ABSTRACT

Dentists' Role in Addressing Obesity in Patients

Background - Reducing the incidence of obesity requires coordination among primary health care providers. Because of their frequent contact with patients, dentists are positioned to recognize patients at risk of developing obesity. The authors conducted a study to assess dentists' interest in and barriers to providing obesity counseling to patients.

Methods - The authors surveyed a random sample of 8,000 American Dental Association members by mail, stratified according to census region (West, Midwest, South, Northeast) and dentist type (general, pediatric). The authors weighted respondents' data to account for the unequal probability of selection and nonresponse rates among regions and dentist types.

Results - In all, 2,965 dentists responded. Overall, 4.8 percent of respondents offered a form of counseling services and 50.5 percent reported that they were interested in offering obesity-related services. More than one-half of the respondents cited fears of offending patients (53.8 percent) and appearing judgmental (52 percent) as major barriers, followed by a paucity of trained personnel (46.3 percent) and patients' rejection of weight-loss advice (45.7 percent). Eighty-two percent of respondents agreed that dentists would be more willing to intervene if obesity were linked definitively to oral disease.

Conclusions - Given continued increases in obesity in the United States and the willingness of dentists to assist in preventive and interventional efforts, experts in obesity intervention, in conjunction with dental educators, should develop models of intervention within the scope of dental practice.

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Dentists' Attitudes About Their Role in Addressing Obesity in Patients

A National Survey

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Obesity prevention and intervention have become major areas of public health focus in the United States. In 2005 to 2006, about 33 percent of American men and 35 percent of American women were obese, defined as a body mass index (BMI) of 30 or higher (1). This represents a doubling of the 15 percent prevalence of obesity among American adults in 1971 to 1974 (1). During the interval, the prevalence of overweight nearly quadrupled among U.S. children 6 to 11 years old and nearly tripled among those 12 to 17 years old (1). For children of the same age and sex, overweight is defined as a BMI at or above the 95th percentile (1). Addressing this tremendous public health problem requires the coordinated efforts of various primary health care providers.

KEY WORDS

Obesity; patient education; pediatric dentistry; survey; weight loss

In 2008, at least 70 percent of Americans had visited a dentist within the previous year (2). Visits were most common among children aged 6 through 11 years (83.7 percent), followed by adolescents aged 12 through 17 years (79.8 percent) (3). Given the frequency of dental visits, especially during childhood, dentists—especially those who serve populations disproportionately affected by obesity—are in an ideal position to recognize patients at risk of developing weight problems.

Because dentists and hygienists typically are educated in behavior modification and methods regarding nutritional counseling for prevention of dental caries, they might be able to adapt these skills to include obesity prevention and intervention services (4,5). However, whether dentists are interested in expanding and feel prepared to expand their practices to include obesity counseling is not known. A recent survey of pediatric dentists in North Carolina found that they were willing to counsel patients about obesity-related health problems but feared offending patients or parents (6). The survey results also showed that a lack of education in dental school regarding obesity was a barrier to providing such services (6).

If dentists are to participate in obesity prevention and intervention efforts, we must understand the factors that influence their involvement. To address this aim, we surveyed a randomly selected sample of American Dental Association (ADA) members who were general and pediatric dentists from across the United States. We assessed their interest in offering obesity prevention and intervention services in their practices, attitudes toward obesity, self-evaluated efficacy in addressing obesity with patients and their families, and perceived barriers to providing such services.

Participants and methods

The institutional review board at the University of North Carolina (UNC) at Chapel Hill approved the research design.

Survey development

Four of us (A.E.C., D.J.C., Z.G., R.A.) developed the data collection instrument specifically for this survey through an analysis of qualitative data obtained from focus groups of pediatricians, pediatric dentists and general dentists. The principal investigator (A.E.C.) asked 20 general dentists attending a continuing education course to complete the questionnaire and review its length, clarity and acceptability. Subsequently, we used a focus group to elicit information from dentists about their perceptions and attitudes toward incorporating obesity interventions into their practices. Their comments, along with those of nutritionists, pediatricians, pediatric dentists and oral epidemiologists, were used to develop content for the national survey.

