



Oral health status of preschool children attending Head Start in Maryland, 2000

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Abstract

Purpose: The objective of this study was to determine the oral health status of preschool children attending Head Start Centers in Maryland.

Methods: Clinical caries examinations were conducted on 482 children between ages 3-5 from 37 Maryland Head Start Centers in 2000. Additionally, 560 questionnaires were completed by their caretakers regarding their child's access to care, potential caries risk factors and history of toothaches.

Results: The overall prevalence of untreated decay was 52%, with a higher prevalence found in rural than urban centers (64% vs 48%). For all children, the mean decayed, filled surfaces (dfs) was 3.64, while the mean decayed surfaces (ds) was 2.90. For those who had caries experience, the dfs was 6.67 and the ds was 5.32. The percentage of children with caries increased by age from 43% for three-year-olds to 62% for four-year-olds. Of those children with caries experience, 17% had complained of a toothache and 9% reportedly cried because of a toothache.

Conclusions: Of significance in this study were the findings that: caries is highly prevalent in this underserved preschool population; pain due to dental caries is not uncommon; and there is little utilization of dental care despite federally mandated and Head Start and Medicaid requirements. (*Pediatr Dent* 24:257-263, 2002)

KEYWORDS: HEAD START, ORAL HEALTH

Received May 14, 2001 Revision Accepted January 2, 2002

Knowledge of the prevalence of dental caries, dental utilization and pain-associated dental caries is limited among U.S. preschool children. Most published studies of caries prevalence among preschool children have examined three- to five-year old children enrolled in Head Start, a federally funded preschool educational and child development program for low-income children and families.

An overview of six studies in the last 15 years of non-Native American Head Start enrollees indicates that more than half of these children have caries experience, with approximately 4.5 decayed, filled surfaces (dfs) per child.¹ The high prevalence of dental caries in Head Start children is compounded by the low level of care. Although Head Start is mandated to provide dental screening and referral for dental care for all enrolled children, in more than half of the surveys of Head Start children the percentage of children with untreated caries is greater than 50%.²

Moreover, most Head Start children, because of their family income, are eligible to receive Medicaid benefits, which include the early and periodic screening, diagnosis and treatment (EPSDT) of medical, dental, vision and hearing conditions. However, only 20% of Medicaid-eligible children receive dental care.³ A number of specific access issues in the dental Medicaid programs have been identified, including insufficient public funding of the program, problems with public and private dental delivery systems that treat these children, dental workforce sufficiency and distribution and issues of culture and communication.^{4,5} Little is known, however, about reasons why preschool children have not been to the dentist from their parents/guardians perspective.

Head Start in Maryland serves approximately 10,000 children in 225 sites (Office of Children, Youth and Families, 2001 General Assembly Budget Presentation). The purpose of the present study was to examine the distribution

of dental caries and its consequences as indicated by report of dental pain, dental care utilization, and perceived barriers to dental care in rural and urban Maryland Head Start children. Furthermore, this study aimed to gain insights regarding caries status, risk factors, and behaviors of these children, and the oral health literacy of their parents/guardians.

Methods

This survey of preschool children attending Head Start centers in Maryland, conducted between April and June 2000, included a dental examination and a self-administered questionnaire sent to the children's parents/guardians. The study was reviewed and approved by the University of Maryland and Maryland's Department of Health and Mental Hygiene's Institutional Review Boards (IRB).

To obtain estimates representative of Maryland Head Start children, a sample of children was proportionally drawn from all counties in Maryland, including Baltimore City. Head Start sites were randomly selected from each county to obtain a sample size of 1,200 children. Children in the selected sites were given a consent form that fully explained the risks or discomfort and possible benefits associated with the examination. Only those children who returned a signed consent form were examined. After starting the data collection, a low return of consent forms required inclusion of other Head Start centers (for a total of 37 centers) to increase the sample size; the new centers were randomly selected. Data from two counties could not be collected (Baltimore and Carroll Counties).

