

# Knowledge of Oral and Physical Manifestations of Anorexia and Bulimia Nervosa Among Dentists and Dental Hygienists

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*Abstract:* Despite the crucial role oral health care providers can have in the early identification of eating disorders and the referral and case management of patients with these disorders, little is known concerning their knowledge of oral complications of these disorders. The purpose of this study was to determine the knowledge among dentists and dental hygienists concerning the oral and physical manifestations of eating disorders. Employing a randomized cross-sectional study, data were collected from 576 dentists and dental hygienists randomly selected from the American Dental Association and the American Dental Hygienists' Association. Results indicated low scores concerning knowledge of oral cues, physical cues of anorexia, and physical cues of bulimia among study participants. More dental hygienists than dentists correctly identified oral manifestations of eating disorders ( $p=.001$ ) and physical cues of anorexia ( $p=.010$ ) and bulimia ( $p=.002$ ). As the first health professional to identify oral symptoms of eating disorders, the most important task of the dental care provider when identifying oro-dental signs of eating disorders is to ensure that the patient receives treatment. Implications for education include the addition of conceptual, procedural, and skill-based curricula objectives addressing etiologic assessment and patient communication—thus increasing behavioral capacity for delivery of restorative care and patient referral.

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The role of the oral health practitioner in the screening and diagnosis of systemic health problems by way of oral and maxillofacial manifestations is well established.<sup>1,2</sup> Although considered a psychological disorder, the oral and maxillofacial problems associated with eating disorders have been well reported in the literature.<sup>3-15</sup> Given that dentists and dental hygienists may be the first health care providers to assess the physical and oral effects of anorexia nervosa and bulimia nervosa, they may be the key health care providers in the secondary prevention of eating disorders.<sup>16-18</sup>

Secondary prevention of eating disorders consists of reducing the rates of the development of a full-blown eating disorder through early identification, referral, and treatment.<sup>19</sup> Oro-dental problems associated with anorexia nervosa and bulimia nervosa can be manifested as early as six months following consistent disordered eating behaviors such as ca-

loric restriction and vomiting.<sup>20</sup> Failure by the dental care provider to identify these oral manifestations may lead to more serious systemic problems and irreversible damage to the oral cavity, in addition to reducing the likelihood of early treatment and case management.<sup>18</sup> Therefore, examination of the mouth, face, and general appearance of the patient by the dentist and dental hygienist is a crucial first step in the secondary prevention of eating disorders and associated systemic conditions.

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## Manifestations of Disordered Eating

The medical problems associated with anorexia and bulimia nervosa (dehydration, electrolyte abnormalities, abnormal heart function, GI compli-

cations, endocrine abnormalities, osteopenia, and increased risk of fertility problems) have been well described in the literature for many years.<sup>21-22</sup> However, the effects of the behaviors associated with eating disorders on the teeth and oral tissues were not identified until more recently.<sup>15</sup> Oral manifestations of eating disorders including erosion patterns in teeth have been documented frequently.<sup>3-4,6-8,10-15</sup> There are two general types of oro-dental effects of eating disorders: intra-oral and extra-oral.<sup>5</sup>

Intraoral effects include dental erosion, traumatized oral mucosal membranes and pharynx, dry mouth, dental caries, periodontal disease, and soft tissue lesions. More specifically, dental erosion involves lingual erosion on the palatal surfaces of the maxillary teeth with a smooth, glossy appearance.<sup>18</sup> Also known as perimylolysis, this erosion is characterized by loss of enamel with rounded margins, a notched appearance of the incisal surfaces of the anterior teeth, amalgam restorations that appear as raised islands, and loss of contours on unrestored teeth.<sup>18</sup> In addition, erosion can cause increased tooth sensitivity to touch and cold temperature.<sup>1</sup> Self-induced vomiting may cause trauma to the soft palate and pharynx. Soft tissue lesions such as angular cheilitis, candidosis, glossitis, and oral mucosal ulceration may also occur, stemming from nutritional deficiencies.<sup>5,16</sup>

Research findings are inconsistent related to the impact of eating disorders upon the prevalence of dental caries and periodontal disease.<sup>23-25</sup> The differences in the prevalence of caries resulting from disordered eating may stem from an individual's oral hygiene, the cariogenicity of the diet, malnutrition, genetic predisposition, fluoride experience during tooth development, and ingestion of certain types of medication.<sup>18</sup> However, distinguishing characteristics among disordered eating patients regarding caries include a predisposition to cervical caries and/or a leathery lesion of dentine leaving large areas of enamel undermined.<sup>5</sup>

