



## EARLY CHILDHOOD CARIES BEYOND THE ORAL CAVITY

## Dental Science

**Dr. Anupama S  
Prakash**

Senior Lecturer Department Of Pedodontics And Preventive Dentistry Karpaga Vinayaga  
Institute Of Dental Sciences

## KEYWORDS

ECC is commonly associated with pain and infection and its severity depends on the extent of the carious involvement. Although pain and infection may be the primary effect of ECC, the condition also may affect general health. The consequences of ECC include a higher risk of new carious lesions,<sup>1-4</sup> hospitalizations and emergency room visits,<sup>5-8</sup> increased treatment cost and time,<sup>9,10</sup> delayed or insufficient physical development (especially in the child's height and/or weight),<sup>11,12</sup> loss of school days and increased days with restricted activity,<sup>13-15</sup> and a diminished ability to learn.<sup>16-19</sup>

**EFFECTS ON NUTRITION AND BODY WEIGHT:**

Role of nutrition in the maintenance of health is well known. It has been found that ECC inhibited adequate nutrition, thereby adversely affecting the growth of the body, specifically weight.

Systematic study of the weights of children with nursing caries has previously indicated that untreated nursing caries may have deleterious effects on weight gain. On a population basis, it had been observed that with advancing age, and presumably increasing severity of nursing caries, there was a deceleration of weight gain such that older children with nursing caries were more likely to be represented by lower-weight percentile categories.<sup>11</sup> In that population of patients with noncont ributory medical histories, untreated nursing caries was found to be the sole responsibility for the extremely low weights exhibited by some children in the absence of any other identifiable causes.

Children with nursing caries tend to be represented in the higher weight categories when they are younger than age 3, perhaps due to the readily available and ever-present source of substrate. However, as they aged, they were increasingly likely to exhibit the deceleration of growth velocity that would move them to a lower percentile weight category. Conceivably, the child's reactions to early pathological pulpal stimuli may not be recognized by caretakers as being noxious in nature. This early stage of the continuum from decalcification to abscess formation may initially result in more subtle alterations of eating and sleeping patterns. Perhaps parental recognition of these alterations comes at a relatively late stage of the continuum, the stage that is ultimately characterized by significantly altered feeding and sleeping patterns which may subsequently affect growth and development.<sup>11</sup>

Although undernourished children may develop more dental caries because a high sugar intake may be detrimental to teeth and nutrition, there are at least three other highly plausible mechanisms for how dental caries may be associated with underweight and poor growth in young children.

First, untreated caries and associated infection can cause pain and discomfort and reduce intake of foods because eating is painful.<sup>20,21</sup> Second, severe caries can affect children's quality of life and thereby growth. Impacts include pain, irritability and disturbed sleeping habits.<sup>22,23</sup> Disturbed sleep may affect glucocorticoid production and growth. Although not all untreated dental caries affects general health, it significantly impacts on the quality of life of children and their dietary intake. Children with untreated ECC had significantly poorer oral health-related quality of life (OHRQoL) than children without ECC as assessed both by the children and their parents.<sup>22,24</sup>

A third possible mechanism of how untreated severe caries with pulpitis affects growth is that chronic inflammation from pulpitis and chronic dental abscesses affects growth via chronic inflammation affecting metabolic pathways where cytokines affect erythropoiesis. For example, interleukin-1 (IL-1), which has a wide variety of actions

in inflammation, can induce inhibition of erythropoiesis. This suppression of haemoglobin can lead to anaemia of chronic disease as a result of depressed erythrocyte production in the bone marrow.<sup>25,26</sup>

**PSYCHOLOGICAL PROBLEMS:**

Increased days with restricted activity and absence from school<sup>13,14,27</sup> and a diminished ability to learn is the one of the complications of ECC. Dental pain has an impact not only on the child's educational development, but also on the economy due to time taken off by parents to take children to the dentist.<sup>27,28</sup>