We developed a self-administered questionnaire that applied social cognitive theory (7-10); it was divided into nine sections covering six domains:

- – personal characteristics;
- – practice characteristics;
- – attitudes and opinions;
- – outcome expectations;
- – self-evaluated efficacy;
- – barriers.

Pilot study

We pilot tested the questionnaire among 500 actively practicing ADA (American Dental Association)-member general dentists in public or private civilian settings in North Carolina whom we selected according to random-number generation from a candidate pool of approximately 3,500 dentists.

We used a three-step method to collect data for the pilot study. First, we mailed an introductory letter to alert dentists that they had been selected for participation in the survey. Two weeks later, we mailed the survey questionnaire to each dentist, along with a cover letter describing the survey and explaining their rights as research participants, a small incentive (a calendar magnet) and a postage-paid return envelope. Two to four weeks after mailing the survey, we mailed a second questionnaire to nonrespondents.

We ended data collection for the pilot survey in November 2007; 313 (62.6 percent) of the 500 dentists returned the surveys. 20 percent of the respondents identified themselves as overweight, more than 75 percent had ownership in their practices and 28.3 percent belonged to group practices. 16 percent of the respondents reported that they were offering weight-related services, and 26.2 percent reported that they were interested in offering such services. Major barriers to offering services included fear of offending patients and a lack of trained personnel. Nearly 86 percent of respondents agreed that if specific oral health problems were linked to obesity, dentists would be more likely to advise patients about weight loss. On the basis of findings from the pilot survey, we developed the national survey (see the appendix in the supplemental data to the online version of this article at "http://jada.ada.org"). This is a 113-item questionnaire covering the same six domains, plus one additional section to be answered by pediatric dentists and general dentists treating children.

We used a Likert scale for the questions, with multiple-choice and open-ended formats. The UNC (University of North Carolina) Center for Health Promotion and Disease Prevention (HPDP) Data Capture Services Unit, Chapel Hill, produced the instrument by using the scannable TeleForm (Autonomy Cardiff, Vista, Calif.) format.

Survey participants

A research associate at the UNC Survey Research Unit (R.A.) selected a stratified random sample of 3,826 general dentists and 4,174 pediatric dentists who were ADA members in active practice (excluding students, retirees and those in military or

institutional settings (mailing list information provided by Hippo Direct, Cleveland).

Among all respondents, 4.8 percent reported that they offered weight-related screening or counseling services to their patients.

We determined the sample size (N = 8,000) by means of optimal allocation (11,12) on the basis of the pilot data to provide a two percent margin of error at a 95 percent confidence level for each critical outcome measure (such as "interest in helping patients achieve their weight-loss goals"). We used statistical software (PROC SURVEYSELECT, SAS version 9.2, SAS Institute, Cary, N.C.) to randomly select the sample, stratified according to census region (West, Midwest, South or Northeast) and practice type (general or pediatric). We weighted the data to account for the unequal probability of selection and adjusted for nonresponse via weighting class adjustments (13). All of the percentages presented in this report reflect this weighting.

Survey procedures

We mailed letters to all selected dentists describing the study and alerting them to expect the survey shortly. Within one week, we mailed the questionnaire to all dentists with a postage-paid return envelope, a cover letter describing the survey and explaining their rights as research participants, and a small incentive (a calendar magnet). Three weeks later, we sent letters to all participants reminding them to complete the questionnaire or thanking them for their participation. Four weeks after sending the reminder letter, we sent a second mailing to all nonrespondents and telephoned them during this period if we had not yet received their surveys. Four weeks after telep-