Oral manifestations differ depending on the specific behaviors associated with various disorders. Lingual tooth erosion, tooth sensitivity, xerostomia, complaining of a dry mouth, dental caries, periodontal disease, enlarged parotid glands, and poor oral hygiene have all been identified as oral complications of bulimia nervosa.<sup>1</sup> However, xerostomia, dry mouth, enlarged parotid glands, and atrophic mucosa have also been associated with behaviors due to anorexia nervosa.<sup>1</sup>

Although clinical diagnosis of anorexia nervosa (AN) and bulimia nervosa (BN) differ, both disorders share physical manifestations with regard to dryness of skin, arrhythmia, and cracked and/or dry nails. Medical problems can manifest in the following systems and organs: blood, cardiovascular, central nervous, endocrine, gastrointestinal, musculoskeletal, renal, and the liver.<sup>3,16</sup>

Additional extra-oral manifestations associated with anorexia include lanugo (growth of fine body hair) and loss of head hair as a result of malnutrition and loss of body fat.<sup>16</sup> Those manifestations in patients with anorexia could also include weight changes ranging from being at a normal weight to being extremely thin in severe cases.<sup>26</sup> Extra-oral signs manifested by behaviors associated with bulimia nervosa include parotid gland enlargement,<sup>5,18</sup> growth or lipoma on extremities, and erosion or inflammation of the fingernail if the finger is used to induce vomiting.<sup>2</sup> Those patients with BN may also exhibit weights ranging from average to about ten pounds overweight.<sup>20,35</sup>

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## Knowledge of Oro-Dental Manifestations and Program Curricula

Despite the crucial role oral health practitioners have in early identification, referral, and case management, little is known regarding their knowledge of eating disorders and the associated physical and oral complications. Harwood and Newton<sup>27</sup> assessed 100 dentists regarding their knowledge of the oral signs of BN. With respect to the dentists' knowledge of the oral manifestations of disordered eating, 91 percent correctly reported enamel erosion, and 66 percent correctly reported dentin hypersensitivity as probable signs. Although parotid dysfunction is a common oral manifestation of disordered eating, 32 percent stated it was not likely to be a sign of BN, and 52 percent reported that they did not know. Fifty-one percent of the dentists reported increased dental caries as a possible sign; however, only 29 percent reported xerostomia, and 19 percent reported parotid enlargement as possible signs. The authors concluded that overall knowledge of the oral manifestations of disordered eating was low among this small sample of dentists.

DiGiacchino et al.<sup>28</sup> assessed thirty-seven dental practitioners (eighteen dentists and nineteen dental hygienists) regarding their knowledge about the physical and oral signs of eating disorders. Most dentists and dental hygienists were aware of the health problems associated with disordered eating (menstrual/reproductive, GI complications, dehydration, anemia, electrolyte imbalance, and esophageal perforations). However, 26.3 percent of hygienists were “not sure” about osteoporosis as an associated health problem; 22.2 percent of dentists and 15.8 percent of hygienists were “not sure” about cardiovascular complications associated with eating disorders; and 21.1 percent of hygienists were “not sure” of the development of periodontal disease. Both dentists (50 percent) and hygienists (36.8 percent) were “not sure” of cardiomyopathy in relation to eating disorders, and 66.7 percent of dentists and 57.9 percent of hygienists were not aware of Russell’s finger (calluses formed on knuckles as a result of self-induced vomiting).

Regarding the oral manifestations of eating disorders, DiGiacchino et al.<sup>28</sup> found that many dentists and dental hygienists either were not sure or did not know the dental and oral complications of disordered eating. Dental care providers recognized the following dental signs and symptoms of eating disorders: 100 percent of both dentists and hygienists identified erosion of dental enamel; 88.9 percent of dentists and 94.7 percent of hygienists indicated dental caries; 94.4 percent of dentists and 89.5 percent of hygienists identified tooth sensitivity; 72.2 percent of dentists and 84.4 percent of hygienists recognized xerostomia; and 94.4 percent of dentists and 78.9 percent of hygienists indicated cheilosis.

However, some questions were included in that study as detractors to identify the extent of knowledge regarding the oral/dental problems associated with eating disorders. The answers to these detractors were either fully incorrect (e.g., attrition on the teeth) or incorrect with regard to the location of the disorder in the oral cavity (i.e., enamel erosion of lingual surface of mandibular anterior teeth). Survey respondents erroneously identified the clinical findings as symptoms of eating disorders: 94.4 percent of dentists and 68.4 percent of hygienists indicated attrition on the teeth; 55.6 percent of dentists and 68.4 percent of hygienists indicated elongated papillae of the tongue; 57.8 percent of dentists and 68.4 percent of hygienists indicated enamel erosion of both buccal and lingual cervical third of posterior teeth; 61.1 percent of dentists and 57.9 percent of

