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Dental Anxiety and Oral Health Outcomes among Rural Older Adults

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Abstract

Objectives—To determine the degree to which rural older adults are able to complete a measure of dental anxiety and to assess the prevalence, as well as the demographic and oral health characteristics, of individuals reporting high dental anxiety.

Methods—A population-based sample of 635 African American, American Indian and white older adults (age ≥ 60 years) completed an in-home survey, and 362 dentate participants completed an oral examination. Dental anxiety was measured using the 4-item Corah's Dental Anxiety Scale (DAS). Gender, ethnicity, age, education and oral health outcomes were compared between those who completed all four DAS questions (completers) and those who did not (non-completers) as well as, among completers, those with high versus low DAS scores.

Results—There were 94 (14.8%) non-completers. Non-completion was associated with older age, lower education, being edentulous, and having gingival recession. 12.4% of DAS completers had high DAS scores, which was more common among those aged 60–70 years, women, and those with oral pain and sore or bleeding gums. In logistic regression analysis, only sore and bleeding gums had a significant association with a high DAS score (OR = 2.40, 95% CI 1.09–5.26).

Conclusions—About one in eight rural older adults have high dental anxiety, which is associated with poor oral health outcomes. Identifying new approaches to measure dental anxiety among a population with limited interaction with dental care providers is needed.

Keywords

Dental Anxiety; Oral Health Outcomes; Rural Older Adults; African Americans; American Indians

Introduction

Existing literature has documented that dental anxiety is associated with poor dental care utilization (1 – 6) and poor oral health outcomes (1, 2, 6, 7 – 12). The prevalence of high dental anxiety (HDA), and its association with oral health has not been examined in rural older adults, particularly those of racial and ethnic minority groups. These populations have significant dental health disparities, and limited access to dental care providers (13 – 15).

Dental anxiety has been measured using a number of validated instruments. This construct is often measured using questions reflective of prior interactions with the dental care system. Adequately assessing dental anxiety might be challenging for rural older adults, because many have had limited interaction with dental care providers. Therefore, this study has two goals: (1) to determine the degree to which rural older adults are able to complete a measure of dental anxiety; (2) to assess the prevalence of HDA and its demographic and oral health correlates.

Methods

Study Design

The Rural Nutrition and Oral Health (RUN-OH) Study is a cross-sectional survey of an ethnically diverse (African American, American Indian, and white) population of community-dwelling older adults in two rural North Carolina counties (16 – 17). Eligibility criteria included: age 60 years old or older, spoke English, were able to give informed consent, and were physically able to complete the interview. Participants were located using a random dwelling selection and screening procedure based on a multistage cluster sampling design in which the primary sampling units (clusters) were stratified and selected with probability proportionate to their sizes. This procedure was designed and implemented by the investigators in consultation with the University of Illinois Survey Research Laboratory. Eligible residents in 635 of the 859 eligible dwelling units completed the interview; 224 refused to participate, for a response rate of 73.9% among eligible participants. Among 413 dentate participants, 362 completed an oral examination, for a participation rate of 87.6%.

Data were collected by face-to-face survey interviews administered by local interviewers and by oral examination conducted on dentate participants by trained dental hygienists under the supervision of a research dentist. Personal interviews were completed in participants' homes or in another location of the participants' choosing, such as a senior center. Interviews took from 1.5 to 2.5 hours to complete. Two dental hygienists performed tooth counts, assessed functional occlusal contacts, and assessed the status of each tooth and the oral soft tissue. The research protocol was approved by the Wake Forest University School of Medicine Institutional Review Board. Informed consent was obtained from all study participants.

Study Measures

The primary outcomes for this study were measures of oral health status. Self-reported measures included: self-rated oral health (categorized as excellent, very good, good, fair or poor), history of diagnosis of periodontal disease ("Have you ever been told by a dentist that you have or have had periodontal or gum disease?"), and current experience with oral pain ("Are you now having problems with mouth pain?"), or sore or bleeding gums ("Are you now having problems with gum soreness or bleeding?").