Table 1

Demographic and practice characteristics of respondents

Characteristic	General Dentists (n = 1,186)		Pediatric Dentists (n = 1,779)	
	Number (%) of Respondents*†	95 % CI**	Number (%) of Respondents	95 % CI
Age (Years)				
26-35	140 (12.1)	10.2-14.0	335 (19.3)	17.5-21.2
36-50	417 (36.5)	33.7-39.3	656 (37.5)	35.2-39.8
> 50	598 (51.4)	48.5-54.3	753 (43.2)	40.8-45.5
Sex				
Male	895 (76.0)	73.5-78.4	1,110 (62.6)	60.3-64.8
Female	283 (24.0)	21.6-26.5	665 (37.4)	35.2-39.7
Race				
White	961 (79.9)	77.5-82.2	1,428 (80.1)	78.2-82.0
Asian	100 (9.3)	7.54-11.0	144 (8.3)	6.99-9.58
African American	27 (2.2)	1.38-3.05	53 (2.9)	2.16-3.73
Multiracial	29 (2.6)	1.62-3.48	66 (3.7)	2.82-4.59
Other	68 (6.1)	4.66-7.48	88 (5.0)	3.94-5.97
Hispanic Ethnicity	40 (3.7)	25.5-30.7	435 (24.6)	4.14-6.26
Self-Classified as Obese or Overweight	331 (28.1)	25.5-30.7	435 (24.6)	22.6-26.6
Ownership in Practice	965 (82.0)	79.8-84.2	1,375 (77.9)	76.0-79.9
Practice Type				
Solo private	722 (61.9)	59.1-64.7	845 (48.4)	46.0-50.7
Group private	371 (31.2)	28.6-33.9	773 (44.3)	42.0-46.6
Public health clinic	29 (2.5)	1.59-3.41	49 (2.8)	2.03-3.59
Other	49 (4.4)	3.17-5.59	77 (4.5)	3.52-5.50
Accept Medicald-Enrolled Patients	349 (30.5)	27.8-33.2	1,063 (61.4)	59.1-63.8

* Not all respondents answered all of the questions.
† The authors weighted the data to account for the unequal probability of selection and adjusted for nonresponse via weighting class adjustments (13). All percentages reflect this weighting.
** CI: Confidence interval.

honing nonrespondents, we called them again and sent a third mailing to those requesting another copy of the survey.

Data collection and analysis

Staff members in the HPDP Data Capture Services Unit scanned the questionnaires, and the director of the HPDP Biostatistical Support Unit (Z.G.) analyzed the data. We used weighted data for all analyses and examined them by using statistical software (SAS version 9.2) to account for the survey sampling design. We summarized survey results according to dentist type and used the χ^2 test for comparisons between dentist types and between respondents and nonrespondents.

Likert scale

We analyzed the five-level Likert scale items used to assess respondents' attitudes and opinions, outcome expectations and self-efficacy both as ordinal variables and as dichotomized variables (for example, "strongly agree/agree" versus "neutral/disagree/strongly disagree"). Because the findings did not differ substantially, we reported the dichotomous findings for ease of presentation. For years in practice, we classified dentists into one of four categories, which we selected arbitrarily: one to five years, six to 10 years, 11 to 20 years or more than 20 years.

Results

Response rate

Data collection began on Sept. 2, 2008, and ended on April 15, 2009, when 3,015 of the 8,000 completed surveys were returned. We determined that 50 of the respondents were not currently practicing dentistry, so we considered them ineligible. Thus, the overall national response rate was 37.1 percent (2,965 responses).

CLINICAL IMPLICATION

Educating dentists about obesity and counseling may reduce barriers for those interested in addressing obesity in their practices.

Sample characteristics

The 1,186 general and 1,779 pediatric dentists who responded to the survey represented all states and the District of Columbia. The results showed no significant differences among the proportions of dentists responding when we categorized them according to the states' rankings in obesity (data not shown).

Most respondents were white men older than 35 years (Table 1), about one-half of whom had been in practice for more

Table 2

Respondents who offered weight-related screening and counseling services

Service	General Dentists (n = 1,186)		Pediatric Dentists (n = 1,779)	
	Number (%) of Respondents*†	95 % CI**	Number (%) of Respondents	95 % CI
Any Service	31 (2.6)	1.72-3.57	111 (6.3)	5.17-7.45
Disribute Pamphlets In Walting Room	6 (0.5)	0.10-0.89	22 (1.3)	0.73-1.78
Dentist Initiates Brief Discussion About Weight Loss	18 (1.6)	0.85-2.32	81 (4.6)	3.62-5.58
Dental Hygienist Provides Weight-Loss Nutritionel Counseling	10 (0.8)	0.30-1.28	29 (1.6)	1.04-2.22
Other Nutrition Speciallist Provides Counseling	2 (0.2)	0.00-0.44	12 (0.7)	0.29-1.04
Dentist Initiates Referral To Medical Specialist For Weight Loss	6 (0.5)	0.10-0.96	58 (3.2)	2.42-4.07

* Not all respondents answered all of the questions.
† The authors weighted the data to account for the unequal probability of selection and adjusted for nonresponse via weighting class adjustments (13). All percentages reflect this weighting.
** CI: Confidence interval.

than 20 years. One-quarter of the participants identified themselves as overweight. Pediatric dentists tended to be younger and more often female compared with general dentists, and they were about twice as likely as general dentists to accept Medicaid-enrolled patients. In all, 39 percent of the respondents belonged to group practices (Table 1).

