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Robert B. Stroube, M.D., M.P.H., Health Commissioner
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Christopher Novak, M.D., M.P.H., Editor
Vickie L. O'Dell, Layout Editor

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Early Childhood Caries (ECC)

Background

In recent years, there has been a paradigm shift regarding the etiology and prevention of dental caries in young children. No longer considered strictly the result of local dietary and bacterial factors, dental caries is now known to be a chronic infectious process that may begin early in childhood and have lifelong health implications. As a result, in the past ten years a movement has occurred towards including primary care medical professionals in providing basic oral health information and applying prevention strategies to young children at high risk for decay. The goal of this article is to give medical professionals in Virginia current information about dental caries and how this disease may affect their patients, as well as new approaches to prevention.

Introduction

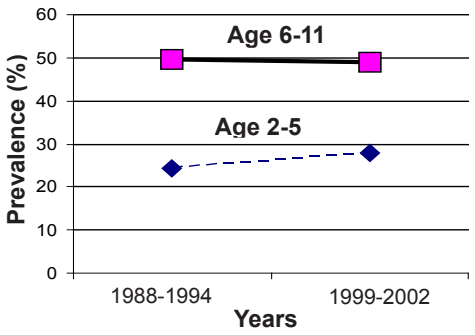
Dental caries ("tooth decay") is a chronic, transmissible disease. Considered the most common chronic disease among children, its prevalence is about five times that of asthma and seven times that of hay fever. When tooth decay occurs in very young children it is called early childhood caries (ECC). ECC is defined as one or more decayed, missing, or filled teeth occurring in a child under six years of age. This is typically a virulent form of dental caries that begins soon after the eruption of the primary teeth and can progress very rapidly. In the past, ECC was referred to as "baby bottle tooth decay." However, that term focuses primarily on the dietary factors involved, and misses the multi-factorial nature of the disease process.

Epidemiology of ECC

Although the overall prevalence of tooth decay in the United States has steadily declined over the past fifty years, poor and minority pre-school children suffer a disproportionate burden of the disease. Severe disparities have resulted in 25% of children having approximately 80% of all tooth decay. According to the National Health and Nutrition Examination Survey (NHANES), 55% of low-income five year olds have had tooth decay, compared with 25% of their more affluent peers. The most recent NHANES data (1999-2002) also shows an increase in decay rates in US children 2–5 years of age, from 24% in 1994 to 28% in 2002 (Figure 1).[1] In Virginia, dental care is the most common unmet health need

reported by Head Start parents and staff. Virginia Head Start data reveal that, overall, 21% of enrolled children 3–5 years of age need dental treatment; needs in individual Head Start Programs in Virginia range from 3% to 46%.[2]

Figure 1. Prevalence of Dental Caries in Primary Teeth, U.S.[1]



Etiology of ECC

Dental caries results from the interaction of three factors: cariogenic microorganisms, fermentable carbohydrates, and a susceptible tooth surface. The principal strain of bacteria implicated in the caries process is *Streptococcus mutans*, an acidogenic microorganism. Research indicates that colonization of the oral cavity with *S. mutans* is generally the result of the transmission of these organisms from the mother to the child through shared utensils, food, and close contact.[3] Once the teeth begin to erupt, usually at six months of age, colonization can occur. The earlier in infancy that *S. mutans* colonizes the teeth, the more likely that severe damage to the primary dentition can develop.[4]

However, the oral environment also impacts the risk for developing decay. Frequent consumption of fermentable carbohydrates, including fruit juice, milk, formula, and soda increases the risk of caries. As the bacteria metabolize the carbohydrates, the resulting acid demineralizes surface enamel, initiating the caries process. The susceptibility of the tooth surface to the decay process also depends to a significant degree on the amount of past exposure to fluoride: optimal fluoride exposure increases resistance of the enamel to the decay process.

Other risk factors for ECC include low socioeconomic status, poor oral health status of the parents, low levels of daily oral hygiene measures, and previous decay experience. In fact, studies show that previous caries experience is one of the strongest predictors of future caries. Therefore, interventions at an early age can have lifelong consequences on the dental health of a child.

Risk Factors for Early Childhood Caries

- Previous caries experience of child or parent
- Visible plaque on tooth surfaces
- Poor daily oral hygiene care
- High intake of sugary foods
- Low fluoride exposure
- Low socioeconomic status
- Poor access to dental services

Possible Consequences of Untreated Tooth Decay

- Pain and infection
- Difficulty chewing
- Difficulty speaking
- Risk of future decay
- Poor weight gain
- Academic failure

Consequences of Untreated Tooth Decay

Functionally, primary teeth are essential for chewing, for space maintenance for the permanent teeth, and for the development of speech. ECC can directly affect a child's health by causing pain, resulting in a disinclination to eat and a failure to thrive. Untreated tooth decay can also lead to systemic infections. ECC can also have broader health impacts. For example, self-esteem issues can result from the effects on speech and/or appearance. Poor oral health is also associated with decreased school performance since children experiencing dental pain often are absent from school and are unable to concentrate on schoolwork (approximately 51 million school hours per year are lost because of dental-related illness).[5] Therefore, ECC impacts not only a child's teeth, but it can also affect the general health and the long-term well-being of a child.