Measures from the oral examination included: tooth-specific gingival recession measured in millimeters, tooth-specific modified gingival index (MGI) measuring inflammation on a 0-4 scale where 0 indicates normal, and 4 indicates severe inflammation (18), and tooth mobility

assessment measured on a 3-point scale where 1 = slight, 2 = moderate, and 3 = severe mobility. The percentage of participants with any tooth that had recession of 4 mm was calculated. The percentage of participants with any tooth that scored 3 for MGI was calculated. The percentage of participants with any tooth that scored 2 for the mobility assessment was calculated. We considered two measures of number of teeth: a dichotomous variable (dentate, edentulous), and a four category variable (edentulous, 1 – 10 teeth, 11 – 20 teeth, > 20 teeth).

Dental anxiety was measured using the 4-item Dental Anxiety Scale (DAS) (19). The items are: (1) “If you had to go to the dentist tomorrow, how would you feel about it?”; (2) “When you are waiting in the dentist's office for your turn in the chair, how do you feel?”; (3) “When you are in the dentist's chair waiting while the dentist gets the drill ready to begin working on your teeth, how do you feel?”; and, (4) “You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments which will be used to scrape your teeth around the gums, how do you feel?” The DAS scores range from 4 to 20, with a score of 9 – 12 indicating moderate anxiety, 13 – 14 indicating high anxiety, and 15 or more indicating severe anxiety. For this paper, we considered the DAS score as a continuous measure, and as a dichotomized variable, using a score of 13 to indicate high dental anxiety (HDA) (20). The internal consistency of the dental anxiety questions in this sample was high (standardized Cronbach's Alpha = 0.74). Participants who did not complete all four questions of the DAS were not given a score. Covariates in this analysis included: age (60 – 69, 70); ethnicity (African American, American Indian or White); gender and education (less than high school, high school, more than high school).

Statistical Analyses

All analyses were performed to account for the stratified, multi-stage cluster sampling design of our study. Data were summarized using the weighted N and percents for categorical variables. Percentages of participants by presence or absence of dental anxiety were calculated for the above covariates, and for the oral health outcomes. Rao-Scott Chi-square tests were calculated for categorical variables and analysis of variance (ANOVA) for the continuous measure of DAS for completion or non-completion of the DAS and high versus low dental anxiety. Logistic regression analyses were performed with each of the binary oral health measures modeled as the outcome and HDA as the primary predictor, adjusted for age, ethnicity, gender and education. Nominal logistic regression was used to model the number of teeth using 21+ teeth as the reference category. All analyses were completed using SAS version 9.2 (SAS Institute, Inc, Cary, NC). A p-value of < 0.05 was considered statistically significant.

Results

The sample included a roughly equal number of persons in the younger (age 60 - 69, n = 301, 47.4%) and older (age 70 and older, n = 334, 52.6%) age groups and was approximately equally distributed across the three ethnic groups (whites, n = 197 (31.0%); African Americans, n = 212 (33.4%); American Indians, n = 226 (35.6%)). The sample had a higher percentage of women (n = 361, 56.1%), compared to men (n = 274, 43.2%).

Of the 635 participants, 94 (14.8%) participants provided an invalid answer to one of the four DAS questions. All invalid answers were “don't know” responses to one or more questions. Weighted analyses were conducted to identify potential participant characteristics of not completing the DAS (Table 1). Seventy-six participants had invalid answers to one question, 25 had invalid answers to two questions and one had invalid answers to 3 of the four questions. One person answered “don't know” to question 1, two answered “don't know” to question 2, 38 answered “don't know” to question 3, and 88 answered “don't

know” to question 4. Significant correlates of not completing the DAS included: older age, less education, not being dentate (and having fewer teeth), and having gingival recession. Having a high MGI trended towards association with not completing the DAS ($p = 0.052$).

Mean DAS scores and HDA classification was available on 541 participants (Table 2). The mean DAS scores were significantly higher for women compared to men (8.0 vs. 6.9, $p = 0.003$), for those aged 60 – 69 compared to those 70 (8.4 vs. 6.7, $p = \mathbf{0.001}$), for those reporting oral pain compared to those not reporting oral pain (8.8 vs. 7.3, $p = 0.030$), and for those reporting fair/poor oral health compared to those reporting better oral health (8.2 vs. 7.0, $p = 0.006$). Of those completing the DAS instrument, 12.4% were classified as having HDA. HDA was significantly more common among women compared to men (16.9% vs. 7.1%, $p = 0.001$). Rates of HDA did not differ significantly by ethnicity. HDA was significantly more common among those aged 60 to 69 years, than among those 70 (19.6% vs. 6.0%, $p < .0001$). Significant differences were observed in oral health status (oral pain, 26.9% vs. 10.5%, $p = 0.014$, sore or bleeding gums, 20.8% vs. 10.1%, $p = \mathbf{0.042}$).

