Oral Health Status of Mississippi Delta 3- to 5-Year-Olds in Child Care: An Exploratory Study of Dental Health Status and Risk Factors for Dental Disease and Treatment Needs

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Abstract

Objectives: *For poor and minority young children, disparities exist in dental health and treatment. In rural impoverished areas, institutions that reach young children and potentially offer access to care are limited. In the current Mississippi Delta study, child care centers were examined as potential venues for oral health intervention and research, and potential risk factors for dental caries and treatment urgency in high-risk preschool children were explored.* ***Methods:*** *Child care centers were selected and attending children recruited. Data on oral health practices were collected from surveys of center directors and parents/caregivers. Children were examined for caries and treatment urgency at centers by dentists. Bivariate and multivariate analyses with a 0.05 alpha were used to examine data.* ***Results:*** *A total of 346 preschool children at 15 participating centers were examined: 46% were female, 68% minority. Minority children and those with public insurance were more than twice as likely to have caries and urgent treatment needs as non-minorities or those with private insurance. The odds of children having caries were half as great if parents reported using floss and nearly twice as great if the parent had experienced a dental abscess. For every soft drink the parent consumed daily, the odds of dental caries for children increased by 44%.* ***Conclusions:*** *Conducting oral health exams and research in child care venues was possible, yet presented challenges. The combined use of two parental variables, reported soft drink consumption and abscess history, appears promising for caries prediction. Implementation of oral health programs and research in child care venues merits further exploration.*

Key Words: Early childhood caries, preschool children, oral health, social inequity, risk factor, exploratory study, child care center, health disparities, Mississippi

Introduction

It is well known that dental caries—a diet-dependent, infectious, and transmissible disease established in the first years of life—is the most pervasive, chronic childhood disease. If left untreated, dental caries can result in toothache, facial abscesses, and impeded growth (1). Therefore, prevention and treatment of caries among young children is paramount in avoiding lifelong difficulties (2-4). However, there are known disparities in dental health as well as receipt of appropriate prevention and treatment for poor and minority children. The percentage of decayed tooth surfaces that go untreated in preschoolers ages 2 to 5 is 67% for non-Hispanic whites, 79% for Mexican-Americans, and 80% for African-Americans (5).

Oral and dental health can be influenced by oral hygiene as well as dietary, biological, and demographic factors (6). The Mississippi Delta, the setting for the current study, is a region of the US that experiences severe disparities for a variety of child health outcomes (7, 8). In the 10 counties involved in the study, 9% of the population consists of children under the age of 5, and 68% of the population is minority. Many of these children live in poverty, with poverty rates ranging from 30% to 45% (9).

Child care centers serve a significant number of young children and deserve attention as potential venues for early preventive and corrective oral interventions. With the exception of studies focusing on children in Head Start programs (10-12), child care venues have not been settings for definitive research studies examining the effectiveness of oral health interventions. The Mississippi Building Research Infrastructure Capacity (MSBRIC) project is conducting oral health research in child care centers located in the Mississippi Delta. The goal of the project is to engage the

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youngest and most at-risk children in community settings and provide standardized approaches to primary prevention, risk management, disease management, and treatment. This pilot study explored the use of information from parents and directors of child care centers to identify correlates of child oral diseases and dental health, as this information could be especially useful for planning dental prevention and care programs for very young children in child care centers. In this paper are described caries occurrence, oral health practices of parents and children, and oral health environments among a sample of 346 children who were enrolled in 15 selected child care centers in the Mississippi Delta.

Methods

The study used a purposive sampling strategy to identify centers that met predetermined criteria. Because the authors are interested in longitudinal research, centers that offered care from infancy to kindergarten and had supportive management were sought. Centers were recruited that 1) enrolled a sufficient number of young children who might be tracked in future years, meaning more than 25 children ranging in age from 6 weeks through 4 years, more than 10 children younger than 2, and more than 10 children between 2 and 5 years of age and that 2) demonstrated willingness of center staff to engage in a longitudinal research process. To further ensure sufficient variability within the study population, centers were recruited that serve racial minority and low-income children, as race and economic status are two demographic characteristics that have been associated with caries risk in young children. The authors surveyed 297 Mississippi Delta licensed child care centers in January 2002 on the demographic characteristics of the children in their care and used the results to select research sites.

