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ORIGINAL RESEARCH

Prevalence of Dental Anxiety and the Psychometric Properties of Modified Dental Anxiety Scale in Nigeria

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ABSTRACT

Aim: This study focused on the Modified Dental Anxiety Scale to determine the prevalence of dental anxiety and assess the psychometric properties in Nigerian population.

Materials and methods: Included in the study were 619 participants (204 males and 415 females) chosen conveniently from among the dental patients, students of post basic nursing and staff nurses, all from University of Benin Teaching Hospital, Benin City, Nigeria. The mean age was 31.34 (11.77) years. Participants completed a questionnaire containing the Modified Dental Anxiety Scale.

Results: The prevalence of high dental anxiety was found to be 10.7% at the cut-off point ≥ 19. Cronbach's alpha for the present Nigerian sample was 0.80. Factor analysis revealed one factor with an eigenvalue greater than 2. This factor explained 55.9% of the variance of the items. In addition, the MDAS showed a significant difference between the genders, with the female ($\bar{X} = 13.86; SD = 4.64$) reporting higher dental anxiety score than the male ($\bar{X} = 12.62; SD = 4.73$).

Conclusion: MDAS demonstrated satisfactory and acceptable psychometric properties. Therefore, dental surgeons, clinical psychologists, psychiatrists and other therapists can use MDAS as an objective tool for detecting and possible management of high dental anxiety in Nigeria.

Keywords: Modified dental anxiety scale (MDAS), Prevalence, Dental anxiety, Gender, Psychometrics.

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INTRODUCTION

Dentally anxious people are a population of public health interest because of the dental health crisis caused by dental avoidance as a result of fear and the suboptimal dental health behaviors that are highly widespread in this group.[1] Poor oral health and consciousness of dental avoidance problems may perhaps give rise to embarrassment, decreased social functioning and maybe reduced quality of life.[2-4]

Regular and conventional care is avoided by dentally anxious individuals, who depend on self-treatment, application of emergency services, and irregular use of traditional or similar preparations to alleviate pain.[5]

Several scales have been developed to measure dental anxiety. Corah Dental Anxiety Scale was established to be accepted among dental researchers.[6] It is uncomplicated, easy to score, short, valid and reliable in testing dental-appointment-associated anxiety.[7] Nonetheless, the scale has a number of flaws which led to the development of the Modified Dental Anxiety Scale[8] merging some slight significant enhancements.[9]

Studies of the prevalence of dental anxiety in general population sample have generated approximates which range from a low of 2.6%[10] to a high of 29.9%.[11] The prevalence of dental anxiety in the adult population in Australia was reported to be 14.9%.[12] In Canada, it was 8.4%, [13] while in Norway it was 16.7%.[14] In Ireland, it was 17%.[15] It has been estimated that 13.6% of the adult population in Ghana suffer from high dental anxiety.[16] About 4 to 7% of the subjects in Japan, Indonesia, Brazil and Argentina reported having extreme dental anxiety.[17]

Quite a number of demographic, behavioral and psychosocial variables have been found to be related to dental anxiety.[18,19] Nearly every research on dental anxiety indicates a higher prevalence among females than males. Although a study on the onset and patterns of change in dental anxiety reported an increase in the prevalence of dental anxiety from 10.6% at age 15 years to 13.3% at 18 years, it has also been widely reported that anxiety tends to decrease with age.[20] Most studies have also found that the prevalence reduces after the age of 50 years, signifying that high dental anxiety is made up at some stage in childhood and adolescence.[17]

Some investigators have projected the prevalence and determinants of dental anxiety but the bulk of the studies has been mainly restricted to populations from industrialized countries.[20-22] For instance, there is little information on the condition in Nigeria and the developing world in general. Previous studies on the prevalence of dental anxiety and psychometric characteristics of dental anxiety have been

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based on rather small samples, many of which were mainly done either among dental patients or students in the classroom setting. In addition, the few available existing local studies in Nigeria have limited their findings to establishing the prevalence, determinants, validity and reliability of MDAS. None of these studies has endeavored to explore the factor analysis of MDAS among the Nigerian population. This study combined these two sample populations, that is, dental patients waiting to see the dentist for an appointment and the nondental patients made up of the staff nurses and student nurses in a tertiary hospital.

The objectives of the present study were to determine the prevalence of dental anxiety and establish the psychometric characteristics of MDAS, which included, for the first time, the exploration of factor analysis of MDAS among the Nigerian population. If practitioners functioning in the various specialized dental centrer are conscious of the intensity of anxiety of their patients, most importantly, if such manifestations are higher among certain risk groups, then the specialists will be in a better position to take measures to help alleviate this emotional problem. Thus, practitioners will be in a good position to advocate for services for persons with dental anxiety.

MATERIALS AND METHODS

Participants

Six hundred and nineteen (619) participants were conveniently selected from people attending the Dental Clinic, students of post basic nursing, and staff nurses, all at University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. Participation ranged in age from 18 to 75 years with a mean of 31.34 years (SD = 11.77).