Among all respondents, 142 (4.8 percent) reported that they offered weight-related screening or counseling services to their patients. The most common intervention in both groups was a brief discussion initiated by the dentist during an appointment, followed by nutritional counseling provided by a dental hygienist (general dentists) or referral to a medical specialist for weight loss (pediatric dentists) (Table 2). Pediatric dentists were much more likely than were general dentists to respond that they referred patients to a medical care provider for weight-related issues.

Table 3 summarizes the characteristics of the 1,498 respondents (50.5 percent) who were interested versus those

Table 3

Characteristics of respondents accordin to interest expressed in providing obesity-related services

Characteristic	Interested				Not Interested			
	General Dentists (n = 564)		Pedlatric Dentists (n = 934)		General Dentists (n = 617)		Pedlatric Dentists (n = 838)	
	No. (%) of respondents*†	95 % CI**‡	No. (%) of respondents	95 % CI	No. (%) of respondents	95 % CI	No. (%) of respondents	95 % CI
Age (Years)								
26-35	73 (13.1)	10.3-15.9	221 (24.1)	21.3-26.9	67 (11.2)	8.66-13.8	113 (14.0)	11.6-16.4
36-50	209 (38.2)	34.1-42.3	360 (38.9)	35.7-42.0	206 (34.8)	30.9-38.7	294 (35.9)	32.6-39.2
> 50	270 (48.7)	44.5-52.9	341 (37.0)	33.9-40.2	326 (54.0)	49.9-58.0	411 (50.1)	46.7-53.6
Male Sex	420 (74.6)	70.9-78.2	529 (56.9)	53.7-60.0	473 (77.5)	74.1-80.8	579 (69.2)	66.0-72.3
Race								
White	456 (79.9)	76.5-83.3	732 (78.3)	76.6-80.9	502 (79.9)	76.6-83.2	694 (82.6)	80.0-85.2
Asian	45 (8.6)	6.17-11.0	91 (9.9)	7.96-11.8	55 (10.0)	7.46-12.5	53 (6.6)	4.85-8.27
African American	17 (3.0)	1.57-4.39	32 (3.4)	2.24-4.57	10 (1.5)	0.59-2.47	19 (2.2)	1.23-3.20
Multiracial	12 (2.1)	0.91-3.29	39 (4.1)	2.86-5.42	16 (2.8)	1.42-4.13	27 (3.2)	2.04-4.46
Other	34 (6.4)	4.28-8.47	40 (4.3)	2.99-5.60	34 (5.8)	3.91-7.75	45 (5.4)	3.85-6.92
Hispanic Ethnicity	31 (5.8)	3.78-7.76	50 (5.6)	4.08-7.10	8 (1.5)	0.46-2.58	38 (4.8)	3.30-6.28
Self-Classified as Obese or Overweight	153 (27.1)	23.4-30.8	221 (23.6)	20.8-26.3	177 (29.2)	25.5-32.8	214 (25.9)	22.9-28.9
Years in Practice								
1-5	64 (11.7)	8.95-14.4	169 (18.5)	16.0-21.0	49 (8.1)	5.9-10.3	70 (8.7)	6.71-10.6
6-10	50 (9.2)	6.77-11.7	166 (18.1)	15.6-20.6	62 (10.4)	7.96-12.3	132 (16.1)	13.6-18.7
11-20	131 (23.7)	20.1-27.3	221 (23.6)	20.9-26.4	122 (20.3)	17.1-23.6	186 (22.5)	19.6-25.3
> 20	309 (55.4)	51.2-59.6	370 (39.8)	36.7-43.0	373 (61.1)	57.2-65.1	435 (52.7)	49.3-56.2
Ownership in Practice	453 (80.7)	77.4-84.0	702 (75.4)	72.6-78.2	510 (83.2)	80.2-86.2	670 (80.6)	77.9-83.4
Practice Type								
Solo private	339 (61.1)	57.0-65.2	424 (46.3)	43.1-49.6	381 (62.5)	58.6-66.4	418 (50.5)	47.1-54.0
Group private	186 (32.8)	28.9-36.8	425 (46.5)	43.3-49.8	185 (29.8)	26.2-33.5	348 (42.0)	38.6-45.4
Public	17 (3.1)	1.65-4.62	25 (2.7)	1.64-3.73	12 (1.9)	0.84-3.02	24 (3.0)	1.79-4.13
Other	16 (2.9)	1.48-4.31	40 (4.5)	3.10-5.81	33 (5.7)	3.82-7.66	36 (4.5)	3.05-5.93
Accept Medicald-Enrolled Patients	173 (31.9)	27.9-35.8	563 (61.1)	58.0-64.3	175 (29.3)	25.6-33.0	499 (61.9)	58.5-65.3