hygienists indicated enamel erosion of the lingual surface of maxillary and mandibular anterior teeth only; 88.9 percent of dentists and 84.2 percent of hygienists indicated enamel erosion of lingual surface of posterior teeth; 66.7 percent of dentists and 73.3 percent of hygienists indicated enamel erosion of lingual surface of mandibular anterior teeth; 72.2 percent of dentists and 68.4 percent of hygienists indicated pronounced appearance of filiform papillae; and 44.4 percent of dentists and 42.1 percent of hygienists indicated abrasion of facial surface of teeth.<sup>28</sup> Findings such as these suggest that oral health practitioners may not be well versed in the intra- and extra-oral of disordered eating, which may limit their ability to engage in secondary prevention behaviors.

Gross et al.<sup>29</sup> surveyed twenty-seven accredited dental programs and 137 accredited dental hygiene programs in the United States and Canada to assess the status of dental and dental hygiene programs regarding inclusion of information on general and oral complications of bulimia and anorexia nervosa. These authors found 41 percent of dental programs and 15 percent of dental hygiene programs reported no instruction of general and oral characteristics of anorexia and bulimia nervosa. Among the 59 percent of dental schools and 85 percent of dental hygiene schools who reported including eating disorders in their curricula, the average time spent on this issue was reported to be less than one hour in duration (twenty-four minutes in the dental programs and fifty-two minutes in the dental hygiene programs). More importantly, this study found that, on average, dental hygiene programs reported spending only fifteen minutes on oral complications of eating disorders and dental programs reported spending only eleven minutes on oral complications.

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## Theoretical Framework and Purpose of This Study

The Health Belief Model is useful for assessment of behavioral inactivity or noncompliance.<sup>30</sup> This model suggests that the adoption of prevention and screening behaviors (such as identification of oral manifestations of eating disorders, oral treatment, and referral) will occur if that person: 1) believes that the prevention behavior will benefit the reduction of the health problem (i.e., oral health and systemic health); 2) has a positive expectation that by performing the prevention behavior they will help

to avoid a negative health condition (i.e., damage to the oral cavity and physical health); and 3) believes that he or she can successfully perform the preventive health behavior (i.e., identification of oral manifestations of eating disorders).

Likelihood of adoption of the prevention or screening behavior is dependent on individual perceptions (perceived susceptibility and perceived seriousness of the health issues); modifying factors including demographic characteristics, knowledge of health issue and prevention behaviors, and cues to action; and perceived benefits of adoption versus perceived barriers.<sup>30</sup> Given that knowledge is a modifying factor in the development of perceived seriousness and perceived susceptibility and a cue to action (i.e., knowledge of oral and physical manifestations of eating disorders may cue the oral health provider in providing prevention behaviors), knowledge of oral and physical cues of disordered eating behaviors were assessed.

The purpose of our study was to assess the knowledge among dentists and dental hygienists with regard to the intra-oral and extra-oral (physical) signs of disordered eating. Knowledge gained from this study will serve as a foundation for the development of effective curricula to increase the number of dentists and dental hygienists involved in patient assessment, referral, and case management.

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## Methods

This study was part of a larger initiative designed to assess secondary prevention behaviors among dental practitioners regarding disordered eating. Employing a randomized cross-sectional study, data were collected via a self-administered paper-pencil questionnaire mailed to subjects. Approval for this study was granted by the principal investigator's Institutional Review Board. Procedures were followed in accordance with the ethical standards of the Institutional Review Board and the National Institutes of Health in accordance with the Helinski Declaration of 1975 as revised in 1983.

Participants consisted of 1,000 dentists randomly selected from the American Dental Association<sup>31</sup> membership and 1,000 dental hygienists randomly selected from the American Dental Hygienists' Association<sup>32</sup> membership. For a confidence level of 95 percent and a margin of error of  $\pm 5$  percent, a sample size of 385 was determined to be the minimum sample size for statistical significance.<sup>33</sup>

Two hundred and seventy-four randomly selected participants (111 dentists and 163 dental hygienists) were ineligible to participate due to incorrect address or because they were currently not practicing as a dentist or dental hygienist, leaving a total of 1,726 eligible participants. Out of that 1,726 eligible dental practitioners selected to participate in the study, 576 questionnaires were returned, yielding an overall response rate of 33.4 percent. More specifically, of the 889 randomly selected dentists, 207 responded to the survey resulting in a response rate of 23.3 percent. Of the 837 eligible dental hygienists, 369 responded to the survey resulting in a 44 percent response rate. These response rates are reasonable for this type of survey.<sup>34</sup>

Each randomly selected dentist and dental hygienist at first contact received an invitational letter explaining the study, a consent form, questionnaire, and prepaid return envelope. The invitational letter and consent form were prepared by the principal investigator following university Institutional Review Board protocol. Each participant was issued a code number used to track responses. To increase the response rate, a follow-up letter with an additional consent form, questionnaire, and prepaid return envelope were mailed to nonresponders three weeks after the initial survey was mailed. For those subjects who did not respond to the initial or second mailing, a third reminder postcard was mailed three weeks after the initial follow-up.