Procedure

Ethical approval for the study was obtained from the Ethics and Research Committee, UBTH. The sample size for this study was consequently selected during a 3-month period. All participants for the study were fully informed of the reason for undertaking the project and of the research process. Participation was voluntary and the participants were assured of confidentiality and anonymity. The dental patients completed the questionnaire in the waiting area while waiting to see the dentist. The questionnaire was administered to students at the School of Post Basic Nursing in group in a lecture hall, while the hospital staff nurses was assessed individually in their respective wards. People below the age of 18 years and people with gross mental abnormality or other diagnosable neurological disorders were exempted from the study. As a benefit of participation, respondents were offered a free ball pen.

Instruments

The Modified Dental Anxiety Scale (MDAS)[8] was used to quantify the participants' level of dental anxiety. MDAS contains five multiple-choice questions, each with a 5 category rating scale, ranging from 'not anxious' to 'extremely anxious'. Each question carries a possible minimum score of 1 and a maximum score of 5, resulting in a total possible minimum score of 5 and a total possible maximum score of 25 for the entire scale. An MDA score of 19 and above indicates a strong likelihood of the respondent being dentally phobic.[8] Following completion of this questionnaire, the participant's age, sex and MDAS score were noted.

Statistical Analysis

The data were analyzed using the Statistical package for Social Sciences (SPSS version 16.0 for Windows). Dental anxiety scores (MDAS) of 19 or more have been used in the literature to suggest that an individual is dental phobic.[8] This cut-off point was used in the study to indicate whether a person is experiencing high dental anxiety or not. Mean score and standard deviation were completed for the important variables separately. Next, t-test for independent sample was used to compare the means of male and female. Analysis of variance (one-way), using Duncan multiple range test, was employed to test the influence of the field of study and age category on each item and the total score of MDAS. The measures of internal consistency (Cronbach's alpha and average inter-item correlation) were used to estimate the reliability of MDAS. Factor analysis was done to determine the number of dimensions the items represent.

RESULTS

The total number of participants available for statistical analysis was 619. Of the 619 participants in the sample, 437 (70.6%) were dental patients, 57 (9.2%) were students at the Post Basic School of Nursing, while 125 (20.2%) were staff nurses of the hospital. With regard to sex, 33.0% (204) were male, while 67.0 (415) were female. In terms of age categories, the participants who were 18 and 29 years were 58.5% (362), 30-49 years were 31.2% (193), 50-69 years were 9.4% (58), while 70 years and above were 1.0% (6). The prevalence of dental anxiety (that is MDAS $\geq$ 19) in the study sample was found to be 10.7% (66). A higher proportion of females (8.1%) than males (2.6%) were highly anxious of dental treatment (Table 1).

Mean score and standard deviations for each item of the MDAS are shown in Table 2. In addition, the items were ordered by their means. As can be seen from this table, the participants were most anxious about having their tooth

Table 1: Demographics, dental status of the Nigerian sample

Sample demographics		*Total(%)*	*n*
Field of study	Dental patients	70.6	437
	School of post basic (Students)	9.2	57
	Staff nurse	20.2	125
Sex	Male	33.0	204
	Female	67.0	415
Age	18-29 years	58.5	362
	30-49 years	31.2	193
	50-69 years	9.4	58
	70 years and above	1.0	6
Dental anxiety	Phobic anxiety	10.7	66
	Nonphobic	89.3	553
	Proportion of males who are anxious	2.65	16
	Proportion of females who are anxious	8.1	50

drilled, followed by the feeling of having a local anesthetic injection in the gum. The internal consistency of MDAS was determined by using Cronbach's alpha and inter-item correlation. Cronbach's alpha for the reliability coefficient of MDAS in the present sample was 0.80 (0.80 for males and 0.80 for females). The average inter-item correlation was 0.58 (0.57 for males and 0.59 for females); corrected item-total correlation varied for the total scale between 0.52 and 0.64 (see Table 2), which is satisfactory. Factor analysis was used to confirm the appropriateness of MDAS items and revealed a strong one-dimensional factor underlying all items with an Eigen value greater than 2. This factor explained 55.9% of the variance of the items. The factor loadings are shown in Table 2. The loading of item 5 was notably lower than the other loadings.

The MDAS means and SD by field of study of the study population are presented in Table 3. For the individual items, the table shows that, for item 1, all the fields of study were significantly different from one another (that is, Dental patients, Post Basic Student nurse and Staff nurse) ($p < 0.05$). The same trend was observed for item 2. Item 3 revealed that the Post Basic student nurses scored significantly higher than the dental patients and the staff nurses ($p < 0.05$). For item 3, there was no significant difference between the dental patients and the staff nurses. Item 4 shows that staff nurse and Post Basic nurses did not differ significantly ($p > 0.05$) but were significantly different from dental patients ($p < 0.05$). Item 5 indicates that all the fields of study did not differ significantly on MDAS ($p > 0.05$). With regard to the total MDAS score, just like item 3, the Post Basic student nurse