All dental examinations were performed by the same pediatric dentist (NM) at each selected Head Start site using a headlight and disposable mirrors. No dental explorers or x-rays were used. Before examining the teeth, the dentist brushed the child's teeth with a dry toothbrush to clean plaque from the teeth. Each tooth surface was classified as decayed, sealed, filled or missing by trauma or by caries. A surface was considered decayed by the presence of cavitation, stained pits and fissure with adjacent opacity or shadowing with transillumination. Presence of dental sealants was recorded; however, sealants were not included in the outcome variables because of their low prevalence in this population

(3%). After the examination, children were given a report card indicating whether there was need for dental treatment and providing contact information for referrals.

The examiner dentist was calibrated with an expert examiner (NT). Calibration consisted of review of written examination criteria for caries and sealants, conjoint examination of 10 children with discussion of decisions, and repeated independent on-site examination of 20 children attending a non-participating Head Start center.

A self-administered questionnaire was sent home with the children to collect demographic and oral health information. The 30-item questions queried the caretakers regarding the child's oral health risks and behaviors, oral pain and dental care utilization. The questionnaire also included items on respondent's (adult) oral health literacy and dental care utilization. (The questionnaire is available from the authors upon request).

The outcome variables in this study are caries experience, dfs, report of having complained or cried from dental pain, dental behaviors, parent or guardian's dental literacy/knowledge and dental care utilization. Outcome variables related to caries were stratified by demographic characteristics. Age was classified as age at the beginning of the school year. Urban/rural classification was based on the Census Bureau's definition; counties were considered rural if more than 70% of their population reside in towns with less than 2,500 persons.⁶ Missing data for race/ethnicity (22%) and gender (15%) precluded inclusion of these variables in analyses.

Statistical analyses of the data consisted of bivariate associations calculated for outcome and stratification variables. Differences between groups were approximated with 95% confidence intervals (CI) using the formula $95\%CI = \text{estimate} \pm (1.96 \times \text{standard error})$. Associations between presence of caries and behaviors were tested with the chi-square statistic. To maximize the use of the data collected, considering the high rate of incomplete answers, all data available were included in the analyses; cases with missing data were excluded from analyses of the particular missing variable.

The effect of children's clustering by Head Start site on results was determined with logistic regression models. Separate logistic regression models were fit for caries experience and report of dental pain. Results from logistic models including the "site variable" and models without it were compared and found essentially similar. Therefore, design effects associated with clustering by Head Start sites were not included in the final analyses.

Results

A total of 562 questionnaires were returned for a response rate of 47%; 80 children who returned the questionnaire did not return a signed consent form and, therefore, could not be examined. The demographic characteristics of children examined who attended Head Start in Maryland are shown in Table 1. Children were evenly distributed by gender and age; just under a quarter of participant children live in rural areas. Close to half of the Head Start children examined were

Table 1. Demographic Distribution of Head Start Children in Maryland, 2000 (n=560)

Age	Percentage (SE)
3 years	53 (2.1)
4 years	47 (2.1)
Gender	
Boys	44 (2.1)
Girls	41 (2.0)
Missing	15 (1.5)
Location	
Rural	24 (1.8)
Urban	76 (1.8)
Race/ethnicity	
NH* white	21 (1.7)
NH black	49 (2.1)
Hispanic	6 (1.0)
Other	2 (0.1)
Missing	22 (1.7)

*Non-Hispanic

Table 2. Percentage of Children with Caries Experience, Decayed and Filled Teeth by Demographic Characteristics (n=482)

	Caries experience Percentage (CI)	Decayed teeth Percentage (CI)	Filled teeth Percentage (CI)
All children			
Total	55(50, 59)	52(48, 57)	8(5, 10)
3 years	46(39, 52)	43(37, 50)	4(2, 7)
4 years	64(58, 71)	62(55, 68)	11(7, 15)
Rural			
Total	66(58, 75)	64(55, 72)	11(5, 16)
3 years	58(46, 69)	53(42, 65)	—
4 years	79(66, 91)	79(66, 91)	—
Urban			
Total	51(45, 56)	48(43, 53)	7(4, 9)
3 years	41(33, 48)	39(32, 47)	—
4 years	61(53, 68)	58(50, 65)	11(6, 16)

