BRIEF COMMUNICATIONS

Toothbrushing Patterns Over Time in At-Risk Metropolitan African-American 5th– 8th Graders

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Abstract

Objectives: *A large study of risky pre-teen behavior provided an opportunity to examine self-reported toothbrushing frequency for stability over time and adequacy.* ***Methods:*** *1115 metropolitan African-American children at risk for violence and drug use self-reported toothbrushing frequency in at least one of five measurement points from 5th to 8th grade as part of a larger study. Longitudinal data were available for 815 students.* ***Results:*** *81% reported mainly twice daily, 8% reported mainly once daily, 10% changed over time, and 1% were consistently less than once daily.* ***Conclusions:*** *Overall, the children reported once or twice daily toothbrushing frequency, stable between 5th and 8th grades. A minority of children showed low or inconsistent frequencies and these results may indicate an opportunity for intervention to improve habits.*

Key Words: Toothbrushing, longitudinal studies, child, African-Americans, health behavior, oral health

Introduction

This paper presents data gathered on toothbrushing frequency from 5th to 8th grades obtained from a larger study of metropolitan at-risk African-American schoolchildren, the Aban Aya Youth Project (1). The Aban Aya Project compared the effects of interventions to prevent violence, pregnancy and drug use with a health education class. Self-report of toothbrushing frequency and other health behaviors were obtained over a four-year period.

More data about toothbrushing frequency and age among children are available from European sources than from the United States, (3-7), although there is a recent report on the toothbrushing practices of children under age six (8). No other studies of toothbrushing frequency over time or by age in US children were discovered in a review of the literature. The opportunity to gain secondary information from another study had the potential to increase a limited knowledge base about toothbrushing habits of US children, particularly at-risk children.

The aims of this study were to determine frequency and stability of toothbrushing over time in metropolitan African-American pre-teens at risk for pregnancy, violence and drug use, and to help assess whether brushing frequency among these children should be a public health concern.

Method

Interventions. The primary interventions tested were a Social Development Curriculum and a Health Education Curriculum. The Social Development Curriculum included teaching cognitive/behavioral skills to build self-esteem and empathy, manage stress, develop interpersonal relationships, resist peer pressure, develop decision-making skills and teach goal-setting, and to use these skills to avoid violence and gang involvement, drug use, and unsafe sexual behaviors. The Health Education Curriculum focused on promoting healthy behaviors related to nutrition, physical activity and self-care (hygiene, dental hygiene, injury prevention and first aid). Each curriculum consisted of 21 lessons in Grade 5, 18 in Grade 6, and 16 in Grades 7 and 8. This curriculum addressed oral hygiene in two hours in Grade 5. Schools were given an incentive of $250 per year for each 5th grade class for a maximum of $1000 per year.

Sampling method. Twelve schools were randomly selected from a pool of 155 Chicago-area schools that were greater than 80% African-American; had less than 50% annual turnover in children; and were rated as risky based on income, attendance, truancy and achievement scores of students. One school refused, and another was chosen.

Sample. Data were collected from 1994-98. The participants were all African-American 5th graders enrolled in these schools during the 1994-1995 school year, followed through the 8th grade. Children who transferred out were not followed af-

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ter transfer for data collection; children who transferred in were added to the study. Parents or legal guardians provided passive consent (active in 8th grade), with less than 1% refusing. The Institutional Review Board approved the larger research and this secondary study. Survey completion rates were 88-91% for Grades 5-6, declining to 85% by Grade 8. Non-completions were due primarily to absenteeism from school. The high completion rate is attributable to the in-class administration of the surveys.

About 20% turnover occurred at each grade level, resulting in an average of 648 children at each wave, with 53% of the original sample still present at the end of Grade 8, and a total analysis sample of 1153. One thousand one hundred and fifteen of the 1153 children answered the toothbrushing question and were the subjects of this analysis. Three hundred (27%) only responded at one measure point, so over-time data were possible for 815 subjects. Federally subsidized school lunches were received by 75-80% of the children. The sample was 50% boys, with an average age of 11 years at the beginning of Grade 5 and 14 years at the end of Grade 8.

Procedures and outcome measures. Outcomes were determined through surveys of students conducted five times between 5th and 8th grades, administered in class by trained project staff, who read the extensive survey aloud to students. Toothbrushing frequency was measured with the question, "On most days, how many times a day did you brush your teeth (in the past week)? Less than once a day, once a day, twice a day, more than twice a day." Measuring occurred at the beginning and end of 5th grade, and at the end of 6th, 7th and 8th grades as reported in Table 1.

TABLE 1
Self-reported toothbrushing frequency in each grade

(Includes children measured only once)

Grade	Beginning of 5th		End of 5th		6th		7th		8th	
Toothbrushing Frequency*†	%	n	%	n	%	n	%	n	%	n
Less than daily	2%	14	2%	14	1%	8	2%	9	1%	7
Daily	15%	102	14%	88	15%	100	19%	110	15%	84
Twice daily	33%	217	37%	234	35%	237	39%	232	41%	221
More than twice daily	50%	330	47%	293	49%	325	41%	244	43%	232
Total	100%	663	100%	629	100%	670	101%	595	100%	544

*Frequency improved from end of fifth to sixth grade (Wilcoxon signed ranks test, $z=-2.192$, $p<.03$).
†Declined from sixth to seventh grade (Wilcoxon signed ranks test, $z=-3.299$, $p<.001$).