* Not all respondents answered all of the questions.
† The authors weighted the data to account for the unequal probability of selection and adjusted for nonresponse via weighting class adjustments (13). All percentages reflect this weighting.
** CI: Confidence interval.
‡ The proportion of dentists within the larger group who had the characteristic of interest, expressed as a percentage. For example, the first entry should be interpreted as 13.1 percent (95 percent CI, 10.3-15.9) of general dentists who expressed interest in providing obesity-related services were aged 26 through years.

who were not interested in providing obesity-related services to patients. Overall, the interested respondents included higher proportions of dentists who were younger than 36 years, female, Hispanic or pediatric specialists, had no ownership in their practices, and had been practicing for less than 10 years. Pediatric dentists who were interested in providing obesity-related services were more likely to be younger, female, in group practices and accepting Medicaid-enrolled patients than were interested general dentists.

Respondents versus nonrespondents

Respondents were similar to non-respondents with regard to year of dental school graduation, ownership of the practice, and group versus solo practice. Nonrespondents were older than respondents (13.7 percent of non-respondents were younger than 35 years versus 16.4 percent of respondents; $P < 0.001$). In addition, 72.0 percent of the respondents were white compared with only 59.8 percent of the nonrespondents ($P < 0.001$). Although the differences were not statistically significant, the rate of response among women was higher than that among men, as female dentists made up 31 percent of respondents versus 26.7 percent of nonrespondents ($P = 0.89$).

Perceived changes in patients' weight and dental disease

We analyzed the answers to these questions only among dentists practicing for more than five years, which we considered to be sufficient time for them to identify trends. In all, 60.8 percent of 1,049 general dentists and 66.0 percent of 1,509 pediatric dentists noted increases in the number of patients who were overweight or obese since they began practicing ($P = 0.005$). However, although respondents reported that they had diagnosed more gingivitis and periodontal problems in their overweight patients (43.3 percent of general dentists agreed, as did 20.3 percent of pediatric dentists; $P < 0.001$), fewer general and pediatric dentists reported diagnosing more caries in these patients since they began practicing (26.2 and 19.6 percent agreed, respectively; $P < 0.001$).

Attitudes and opinions

Fig. 1 shows results summarizing general and pediatric dentists' agreement and strong agreement with various statements. Pediatric dentists were significantly more likely than general dentists to support a role in helping patients achieve their weight-loss goals. General dentists were significantly more likely to agree that overweight people lacked the willpower to control their diets, and that until obesity is linked with dental disease, they would not be interested in advising their patients about weight loss.

Outcome expectations and self-efficacy.

