molar sealed. A statistically significant difference (p=0.01) between urban-public (2.5%), rural-public (3.39%) and urban-private (11.0%) schools was observed. The prevalence of sealants was higher in males (5.5%) than females (2.9%); (p= 0.02).**

Conclusions: **the prevalence of dental sealants in the first permanent molars of 12-year olds living in Puerto Rico during 1997 (4.3%) is lower than that reported in the United States (18.5%). Sealant prevalence was higher in males and students attending (urban) private schools.**

Key words: Pit and fissure sealant, 12 year-old, Cross-sectional study, Puerto Rico, Dental sealants prevalence

Dental sealants are caries preventive resins that are applied to the pit and fissure surfaces of teeth. Sealants inhibit the caries process by acting as physical barriers, preventing the accumulation of substrate, bacteria, and their metabolic byproducts on caries-susceptible enamel surfaces (1). The American Dental Association and the Surgeon General of the United States of America advocate the utilization of pit and fissure sealants as a primary preventive measure for dental caries (2,3), and the United States Department of Health and Human Services has established the goal that 50% of children (aged 8 and 14 years) have pit and fissure sealants on their permanent molars by the year 2010 (4). In Puerto Rico, the Department of Health has established a goal that 30% of children aged 8 to 14 years will have sealants on their permanent molars by the year 2010 (5).

The application of dental sealants is underemployed as a preventive measure. In 1995, Cherry-Peppers (6) reported that only 15% of U.S. children (6-17 years old) had dental sealants (17% whites and 5% blacks). The under-utilization of dental sealants by practitioners has been attributed to concerns regarding: 1) the potential for sealing teeth with caries, 2) limited sealant longevity, 3) limited or no insurance coverage, 4) sensitivity of the technique for routine success, and 5) the potential lack of efficacy of the procedure. In addition, there has been a lack of emphasis on the use and benefits of sealants by dental schools. Improvements in materials and knowledge have addressed some of these concerns; however, older dentists may not employ sealants as a routine procedure (7-10, 2).

*A.R. Elías-Boneta; Professor, University of Puerto Rico Medical Sciences Campus, School of Dentistry Research Center, PO Box 365067 San Juan, Puerto Rico 00936-5067, Telephone (787) 765-3379, aelias@rcm.upr.edu; *R. Hanke; Assistant Professor, University of Puerto Rico Medical Sciences Campus, Pediatric Dentistry Postgraduate Program, rosanahanke@hotmail.com; *K. Psoter; Research Associate, University of Puerto Rico Medical Sciences Campus, School of Dentistry Research Center; *C. Toro, Professor, University of Puerto Rico Medical Sciences Campus, School of Dentistry Research Center; *†W. Psoter, Associate Professor, University of Puerto Rico Medical Sciences Campus, School of Dentistry Research Center and Assistant Professor, New York, University College of Dentistry, Department of Epidemiology & Health Promotion, 345 East 24th Street, New York, NY 10010, Telephone: (212) 998-9942;

**Research Center, School of Dentistry, Medical Sciences Campus, University of Puerto Rico, San Juan, Puerto Rico;*
†Department of Epidemiology and Health Promotion, New York University College of Dentistry, New York, New York

Of particular concern is achieving efficacious sealant placement in high-risk populations. In fact, Caucasian and African American populations of lower socio-economic status (SES) have a lower prevalence of dental sealants than populations with higher SES levels (6). In the US, 18.5% of 5-17 year olds presented sealants in 1988-91 (11).

In Puerto Rico a health reform program for the medically indigent (representing 30% of the total population) was gradually implemented, beginning in 1994 and completed in 2000. Dental coverage under the Puerto Rico health reform program includes pit and fissure sealants; both permanent and primary molars are eligible for sealants among children up to eight years of age, and secondary permanent molars are eligible for sealants in children up to the age of 14 (12).

Although only limited data are available regarding the prevalence of pit and fissure sealants in Puerto Rican children, the "Administración de Seguros de Salud de Puerto Rico", the agency that monitors the Health Reform Program, estimated an increase in dental sealant utilization in the first permanent molars of 8 year olds, from 2% in 1992 to 8% in 1998 (12).

The primary objective of this study was to estimate the prevalence of pit and fissure sealants on first permanent molars in twelve year olds living in Puerto Rico during 1997 and to further evaluate dental sealant prevalence by 1) urban/rural and public/private school status, as well as, 2) gender. The information obtained in the study is necessary in order to evaluate and plan primary caries prevention programs at the community level in Puerto Rico.