Dental treatment makes a very significant difference to the psychological and social aspects of the child's life.<sup>22,24,29,30,31</sup> These improvements include less pain and improved abilities to eat and sleep. In one study, parents perceived treatment had positive social impacts on their child: more smiling, improved school performance and increased social interaction.<sup>32</sup>

Children with ECC have been said to have behaviour described as strong tempered, commonly restless and fussy. These children do not always verbalize their pain and may only reflect chronic dental pain by decreased appetite and increased irritability and sleeplessness. Decreased appetite and depression secondary to chronic dental disease, may also lead to poor behaviour in school and negative self esteem. Complete rehabilitation of such patients under general anesthesia can improve their life style.<sup>33</sup>

**MEDICAL PROBLEMS:**

The consequences of high caries levels also include a higher risk of hospitalisations and emergency dental visits.<sup>5</sup> In many hospitals' Emergency departments, a leading pediatric admission symptom is dental pain.<sup>34</sup> Emergency department (ED) dental intervention is, in most cases, limited to management of pain and infection, leaving the source untreated at significant cost to the patient, the hospital and society and impeding a system designed and staffed for emergent medical events.<sup>35</sup> Many ED admissions become prolonged hospitalizations for management of facial cellulitis. The length of stay averages five days but can be far longer, and the cost of care can be significant.<sup>36</sup>

As with ED management of ECC infection and pain, many such hospitalizations do not result in definitive care for either the offending tooth or other carious teeth. Worse, these interventions may have untoward consequences.<sup>34</sup> In a study of pediatric patients with facial cellulitis, researchers found that ED physicians were more likely to order computed tomographic (CT) imaging than were pediatric dentists, with no difference in treatment outcome.<sup>37</sup> This finding is most relevant because a growing body of literature suggests that head and neck CT imaging is responsible for an increase in thyroid cancer incidence in children.<sup>38,39</sup>

**PROBLEMS WITH GENERAL ANESTHESIA:**

Treatment under general anesthesia for extensive dental repair is another costly and potentially risky consequence of ECC.<sup>34</sup> The human toll of treating children under general anesthesia also can be significant. Cravero and colleagues included dental cases in their assessment of adverse events in sedation and general anesthesia, stating that of all patients who receive these services, the pediatric population is at highest risk and has the lowest tolerance for error.<sup>40</sup>

**EFFECTS ON CHILD DEVELOPMENT AND WELL BEING:**

Knowledge of the impact of ECC on the development of the child in physical, emotional and intellectual terms is fragmented. The effect of

ECC-related pain on distraction from learning and school performance is significant. Anecdotally, school systems nationwide, particularly those that serve a significant low income population, report that dental problems contribute to learning difficulties.<sup>41</sup> A study in Michigan has documented loss of sleep, inability to concentrate in school and absences from school all caused by dental caries-related pain.<sup>41</sup>

#### **EFFECT ON GROWTH AND DEVELOPMENT:**

Dental treatment of teeth with ECC results in pain elimination and has been associated with improved growth velocities<sup>20</sup> and improved quality of life.<sup>22,24,42</sup> The potential for increased glucocorticoid production in response to pain, decreased sleep patterns and the overall increased metabolic rate during the course of infection may all conspire to retard normal growth and development in patients with ECC. Apart from pain and infection other complications like loss of weight, psychological problems, speech problem, esthetics and malnutrition have a long-term effect on the proper growth and development of the child.

#### **EFFECTS ON FAMILY:**

At the level of family consequences, there is a troubling association between ECC and child maltreatment. Sheller and colleagues<sup>43</sup> concluded that a dysfunctional family or social situation can lead to a recurrence of ECC, often with emotional outbursts and the threat of or actual violence. The relationship between ECC and neglect is well established and child maltreatment experts included dental caries in their listing of health conditions that predispose children to maltreatment.<sup>44,45</sup>

#### **CONCLUSION:**

Meaningful assessments of the effect of ECC on child development, learning and family function and the economic burdens it places on families, communities and the health care system are needed to describe the importance of this preventable disease adequately. Until such a comprehensive assessment—including routine diagnostic coding—is developed, the epidemic of ECC likely will continue to put the health and lives of children at risk.

