

# Effect of nursing caries on body weight in a pediatric population

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## SCIENTIFIC ARTICLES

### Abstract

*A review of anesthesia and sedation records of children with nursing caries was undertaken. The weights of these 115 children with otherwise noncontributory medical histories were compared to subjects matched for age, gender, race, and socioeconomic status. Nursing caries children were treated using either sedation or general anesthesia and received treatment for at least one pulpally involved tooth. Comparison subjects had no gross carious lesions. The average age for both the comparison and test groups was 3.2 years (SD = 1.01 and 0.98, respectively). While comparison patients weighed  $16.2 \pm 3.08$  kg, patients with nursing caries weighed only  $15.2 \pm 2.66$  kg. This difference was statistically significant ( $P < 0.005$ ). Of the nursing caries patients, 8.7% weighed less than 80% of their ideal weight, compared with only 1.7% of the comparison patients ( $P < 0.02$ ). Of nursing caries children, 19.1% were in the 10th percentile or less for weight, compared with only 7.0% of comparison subjects ( $P < 0.01$ ). The mean age of "low weight" patients with nursing caries was significantly greater than for patients at or above their ideal weights, indicating that progression of nursing caries may affect growth adversely. (Pediatr Dent 14:302-5, 1992)*

### Introduction

Nursing caries is a form of rampant decay of the primary dentition distinguished by the specificity of tooth surfaces involved and the rapid progression of carious lesions on surfaces that otherwise are considered to be at low risk for decay.<sup>1</sup> The interaction of host pathogenic oral microorganisms, fermentable carbohydrates, and susceptible tooth surfaces results in the carious lesions that characterize nursing caries. Additionally, inadequacy of the host's immunodefenses is suspected to play a role in the acquisition of carious lesions.<sup>2</sup>

The role of nutrition in the maintenance of health is well known. Nutritional deficiencies in the growing child, whether due to deprivation, overindulgence, or malabsorption syndromes may have significant impact on neural development and somatic growth.<sup>3</sup> The potential impact of eating disorders on overall health also has been established. Individuals afflicted with anorexia nervosa or bulimia may exhibit a wide range of findings consistent with self-induced starvation or purging. In addition to the effects on the dentition and oral mucosa, weight loss, hormonal disturbances, thermoregulatory and electrolyte balance disturbances resulting in cardiovascular and renal failure all have been observed.<sup>4,5</sup>

The constellation of feeding disorders resulting in nursing caries is currently most recognized for its impact on the dentition, rather than on overall health. Recently, a report of an otherwise healthy child with "failure to thrive" (FTT) demonstrated that severe dental decay can be a contributing factor.<sup>6</sup> FTT is a symptom observed in increasing numbers of children as more infants with serious medical problems are surviv-

ing the pre- and postnatal periods. Additionally, as parents institute feeding programs that are inappropriate, restrictive, and of questionable nutritional value, otherwise healthy children may evidence failure to thrive.<sup>6</sup>

FTT, a symptom whose designation usually is reserved for children younger than 3 years of age, has been reported to have a prevalence of 9.6%,<sup>7</sup> and to account for 5% of all pediatric hospital admissions.<sup>8</sup> By definition, FTT consists of:

1. Weight or height below the third percentile for age
2. Weight less than 80% of ideal weight for age
3. Failure to maintain a previously established growth pattern, and/or
4. Growth failure of unknown origin.<sup>6</sup>

Since comparative growth charts do not consider such factors as racial, environmental, and hereditary differences, the definition of FTT has shortcomings. Accurate evaluations may be made only after a thorough medical examination has been performed, and social and family histories, including the heights of parents, are obtained.

When a child's clinical presentation is consistent with FTT, the etiology must be investigated. FTT is categorized as being either organic, nonorganic, or mixed. Organic and mixed FTT require identification of an associated organic disease or condition, such as congenital heart disease or neurologic disorders. When all organic etiologies have been excluded and there are findings consistent with an adverse environment, such

as inadequate maternal information in caring for the infant, the diagnosis of nonorganic FTT may be made.<sup>5</sup>

The purpose of this study was to investigate the body weight of children with a specific feeding disorder — nursing caries — and to compare this population to a matched control group.

## Materials and Methods

A retrospective review of patient records was undertaken for all patients undergoing either sedation or general anesthesia to manage nursing caries, from 1987 to 1991. The study patients presented for care in a municipally funded dental department that supported an advanced education program in pediatric dentistry. Nursing caries was defined on the basis of the classical distribution of caries on the maxillary incisors, and was determined by an independent review of dental charts by two individuals. Only those patients who had otherwise noncontributory medical histories and no gross carious lesions were included in the study. Additionally, only those patients who had at least one pulpally involved tooth treated by extraction or appropriate pulpal therapy were included. Comparison subjects were obtained through the outpatient pediatrics department of the same institution. All comparison subjects were matched for age and gender by two individuals who were unaware of the weight of the test subjects.