* CI: 95% confidence interval
 —: small sample size, unreliable data

Table 3. Mean DFS Scores by Caries Experience Status and Demographic Characteristics (n=482)

	dfs Mean (SE)	ds Mean (SE)	fs Mean (SE)
All children	3.64 (0.31)	2.90 (0.25)	0.74 (0.18)
Age			
3 years	2.44 (0.30)	2.07 (0.22)	0.37 (0.20)
4 years	5.09 (0.58)	3.98 (0.48)	1.11 (0.33)
Residence			
Rural	4.43 (0.56)	3.72 (0.50)	0.71 (0.26)
Urban	3.37 (0.37)	2.62 (0.28)	0.74 (0.23)
With caries experience			
Age			
3 years	5.35 (0.55)	4.54 (0.37)	0.81 (0.44)
4 years	7.93 (0.82)	6.19 (0.67)	1.74 (0.51)
Residence			
Rural	6.68 (0.73)	5.60 (0.67)	1.01 (0.38)
Urban	6.67 (0.64)	5.19 (0.48)	1.47 (0.45)

*SE: standard error

non-Hispanic black, reflecting the overrepresentation of non-Hispanic black children in low socioeconomic levels.

The distribution of children by their caries experience and the presence of decayed or filled teeth is shown in Table 2. More than half (55%) of the examined children had caries experience (decayed or filled teeth), with strong gradient by age and rural residence. Four-year old children, as compared to three-year olds (64% vs 46%) and children from rural areas, as compared to children from urban areas (66% vs

51%) were more likely to experience caries. Almost all the caries experience among these Head Start children was represented by untreated decay, with 52% of all children or 96% of children with caries experience having untreated decay (data not shown). Conversely, the percentage of children with filled teeth was very low (8%). Overall, four-year-old children were more than twice as likely to have at least one filled tooth than three-year-old children (11% vs 4%).

Table 3 shows that children attending Head Start in Maryland had an average 3.64 decayed and/or filled surfaces, with 2.90 (80%)

of these surfaces recorded as decayed. Age was a factor in the dfs as shown by four-year olds having twice as many decayed and filled surfaces as the three-year olds (5.09 vs 2.44). Analyses of dfs among children who had caries experience indicate that their dfs was almost twice that of all children (6.67 vs 3.64); however, the dfs' composition resembled that of all children, (ie, 80% of the dfs was decayed surfaces and only 20% of the dfs was filled surfaces. Children who had caries experience also had higher dfs at four years of age than at three years of age (7.93 vs 5.35).

The distribution of children by dental location of untreated lesions is presented in Table 4. A full 86% of children with untreated caries had lesions in posterior surfaces, with a mean of 3.64 decayed posterior surfaces. Most of the children had decay in pits and fissures (86%) and almost a quarter of the children had lesions in smooth surfaces (23%). Untreated carious lesions in anterior maxillary surfaces were found in 36% of the children with untreated caries.

Prevalence of children ever complaining or children crying of dental pain are presented in Table 5. A child's complaining from dental pain was reported by the parents or guardians in 10% of the children. Yet, if only those children who have had caries experience were considered, the percentage was almost twice as high (17%). Furthermore, older children and children from rural counties were more likely to complain from dental pain than younger children and children from urban counties.

The prevalence of severe dental pain was estimated by asking whether the children have cried from dental pain. Of all children, 5% reportedly had cried from pain; but considering only those children who have had caries experience the percentage of children who have cried from dental pain almost doubled to 9%. Older children and children from

Table 4. Distribution of Preschool Children with Caries by Lesion Location (n=263)

	Percent children	Mean surfaces
Posterior surfaces	86	3.64
Pit and fissure*	86	3.00
Smooth**	23	0.63
Maxillary anterior surfaces	36	1.49
Proximal	27	0.70
Buccal/lingual	29	0.78

* Pit and fissures include occlusal surfaces of molars, as well and lingual surfaces of maxillary second molars and buccal surfaces of mandibular second molars.

** Smooth surfaces of molars includes mesial and distal surfaces of molars, as well as buccal and lingual surfaces not included as fissure surfaces.