#### **REFERENCES**

- Grindeford M, Dahllöf G, Modéer T. Caries development in children from 2.5 to 3.5 years of age: A longitudinal study. *Caries Res.* 1995;29:449-54.
- O'Sullivan DM, Tinanoff N. The association of early dental caries patterns with caries incidence in preschool children. *J Public Health Dent.* 1996;56:81-83.
- al-Shalan TA, Erickson PR, Hardie NA. Primary incisor decay before age 4 as a risk factor for future dental caries. *Pediatr Dent.* 1997;19:37-41.
- Heller KE, Eklund SA, Pittman J, Ismail AI. Associations between dental treatment in the primary and permanent dentitions using insurance claims data. *Pediatr Dent.* 2000;22:469-74.
- Majewski R F, Snyder C W, Bernat J E. Dental emergencies presenting to a children's hospital. *J Dent Child* 1988; 55: 339-42.
- Sheller B, Williams BJ, Lombardi SM. Diagnosis and treatment of dental caries-related emergencies in a children's hospital. *Pediatr Dent.* 1997;19:470-75.
- Fleming P, Gregg TA, Saunders ID. Analysis of an emergency dental service provided at a children's hospital. *Int J Paediatr Dent.* 1991;1:25-30.
- Schwartz S. A 1-year statistical analysis of dental emergencies in a pediatric hospital. *J Can Dent Assoc.* 1994;60:959-68.
- Griffin SO, Gooch BF, Beltran E, Sutherland JN, Barsley R. Dental services, costs, and factors associated with hospitalization for Medicaid-eligible children, Louisiana 1996-97. *J Public Health Dent.* 2000;60:21-7.
- Ramos-Gomez FJ, Huang GF, Masouredis CM, Braham RL. Prevalence and treatment costs of infant caries in Northern California. *J Dent Child.* 1996;63:108-12.
- Acs G, Lodolini G, Kaminsky S, Cisneros GJ. Effect of nursing caries on body weight in a pediatric population. *Pediatr Dent.* 1992;14:302-5.
- Ayhan H, Suskan E, Yildirim S. The effect of nursing or rampant caries on height, body weight, and head circumference. *J Clin Pediatr Dent.* 1996;20:209-12.
- Reisine S T. Dental health and public policy: the social impact of disease. *Am J Public Health* 1985; 75: 27-30.
- Gift H C, Reisine S T, Larach D C. The social impact of dental problems and visits. *Am J Public Health* 1992; 82: 1663-8.
- Hollister MC, Weintraub JA. The association of oral status with systemic health, quality of life, and economic productivity. *J Dent Educ.* 1993;57:901-12.
- Peterson J, Niessen L, Nana Lopez G. Texas public school nurses' assessment of children's oral health status. *J Sch Health.* 1999;69:69-72.
- Schechter N. The impact of acute and chronic dental pain on child development. *J Southeastern Society of Ped Dent.* 2000;6:16.
- Ramage S. The impact of dental disease on school performance. *J Southeastern Society of Ped Dent.* 2000;6:26.
- Oral Health and Learning. Vol 2001. National Center for Education in Maternal and Child Health (NCEMCH) and Georgetown University; 2001.
- Acs G, Shulmann R, Ng M W, Chussid S. The effect of dental rehabilitation on the body weight of children with early childhood caries. *Pediatr Dent* 1999; 21: 109-13.
- Hayes C. Nutrient intake of children with severe early childhood caries (S-ECC). American Association for Dental Research 2006.
- Low W, Tan S, Schwartz S. The effect of severe caries on the quality of life in young children. *Pediatr Dent* 1999; 21: 325-326.
- Reisine S T. The impact of dental conditions on social functioning and quality of life. *Annu Rev Public Health* 1988; 9: 1-19.
- Filstrup S L, Briskie D, da Fonseca M et al. Early childhood caries and quality of life: child and parent perspectives. *Pediatr Dent* 2003; 25: 431-40.
- Means R T, Krantz S B. Progress in understanding the pathogenesis of the anemia of chronic disease. *Blood* 1992; 80: 1639-47.