According to the survey findings, pediatric dentists felt more confident than general dentists in calculating and interpreting BMI scores (45 percent felt confident or highly confident versus 32.4 percent; $P < 0.001$), in applying nutritional counseling skills (45.9 percent versus 35.4 percent; $P < 0.001$) and in applying behavior modification skills related to weight loss (21.9 percent versus 19.2 percent; $P = 0.10$). These findings might reflect the fact that pediatric dentists were far more likely than

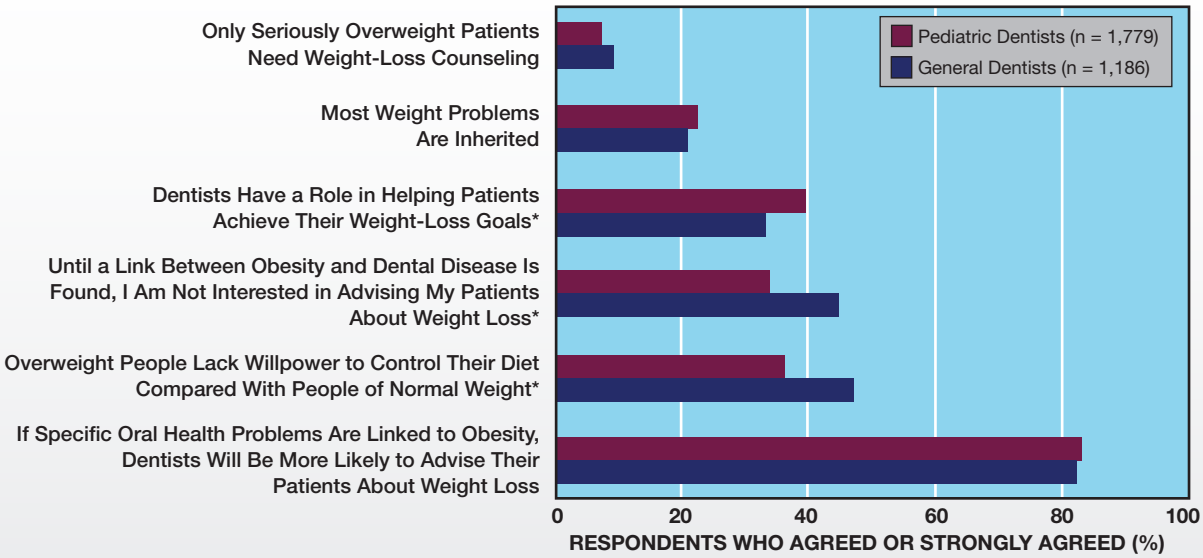

FIG. 1. Proportions of generral dentists and pediatric dentists who agreed or strongly agreed with statements regarding attitudes and opinions about obesity. *$P < 0.05$.

general dentists to report having received education in these activities during dental school (for BMI, 30 percent versus 15.3 percent; for nutritional counseling, 80.4 percent versus 60.6 percent; for behavior modification, 17.0 percent versus 11.9 percent; all $P < 0.001$).

Barriers to offering obesity interventions

Fig. 2 shows respondents' perceived major barriers to providing obesity-related interventions to patients. More than one-half of respondents cited a fear of offending the patient or parent and a fear of appearing judgmental of the patient or parent. "Other" responses included the following:

- – "no coherent effort by schools and medical societies";
- – "no correlation between caries and obesity";
- – "I am obese myself";
- – "no clear guidelines";
- – "do not know how to start the conversation";
- – "cultural biases toward overweight."

The survey findings show that pediatric dentists were significantly less likely than general dentists to cite a lack of trained personnel, education, knowledge, reimbursement, referral options, educational material or interest in the topic as major barriers to providing obesity-related services, and a significantly smaller proportion cited the possibility of being perceived by the state dental board as practicing medicine. On the other hand, significantly more pediatric than general dentists cited a fear of appearing judgmental and a lack of patient acceptance of weight loss advice as major barriers to offering services.

Discussion

In this survey of 2,965 general and pediatric U.S. dentists, 142 respondents (4.8 percent) reported that they were offering obesity-related interventions to patients, and another 50 percent indicated an interest in offering such services. The major barriers to offering obesity-related services reflected dentists' fears of offending patients or parents or appearing judgmental, as well as a lack of education in and knowledge of the topic. Overall, respondents indicated a much greater willingness to offer weight-related interventions if a definitive link were found between obesity and oral health.