All children in selected centers were asked to participate. Informed consent documents were sent to parents along with the questionnaires in January 2003. All consent forms and surveys were sent home via the child for completion by the parents approximately 10 days prior to the scheduled dental examinations at the child care centers. Field staff followed up with child care center personnel to ascertain that parents who had not returned the materials did, in fact, receive them. For children whose parents did not return the form within 1 week prior to the scheduled dental examinations, duplicate consent forms and parent surveys were sent home. Research staff were available both via telephone prior to the dental assessments and on site the day of the dental assessments. Child care center staff assisted with the sending and receiving of the parental surveys and informing field staff of the numbers of forms received. The Institutional Review Boards of Mississippi State University and the University of Mississippi Medical Center approved the study protocol.

Parent questionnaire items were developed jointly by the research team and the dentists who conducted the assessments, with input from pediatric dental consultants, a child care director, and child care educators. Self report measures were used because of the wide geographical distribution of the child care centers within the Mississippi Delta counties, the working schedules of parents that resulted in limited parent interaction with the center staff, and the expense of face-to-face interviews. The questionnaire was brief (10 to 20 minutes) and set at a low reading level (grade level 3.7 using the Fleisch-Kincaid Index). The parental survey included 15 questions regarding their own oral health history, current oral hygiene practices, and daily consumption of soft drinks, as parental behaviors can be predictors of behaviors in their children (13). The parental survey also included 13 items regarding the child's oral health history, current hygiene practices, and dietary intake. Information on demographic and family characteristics included parent education and employment, the number of people in the household, the type of medical insurance coverage on the child, and participation in the Federal Free Lunch program—a public assistance program for school-age children from households with income up to 130% of the federal poverty level (14). Family income was not requested because it is especially difficult to obtain answers to income questions (15). Instead, insurance coverage was used as a proxy for family socioeconomic status since Medicaid and SCHIP eligibility requirements dictate low income for recipients (16). It was assumed that families without health insurance were the working poor who were economically situated between those with public insurance and those with private insurance.

Directors of the 15 participating child care centers completed surveys on oral health and dietary practices within their centers. As with the parental survey, all the items were reviewed by the research team, dental consultants, and a child care director to determine appropriateness in assessing desired characteristics. These surveys were completed prior to the onsite dental assessments.

Only children who were present on the day of the scheduled dental examinations and whose parents had consented to their participation and completed the survey were examined by the project dentists (n=346). To ensure consistency, all examinations were performed on site at the child care centers by the same board-certified pediatric dentist in May, June, and August 2003. A second dentist recorded all of the results using a modified version of a dental public health oral screening form (17). Children were examined using a high intensity light, a mirror, and tongue blades for retraction of soft tissues to determine the presence of caries, defects, and other indicators of significant oral conditions. In some instances, a dental explorer was used to remove food or debris from fissures and/or determine the presence of cavitation if the diagnosis was questionable using adequate lighting and a careful exam alone.

Parents were informed of the results of the examination. Parents were told whether the child needed follow-

up (none needed, routine, or urgent) and given the examining dentists' names and phone numbers. No data were collected on whether the child actually received subsequent restorative care.

Two oral health status indicators were computed from the examinations: 1) Evidence of oral diseases, defined as any decay, missing teeth due to extraction, or fillings and based on a total def score greater than zero (def>0); and 2) Treatment Urgency. Treatment Urgency was categorized as "urgent," "routine," or "no obvious problems" using the following criteria: a) urgent—if the child had obvious infection, current pain, or conditions expected by the examiner to elicit imminent pain, gross carious lesion, or trauma potentially involving pulpal tissue; b) routine—if the child had presence of any dental problem not currently causing pain and/or infection; c) no obvious problem—if no dental problems were noted on examination. The treatment urgency categories were collapsed to a dichotomous variable (no problems/routine treatment versus urgent treatment needed) for logistic regression analyses.

