## Evaluation of a Program to Prevent Early Childhood Caries

George Angelos, John P. Brown\*, Dennis McMahon, and Kishore Shetty

Brownsville Community Health Center and

Department of Community Dentistry University of Texas Health Science Center at San Antonio

1999

## ABSTRACT

## Evaluation of a Program to Prevent Early Childhood Caries.

George Angelos, John P. Brown<sup>\*</sup>, Dennis McMahon, and Kishore Shetty.

Brownsville Community Health Center and University of Texas Health Science Center at San Antonio

A program to prevent caries in early childhood was administered by a bilingual dentist in a community health center and consisted of: 1. Instruct the parent not to put the child to sleep with a bottle. 2. (a) Instruct the parent in daily toothbrushing with fluoride toothpaste; (b) Application of fluoride varnish at dental visits. Progress was evaluated by 1. Asking if the child used a bottle at bedtime. 2. Evaluation of gingival bleeding on brushing the maxillary anterior teeth - a surrogate for inadequate F<sup>-</sup> use and a measure of plaque Specific clinical records were kept. control. **Recalls** at frequent intervals allowed the interventions to be repeated until both factors were favorable and maintained - Program Completion. Incompletion was defined as all other cases, including those who did not keep appointments.

190 predominantly Mexican American children aged 2-3 who were initially caries free were studied over the years 1995 to early 1998. Caries evaluation was by dental record review if a subsequent visit had occurred, by special recall or by home visit. 118 Completed the program, 37 were Incomplete and 35 (18%) were lost to follow up. 19% of Completers developed caries versus 43% of Incompleters (p<0.01), and average dt scores were 0.42 versus 1.32 (p<0.02). <u>This evaluation</u> <u>indicates a significant but relative benefit of the preventive</u> <u>interventions</u>. Due to the biases inherent in a retrospective design, the program should now be evaluated prospectively as a controlled clinical trial, at younger age, and by other health personnel responsible for preschoolers. 2

# INTRODUCTION

Epidemiology of Early Childhood Caries at Women Infants and Children (WIC) Nutrition Centers in South Texas.

For all (3003) children studied under six years of age, 28.2% had caries, including 15.9% who had Baby Bottle Tooth Decay (BBTD) pattern of caries, assessed by the Godoy classification of 4 maxillary incisors (Godoy, Mobley, Jones. J. Dent. Res. 73:144, 1994). This includes uncavitated enamel lesions.

	Table A					
'n	Age	deft	defs	% of defs c.f. at 4<5 yrs (5.33)		
526	<1 yr	0.10	0.12	2.3%		
697	1<2 yrs	0.54	0.73	13.7%		
713	2<3 yrs	1.24	2.20	41.3%		
(Garcia-Godoy F, Mobley CC, Jones DC "Caries and Feeding Practices in South Texas Preschool Children" 1995 Nat. Cotr for Health Stats. CDC)						

14% of all def surfaces in the preschool years occur before age 2, and 41% before age 3.

$\bigcap$	T	able B	
Age	BBTD Pattern of Caries, Prevalence	BBTD <u>with</u> Cavitation Prevalence	BBTD <u>without</u> Cavitation, Prevalence
<1 yr	3.6%	0.4%	3.2%
1<2 yrs	11.5%	3.6%	7.9%
2<3 yrs	20.5%	11.2%	9.3%
(Garcia-God Texas Presc	oy F, Mobley CC, Jones hool Children" 1995 Na	s DC "Caries and Feeding t. Cntr for Health Stats, C	g Practices in South CDC).

At <1 year, 89% of children with BBTD pattern have potentially remineralizable caries, 69% at age 1<2 years, and 45% at age 2<3 years.

There is very little data on the effectiveness from field trials, or the efficacy from controlled clinical trials, of preventive or treatment programs for early childhood caries (ECC). Yet it is a problem of substantial morbidity, cost and even mortality in treatment. A recent conference on ECC reported no such studies (Comm. Dent. Oral Epi 26:Suppl 1, 1998).