The three-part paper-pencil twenty-seven-item questionnaire included: 1) current practice with regard to secondary prevention of eating disorders; 2) health beliefs (perceived seriousness of anorexia nervosa, perceived seriousness of bulimia nervosa, knowledge of physical manifestations of anorexia nervosa, knowledge of physical manifestations of bulimia nervosa, and knowledge of oral manifestations of eating disorders); and 3) demographic variables (gender, race, age, occupation, and years of practice).

Knowledge of oral manifestations of eating disorders was measured with a nine-item knowledge assessment. Scores of seven or more correct were regarded as having a high level of knowledge concerning oral manifestations, and scores of six or less were regarded as having a low level of knowledge. Knowledge of physical manifestations of anorexia nervosa and knowledge of physical manifestations of bulimia nervosa were each measured with an eight-item knowledge assessment. Scores of six or more correct were regarded as having a high level of



knowledge concerning oral manifestations, and scores of five or less were regarded as having a low level of knowledge.

Data were analyzed using SPSS V.11. Descriptive statistics, mean, standard deviation (for interval and ratio data), frequency, and percent (for nominal and ordinal data) were applied to appropriate variables. To test for significant differences between hygienists and dentists, Chi-square was utilized.

## Results

Table 1 depicts the demographics of the survey respondents. Participants included 36 percent dentists (n=207; 80.2 percent male, 19.8 percent female) and 64 percent dental hygienists (n=369; 1.4 percent male, 98.6 percent female). The average age of the dentists was 49.3 years and 41.31 years for dental hygienists. On average, dentists reported a greater number of years in professional practice than dental hygienists (28.18 years vs. 16.38 years). The majority of dental practitioners reported practicing in the south/southeast, midwest, and southwest regions of the United States, followed by approximately 15 percent reporting practicing in the northeast and 13 percent in the northwest regions.

Table 2 depicts the frequency and percentage of dentists and dental hygienists who correctly/incorrectly identified oral manifestations of disordered

eating behaviors. The majority of both dentists and dental hygienists correctly identified dentin hypersensitivity (90.8 percent and 91.6 percent respectively) and enamel erosion of lingual and occlusal surfaces of maxillary and posterior teeth (92.3 percent and 83.2 percent respectively). In addition, 76 percent of dentists and dental hygienists combined correctly identified gingival inflammation. However, only 71 percent of both dentists and dental hygienists correctly identified xerostomia, and 69 percent correctly identified enamel erosion of the lingual surfaces of the mandibular anterior teeth as oro-dental signs. Relatively few dentists and dental hygienists correctly identified parotid enlargement (29.5 percent dentists, 50.7 percent dental hygienists) and parotid dysfunction (30.9 percent dentists, 49.9 percent dental hygienists).

With regard to dental caries and periodontal disease, “unsure” would have been the correct response as there is conflicting information in the literature with regard to these manifestations being a result of disordered eating behaviors. However, 81.2 percent of dentists and 92.1 percent of dental hygienists indicated dental caries as a sign, and 46.4 percent of dentists and 44.7 percent of dental hygienists indicated periodontal disease as an oral manifestation.

Table 3 depicts differences between dentists and dental hygienists regarding knowledge of the oral manifestations of eating disorders. Only 16 percent of dentists and 28 percent of dental hygienists had scores that were categorized as indicative of high knowledge of oral cues associated with eating disorders. Chi-square analysis revealed a statistically significant difference (p=.001) between dentists and dental hygienists with a greater number of dental hygienists correctly identifying oral cues of disordered eating behaviors.

Table 4 represents frequencies and percentages of dental providers who correctly/incorrectly identified physical cues of behaviors associated with AN. The majority of dentists and dental hygienists correctly identified being extremely thin (64.2 percent and 96.7 percent respectively), arrhythmia (54.6 percent and 76.2 percent respectively), cracked dry nails (52.2 percent and 78.3 percent respectively), and loss

**Table 1. Demographic characteristics for all dental practitioners (n=576)**

Variable	Dentists (n=207) f (%)	Dental Hygienists (n=369) f (%)	Total (n=576) f (%)
<b>Gender*</b>			
Male	162 (80.2)	5 (01.4)	167 (29.3)
Female	40 (19.8)	362 (98.6)	402 (70.7)
<b>Region of Practice†</b>			
Northeast	19 (9.7)	62 (17.8)	81 (14.9)
South/Southeast	56 (28.6)	66 (18.3)	122 (21.9)
Midwest	46 (29.1)	77 (22.2)	123 (24.6)
Southwest	42 (18.4)	108 (29.2)	150 (25.7)
Northwest	33 (12.6)	47 (12.5)	80 (12.8)
Variable	mean±sd	mean±sd	mean±sd
Age	49.33±11.21	41.31±10.20	44.19±11.24
Years of Professional Practice	28.18±11.44	16.38±11.68	19.31±12.18

\*Seven participants did not respond to question regarding gender.