Between 2007 and 2008, obesity rates in adults increased in 38 states and territories (14). In 42 states and territories, at least 25 percent of the adult population is obese (14). About 70 percent of the U.S. population visits a dentist at least once per year (2), suggesting that dentists may be in an ideal position to observe changes in their patients across time that indicate an increasing risk of becoming obese. Some researchers have suggested that the dental office is an ideal site for obesity in-

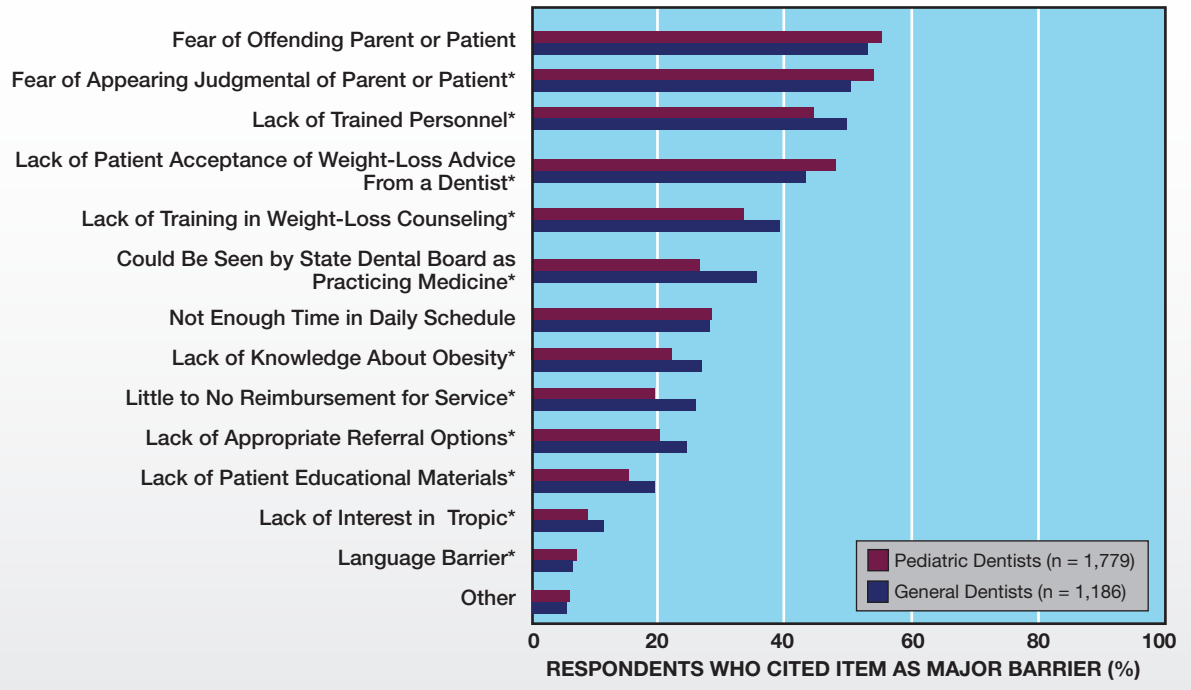

FIG. 2. Perceived major barriers to affering obesity-related interventions among general dentists and pediatric. *$P < 0.05$.

tervention services (4,15,16). Whether dentists are prepared or willing to address this major health concern with their patients is unknown, however. To our knowledge, our study represents the first large-scale examination of this topic.

Overall, nearly 40 percent of all respondents reported that they would not consider providing obesity-related counseling until a link is established between obesity and oral health. Although data are lacking regarding a direct relationship between obesity and dental disease, fairly recent epidemiologic evidence strongly suggests a relationship between periodontal inflammation, systemic levels of inflammatory biomarkers and obesity (17-19). This is in addition to long-standing evidence of obesity as a risk factor for coronary artery disease (20), heart failure (20) and diabetes (21). Accordingly, the editors of the American Journal of Cardiology and Journal of Periodontology (22) recently issued a joint consensus report on periodontitis and atherosclerotic disease that listed obesity as a risk factor for the development and severity of periodontal disease.