#### METHODS

All children aged <3 years who attended the Brownsville Community Health Center in the Lower Rio Grande Valley of Texas, were entered into an Early Childhood Caries Prevention Program which was carried out by a bilingual dentist who:

- 1. Instructed the parent not to put the child to sleep with a bottle and discussed the implications for tooth decay.
- 2. (a) Demonstrated toothbrushing on the child to the parent, and instructed on the appropriate daily use of fluoride toothpaste (~0.1% F<sup>-</sup>)
  - (b) Applied fluoride varnish on a toothbrush (23mg F/ml Duraflor)

<u>Progressive evaluation and intervention</u> by the same dentist, at frequent, short, structured dental visits for parent and child which took approximately 5 minutes, consisted of:

- 1. Asking the parent if the child used a bottle at bedtime (subjective) and reinstruction/reinforcement.
- 2. Evaluation of gingival bleeding on brushing the maxillary anterior teeth (objective, and with inference on use of F toothpaste) and reinstruction/reinforcement of brushing with F toothpaste.
- 3. F varnish application.

All children were recalled at frequent intervals by mail and/or by telephone. Children who failed to return were re-appointed. Contact was also reestablished by monitoring other family members attendance at the health center for dental or any other reason. Specific intervention and evaluation records were made at each date of visit for cavitated caries lesions, bottle cessation, gingival bleeding on brushing, and fluoride varnish application.

6

Children completed the program by attaining

1. Bottle cessation at bedtime, by parent report.

AND

2. Lack of gingival bleeding on brushing; assessed by the dentist.

<u>Completers</u> were placed on a 6 month periodic recall system. <u>Incompleters</u> were those who had not attained these program objectives.

Evaluation was at scheduled recall, specific recall for this purpose or by home visit.

This study is of the 190 predominantly Mexican American children aged <3 years who were "caries free" on entering the program. Children who initially had frank (dentin) caries were not included in this study.

The interventions and evaluations were assessed in early 1998.

7

### RESULTS

	n	Caries Prevalence %	Observed Mean dt Increment for Study Period	Mean Total Days Observed (Range)	Mean No. of Dental Visits (Range)
Completers	118 (62%)	19%	0.42	434 (21-1190)	3.6 (2-10)
Incom- pleters	37 (19%)	43%	1.32	428 (21-882)	3.6 (2-10)
Lost to follow up	<u>35 (18%)</u> 190 (100%	 )			

Mean time between intervention visits was 86 days for Completers and 79 days for Incompleters.

% of subjects who attained the program objectives  $\geq$  62% (118/190).

In order to evaluate caries, it is necessary to control for the period of observation (from first to last visit) and number of interventions (no. of visits -1), for Completers and Incompleters of the preventive program.

The variables considered were:

DependentCARIESYN-caries occurrence, yes/no<br/>NMCARIES - caries increment, dtIndependentDAYS of total observation<br/>VISITS, number of dental visits/interventions<br/>COMPLT10, completion of the prevention<br/>program, no=1, yes=0, so that if<br/>COMPLT10=1, it indicates the presence<br/>of the risk factor

LOGISTIC REGRESSION on CARIESYN with the <u>single</u> explanatory variable COMPLT10, yielded an odds ratio of 3.6 for Incompleters vs. Completers. That is, Incompleters had an odds ratio 3.6 times that of Completers.

When covariates were included in a STEPWISE LOGISTIC Model, it was found that it was not necessary to include both days and visits in the model, due in large part to the fairly strong correlation between the two (r=.64). The model that included both COMPLT10 and VISITS (as a covariate) yielded an odds ratio for COMPLT10 of 3.5, i.e., Incompleters have an odds ratio of 3.5 times that for Completers (given that they have the same number of VISITS). Both VISITS (p<.002) and COMPLT10 (p<.003) were highly significant.