†Twenty participants did not respond to question regarding region of practice.

of body hair (49.3 percent and 64.0 percent respectively) as cues of AN. Only 28 percent of dental practitioners correctly identified lanugo, and only 7 percent correctly identified normal weight as a physical characteristic of anorexia nervosa. Additionally, 89 percent of dental practitioners correctly stated that obesity was not a sign; however, only 7 percent correctly identified Russell's finger as not being characteristic of AN.

Knowledge of physical cues of behaviors associated with BN are also depicted in Table 4. Few dental practitioners correctly identified Russell's finger (6 percent) and arrhythmia (45 percent) as physical signs of BN. The majority of dental practitioners *incorrectly* identified loss of body hair (90.3 percent dentists, 79.9 percent dental hygienists), lanugo (91.3 percent dentists, 80.8 percent dental hygienists), and being extremely thin (74.9 percent dentists, 53.7 percent dental hygienists) as signs of BN.

Table 3 represents differences in knowledge of physical cues of AN and BN by dental practitioners. Although the majority of dentists and dental hygienists were categorized with low scores with regard to physical cues of AN (87.4 percent and 78.9 percent respectively) and physical cues of BN (99.5 percent and 94.3 percent respectively), Chi-square analysis revealed statistically significant differences among dental practitioners with more dental hygienists than dentists correctly identifying physical cues of AN ( $p=.010$ ) and BN ( $p=.002$ ).

## Discussion

The oro-dental and physical manifestations associated with eating disorders have been well reported in the literature.<sup>3-15</sup> Although eating disorders are considered psychological disorders, the oral health practitioner may be the first health care provider to assess the oral and physical effects of disor-

**Table 2. Knowledge of oral cues of eating disorders (dentists n=207; dental hygienists n=369)**

Oral Manifestation	Practitioner	Not a sign f (%)	Unsure f (%)	A sign f (%)
Dentin hypersensitivity	Dentists	4 (1.9)	15 (7.2)	188 (90.8)
	Hygienists	7 (1.9)	24 (6.5)	338 (91.6)
Dental caries*	Dentists	21 (10.1)	18 (8.7)	168 (81.2)
	Hygienists	14 (3.8)	15 (4.1)	340 (92.1)
Xerostomia	Dentists	13 (6.3)	80 (38.6)	114 (55.1)
	Hygienists	9 (2.4)	66 (17.9)	294 (79.7)
Parotid enlargement	Dentists	10 (4.8)	136 (65.7)	61 (29.5)
	Hygienists	9 (2.4)	173 (46.9)	187 (50.7)
Parotid dysfunction	Dentists	9 (4.3)	134 (64.7)	64 (30.9)
	Hygienists	6 (1.6)	179 (48.5)	184 (49.9)
Enamel erosion of lingual and occlusal surfaces of maxillary posterior teeth	Dentists	9 (4.3)	7 (3.4)	191 (92.3)
	Hygienists	35 (9.5)	27 (7.3)	307 (83.2)
Enamel erosion of lingual surface of mandibular anterior teeth	Dentists	42 (20.3)	29 (14.0)	136 (65.7)
	Hygienists	73 (19.8)	34 (9.2)	262 (71.0)
Periodontal disease*	Dentists	42 (20.3)	69 (33.3)	96 (46.4)
	Hygienists	72 (19.5)	132 (35.8)	165 (44.7)
Gingival inflammation	Dentists	13 (6.3)	41 (19.8)	153 (73.9)
	Hygienists	15 (4.1)	67 (18.2)	287 (77.8)

\*Literature inconsistent with regard to dental caries and periodontal disease as manifestations of disordered eating behaviors; thus, correct answer would be "unsure."

dered eating behaviors. Due to the complexity of these disorders, successful secondary prevention calls for knowledge and understanding of oral and physical manifestations. As part of a larger initiative examining the role of the dental practitioner in the secondary prevention of disordered eating, the purpose of this study was to determine the extent to which oral health practitioners know the oral and physical cues of disordered eating behaviors.