Nearly 40 percent of all respondents reported that they would not consider providing obesity-related counseling until a link is established between obesity and oral health. Genco and colleagues (17) and Boesing and colleagues (23) reported an association between the hyperinflammatory state—as measured by tumor necrosis factor α and its soluble receptors—in people who are obese and an exacerbation of periodontal infections as a result of the exaggerated response caused by the infecting organisms. Many of the respondents in our study indicated that they observed more periodontal disease among patients who are obese, which may be a clinical manifestation of the association between obesity and inflammation (17,19). This phenomenon also might reflect the 55 percent increase in the prevalence of diabetes mellitus in the United States from 1988 to 2000 (24), given that insulin resistance increases the risk of developing severe periodontal disease by an estimated 50 percent among patients who are overweight (17). Of note, Borrell and colleagues (25) reported that the prevalence of periodontitis among U.S. adults decreased by 42 percent (from 7.3 percent to 4.2 percent) during the same period.

Although respondents observed more periodontal disease in patients who were obese or overweight, they did not observe more caries in these patients. This may be surprising, because poor diet is a common denominator for both caries and increased BMI (26). However, the results of numerous studies (27) have failed to show a consistent association between caries and obesity.

In the United States, obesity carries some degree of social stigma (28). In our study, 1,193 dentists (40.6 percent) responded that overweight people lack willpower compared with normal-weight people, whereas 640 dentists (21.8 percent) responded that most overweight problems are inherited (Fig. 1). Negative attitudes about obese people are common and have been reported among other health care professionals (29,30). To overcome the effects of this stigma on patients, dentists treating a population at an increased risk of developing obesity may benefit from additional education regarding the social implications of obesity and appropriate behavioral strategies for overcoming bias, whether or not they choose to intervene.

Principal barriers

The principal barriers identified by both general and pediatric dentists were fears of offending the patient or parent and appearing to be judgmental. They expressed these concerns in comments that described a fear of losing patients from the practice: "I cannot offend the mothers" and "I am not going to get into another no-win situation." Clinicians might lessen the possibility of offending patients or parents by framing weight- and diet-related counseling efforts as part of an integrated, holistic approach that incorporates oral health status into an assessment of risk factors common to many diseases (31).

In addition to the major barriers listed in the questionnaire, many respondents added their own barriers, such as fear of upsetting pediatricians, who are a large source of referrals; being overweight themselves and thus not being credible; fear of contradicting advice that pediatricians may have given to parents; and legal issues associated with a failure to achieve weight-loss results.

In our study, more pediatric than general dentists and more female than male dentists stated that they were interested in providing obesity-related services. These results are consistent with those of a study of U.S. female physicians conducted by Frank and colleagues (32), who found that specialty physicians such as obstetricians, gynecologists and pediatricians were more likely to provide nutritional and weight-loss counseling to their patients than were general physicians.

Kading and colleagues (33) also found that among dental hygienists, those who worked in specialty practices were more confident in the areas of obesity education and counseling. These findings may reflect the nature of dental care in many specialty practices, given that patients tend to have more advanced needs for oral health care. Future analyses of the data from our national survey should yield greater insights into barriers perceived by general versus pediatric dentists and by male versus female dentists.

The fact that 4.8 percent of respondents were already offering one or more obesity-related interventions is of considerable interest and value. Further investigation into these provider-initiated practices, including protocols and outcomes, may help inform feasible approaches for other dental practices to investigate and implement.

Study limitations

This study has several limitations. First, the response rate was low at 37.1 percent. Still, this represents nearly 3,000 dentists from across the United States, the largest sample to date for this type of survey, to our knowledge. In addition, we weighted the final point estimates to adjust for class differences between re-

spondents and nonrespondents. Second, we did not adjust for the multiplicity of comparisons; therefore, one should consider these data to be hypothesis generating only, not conclusive. Third, as with all surveys, the subjectivity of the responses may not accurately reflect current behaviors of dental practices. Researchers should examine topics covered in this survey in other cohorts.

Conclusions

As the incidence of obesity continues to rise in the United States, health care providers must coordinate prevention and interventional efforts for maximum effect. Given the positioning of dentists willing to assist in such efforts, it appears reasonable for experts in obesity intervention, in conjunction with dental educators, to develop intervention models to be implemented within the scope of dental practice. In addition, educators can develop formal programs focusing on the assessment of obesity risk factors and oral health implications to be incorporated into dental school curricula and continuing dental education. Given that respondents cited fears of appearing judgmental and causing offense as major barriers to offering intervention services, training might be necessary to teach clinicians how to convey information with sensitivity and objectivity.

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