Thus, for 2 patients with the name number of VISITS, with 1 patient not completing the program and the other completing, the Incompleter would have an odds ratio for occurrence of caries that is 3.5 times that of a Completer.

With STEPWISE LINEAR REGRESSION on caries increment, dt (NMCARIES), completion of the prevention program (COMPLT10) first entered the equation. For DAYS and VISITS, being co-variates, one could enter the equation and exclude the other. The model for NMCARIES was set with no constant term, since dt intially was zero.

	Parameter Estimate	Sig.
CMPLT10	.8747	p<0.0011
DAYS	.00105	P<0.0001

The interpretation, with Incomplete = 1 and Complete = 0, is that Incomplete children had 1 x .8747 = .88 decayed teeth per child <u>more</u> than those who completed the program.

Children who completed the program were predicted to have 434 days x .00105 = .46 decayed teeth per child for the study period.

For a time period of one year the predicted mean dt incidence was:

Completers .38 (.00105 x 365) Incompleters 1.26 (.38 + .88)

Those not completing the program were predicted to develop 3.3 times the dt per annum of those who completed it (1.26 ÷ .38 = 3.3)

## DISCUSSION

Parental report of use of F toothpaste is subjective and easily biased by interactions with the instructor.

Gingival bleeding on toothbrushing by the dentist was used to assess inadequate plaque control and infer inadequate fluoride toothpaste use. Parents were instructed to use F toothpaste and it was inferred that if used daily and appropriately, gingival bleeding would resolve as a result of mechanical plaque control. This inference could be less correct for those children who did not have gingival bleeding initially. Nevertheless, the presence of gingival bleeding on brushing primary incisors is considered objective evidence of a lack of appropriate and frequent toothpaste use. In this way gingival bleeding was used as a caries risk marker.

This inference arose from observations with intervention of early carious primary incisors which became plaque free, non-progressive, white-spot lesions, as evidenced by later erupted normal enamel at the gingival margin. A similar remineralization effect with intervention has also been observed in open cavitated lesions which became plaque free, darkened, eburnated and non-progressive.

- At least two thirds of parents were able to attain the program objectives for their child in a mean of 2.61 intervention visits (range 1-9). Over a mean of 2.57 (range 1-9) intervention visits, one third either did not attain the program objectives or were lost to follow up.
- Caries prevalence (percent) was observed to be more than twice as high in those who did not complete the program. After controlling for number of intervention visits, <u>likelihood of developing</u> caries was 3.5 times higher in those who did not complete the program. Total time of observation was included in the model as a co-variate.
- Caries incidence (dt) over a one-year period was estimated to be 0.88 higher in children who did not complete the program (dt 1.26 versus 0.38). It was observed to be 0.90 higher (dt 1.32 versus 0.42) over the mean of 433 days of the study. <u>This is a</u> <u>three-fold annual difference in caries incidence</u>.

The Strength and Quality of Evidence from this effectiveness study, to support the described program to prevent Early Childhood Caries, may be categorized as:

Strength Category A "Good evidence to support a recommendation for use." Quality Category 2 -"Evidence from at least one well designed clinical trial without randominzation,...."

(Canadian Med. Assoc. Evidence Based Medicine Can. Med. J. 1995; 152, 201-2)

nature of the The retrospective study weakens implications of causality. Therefore, this ECC Prevention Program should be evaluated prospectively in a controlled clinical efficacy trial, for even younger children, and by other health personnel who have early childhood responsibilities involving regular and periodic contact.

## CONCLUSIONS

- 1. A retrospective study of a simple fiveminute intervention and instruction program, consisting of one dietary and two fluoride plus oral hygiene interventions designed to prevent early childhood caries, was found to be attainable by at least 62% of parents, who completed the program for their children.
- 2. The likelihood (odds ratio) of developing caries was 3.5 times higher in those children who did not complete this program, after controlling for number of visits.
- 3. Program non-completers developed over three times the mean number of decayed primary teeth per year, than completers. (mean dt increment 1.26 versus 0.38 per annum)