Methods

Sample Design: The study design and sampling have been described previously (13). Briefly, a cross-sectional, nationally representative oral health study of Puerto Rican 12-year olds was conducted in 1997. A probabilistic stratified sample of public and private schools (71) was selected from the eleven health administrative regions of Puerto Rico, according to the type of school and economic status. Both urban and rural communities were represented. In ten regions, five public schools and one private school were selected; in the North Region ten public and five private schools were selected. Children were examined for the presence of pit and fissure dental sealants in addition to dental caries and dental fluorosis. The Institutional Review Board of the Medical Sciences Campus of the University of Puerto Rico approved the study.

Oral Examinations: The National Institute of Dental and Craniofacial Research (NIDCR) caries diagnostic criteria for oral health surveys include guidance for assessing the presence or absence of pit and fissure sealants (14). Four calibrated examiners standardized to using the NIDCR criteria performed the visual/tactile oral examinations using #23 explorers, flat surface mirrors, external light sources and compressed air; no radiographs were employed (13).

Data Analysis

Gender and public/private school status were incorporated into the modeling as potential explanatory variables. Public/private school attendance was used as a surrogate for socioeconomic status (SES) level (13). STATA statistical software was used to analyze the data. Prevalence was calculated using weighting procedures by probability of selection, stratification by health regions, and clustered. Estimates were produced by gender and urban-rural-public-private school status. For between-group comparisons, "p values" were calculated.

Results

A total of 1,435 subjects were examined between April and December 1997. The distribution of the demographic characteristics of gender, residence and school type were as follows: 49% females, 51% males; 62% urban, 38% rural; 18% private schools, 82% public schools. During the data collection process 1,621 eligible students were identified of which 1,435 were examined for a response rate of 89%. The Kappa statistic for interexaminer reliability ranged from .83 to .95.

Overall, 4.3% of the 12-year olds living in Puerto Rico during 1997 had at least one dental sealant on their first permanent molars (Tables 1-3). Children attending urban–private schools had a statistically significant (p=0.01) higher prevalence of sealants (11.0%) than both urban-public (2.5%) and rural-public (3.4%) school children (Table 1). Similarly, more males (5.6%) than females (3.0%) had dental sealants (p= 0.02) (Tables 2-3). Overall, children with sealants averaged 2.2 first permanent molar sealants.

Table 1. Prevalence of first permanent molar sealants in twelve-year old children by urban/rural-public/private schools in Puerto Rico

Urban/Rural Public/Private	N*	% Total N	Weighted Sealed N	% With Sealants	P-value
Urban/public	30669	42.9	758	2.5	
Rural/public	28346	39.7	966.8	3.4	
Urban/Private	12343	17.3	1365	11.0	
TOTAL	**71358**	**100**	**3090**	**4.3**	**0.0095**

* weighted by probability of selection

Table 2. Prevalence of first permanent molar sealants in twelve-year old children by gender in Puerto Rico

Gender	N*	% Total N	Weighted Sealed N	% With Sealants	P-value
Male	37324	52.2	2072	5.6	
Female	34034	47.7	1018	3.0	
TOTAL	**71358**	**100**	**3090**	**4.3**	**0.0176**

*weighted by probability of selection

Table 3. Prevalence (%) of first permanent molar sealants in twelve-year old children by gender and urban-rural/public-private schools in Puerto Rico

Gender	Urban/ Public	Rural/ Public	Urban/ Private	% With Sealants
Male	2.3	5.0	16.0	5.6
Female	2.7	1.8	6.0	3.0
TOTAL	**2.5**	**3.4**	**11.0**	**4.3**

Discussion

In 1997 the prevalence of pit and fissure sealants in twelve-year olds living in Puerto Rico was 4.3%. This percentage is far from the goal established by the Department of Health of Puerto Rico for the year 2010 (30%) and lower than that reported for 5-17 year olds in the US (18.5%) in 1988-91 (11).

In Puerto Rico, twelve-year olds attending private schools had a higher prevalence (statistically significant) of pit and fissure sealants than children in public schools. Similarly, in a previous report we found that Puerto Rican children attending private schools had a *lower* prevalence of dental caries than children attending public schools (13). Each of these findings is most likely a function of differences in socioeconomic status, as measured indirectly by school type (public or private), with private school students being of generally higher SES than public school students. (13). Health care models and access to dental services in Puerto Rico prior to the health reform may be important factors contributing to the observed difference.