Table 5. Report of Dental Pain by Demographic Characteristics

	Complained of pain		Cried of pain	
	Percent	(SE)	Percent	(SE)
All children (n=391)	10	(1.5)	5	(1.1)
Age				
3 years	7	(1.7)	3	(1.3)
4 years	13	(2.6)	7	(1.9)
Residence				
Rural	15	(3.8)	8	(2.8)
Urban	8	(1.6)	4	(1.1)
Children with caries experience (n= 205)	17	(2.6)	9	(2.0)
Age				
3 years	14	(3.7)	—	—
4 years	19	(3.7)	11	(2.9)
Residence				
Rural	22	(5.5)	13	(4.4)
Urban	14	(2.9)	7	(2.1)

* SE: standard error

—: small sample size, unreliable data

rural counties tended to be more likely to have cried from dental pain, but these differences did not reach statistically significance.

Basic knowledge and oral health and behaviors are presented in Table 6. Almost all respondents (93%) thought that giving a child a bottle with sugared drinks could cause caries. Consistently, only 1% of adult respondents reported that their children currently take naps with a bottle; yet, 41% reported that their children never used a bottle to take naps. Even though 52% of all examined children had untreated decay, only 17% of the adult respondents were aware that their child had untreated cavities; moreover, 33% of parents/guardians of children with untreated decay were aware of the presence of untreated decay (data not shown). On the other hand, the awareness about untreated caries of 81% of adult respondents whose children were diagnosed with caries was confirmed by clinical examination (data not shown).

Regarding behaviors that can affect dental health, parents responded that the drinks most frequently used by their children included juice (64%), followed by milk alone (42%) and water alone (35%). However, 45% of adults reported the most frequent drink to be Kool-Aid or similar beverage, soda, or milk with sugars. Overall, 78% of preschool children reported a highly cariogenic beverage as the most frequently used drink. Analyses of tooth brushing behavior indicated that 2/3 (65%) of all children reportedly had their teeth brushed more than once a day and almost a third (31%) reportedly had their teeth brushed at least once a day. The rest of the children (5%) had their teeth brushed a couple of times per week.

Table 6. Oral Health Knowledge and Behaviors (n=460)

	Percentage (SE)	
Dental literacy		
Taught how to care for baby's teeth	71	(2.2)
Think bottle can produce caries	93	(1.2)
Think child has untreated caries	17	(1.9)
Behaviors		
Never used bottle for naps	41	(2.3)
Use bottle for naps now	1	(0.6)
Use a sippy cup now	14	(1.6)
Drinks frequently used		
Milk alone	42	(2.3)
Milk and sugar	8	(1.3)
Juice	64	(2.2)
Soda	16	(1.7)
Kool-Aid	21	(1.9)
Tea	11	(1.5)
Water alone	35	(2.2)
Tooth brushing		
Never	0	(0.0)
Couple times/week	5	(1.0)
Once a day	31	(2.1)
More than once/day	65	(2.2)
Who brushes child's teeth		
Child alone	9	(1.3)
Adult alone	30	(2.1)
Child and adult	61	(2.3)

*SE: standard error

Most parents said their children participate in brushing their teeth with an adult (61%); however, a considerable percentage of children reportedly were left to brush alone (9%) or do not participate in brushing their teeth (30%). Children whose teeth were brushed at least daily were less likely to have caries experience than children whose teeth were brushed a couple of times per week (χ^2 , $P=0.034$). However, who brushes the child's teeth was not associated with caries experience (χ^2 , $P=0.603$).

Table 7 presents issues of child's dental care utilization. More than half (58%) of Maryland Head Start children reportedly had visited the dentist at least once in their lives. Of those children with at least one dental visit, most had their first visit when they were between two and four years of age (72%). Almost half of children who reported previous dental visits reportedly saw a dentist every six months and a third saw a dentist every year; but 18% saw a dentist when needed, (ie, when the caregiver was aware that there were problems that needed to be treated by the dentist. For those children who had not seen a dentist, the most common reason given by respondents for not having dental visits

was that the child is too young (42%) and lack of perceived dental problem (29%). There were no responses to the question that the reason for no dental visits was that they expected the problems to go away.