Weights for test subjects were obtained from either the medical record or sedation record prepared on the day of dental treatment. Comparison subjects weights were obtained at the time of their visit to the pediatrics clinic and were recorded in the medical chart. Protocols for weight measurement were consistent for all patients.

All weights were recorded and charted on standard growth charts. Charting was performed by an experienced individual aware of the age, gender, and weight of the child, but not group status. Analysis of weight differences was performed utilizing a paired *t*-test. Analysis of Log Likelihood testing was performed on weight distribution counts assigned to weight percentiles. Wilcoxon's signed rank testing was performed on the differences in percentile weight assignments. Finally, for each weight category, the age of representative patients was compared, utilizing ANOVA and unpaired *t*-tests.

## Results

One hundred and fifteen patients with nursing caries met the inclusion criteria established for this study and were compared to 115 matched subjects.

### Age, Gender, Weight, and Percentile Weight Category (Table 1)

The mean age of both study and comparison groups was 3.2 years.

Sixty per cent of both test and comparison patients were male, while 40.0% were female.

The mean weight of comparison patients was 16.2 kg, while test subjects weighed 15.2 kg. This difference was significantly different ( $P < 0.005$ ).

The mean percentile weight category of comparison patients corresponded to mean weight between the 50th and 75th percentiles. The mean percentile weight for test subjects corresponded to mean weights between the 25th and 50th percentiles ( $P < 0.001$ ).

### Weight Distribution (Table 2, page 304)

Of patients with nursing caries, 8.7% presented with weights in the lowest percentile category, representing weights less than 80% of ideal weight, compared with

**Table 1. Mean age, gender, weight, and percentile weight category for nursing bottle and comparison patients**

	Nursing Caries Patients	Comparison Patients
Age (years)	3.2 ± 1.01	3.2 ± 0.98
Gender	60% male 40% female	60% male 40% female
Weight (kg)	15.2 ± 2.66*	16.2 ± 3.08
Percentile category	25th < x < 50th <sup>†</sup>	50th < x < 75th

\*  $P < 0.0051$ ,  $t = 2.87$ , 114 d.f., weight differences.

<sup>†</sup>  $P < 0.001$ , Wilcoxon's signed rank test.

only 1.7% of the comparison patients ( $P < 0.01$ ). Additionally, 19.1% of the nursing caries patients were categorized as being in less than the 10th percentile for weight, compared with only 7.0% of the control subjects ( $P < 0.01$ ). Overall, the weights of control patients were significantly more likely to be represented by the higher percentile categories ( $P < 0.005$ ).

### Age and Percentile Weight (Table 3, page 304)

The representative age of patients weighing less than the 10th percentile or more than the 90th percentile is illustrated in Table 3. Children with nursing caries weighing less than the 10th percentile were significantly older than the children weighing more than the 90th percentile ( $P < 0.01$ ). There were no significant age differences for the comparison children that represented these weight percentiles. Overall, age was significantly associated with the percentile weight. Nursing caries children in the lower percentile weight categories were significantly older than children at or above their ideal weight ( $P < 0.05$ ).

## Discussion

Our study suggests that the manifestations of nursing caries may go beyond pain and infection. Although

**Table 2. Percentile weight category distribution for nursing bottle and comparison patients**

Percentile Weight (%)	Percentile Category	Nursing Caries (%)	Comparison Patients (%)
x < 5th	1	10 (8.7)*	2 (1.7)
5th < x < 10th	2	12 (10.4)	6 (5.2)
10th < x < 25th	3	20 (17.4)	8 (7.0)
25th < x < 50th	4	20 (17.4)	29 (25.2)
50th < x < 75th	5	23 (20.0)	22 (19.1)
75th < x < 90th	6	14 (12.2)	24 (20.9)
x > 90th	7	16 (13.9)	24 (20.9)

*P* < 0.005, Analysis of Log Likelihood, Chi-square = 18.38, 6 d.f.

\* *P* < 0.02, weight category 1, nursing caries vs. control, Chi-square = 5.62, 1 d.f.

**Table 3. Age and percentile weight for nursing bottle and comparison patients**

Weight Percentile	Age (years)	
	Nursing Caries Patients	Comparison Patients
x < 10th	3.59 ± 1.05*	2.98 ± 1.20
x > 90th	2.76 ± 0.65	2.96 ± 0.94

*P* < 0.01, *t* = 2.78, 36 d.f., unpaired *t*-test.

pain and infection may be the primary effects of nursing caries, the condition also may affect general health. The potential for increased glucocorticoid production in response to pain, decreased growth hormone secretion in response to disturbed 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 nursing caries. In this study, children with nursing caries weighed significantly less than their matched controls. Additionally, as the age of children with nursing caries increased, the likelihood of their being represented in the lowest weight percentiles significantly increased.