In adjusted logistic regression models of the oral health outcomes, only sore or bleeding gums was significantly associated with HDA (OR = 2.4, 95% confidence interval, 1.09 – 5.26). Other oral health outcomes with odds ratios greater than 1.0 (e.g., fair/poor self-rated oral health, 1.83 or oral pain, 1.88) were not statistically significant.

Discussion

Dental anxiety is a construct frequently assessed in clinical and epidemiologic studies of oral health, and high levels of dental anxiety are associated with poor dental care utilization and oral health outcomes (1 - 12). Most questionnaires used to quantify dental anxiety are short and easy to administer. For example, Pohjola et al (21 - 22) used a single question on dental anxiety in a study of adults in Finland, and showed that this indicator was associated with higher OHIP (Oral Health Impact Profile) scores and other indicators of dental health. For this study, the four-question Corah's Dental Anxiety Scale was used, which is common in dental research studies. However, the instruments used to assess dental anxiety generally require some degree of engagement with dental care providers in order to adequately respond to the survey questions. Many of the studies of dental anxiety have utilized clinic-based populations and may not adequately reflect the true nature of dental anxiety in populations with limited contact with dental services.

Older adults in rural communities have significant oral health disparities (13 - 15). Limited information is available for this population regarding the prevalence of dental anxiety and the association between dental anxiety and oral health outcomes. Furthermore, as this population has limited access to dental care providers, little information documents the extent to which this population would have difficulty responding to questions used to assess dental anxiety.

This study shows that 12.4% of rural older adults would be classified as having HDA. However, this percentage may actually be higher, considering that 14.8% of these older adults did not give a valid answer to one or more of the DAS questions, and not completing the DAS was associated with at least two oral health indicators. The DAS was particularly problematic for adults aged 70 and older, who would have been even less likely to have interactions with dental care providers, especially at earlier ages. This is especially true for the two questions pertaining to use of a drill or scraping instruments by the dentist. At least two-thirds of participants who responded “don't know” to these two questions indicated that they had not been to a dentist in at least the past three years (Table 4).

Similar to other studies (23 – 27), women had higher dental anxiety scores, with nearly 1 in 6 fitting into this category. Efforts to target this population to improve the dental care experience should be investigated. No differences in HDA by ethnicity were observed, but education was strongly correlated with this indicator; the prevalence of HDA was more than double for those with less than a high school education, compared to those with more than a high school education. This may complicate efforts to alleviate dental anxiety in this population.

This study demonstrated that HDA was associated with some indicators of poor oral health in this population. Thus, HDA may explain, to some extent, the oral health disparities seen in rural populations, particularly among older women. Further research is warranted to more fully elucidate this association.

The findings of this study should be viewed in light of its limitations. First, this study is cross-sectional, so the temporal nature of the relationship observed between dental anxiety and oral health outcomes comes into question. The study also relies on self-reported measures of some oral health outcomes, so there may be some bias introduced in the collection of data. This study included a measure of dental anxiety, rather than dental fear or phobia, which, while these constructs overlap, are recognized as distinct features (24). Also, as noted, some participants were not able to complete the DAS, so we are not able to adequately assess the relationship between dental anxiety and oral health outcomes in this group. Finally, we acknowledge that there may be other variables that may contribute to the variation in DAS in this population that were not considered in this analysis, so further examination is warranted. Nonetheless, this study has a number of strengths, including a large, ethnically diverse rural sample and standardized measures of oral health outcomes and questionnaires for self-reported measures, including dental anxiety.

In summary, we observed in our study of a rural, multi-ethnic older adult population, that about 1 in 8 older adults had HDA, with higher rates among women and those with lower education levels. Furthermore, given the sparse interaction with the dental care providers, a significant number of these older adults could not complete the questions pertaining to the assessment of dental anxiety, suggesting that other strategies should be used to capture this construct in this population. The association of HDA with indicators of poor oral health indicates that efforts should be made to alleviate this anxiety in order to help improve dental health.