All data were entered into a computer data file and analyzed using the SPSS (18) statistical software. First, bivariate associations were explored by cross-tabulation/contingency table analysis using chi-squared as the test of statistical significance. Second, predictors that were significant in the bivariate analyses were selected for multivariate analyses using logistic regression. This allowed for the association to be tested while controlling for potentially confounding variables. An alpha level of .05 was used for these exploratory analyses. Analyses were conducted on both the full sample and on a sub-sample of 3- to 5-year-olds (n=200) because of higher occurrence of caries in the older age group. Missing data due to varying non-response to survey items limited the number of cases for multivariate analyses.

Results

Of the 297 licensed child care centers surveyed, 179 centers responded, and 33 centers met the selection criterion. For economy of scale, the 9 sites with the largest total enrollments (50 or more) were first invited to participate and 8 agreed to participate. To include more young children in the sample, two Early Head Start centers were recruited. An additional 4 centers that met basic criteria and generally covered areas of the Delta that were not served by either the larger centers or the Head Start centers were then recruited.

The number of children in each center who participated in the study varied. The participation rates ranged from a low of 21% of the children at one center to all of the children at another center. The average participation rate was 50%. Of the total enrollment of 797 children in the 15 child care centers, 384 parents (48.2%) completed the consent form and parent survey. Among children whose parents consented, 90% were present on the day of the dental screening and constituted the final sample. The final sample did not differ on the basis of age distribution ($x^2 = .71$, df = 2, $p > .05$) from that of the total enrollment of the 15 centers.

Table 1 shows demographic characteristics of children and their parents. Although 76% of parents were employed full-time, only one-third of the families had private health insurance. Most families (63.9%) had public insurance (Medicaid or SCHIP), with only 3.5% reporting no insurance coverage. In addition, 63.3% reported that their children were eligible for the Federal Free Lunch Program.

Most parents (95.3%) reported that they do consume soft drinks, with an average of 3.2 (±2.6) drinks per day. The survey instrument did not include the soft drink consumption of children. Instead, parents were asked if their child used a sippy cup or bottle and the types of drinks that were given to children who used a sippy cup or bottle. Ninety percent (90%) of children under 1 year old used a sippy cup or bottle. Parents reported that 98% of children of all ages using a bottle or sippy cup drank juice; 66% drank milk; 59% drank noncarbonated drinks, such as Kool-Aid, tea, or punch; 13% drank water; and 7% drank soda. Parents were asked about the frequency and type of snack consumed by the child. Almost all (97%) of the children were given snacks between meals, and 80% were given 2 or more different types of snacks between meals. Only 4.3% of parents

TABLE 1
Demographics of children and parents/caregivers

Variable	Number, Mean or Percent
Number of children screened	346
Age of children	
Mean age	2.9 years
Age range	4 months to 8 years
Sex of children	
Male	54.2%
Female	45.8%
Race/ethnicity of children	
African American	66.5%
White	32.1%
Hispanic	0.3%
Other	0.3%
Unknown or missing	0.9%
Parent/caregiver education	
High school or less	38.7%
Some college	25.8%
College graduate or higher	35.4%
Medical insurance coverage	
No insurance	3.5%
Medicaid or SCHIP (public)	63.9%
Private insurance	32.7%

TABLE 2
Frequency distribution and results of logistic regression models of parent variables on child oral health status indicators, all children, N = 293 to 335