The medically indigent of Puerto Rico also have access to a universal health care system, a government-sponsored Health Reform program that was gradually implemented between 1994 and 2000. The Puerto Rican system is expected to increase access to dental care and sealant placement; however, by 1997, the prevalence of dental sealants in 12-year olds living in Puerto Rico was low. This may be partially explained by the high caries rate in Puerto Rico, (13) and the fact that on average, the first permanent molars would have been erupting around 1992, prior to health reform. These facts may likewise explain the average (2.2) sealants per child with sealants.

In this study, twelve-year old males had a higher prevalence (statistically significant) of pit and fissure sealants than twelve-year old females. In a similar stratified sample of North Carolina children ages 6-17 no difference was found between genders (15); however, Gonzalez et al, in a study of Wisconsin children, reported that females are more likely than males to have had sealants present (16).

Conclusions

The prevalence of dental sealants in the first permanent molars of 12-year olds living in Puerto Rico (4.3%) is lower than that reported for the United States (18.5%). The prevalence of sealants was higher among males than females and higher in students attending urban private schools than among both rural and urban public school students.

Recommendations

1) The high levels of dental caries and the low prevalence of pit and fissure sealants in Puerto Rico calls for the establishment of community and school-based sealant programs, particularly in low socioeconomic areas.
2) The Puerto Rico Department of Health should promote the use of pit and fissure sealants among Health Reform providers for the benefit of the population, particularly at the lower socioeconomic levels, within which dental caries is also more prevalent (14).
3) Dental School curricula should emphasize the importance and efficacy of dental sealants as a primary preventive modality.
4) New studies to investigate the impact of the Health Reform on the prevalence of sealants should be commissioned.

References

1. Luca-Fraga L.R and Pimenta L.A.F. Clinical evaluation of glass-ionomer/resin-based hybrid materials used as pit and fissure sealants. *Quintessence Int* 32(6): 463-468, 2001.
2. Gilpin J. L. Pit and Fissure Sealants: A Review of the Literature. *J Dent Hyg* Summer 71(4):150-156, 1997.
3. U.S. Department and Health and Human Services. Oral Health in America: A report of the Surgeon General- Executive

Summary. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institute of Health, 2000.
4. U.S. Department of Health and Human Services. Healthy People 2010. Focus Area 21: Oral Health. Washington, DC: U.S Government Printing Office, January 2000.
5. Departamento de Salud de Puerto Rico. Puerto Rico gente saludable 2010. Division de Planificación. San Juan, PR. 2000.
6. Cherry-Peppers G. Sealant use and dental utilization in U.S. children. *J Dent Child* 62(4): 250-255, 1995.
7. Clark C and Berkowitz J. The relationship between the number of sound, decayed, and filled permanent tooth surface and the number of sealed surfaces in children and adolescents. *J Public Health Dent. Summer* 57(3): 171-175, 1997.
8. Frazier, P. J. Use of sealants: societal and professional factors. *J Dent Educ.* 48(2 Suppl): 80-95, 1984.
9. Feigal, R. J. Sealants and preventive restorations: review of effectiveness and clinical changes for improvement. *Pediatr Dent* 20(2): 85-92, 1998.
10. Primosch R.E. and Barr E.S. Sealant use and placement techniques among pediatric dentists. *J Am Dent Assoc* 132(10): 1442-1451, 2001.
11. Selwitz R.H. et al. The Prevalence of Dental Sealants in the US Population: Findings from NHANES III, 1988-91. *J Dent Res* 75(Spec Issue): 652-660, 1996.
12. Administración de Seguros de Servicios de Salud. *Base de Datos de Elegibles y Asegurados*. San Juan. Puerto Rico. 1997.
13. Elias-Boneta et al. Dental caries prevalence of twelve year olds on Puerto Rico. *Community Dent Health* 20: 171-176, 2003.
14. National Institute of Dental Research, Epidemiology and Oral Disease Prevention Program. Oral health surveys of the national institute of dental research/ diagnostic criteria and procedures. (NIH Publication #91-2847). Maryland: U.S. Department of Health and Human Services, 1991.
15. Rozier, R.G. et al. The Prevalence of Dental Sealants in North Carolina Schoolchildren. *J Public Health Dent* 54(3): 177-183, 1994.
16. Gonzalez C.D. et al. Sealant status and factors associated with sealant presence among children in Milwaukee, WI. *J Dent Child* 62(5), 335-341, 1995.