The results of this study indicate that the majority of oral health providers had low knowledge of oral cues associated with eating disorders, but dental hygienists were more likely to correctly identify the oral manifestations. This study supports the previous work of Harwood and Newton<sup>27</sup> and DiGioacchino et al.<sup>28</sup> in that although a large percentage of dental practitioners correctly identified erosion and dentin hypersensitivity as signs, the majority also *incorrectly* identified dental caries as manifestations of disordered eating behaviors. This study also supports the findings of Harwood and Newton<sup>27</sup> in that a large number of dentists were not aware of xerostomia, parotid enlargement, and parotid dysfunction as signs of disordered eating. Associated

**Table 3. Differences in knowledge of oral and physical cues of eating disorders among dentists and dental hygienists (dentists n=207, dental hygienists n=369)**

Variable	Practitioner	Knowledge Scores		p-value
		Low f (%)	High f (%)	
Oral cues regarding disordered eating behavior†	Dentists	174 (84.1)	33 (15.9)	.001*
	Hygienists	265 (71.8)	104 (28.2)	
Physical cues of anorexia nervosa‡	Dentists	181 (87.4)	26 (12.6)	.010*
	Hygienists	291 (78.9)	78 (21.1)	
Physical cues of bulimia nervosa‡	Dentists	206 (99.5)	1 (.05)	.002*
	Hygienists	348 (94.3)	21 (5.7)	

\*Tests are significant if  $p < .05$ .

†Sum score between 0-9; scores from 0-6 indicate low knowledge; scores between 7-9 indicate high knowledge.

‡Sum score between 0-8; scores from 0-5 indicate low knowledge; scores between 6-8 indicate high knowledge.

with these findings concerning lack of knowledge with regard to xerostomia, parotid enlargement, and dental caries are the findings by Gross et al.,<sup>29</sup> who reported that, in their study of dental and dental hygiene programs, fewer than 70 percent of dental programs specifically covered xerostomia, caries, parotid enlargement, and perimyololysis.

Both dentists and dental hygienists who responded to the survey demonstrated low levels of knowledge about physical manifestations of AN and BN, especially lanugo among AN and Russell's fin-

ger among BN. These findings are similar to the results of DiGiacchino et al.<sup>28</sup> in that very few oral health practitioners identified these manifestations as results of disordered eating behaviors. In addition, the majority of dental practitioners in this study did not correctly identify "normal weight" as a sign of both AN and BN. This finding is noteworthy in that those with BN exhibit weights that are at normal to about ten pounds overweight, while becoming extremely thin occurs only after long periods of AN.<sup>35</sup> These results point toward a possible biased

**Table 4. Knowledge of physical cues of anorexia nervosa and bulimia nervosa among dentists and dental hygienists (dentists n=207, dental hygienists n=369)**

Variable	Practitioner	Anorexia		Bulimia	
		Correct f (%)	Incorrect f (%)	Correct f (%)	Incorrect f (%)
Normal weight	Dentists	18 (8.7)	189 (91.3)	97 (46.9)	110 (53.1)
	Hygienists	23 (6.2)	346 (93.8)	256 (69.4)	113 (30.6)
Obesity*†	Dentists	178 (86.0)	29 (14.0)	118 (57.0)	89 (43.0)
	Hygienists	337 (91.3)	32 (8.7)	166 (45.0)	203 (55.0)
Extremely thin†	Dentists	195 (69.2)	12 (5.8)	52 (25.1)	155 (74.9)
	Hygienists	357 (96.7)	12 (3.3)	171 (46.3)	198 (53.7)
Lanugo†	Dentists	34 (16.4)	173 (83.6)	18 (8.7)	189 (91.3)
	Hygienists	126 (34.1)	243 (65.9)	71 (19.2)	298 (80.8)
Arrhythmia	Dentists	113 (54.6)	94 (45.4)	74 (35.7)	113 (64.3)
	Hygienists	281 (76.2)	88 (23.8)	183 (49.3)	187 (50.7)
Cracked/dry nails	Dentists	108 (52.2)	99 (47.8)	66 (31.9)	141 (68.1)
	Hygienists	278 (75.3)	91 (24.7)	195 (52.8)	174 (47.2)
Loss of body hair†	Dentists	102 (49.3)	105 (50.7)	20 (9.7)	187 (90.3)
	Hygienists	236 (64.0)	133 (36.0)	74 (20.1)	295 (79.9)
Growth or lipoma on extremities*	Dentists	12 (5.8)	195 (94.2)	8 (3.9)	199 (96.1)
	Hygienists	30 (8.1)	339 (91.9)	26 (7.0)	343 (93.0)

\*The correct response is that they are *not* associated as a sign or symptom of AN.