		Evidence of Oral Diseases					Treatment Urgency			
		Unadjusted		Adjusted[1]			Unadjusted		Adjusted[1]	
Variables	% Yes[2]	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	% Yes[3]	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Parent Floss		0.53 (0.33,0.85)	.008	0.77 (0.45,1.34)	.35		0.58 (0.25,1.35)	.20	0.80 (0.29,2.26)	.68
No (n=148)	39.9					9.5				
Yes (n=177)	26.0					5.7				
Parent Abscess		1.74 (1.06,2.86)	.03	1.95 (1.09,3.49)	.02		4.10 (1.66,10.1)	.002	4.62 (1.61,13.3)	.004
No (n=214)	29.0					3.8				
Yes (n=101)	41.6					13.9				
Parent Daily Soft Drink Consumption		1.44 (1.18,1.76)	.0001	1.54 (1.21,1.95)	.001		1.37 (0.95,1.95)	.09	1.49 (0.96,2.30)	.07
0 (n=18)	16.7					0				
1 (n=60)	23.3					1.7				
2 (n=109)	26.6					10.1				
3 (n=57)	40.4					7.0				
4 or more (n=91)	45.1					9.9				

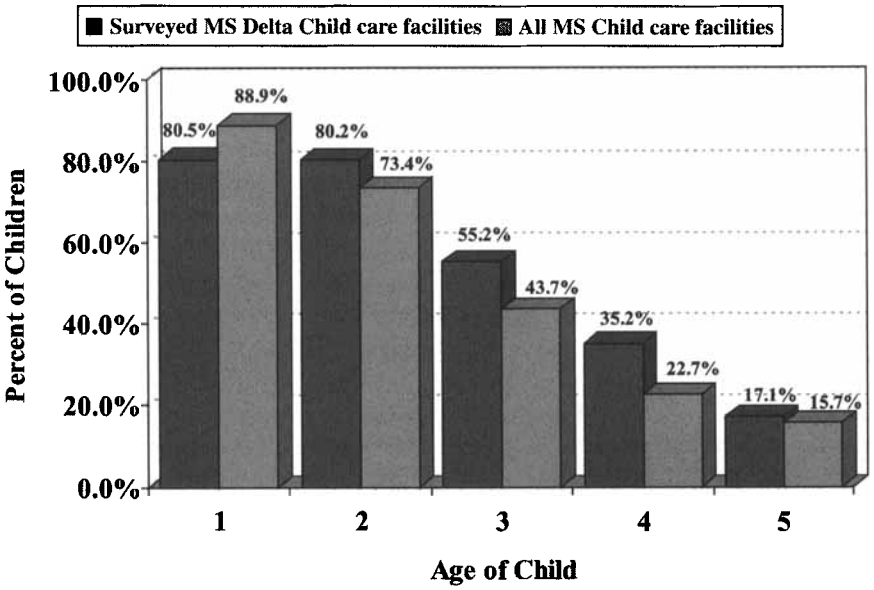
Notes:
1. Adjusted for child age, race, health insurance, and parent variables in table
2. Percent of children with evidence of oral disease
3. Percent of children urgently needing treatment

reported only giving their children fruit as a between-meal snack.

About one-third of the children brushed their own teeth and the rest were assisted by a family member. For most children (92%), their teeth were brushed 1 to 2 times per day. Over half (57%) of all children and most (83%) of the younger children (under age 4) had never had a dental visit. About one-quarter of children (27.5%) had reportedly seen a dentist within the past 6 months, and an additional 16.2% had reportedly seen a dentist at some time over 6 months ago (11.1% within the past year, 3.3% more than 1 year, and 1.8% more than 2 years ago). Of the 86 3- to 5-year-olds with caries experience, 61 (71%) had a dental visit. Of those with a visit, 24 had received some treatment, but only 9 had received repair of all affected teeth.

Virtually all (99%) of the parents reported that they brush their teeth daily, while 54% reported that they floss. Six percent (6%) of parents reported that they had never seen a dentist. Most (67.5%) who had seen a dentist indicated a dental visit within the past year; 13.4% reported seeing a dentist over 1 year ago; and 19.1% reported that it had been more than 2 years since their last dental visit. Seventy-five percent (75%) reported having had a cavity; 38% reported having a tooth extraction; and 32% reported having had an abscessed tooth.