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Table 1

Comparison of completers and non-completers of the DAS questionnaire according to demographic and oral health characteristics [N(%)]

	DAS Completion		p-value
	Yes	No	
Total	541 (85.2)	94 (14.8)	
Gender			
Female	292 (84.9)	52 (15.1)	0.833
Male	249 (85.6)	42 (14.4)	
Ethnicity			
White	260 (85.7)	43 (14.3)	0.893
African American	114 (83.6)	22 (16.4)	
American Indian	167 (85.5)	28 (14.5)	
Age			
60-69	255 (90.0)	28 (10.0)	0.024
70	286 (81.4)	66 (18.6)	
Education			
Less than HS	282 (79.7)	72 (20.3)	0.0003
HS	138 (88.5)	18 (11.5)	
More than HS	121 (96.6)	4 (3.4)	
Dentate			
Yes	364 (88.7)	49 (11.3)	0.029
No	177 (79.7)	45 (20.3)	
Number of Teeth			
0	177 (79.7)	45 (20.3)	0.002
1-10	81 (76.7)	25 (23.3)	
11-20	118 (90.2)	13 (9.8)	
21+	166 (93.5)	12 (6.5)	
Periodontal Disease			
Yes	257 (82.9)	53 (17.1)	0.153
No	283 (87.6)	40 (12.4)	
Oral Pain			
Yes	62 (89.2)	8 (10.8)	0.381
No	479 (84.7)	86 (15.3)	
Sore or Bleeding Gums			
Yes	119 (88.0)	16 (12.0)	0.329
No	418 (84.3)	78 (15.7)	
Self-Rated Oral Health			
Excellent/Very Good/Good	296 (85.3)	51 (14.7)	0.887
Fair/Poor	241 (84.8)	43 (15.2)	
Modified Gingival Index [*]			
No teeth that scored 3 or more	222 (90.5)	23 (9.5)	0.052

DAS Completion			
	Yes	No	p-value
Any teeth that scored 3 or more	24 (76.9)	7 (23.1)	
Mobility Assessment *			
No teeth that scored 2 or more	241 (91.0)	24 (9.0)	0.101
Any teeth that scored 2 or more	61 (81.1)	14 (18.9)	
Gingival Recession *			
No teeth that scored 4 or more	160 (94.3)	10 (5.7)	0.006
Any teeth that scored 4 or more	124 (84.7)	22 (15.3)	

* Only measured on dentate participants who attended the oral examination

Table 2

Demographic and oral health characteristics of rural older adults according to dental anxiety categories (high versus **moderate/low**) [N(%)]

	Mean Dental Anxiety Score		Dental Anxiety Score Categories		
	Mean(SE)	p-value [^]	High (13)	Moderate/Low (<13)	p-value ⁺
Total	7.5 (0.27)		67 (12.4)	474 (87.6)	
Gender					
Female	8.0 (0.36)	0.003	49 (16.9)	243 (83.1)	0.001
Male	6.9 (0.27)		18 (7.1)	232 (92.9)	
Ethnicity					
White	7.5 (0.38)	0.715	31 (11.9)	229 (88.1)	0.790
African American	7.7 (0.34)		17 (14.5)	97 (85.5)	
American Indian	7.3 (0.46)		19 (11.6)	148 (88.4)	
Age					
60-69	8.4 (0.42)	0.001	50 (19.6)	205 (80.4)	<.0001
70	6.7 (0.28)		17 (6.0)	269 (94.0)	
Education					
Less than HS	7.9 (0.39)	0.187	45 (15.8)	237 (84.2)	0.089
HS	6.9 (0.43)		14 (10.1)	124 (89.9)	
More than HS	7.3 (0.39)		8 (7.0)	113 (93.0)	
Dentate					
Yes	7.6 (0.25)	0.604	49 (13.3)	316 (86.7)	0.620
No	7.3 (0.55)		18 (10.4)	158 (89.6)	
Number of Teeth					
0	7.3 (0.55)	0.339	18 (10.4)	158 (89.6)	0.738
1-10	8.1 (0.50)		11 (14.0)	69 (86.0)	
11-20	7.8 (0.46)		19 (16.4)	99 (83.6)	
21+	7.2 (0.42)		18 (10.9)	148 (89.1)	
Periodontal Disease					
Yes	7.8 (0.40)	0.338	36 (14.1)	221 (85.9)	0.431
No	7.3 (0.35)		31 (10.8)	253 (89.2)	
Oral Pain					