Discussion

Dental caries and access to oral health care is a major health problem in US preschool children, especially low socioeconomic populations.⁷ However, there is surprisingly little information for this age group regarding the prevalence of the disease, the associated risk factors and oral pain associated with caries. This lack of data hinders understanding of the disease process and impedes the development of evidence-based policies regarding caries prevention and dental treatment for preschool children. The present cross-sectional study describes and discusses the prevalence of dental caries, caries risk factors, access to care, and dental pain in Maryland Head Start children.

The subjects of this study were three- and four-year-old children from 37 Head Start programs across Maryland. Head Start is a federally funded program whose eligibility requirements include being under 185% of federal poverty level. Therefore, the present study should be interpreted recognizing that the children are all from low socioeconomic settings. All children enrolled in Head Start are supposed to receive comprehensive health services, including medi-

cal, dental, nutrition and mental health services. In addition, since most Head Start children are from low-income groups, they are eligible to receive Medicaid and its EPSDT services.

The low response rate is the main limitation of this study; just 40% of the children included in the sample returned the consent form and 47% returned the questionnaire. Therefore, the generalizability of these results is an issue; however, the consistency between these results and results published from Head Start populations in other states suggests that the data could well represent Head Start children in Maryland. Another study limitation, derived from the field conditions for examination, is the lack of air to dry off the teeth before examination, especially when explorers are not used. If anything, field conditions and lack of radiographs would underestimate the true caries prevalence. Despite these limitations, this study presents valuable data on children's oral health risks and behaviors, dental pain, and dental care services utilization.

In the present study, 55% of the children had decayed or filled tooth surfaces, with a mean dfs of 3.64 (Tables 2 and 3). Such high caries prevalence in three- and four-year-old children is similar to other reports from Head Start children in the United States, with reported dfs scores in Head Start children ranging from 2.19 in Hartford, Connecticut (8) to 6.35 from sites in the Southwestern United States.⁹ Prior studies, however, did not characterize dental caries prevalence based on urban or rural locations. We observed a 16% greater caries experience and a 27% greater numbers of decayed surfaces in those children from rural Maryland locations (Table 2, differences not show).

Such findings may be due to the fact that those children living in rural locations are less likely to benefit from water fluoridation. The major metropolitan areas of Maryland are fluoridated, whereas, the rural areas generally are not. Besides the greater caries prevalence in rural locations, less dental care appeared to be available for these children. Lower utilization of dental care among preschool children residing in rural than in urban areas (45% vs 53%; National Health Interview Survey 1997 and 1998, unpublished data, tabulated by Vargas, 2001) is associated with the greater concentration of dentists in urban areas, and lower dental insurance coverage among children residing in rural areas.

The present study also confirms reports that those children with any caries experience have a greater burden of disease than the general population.² The traditional format for reporting caries prevalence data, using average number of decayed teeth across all children, masks the extent of caries among those children with decay. The mean dfs score of 6.67 for those Head Start children with caries experience versus the mean dfs score of 3.64 for all children show the extent of caries in affected children.

It is interesting to note that 86% of the children with dental caries have disease in the pits and fissures of their molars, with an average of 3.00 affected surfaces. This finding suggests that an important preventive strategy for preschool children at high caries risk could be the provision

Table 7. Characteristics of Dental Care Utilization

	Percentage	(SE)
Has visited the dentist	58	(2.3)
Age first dental visit		
Less 2 years	14	(2.2)
2 years but less than 3 years	33	(2.9)
3 years but less than 4 years	39	(3.0)
4 years but less than 5 years	14	(2.1)
Frequency of care		
6 months	49	(3.1)
Every year	33	(3.0)
As needed	18	(2.4)
Reasons for no dental visit** (n=181)		
Child is too young	42	(3.7)
No problem	29	(3.4)
Cannot find dentist	16	(2.7)
No insurance	4	(2.6)
Cannot get appointment	11	(2.3)
Too busy	10	(2.2)
Too expensive	9	(2.1)
Dentist too far	4	(1.4)
Problem will go away	0	(0.0)

* SE: standard error

**Total is more than 100% because parents could check multiple reasons

of dental sealants for primary molars.¹⁰ The other location of high caries prevalence in these Head Start children was on the maxillary anterior teeth, with more than one third of the children with caries experience having lesions on the anterior teeth. Fluoride varnish has recently gained popularity as a method to prevent and suppress caries in preschool children,^{11,12} and such a strategy should be explored to determine its effect on maxillary anterior caries in these high-risk children.