The use of standardized growth curves when evaluating a specific patient or population must be undertaken with caution. The diagnosis of FTT is not ordinarily done on the basis of static information. Since standard growth curves may be inappropriate to use for specific populations, particular emphasis must be placed upon any alterations in previously established growth patterns. When groups are compared to one another, however, the static information does provide information regarding differences between the groups and standard curves may be used as reference points. There is little reason to believe that the population included in this study, children receiving comprehensive care in a municipally funded facility, are reflective

of the population used in establishing standard growth curves. However, the presence of an appropriately selected control group does offer the opportunity to compare both groups to the standard curves to investigate the potential effects of the dependent variable on this population.

The relationship between age and percentile weight is of particular interest. Although there was no age difference between control subjects in the bottom and top 10th weight percentiles, there was a significant age difference in the nursing caries group. Children with nursing caries who were in the bottom 10th percentile for weight were significantly older than control children at or above their

ideal weight. It is likely that younger children, with earlier stages of nursing caries, prior to the onset of pain and infection, continue their feeding habits, particularly the high carbohydrate intake associated with nursing caries. However, as the children age and caries progresses, the onset of pain and infection may alter eating habits. Decreased dietary intake secondary to pain can result in an alteration of established growth patterns.

Our study did not evaluate the chief complaint systematically at initial presentation. It is not known whether there is an association between age and chief complaint. It is probable that those children presenting with a chief complaint involving esthetics would be less likely to manifest later sequelae of nursing caries, if appropriate treatment were provided. Parents for whom esthetics is not an important consideration are more likely to present only when there is pain, alteration of sleeping or eating patterns, or when they have been referred by a pediatrician. At that point, the advanced state of untreated nursing caries may have begun to disrupt established growth patterns.

The association between age and percentile weight suggests that the timely treatment of nursing caries at its early stages may preserve general health, in addition to preventing pain and infection. The great challenge to the pediatric dentist remains the prevention of nursing caries. When this objective cannot be attained, the rationale for early diagnosis, as outlined by Goepferd,<sup>9, 10</sup> is strengthened. The maintenance of general health can be achieved through the early definitive treatment, with appropriate protection of the developing psyche.<sup>11</sup>

Future study evaluating potential alterations in growth patterns in nursing caries patients, both prior and subsequent to dental rehabilitation may offer additional evidence that nursing caries can contribute to failure to thrive and that appropriate treatment can promote general health.

Also, a careful assessment of the other forms of chronic infection (such as otitis media) that may be seen in patients with nursing caries, can help to clarify the role of the host's immunodefenses. Whether nursing caries is an independent entity or part of a subtle underlying susceptibility to infection, its prevention, early diagnosis, and early treatment must be a part of an overall health maintenance program.

## Conclusions

1. Children with nursing caries weighed significantly less than control children.
2. Children with nursing caries were significantly more likely to weigh less than 80% of their ideal weight, thereby satisfying one of the diagnostic criteria for FTT.
3. Children with nursing caries who were in the bottom 10th percentile for weight, were significantly older than those children at or above their ideal weight.

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1. Ripa LW: Nursing caries: a comprehensive review. *Pediatr Dent* 10:268-82, 1988.
2. Hajishengallis G, Russell MW: Inhibition of streptococcus mutans Ag I/II binding to saliva coated hydroxylapatite by S-IgA antibodies. *J Dent Res* 71:147 (Abst 330), 1992.
3. Root AW: Failure to thrive and problems of growth. In *The Neonate*, DS Young, JM Hicks eds. New York: John Wiley and Sons, 1976, pp 157-68.
4. Gross KBW, Brough KM, Randolph PM: Eating disorders: anorexia and bulimia nervosas. *ASDC J Dent Child* 53:378-81, 1986.
5. Brady WF: The anorexia nervosa syndrome. *Oral Surg* 50:509-16, 1980.
6. Elice CE, Fields HW: Failure to thrive: review of the literature, case reports, and implications for dental treatment. *Pediatr Dent* 12:185-89, 1990.
7. Mitchell WG, Gorrell RW, Greenberg RA: Failure to thrive: a study in a primary care setting: epidemiology and follow-up. *Pediatrics* 65:971-77, 1980.
8. Levine MI: Failure to thrive: introduction. *Pediatr Ann* 7:737-42, 1978.
9. Goepferd SJ: Infant oral health: a rationale. *ASDC J Dent Child* 53:257-60, 1986.
10. Goepferd SJ: Infant oral health: a protocol. *ASDC J Dent Child* 53:261-66, 1986.
11. American Academy of Pediatric Dentistry: Protection of the developing child's psyche. *American Academy of Pediatric Dentistry, Reference Manual*, p 31, 1991-92.

## Future Annual Session Sites

May 27-June 1, 1993	Hyatt Regency Crown Center and Westin Crown Center, Kansas City, MO
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