* Fermentable Carbohydrate
**Particularly *Streptococcus mutans*

Prevention of ECC

Education

ECC prevention efforts have historically focused on reducing risk factors associated with life style choices. The education of parents of children who are at high risk for ECC is crucial to affecting behavioral changes that will reduce the risk of developing cavities. The desired behavior changes typically include improved daily oral hygiene measures, reduced amounts and frequency of intake of fermentable carbohydrates, avoidance of feeding practices that result in bacterial transmission, and cessation of sleeping with a bottle containing anything except water.

Fluoride

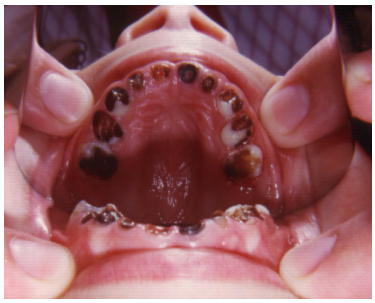
Fluoride reduces the incidence of ECC. Fluoridated water has been recognized by the Centers for Disease Control and Prevention as an evidence-based public health strategy for reducing tooth decay.[6] Through fluoridated water sources, fluoride is incorporated systemically into the tooth structure during formation, rendering it more resistant to breakdown after eruption into the oral cavity.

Topical sources of fluoride can include toothpastes, mouthwashes, and professionally applied formulations. Fluoride from these sources prevent enamel breakdown by inhibiting demineralization, enhancing remineralization, and interfering with the acid production of the bacteria. Fluoride varnish, a highly concentrated form of 5% sodium fluoride in a natural wood-based resin, is the newest weapon in the fight against tooth decay in young children.

Fluoride Varnish

Fluoride varnish is one of the easiest modalities to use to help prevent ECC. It has proven efficacy in preventing tooth decay and promoting remineralization of early carious lesions in the primary and secondary dentition.[7] Studies show a 40% to 60% reduction in decay rates with semi-annual applications. Fluoride varnish has been used extensively as a decay preventive agent in Europe, Canada, and Scandinavian countries for decades. Its use in the United States is more recent; however, it is quickly becoming the standard of care for the topical application of fluoride.

Fluoride varnish is an extremely safe and effective means of applying topical fluoride to the teeth of a pre-school child. The sticky resin enables immediate adherence to the tooth surface for up to 24 hours, maximizing the chemical uptake of fluoride ions into surface enamel and rendering the treated enamel much more resistant to the decay process. The application is very easy and requires no special equipment: the varnish is painted directly onto the tooth surface using a small application brush. The parent and provider are in a knee-to-knee position with the infant/toddler in the lap. Depending on the number of erupted teeth, the time required for application ranges from five seconds to one minute.



Role of Medical Professionals

Primary care medical professionals are increasingly being called upon to provide basic oral assessments and preventive measures for high-risk children. The pediatrician sees a child eight to twelve times before the age of three for immunization and well-child visits. Because medical professionals are easily positioned to offer services to these young children, the current approach is to encourage them to become involved in the primary prevention of ECC. Many states, including Virginia, are exploring this creative oral health initiative, which has the support of the American Academy of Pediatrics (AAP). **The AAP states that every child should begin to receive oral health risk assessments by six months of age by a qualified pediatrician or pediatric healthcare professional.**[8] In a recent AAP survey, 90% of pediatricians felt that they had an important role in identifying dental problems and providing education regarding the prevention of tooth decay.[9]

> "What amounts to a silent epidemic of dental and oral diseases is affecting some population groups. This burden of disease restricts activities in schools, work, and home, and often significantly diminishes the quality of life."
>
> David Satcher, PhD, MD
> Surgeon General, 1998-2002

Bright Smiles for Babies Program

In July 2005 the Virginia Department of Health implemented a prevention and educational program (Bright Smiles for Babies) to raise awareness among medical professionals about oral health issues of disadvantaged pre-school children, and to improve access to preventive services for these children. The program provides training for medical professionals, including physicians and nurses, in private and public healthcare settings. The training addresses the three major components of the prevention program:

1. Caries risk assessment
2. Anticipatory guidance for parents
3. Fluoride varnish application

The caries risk assessment includes the identification of risk factors such as previous decay experience, oral health status of parents/guardians, fluoride exposure, daily oral hygiene measures, and sugar intake. Anticipatory guidance focuses on the risk factors that exist for that child and the parents/guardians. Fluoride varnish is applied to the teeth of children who are determined to be at high risk for developing tooth decay. In Virginia, physicians, nurses, nurse practitioners, physician assistants, and dental professionals can apply fluoride varnish.