FIGURE 1
Survey comparison: children in Mississippi child care centers who had never received a dental checkup, as reported by parents



Sources: 2003 BRIC Project and Unit for Community and Environmental Studies, Social Science Research Center, Mississippi State University

Association between parental behavior and children's oral health. Although a number of variables were examined in the exploratory analyses, including parent education, 3 parent variables were significantly associ-

ated with 1 of the 2 child oral health status indicators in simple (bivariate) logistic regression. Flossing, a history of abscessed teeth, and daily soft drink consumption were each associated with evidence of oral diseases in children (see Table 2). These items were measured with the following questions: Do you clean your teeth daily? (yes/no) Use dental floss? (yes/no) Have you ever had an abscessed tooth? (yes/no) Do you drink cokes, fruit drinks, or other sugared liquids? (yes/no) If so, how many daily? (blank space provided) The odds of oral diseases were about half (0.53) for children of parents who reported that they floss their teeth compared to children of parents who did not floss. Children of parents with a history of an abscessed tooth were 1.74 times more likely to have evidence of oral diseases than children whose parents reported no abscessed teeth. In addition, for every soft drink that the parent consumed on a daily basis, the odds of oral diseases increased by 44%. In the multivariate logistic regression model controlling for child age, race, health insurance, and all parent variables, parent abscess and soft drink consumption remained statistically significant predictors of oral diseases in children.

Child care centers' oral health practices and children's oral health. Among child care centers, the average def scores ranged from 0.31 to 3.35. Seven of the 15 child care centers had one-half or more of their children with caries experience. Urgent dental treatment needs of children varied by center, ranging from 0% to 28%. Of the 15 centers, 5 reported having individualized oral hygiene programs through which children were given an opportunity to brush their own teeth at the child care facility daily; 9 reported that they did not have such a program; and 1 did not report. Among children 3 and older who were in centers with in-house oral hygiene programs, 5.6% (3 out of 54) had urgent needs. In the centers with no in-house program, 11.8% (18 of 153 children) had urgent dental care needs; however, the difference was not statistically significant. Twenty-seven percent (27%) of centers reported having a record of each child's dentist in case of an emergency, which was somewhat fewer than the 32% reportedly doing so in a recent statewide survey of child care center directors in Mississippi (R. McMillen, oral communication, May, 2004).

Findings from the dental examination. No dental problems were observed in the 13 children younger than 12 months of age. Among the 36 children between the ages of 1 and 2, 7 (19.4%) had evidence of oral diseases, but none were judged to need urgent treatment. Among the 84 2-year-olds (24-35 months), 14 (16.7%) had evidence of oral diseases, and 4 (4.8%) were judged to have urgent treatment needs. Of the 200 children ages 3 to 5 screened, 86 (43%) had evidence of oral diseases, with an average of 1.1 teeth affected (±1.8), and 24.5% had caries affecting the maxillary anterior teeth (early childhood caries).

Child characteristics and their oral health. Significant predictors of oral diseases and urgent treatment need among 3- to 5-year-olds are presented in Table 3. The results of simple logistic regression revealed that being older in age, being African-American, and having public insurance (compared to private insurance) were independently associated with oral diseases. African-American children were 2.2 times more likely to have caries, fillings, or extractions due to caries than white children. Families with public insurance (Medicaid or SCHIP) were 2.85 times more likely than families with private insurance to have children with oral diseases. Although 42.9% of children without health insurance had evidence of oral diseases, the number of cases was small (n=7), and the rate of oral diseases in this group was not statistically different from the private insurance group. Multivariate logistic regression, controlling for all child

TABLE 3
Frequency distribution and results of logistic regression models of child variables on child oral health status indicators of children ages 3-5, N = 196 to 200