Mean Dental Anxiety Score			Dental Anxiety Score Categories		
	Mean(SE)	p-value [^]	High (13)	Moderate/Low (<13)	p-value ⁺
Yes	8.8 (0.67)	0.030	17 (26.9)	45 (73.1)	0.014
No	7.3 (0.28)		50 (10.5)	429 (89.5)	
Sore or Bleeding Gums					
Yes	8.1 (0.52)	0.208	25 (20.8)	94 (79.2)	0.042
No	7.4 (0.29)		42 (10.1)	376 (89.9)	
Self-Rated Oral Health					
Excellent/Very Good/Good	7.0 (0.33)	0.006	25 (8.5)	271 (91.5)	0.079
Fair/Poor	8.2 (0.36)		42 (17.4)	199 (82.6)	
Modified Gingival Index [*]					
Any teeth that scored 3 or more	7.4 (0.77)	0.773	32 (14.8)	189 (85.2)	0.978
No teeth that scored 3 or more	7.6 (0.35)		4 (14.5)	20 (85.5)	
Mobility Assessment [*]					
Any teeth that scored 2 or more	8.1 (0.50)	0.458	35 (13.0)	206 (87.0)	0.756
No teeth that scored 2 or more	7.6 (0.35)		8 (14.5)	53 (85.5)	
Gingival Recession [*]					
Any teeth that scored 4 or more	8.0 (0.35)	0.176	22 (14.4)	139 (85.6)	0.833
No teeth that scored 4 or more	7.3 (0.38)		18 (13.5)	106 (86.5)	

* Only measured on dentate participants who attended the oral examination

[^] p-values are from ANOVA tests

⁺ p-values are from Rao Scott Chi-Square tests

Table 3Logistic regression analyses for dental anxiety (high versus moderate/low) ^{*}

Outcome	Odds Ratio	95% CI	p-value
Dentate	1.29	0.51 – 3.30	0.591
Number of Teeth			
0	0.78	0.24 – 2.54	0.685
1-10	1.16	0.47 – 2.83	0.750
11-20	1.25	0.46 – 3.35	0.662
Periodontal Disease	1.13	0.55 – 2.31	0.742
Oral Pain	1.88	0.80 – 4.42	0.150
Sore or Bleeding Gums	2.40	1.09 – 5.26	0.030
Fair/Poor Self-Rated Oral Health	1.83	0.69 – 4.90	0.228
High Modified Gingival Index	1.37	0.34 – 5.51	0.654
High Mobility Assessment	0.64	0.24 – 1.72	0.380
High Gingival Recession	1.11	0.56 – 2.20	0.759

^{*} Table represents Odds Ratios and 95% confidence intervals for 9 separate logistic regression analyses. All models were adjusted for gender, ethnicity, age group and education

Table 4

Comparison of Responses (N, %) to Two DAS Questions According to Time of Most Recent Dental Care Visit

DAS Question/Response	Most Recent Dental Care Visit		
	Within the Past Year	More than a Year Ago but Within Three Years	Three or More Years Ago
How Would You Feel About Waiting in a Dental Chair While the Dentist Prepares a Drill?			
Relaxed	133 (45.1)	37 (12.5)	125 (42.4)
A Little Uneasy	35 (39.3)	13 (14.6)	41 (46.1)
Tense	30 (29.1)	26 (25.3)	47 (45.6)
Anxious	26 (31.3)	14 (16.9)	43 (51.8)
So Anxious That You Sometimes Break Out In a Sweat or Almost Feel Physically Sick	7 (26.9)	4 (14.3)	15 (57.6)
Don't Know	2 (5.4)	7 (18.9)	28 (75.7)
How Would You Feel About Waiting in the Dental Chair While the Dentist Prepares Instruments for Scraping Your Teeth?			
Relaxed	155 (47.5)	40 (12.2)	131 (40.2)
A Little Uneasy	29 (32.2)	18 (20.0)	43 (47.8)
Tense	19 (25.7)	16 (21.6)	39 (52.7)
Anxious	14 (31.8)	8 (18.2)	22 (50.0)
So Anxious That You Sometimes Break Out In a Sweat or Almost Feel Physically Sick	3 (25.0)	4 (33.3)	5 (41.7)
Don't Know	13 (14.9)	15 (17.2)	59 (67.8)