†The correct response is that they are *not* associated as a sign or symptom of BN.

perception of the physical characteristics of both AN and BN. As such, changing the visual perceptions of dental hygienists and dentists with regard to those who have eating disorders may enable them to make the link between oral and physical manifestation, which will assist proper etiologic assessment of oro-dental problems.

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## Conclusions

Early detection and intervention play a key role in the recovery of eating disorders. Dental practitioners are instrumental in the recovery process as they are often the first health professionals to identify signs and symptoms of disordered eating. The oral and physical manifestations are recognizable and follow consistent patterns. However, it is important to note that the type of erosion must be differentiated from other types of erosion and processes that are unrelated to behaviors associated with eating disorders. Additionally, biased perceptions with regard to patient susceptibility may inhibit accurate etiologic assessment. Consequently, oral health practitioners must be knowledgeable and skilled to assess patients' signs and symptoms.

The assessment of possible disordered eating behaviors among patients involves knowledge of both oral and physical manifestations. To increase the adoption of secondary prevention specific to eating disorders among dental practitioners, the results of this study suggest that greater emphasis should be placed on increasing recognition of oro-dental and physical cues of disordered eating behaviors. Dental and dental hygiene curricula should devote both didactic and clinical instruction with regard to identification of oral manifestations of eating disorders, patient approach, oral treatment, and patient referral. As supported by the work of Gross et al.,<sup>29</sup> many dental care providers may be inadequately prepared to identify, treat, and refer patients with eating disorders. Implications for curricula and teaching include increasing the number of dental and dental hygiene programs that include anorexia and bulimia in their curriculum. Additionally, the allocation of instruction time with regard to the prevalence of eating disorders, etiology of eating disorders, physical characteristics, psychological characteristic, oral manifestations, oral treatment modalities, and patient referral should be increased via both didactic and clinical instruction. Conceptual objectives may in-

clude: 1) knowledge of psychological characteristics of those with eating disorders; 2) the interrelationship between eating disorders, other co-morbid disorders, and oro-dental manifestations; and 3) knowledge of the oral and physical manifestations of eating disorders. Procedural curricula objectives should be geared toward the development of the oral health practitioners' skill with regard to differentiating eating disorder specific signs and symptoms from other types of erosion, techniques for the assessment of physical cues of eating disorders, and triangulation of oral and physical cues with patient health history and patient/provider communication. These objectives should be incorporated within the dental and dental school curriculum as well as continuing education workshops via didactic and experiential modes of teaching.

Once equipped with factual, conceptual, and procedural knowledge, the dental practitioner is prepared for accurate etiologic assessment via triangulation of oral and physical cues of eating disorders with information gathered from the patient's health history and patient/provider communication. When appropriately identified as oral manifestations that result from behaviors associated with eating disorders, the dental practitioner can provide pre-restorative care (protecting exposed dental faces, desensitization of exposed dentin, and decreasing solubility of enamel and dentin), restorative care, and referral for treatment.<sup>13</sup> These secondary prevention behaviors provided by the dental practitioner provide mechanisms for decreasing the potential for further damage to the teeth and oral cavity as well as improving the patient's quality of life.

Further theory-based research is needed to explore precursors influencing adoption of secondary prevention specific to eating disorders by dental care providers. The identification of these factors will facilitate the development of enhanced dental and dental hygiene curriculum and continuing education, thereby increasing the number of dental practitioners consistently engaged in secondary prevention. In addition, research with regard to the most effective methods of increasing oral health care providers' knowledge and self-efficacy with regard to secondary prevention of eating disorders is needed.