A new contribution to the dental literature is the information that 10% of these preschool children have complained of dental pain. Dental pain is an important issue in preschool children, yet the only data collected have been indirectly extrapolated from emergency visits or from clinical examinations that were suggestive that dental caries was significant enough to possibly cause pain.¹³ The potential importance of dental pain in preschool children is also suggested from studies of growth retardation in children with severe dental caries.^{14,15}

In the present sample of Head Start children with caries experience, many of them had suffered from dental pain, with 17% of them reportedly complaining of dental pain and 9% reportedly crying because of dental pain. This high prevalence of pain might be associated with the fact that parents may have difficulty in finding dentists for their children. General dentists frequently elect not to treat these children because they do not have enough experience with this age group. Additionally, a significant proportion of dentists do not accept children enrolled in Medicaid in their practices. The current findings should provide convincing evidence of the seriousness of oral disease in certain preschool population. Programs to prevent and treat dental caries among Head Start children need to be vigorously explored to prevent episodes of dental pain.

As C. Earl Fox, former HRSA administrator, said "We have the knowledge, skills and tools to eliminate the suffering of dental disease for most children, yet somehow we have failed to put the pieces together for our nation's most vulnerable children."¹⁶

The finding from the survey of oral health knowledge and behaviors survey suggests: (1) that the parents generally have understanding of how to prevent dental caries as reflected by their reported knowledge of about the causes of caries; (2) their reported behaviors of never allowing their child to use a bottle for naps; and (3) their overwhelming response that the children brush their teeth with supervision, once or more per day.

In contrast to these positive health behaviors, parents report that drinks most frequently used by their children had high sugar content. The high percentage of parents reporting juice as the most frequent beverage for the children is of concern. Fruit juices/drinks contain between 10%-13% sugar and their frequent consumption, with or without a bottle, is considered a high caries risk factor for preschool children.¹⁷

This study also asked parents to respond to questions regarding access to care. Almost 60% of the parents reported that their child had a dental visit, with most children having their first dental visit when they were three or four years of age. Of those parents who have not taken their child to the dentist, access issues (eg, the parent could not find a dentist, do not have insurance, cannot get an appointment, dental care is too expensive and the dentist is too far away) were frequently cited. However, almost half of the parents said that their child was too young to visit the dentist and a third of the parents said that their child did not have dental problems. The high frequency of these two last responses indicates that there is still a need to educate parents about the first year dental visit¹⁸ and about the importance of dental visits for preventive purposes.

Results from this cross-sectional study of children attending Head Start programs in Maryland are similar to those of other recent reports^{2,8,9,19} showing that these three- and four-year-old children have significant dental needs and significant barriers to care. These results also indicate that: (1) caries severity in those children that have disease is much greater than the overall means generally reported; (2) caries is greatest in the molar pit and fissure surfaces which can be prevented by dental sealants; (3) many of these children have dental pain; (4) a risk factor for caries may be the high use of juice and sodas; and (5) unawareness accounts for most of the reasons that these Head Start children have not had a dental visit.

This study clearly illustrates that government agencies and organized dentistry must respond to the health needs of underserved preschool children and assure that dental care is readily available by addressing dental workforce inadequacies, geographic accessibility, assuring that public insurance programs for children are adequate and by developing effective protocols for early intervention and disease suppression.

Conclusions

1. Dental caries was found to be highly prevalent in Maryland Head Start children, with the greatest occurrence found in rural 4-year-olds.
2. Dental pain, especially in those Head Start children that have dental caries, is not uncommon.
3. Despite Head Start and Medicaid requirements, there is low utilization of oral health care in Maryland Head Start children. Poor utilization can be attributed to access issues and a lack of parental oral health knowledge.

Acknowledgements

This study was supported in part by project H18 MC-00023-09 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, Department of Health and Human Services.

The data collection coordination of Heather Horan is gratefully acknowledged.

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