- Means R T. Recent developments in the anemia of chronic disease. *Curr Hematol Rep* 2003; 2: 116-21.
- Ratnayake N, Ekanayake L. Prevalence and impact of oral pain in 8-year-old children in Sri Lanka. *Int J Paediatr Dent* 2005; 15: 105-12.
- Shepherd M A, Nadanovsky P, Sheiham A. The prevalence and impact of dental pain in eight year old school children in Harrow, England. *Br Dent J* 1999; 187: 38-41.
- Thomas C W, Primosch R E. Changes in incremental weight and well-being of children with rampant caries following complete dental rehabilitation. *Pediatr Dent* 2002; 24: 109-13.
- Anderson H K, Drummond B K, Thomson W M. Changes in aspects of children's oral-health-related quality of life following dental treatment under general anaesthetic. *Int J Paediatr Dent* 2004; 14: 317-25.
- Acs G, Pretzer S, Foley M, Ng M W. Perceived outcomes and parental satisfaction following dental rehabilitation under general anesthesia. *Pediatr Dent* 2001;23:419-23.
- White H, Lee J Y, Vann W F Jr. Parental evaluation of quality of life measures following pediatric dental treatment using general anesthesia. *Anesth Prog* 2003; 50: 105-10.
- Sheiham A. Dental caries affects body weight, growth and quality of life in pre-school children. *British dental journal.* 2006 Nov;201(10):625-6.
- Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: The Human and Economic Cost of Early Childhood Caries. *JADA* 2009;140(6):650-7.
- Graham DB, Webb MD, Seale NS. Pediatric emergency room visits for nontraumatic dental disease. *Pediatr Dent* 2000;22(2):134-40.
- Lin Y T, Lu P W. Retrospective study of pediatric facial cellulitis of odontogenic origin. *Pediatr Infect Dis J* 2006;25(4):339-42.
- Rawlins J. Cost and Treatment of Dental Caries-Related Cellulitis (master's thesis). Columbus, Ohio: The Ohio State University; 2008.
- Mazonakis M, Tzedakis A, Damilakis J, Gourtsoyiannis N. Thyroid dose from common head and neck CT examinations in children: is there an excess risk for thyroid cancer induction? *Eur Radiol* 2007;17(5):1352-57.
- Jimenez RR, Deguzman MA, Shiran S, Karrellas A, Lorenzo RL. CT versus plain radiographs for evaluation of c-spine injury in young children: do benefits outweigh risks? *Pediatr Radiol* 2008;38(6):635-44.
- Cravero JP, Blike GT, Beach M, et al. Incidence and nature of adverse events during pediatric sedation/anesthesia for procedures outside the operating room: report from the Pediatric Sedation Consortium. *Pediatrics* 2006;118(3):1087-96.
- Children's oral health: more vigilance needed—study shows effects on quality of life. *Dental UM* 2006;22(1):69-70.
- Easton JA, Landgraf JM, Casamassimo PS, Wilson S, Ganzberg S. Evaluation of a generic quality of life instrument for early childhood caries-related pain. *Community Dent Oral Epidemiol* 2008;36(5):434-40.
- Sheller B, Williams BJ, Hays K, Mancl L. Reasons for repeat treatment under general anesthesia for the healthy child. *Pediatr Dent* 2003;25(6):546-52.
- Friedlaender EY, Rubin DM, Alpern ER, Mandell DS, Christian CW, Alessandrini EA. Patterns of health care use that may identify young children who are at risk for maltreatment. *Pediatrics* 2005;116(6):1303-08.
- Valencia-Rojas N, Lawrence HP, Goodman D. Prevalence of early childhood caries in a population of children with history of maltreatment. *J Public Health Dent* 2008;68(2):94-101.