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## REFERENCES

1. Little JW. Eating disorders: dental implications. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;93:138-43.



2. Bouquot JE, Seime RJ. Bulimia nervosa: dental perspectives. *Aesth Dent* 1997;9:655-64.
3. Lemberg R, ed. *Eating disorders: a reference sourcebook*. Phoenix: Oryx Press, 1999:7-9,105-92.
4. Hazelton LR, Faine MP. Diagnosis and dental management of eating disorder patients. *Int J Prosthodont* 1996;9(1):65-73.
5. Robb ND, Smith BGN. Anorexia and bulimia nervosa (the eating disorders): conditions of interest to the dental practitioner. *J Dent* 1996;24(1-2):7-16.
6. Mitchell JE. Medical complications of bulimia nervosa. In: Brownell KD, Fairburn CG, eds. *Eating disorders and obesity: a comprehensive handbook*. New York: The Guilford Press, 1995:271-8.
7. Goldbloom DS, Kennedy SH. Medical complications of anorexia nervosa. In: Brownell KD, Fairburn CG, eds. *Eating disorders and obesity: a comprehensive handbook*. New York: The Guilford Press, 1995:266-70.
8. Atshuler BD, Deshow PC, Waller DA, Hardy BW. An investigation of the oral pathologies occurring in bulimia nervosa. *Int J Eat Disord* 1990;9(2):191-9.
9. Brewer TL. The necessity for dental awareness of the presenting signs and symptoms of bulimia nervosa. *Oklahoma Dent Assoc J* 1987;Summer:24-7.
10. Gross KBW, Brough DM, Randolph, PM. Eating disorders: anorexia and bulimia nervosa. *J Dent Child* 1986;September-October:378-81.
11. Abrams RA, Ruff JC. Oral signs and symptoms in the diagnosis of bulimia. *J Am Dent Assoc* 1986;113:761-3.
12. Harrison JL, George LA, Cheatham JL. Therapies for reduction of dental destruction resulting from the manifestations of bulimia nervosa. *Texas Dent J* 1984;July:12-5.
13. Kleir DJ, Aragon SB, Averbach RE. Dental management of the chronic vomiting patient. *J Am Dent Assoc* 1984;108:618-21.
14. Wolcott AR, Yager Y, Gordon G. Dental sequelae to the binge purge syndrome (bulimia: report of cases). *J Am Dent Assoc* 1984;109:723-5.
15. Stege P, Visco-Dangler L, Rye L. Anorexia nervosa: review including oral and dental manifestations. *J Am Dent Assoc* 1982;104:648-52.
16. Milosevic A. Eating disorders and the dentist. *Br Dent J* 1999;186(3):109-13.
17. Schmidt U, Treasure J. Eating disorders and the dental practitioner. *Eur J Prosthodont Restorative Dent* 1997;5(4):161-7.
18. Studen-Pavlovich D, Elliott M. Eating disorders in women's oral health. *Dent Clin North Am* 2001;45(3):491-511.
19. Piran N. Prevention of eating disorders. In: Fairburn CG, Brownell KD, eds. *Eating disorders and obesity: a comprehensive handbook*. New York: The Guilford Press, 2002:367-76.
20. National Eating Disorders Association. Eating disorders information. At: [www.nationaleatingdisorders.org](http://www.nationaleatingdisorders.org). Accessed: July 20, 2004.
21. Cavanaugh CJ, Lemberg R. What we know about eating disorders: facts and statistics. In: Lemberg R, ed. *Eating disorders: a reference sourcebook*. Phoenix: Oryx Press, 1999:7-11.
22. Pomeroy C, Mitchell JE. Medical complications of anorexia nervosa and bulimia nervosa. In: Brownell KD, Fairburn CG, eds. *Eating disorders and obesity: a comprehensive handbook*. New York: The Guilford Press, 2002:278-85.
23. De Moor RJG. Eating disorder-induced dental complications: a case report. *J Oral Rehab* 2004;31:725-32.
24. Milosevic A, Slade PD. Theorodental status of anorexics and bulimics. *Br Dent J* 1989;167:66-70.
25. Clarke DC. Oral complications of anorexia nervosa and/or bulimia. *J Oral Med* 1985;40:134-8.
26. *Diagnostic and statistical manual of mental disorder*. 4<sup>th</sup> ed. Washington, DC: American Psychological Association, 1994.
27. Harwood P, Newton T. Dental aspects of bulimia nervosa: implications for the health care team. *Eur Eating Disorders Rev* 1995;3(2):93-102.
28. DiGiacchino RF, Keenan MF, Sargent RG. Assessment of dental practitioners in the secondary and tertiary prevention of eating disorders. *Eating Behaviors* 2000;1:79-91.
29. Gross KBW, Mayberry WE, Feil PH, Cowan RD. Bulimia and anorexia nervosa in dental and dental hygiene curricula. *J Dent Educ* 1990;54:210-2.
30. Janz NK, Champion VL, Strecher VJ. The Health Belief Model. In: Glanz K, Rimer BK, Lewis FM, eds. *Health behavior and health education: theory, research, and practice*. San Francisco: Jossey-Bass, 2002:45-66.
31. American Dental Association. At: [www.ada.org](http://www.ada.org). Accessed: October 2004.
32. American Dental Hygienists' Association. At: [www.adha.org](http://www.adha.org). Accessed: October 2004.
33. Florey C du V. Sample size for beginners. *BMJ* 1993;306:1181-4.
34. Bailey DM. *Research for the health professional: a practical guide*. Philadelphia: F.A. Davis, 1991:93.
35. Thurstin AH. Behavioral, physical, and psychological symptoms of eating disorders. In: Lemberg R, ed. *Eating disorders: a reference sourcebook*. Phoenix: Oryx Press, 1999:12-7.