Results

Although the larger study hypothesized that the Health Education Curriculum would improve health behaviors, the intervention had no effect on toothbrushing frequency. Table 1 presents the toothbrush frequencies over time. At each point, at least 80% of the children reported brushing at least twice daily, and 98% reported brushing at least daily. Only four percent reported brushing less than daily any time during the study. However, a substantial proportion (31%) reported brushing less than twice daily at least once during the period (data not shown).

The frequency of brushing more than daily was greater in late 5th grade compared to 6th grade. The frequency of brushing less than twice daily declined from the 6th grade to the 7th. There were surprisingly low correlations between a child's brushing frequencies at any two times. The largest correlation was .42 (Spearman) between the late 5th and 6th grade (data not shown).

Each child was present from one to five times for the survey. This number of observations was significantly associated with brushing frequency. Children measured only once were less likely to report toothbrushing $\geq$ 2/day in late 5th grade, and more likely to report >= 2 times/day in 7th and 8th grades (likelihood ratio= 47.00, 12 df, $p<.000$). Girls were significantly more likely to be present at any measuring point (T test, $p<.000$), but did not differ from boys in brushing frequency. Overall, no linear change was observed in those children for whom more than one observation was available, when examined with a linear trend model with correlated intercept and slope, controlling for demographic factors (MIXOR version 2.0 (9), data not shown). Gender had no association with the linear trend in brushing.

In order to more clearly describe the changes in brushing frequency over time, the children were divided into patterns of longitudinal brushing habits. Definitions and frequencies of each pattern are given in Table 2. About 81% of the children showed consistent brushing at least 2 times per day over time, and another 8% averaged at least daily.

Discussion

It is possible that the variance noted in these data was due to low reliability in the self-report measure of toothbrushing. In addition, all self-reported data are susceptible to bias toward socially desirable behavior. However, since the outcomes of the larger study were from self-report of drug use and violent behavior, the investigators were particularly careful to ensure that the children realized the information was confidential. Since the children were willing to report the other socially undesirable behavior, it was assumed that they were willing to report low toothbrushing frequency.

Secondly, those subjects measured only once responded differently than those measured more than once. This indicates a selection bias that may have suppressed a slight increase in brushing over time. Since the differences were only in the level that might be termed "over-brushing," this potential bias does not affect the finding

TABLE 2
Over-time patterns of toothbrushing frequency from the 5th to the 8th grade

(Excluding those with only one observation).

Always brushed ≥2/day.	341	42%
Occasionally dipped to 1/day, averaged 2/day	305	39%
Averaged between 1/day and 1.5/day*	80	8%
Decline over time †	38	5%
Averaged less than 1/day	8	1%
Improvement over time ‡	24	3%
Not classifiable	19	2%
Total	815	100%

*Seven subjects in this group fell to less than 1/day once during the study, but fit this category best.
†Initially brushed ≥2/day, and brushed <2/day the last 2 measurements (included only those with at least 3 measurements).
‡Initially brushed <2/day, and brushed ≥2/day the last 2 measurements (included only those with at least 3 measurements).

that the average child brushed twice a day or more.

Another limitation is that the frequency of brushing is less important in preventing caries than the use of a fluoride dentifrice (2, 10). Ideally, future testing instruments developed for pre-adolescent health studies would allow more depth of inquiry on oral health behaviors over time.

How frequently toothbrushing should occur depends on the thoroughness of the cleaning. The Consensus Report of the Proceedings of the European Workshop on Mechanical Plaque Control states that to prevent caries and periodontal disease, meticulous removal of plaque (coronal and interproximal) using fluoride toothpaste need only be done daily. However, the report recognized that most people do not remove plaque meticulously and therefore benefit from twice daily cleansing (2). In patient education materials, the American Dental Association and the American Academy of Pediatric Dentistry recommend brushing twice daily with a fluoridated toothpaste (11, 12).

Using twice-daily toothbrushing as the standard, the at-risk metropolitan African- American preteens in this study performed well. The data address a void in the information available on over-time toothbrushing habits of American children, particularly children from a disadvantaged social group. Their brushing patterns were similar to self-reports of American adults (13, 14), European children (3-5), and older data on American children (6).

Although overall frequency was good, consistency was only passable. Small, statistically significant differences were found between some of the measuring points, and the maximum correlation between points was only moderate, a finding also reported previously (3). While 81% of the children who were available over time averaged at least twice daily, many slipped to daily frequency at least once during the study.

A small proportion of children (4%) reported brushing less than daily at least once over the course of the study, and a substantial proportion (31%) fell to brushing only daily or less at least once. The latter are children who had good brushing frequency sometime in their short lives, suggesting that encouragement and reinforcement could bring them up to higher levels more consistently. The increased brushing could improve their exposure to fluoride, and could promote the establishment of good habits to prevent periodontal disease. The 4% who brush less than daily are cause for more concern. Educators and dental professionals may want to identify these children for specific intervention.

While this study had limitations, it proved possible to track and evaluate toothbrushing frequency over time with this project. These findings illustrate the potential advantages and limitations of including oral health behavior questions in larger studies. Larger and more representative samples can be measured, but the number and type of measures used are limited by the needs of the larger study.

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