		Evidence of Oral Diseases					Treatment Urgency				
		Unadjusted		Adjusted[1]			Unadjusted		Adjusted[1]		
Variables	% Yes[2]	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	% Yes[3]	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Age (years)		2.02 (1.38,2.96)	.0001	1.99 (1.34,2.95)	.001		2.13 (1.17,3.86)	.01	2.10 (1.13,3.89)	.02
3 (n=92)	28.3					5.6				
4 (n=72)	50.0					11.1				
5 (n=36)	66.7					10.6				
Race		2.21 (1.13,4.31)	.02	1.78 (0.82,3.83)	.14		1.63 (0.52,5.12)	.40	1.49 (0.39,5.65)	.55
White (n=55)	29.6					7.3				
Black (n=143)	47.6					11.3				
Health Insurance			.004		.12			.102		.18
None (n=7)	42.9	1.93 (0.37,9.36)	.41	1.68 (0.32,8.58)	.53	28.6	7.00 (1.0,47.9)	.048	6.25 (0.87,44.9)	.07
Public (n=118)	52.5	2.85 (1.53,5.29)	.001	2.07 (1.02,4.16)	.04	12.8	2.57 (0.82,8.08)	.105	1.81 (0.50,6.50)	.36
Private (n=75)[4]	28.0					5.4				

Notes: 1. Adjusted for all child variables 2. Percent of Children with evidence of oral disease. 3. Percent of children urgently needing treatment. 4. Reference category

variables, simultaneously showed that only age remained statistically significant. Controlling for race and insurance coverage, the adjusted odds ratio for age decreased slightly (from 2.02 to 1.99). This indicates that, on average, the likelihood of a child having caries doubles with each year of age. Age was also a predictor of treatment urgency in both the simple and multivariate logistic regression models. Race and insurance coverage were not associated with the need for urgent treatment.

Discussion

The authors found that child care centers serving high-risk children in the Mississippi Delta are willing to participate in oral health research. They also found that parents are willing to provide information about their oral health and that of their children and will permit dental examinations to be conducted in child care centers. These results suggest that it is possible to reach children with a relatively high rate of dental caries and need for dental attention in the child care venue.

This study also explored parental self-reported predictors of oral diseases in their children. Although a challenging task, two predictors of oral diseases and urgent treatment needs were identified. The authors' finding of an association between soft drink consumption by the parent and caries history in the child has precedence in the literature. In addition, it was found that parents' history of an abscessed tooth was related to the child having an urgent dental care need. The findings of the study relate to a report by the Association of State and Territorial Dental Directors that maternal mutans streptococci levels and the presence of active caries were predictors of children's caries experience (17).

The authors were also interested in determining the characteristics of child care centers that affect children's oral health. Unfortunately, the relatively small number of children in centers with daily oral care programs was too small to permit conclusive analysis. Only 5 centers reported having an oral hygiene program. There was a non-significant trend for centers with such in-house programs to have a lower percentage of children with unmet and urgent dental care needs.

Several limitations of the study should be noted. Potential selection bias may have played a role in this study's participation rates and outcomes, as consenting parents may have agreed to their child's participation because they were concerned the child had disease and needed treatment, suggesting higher rates of disease in examined children than those not examined, or because they were more attuned parents, suggesting lower rates of disease in the children examined. Participation rates were comparable to other studies; a 2002 Connecticut study obtained similar participation rates for children (53%) in Head Start centers (11). Single-site studies of Head Start centers have reported higher (94%) participation rates (19); however, as a multi-site study, the current study would be expected to exhibit more variation in participation rates. The highest rate of participation in the current study (100%) was, in fact, a Head Start center. Head Start centers have, as routine practice, oral health programs in their centers that respond to national program requirements.

The data collection method, use of self-report, may also be a limitation due to the tendency of respondents to answer in accordance with social expectations and memory biases (20). However, it is important to investigate whether parental self-reports of dietary habits or dental status could be useful predictors of childhood caries in the absence of clinical information. In particular, the combined use of the 2 variables, parental soft drink consumption and parental abscess history, appears promising as a potential predictor of subsequent caries experience. Furthermore, telephone calls to parents could be substituted for written surveys if literacy levels are low.

In conclusion, the willingness of center directors to participate in research and the findings of this pilot study are encouraging. Understanding the risk factors, occurrence, and progression of dental caries as a disease process among diverse preschool populations enhances opportunities for tailoring prevention and intervention strategies to improve children's oral health outcomes. The association between the use of in-house oral care programs, specialized dietary practices, and other preventive and treatment programs that may be implemented in child care venues merits further exploration.

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