As of October 2006 over 200 medical professionals have been trained through the Bright Smiles for Babies program. Trainings, which are free of charge, have occurred in a variety of safety net provider settings (e.g., health departments, WIC clinics, community health centers), as well as private physicians' offices.

Summary

The year 2000 Surgeon General's Report on Oral Health stated that "oral health is essential to the general health and well-being of all Americans."[10] By broadening the domain of medical professionals to include ECC prevention strategies, physicians and nurses can improve the health and well-being of our most vulnerable children. For information about Bright Smiles for Babies, or to schedule a training, contact Susan Pharr, BSDH, MPH, Early Child Oral Health Coordinator, Virginia Department of Health, Division of Dental Health, at susan.pharr@vdh.virginia.gov or (804) 864-7782.

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Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, September 2006						Total Cases Reported Statewide, January - September		
		Regions							
	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	46	5	25	1	15	0	413	430	510
Campylobacteriosis	93	27	16	19	16	15	488	437	491
Chickenpox	57	6	29	8	9	5	1,261	329	426
***E. coli,* Shiga toxin-producing**	24	10	1	5	3	5	119	67	44
Giardiasis	93	34	15	18	11	15	355	411	306
Gonorrhea	733	79	81	128	196	249	5,036	6,422	7,137
Group A Strep, Invasive	12	7	0	3	0	2	111	69	70
Hepatitis, Viral									
A	8	1	3	1	2	1	45	59	84
B, acute	8	0	2	0	3	3	43	110	141
C, acute	0	0	0	0	0	0	6	9	8
HIV Infection	56	3	31	1	16	5	660	593	647
Lead in Children†	89	9	17	21	25	17	518	474	540
Legionellosis	9	3	0	3	1	2	49	33	36
Lyme Disease	54	11	39	0	1	3	212	166	116
Measles	0	0	0	0	0	0	0	0	<1
Meningococcal Infection	0	0	0	0	0	0	15	21	24
Pertussis	22	7	8	3	0	4	155	278	130
Rabies in Animals	65	16	19	15	3	12	470	387	390
Rocky Mountain Spotted Fever	14	0	2	2	7	3	84	73	33
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	141	30	32	19	30	30	737	864	882
Shigellosis	16	4	8	1	2	1	60	99	298
Syphilis, Early§	48	1	5	1	12	29	262	208	163
Tuberculosis	23	1	13	3	5	1	196	227	199

Localities Reporting Animal Rabies This Month: Accomack 1 fox, 1 skunk; Albemarle 2 raccoons; Alexandria 1 bat, 1 raccoon; Appomattox 1 skunk; Augusta 2 raccoons, 1 skunk; Bath 1 cat, 1 raccoon; Bedford 1 skunk; Buckingham 1 skunk; Carroll 1 raccoon; Clarke 1 raccoon; Danville 1 skunk; Fairfax 1 bat, 1 cat, 2 foxes, 3 raccoons, 1 skunk; Fauquier 1 cat, 1 fox, 2 raccoons; Franklin City 1 raccoon, 1 skunk; Gloucester 1 cat; Henry 1 bat, 1 skunk; Isle of Wight 1 raccoon, 1 skunk; James City 1 fox; Loudoun 1 cat, 2 raccoons; Lynchburg 1 raccoon; Madison 1 bat; Mecklenburg 1 fox; Middlesex 1 skunk; Page 1 skunk; Patrick 1 raccoon; Pittsylvania 1 raccoon; Prince William 1 bat, 1 fox, 1 raccoon, 3 skunks; Radford 1 bat; Rappahannock 1 fox; Richmond City 1 bat; Roanoke City 1 bat; Rockbridge 1 skunk; Russell 1 raccoon; Suffolk 1 raccoon; Virginia Beach 1 raccoon; Westmoreland 1 fox; Wythe 1 raccoon, 2 skunks.

Toxic Substance-related Illnesses: Adult Lead Exposure 10; Cadmium Exposure 1; Carbon Monoxide Exposure 110; Mercury Exposure 1; Pneumoconiosis 5.

*Data for 2006 are provisional. †Elevated blood lead levels ≥10µg/dL. §Includes primary, secondary, and early latent.

Submitted by:
Susan Pharr, BSDH, MPH
Division of Dental Health, VDH

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