Table 2: Summary statistics for the MDAS

Item	*Description*	*M*	*SD*	*Rank*	*Corrected item—total correlations*	*Factor loadings*
3	If you were about to have a tooth drilled, how would you feel?	3.07	1.29	1	0.60	0.75
5	If you were about to have a local anesthetic injection in your gum, above an upper back tooth, how would you feel?	2.98	1.28	2	0.52	0.68
2	When you are waiting in the dentist's office for your turn in the chair, how do you feel?	2.54	1.24	3	0.64	0.80
4	If you were about to have your teeth scaled and polished, how would you feel?	2.46	1.28	4	0.57	0.73
1	If you had to go to the dentist tomorrow, how would you feel about it?	2.39	1.23	5	0.61	0.77

Table 3: Individual item and total MDA scores according to the field of study

Questionnaire item	*Dental patients (SD)*	*Staff nurse (SD)*	*Students of school of post basic (SD)*	*p-value (ANOVA)*
Anticipating visit to dental clinic	2.44 (1.28)[c]	2.06 (0.99)[b]	2.77 (1.09)[a]	0.00
Waiting in the dentist's office for treatment	2.59 (1.28)[c]	2.18 (1.02)[b]	2.96 (1.12)[a]	0.00
Waiting in the dental chair for drilling of teeth	3.04 (1.33)[b]	3.00 (1.10)[b]	3.51 (1.17)[a]	0.02
Waiting in the dental chair for scaling of teeth	2.55 (1.35)[b]	2.09 (0.98)[a]	2.63 (1.19)[a]	0.00
Waiting in the dental chair to have local anesthetic injection in the gum	2.95 (1.31)[a]	3.02 (1.43)[a]	3.21 (1.25)[a]	NS
Total score	13.56 (4.87)[b]	12.34 (4.07)[b]	15.09 (4.08)[a]	0.00

Means with the same superscripts (a, b, c) are not significantly different ($p > 0.05$); NS: nonsignificant

Table 4: Individual item and total MDA scores according to gender

Questionnaire item	*Male (SD)*	*Female (SD)*	*p-value (t-test)*
Anticipating visit to dental clinic	2.30 (1.25)	2.44 (1.21)	NS
Waiting in the dentist's office for treatment	2.44 (1.23)	2.59 (1.23)	NS
Waiting in the dental chair for drilling of teeth	2.79 (1.29)	3.21 (1.25)	0.00
Waiting in the dental chair for scaling of teeth	2.41 (1.33)	2.49 (1.26)	NS
Waiting in the dental chair to have local anesthetic injection in the gum	2.68 (1.29)	3.13 (1.25)	0.00
Total score	12.62 (4.73)	13.86 (4.64)	0.00

Level of significance $p < 0.05$; NS: nonsignificant

participants significantly scored higher on total MDAS than the dental patients and the staff nurses ($p < 0.05$). However, dental patients and staff nurses did not differ significantly on total MDAS ($p > 0.05$).

The mean and standard deviation (SD) of the MDAS for the total study population by gender are shown in Table 4. It can be observed that, for item 1, there was no significant difference between males and females ($p > 0.05$). The same trend was observed for items 2 and 4. However, items 3 and 5 suggest that females reported significantly higher dental anxiety scores than males ($p < 0.05$). Furthermore, the table revealed that total MDAS mean score for females ($\bar{X} = 13.86$, SD = 4.64) was significantly higher than for males ($\bar{X} = 12.62$, SD = 4.73).

The MDAS means and SD by age of the study population are presented in Table 5. Based on the individual items (1-5), there was no statistical difference in the manifestation of dental anxiety among the different age groups ($p > 0.05$). The same pattern was observed for the total MDAS score. Based on the total MDAS score, participants in the 18 to 29 age group showed the highest total MDAS scores ($\bar{X}$ 13.70, SD = 4.73) followed by 30-49, 50-69 and >70 age groups. However, these differences were not statistically significant.

DISCUSSION

This study is an effort to investigate the prevalence of dental anxiety and to obtain psychometric properties for the MDAS among the Nigerian population. A larger sample size, the sampling process, which included both dental patients and the nondental participants, and subjecting the MDAS to factor analysis, are an important strength to this study in enabling assessment of the prevalence and establishment of psychometric properties for MDAS in Nigeria.

In this study, one of the utmost severe assessments (MDAS ≥ 19) of dental issues was used to measure the participants' levels of dental anxiety and anticipated levels of dental anxiety concerning dental treatment. The study revealed that approximately 10.7% of the Nigerian people were classified as experiencing dental phobia. Although information about the prevalence of dental phobia from a national perspective in Nigeria is nonexistent, this estimated prevalence in this study is higher than the prevalence reported by other local studies.[20,23] These inconsistencies may be due to different measures of dental anxiety, differences in the type and combinations of study participants and differences in the cut-off points in evaluating dental phobia. Therefore, it is necessary to exercise restraint when relating studies that use different measures and cut-off values. For example, two conventional cut-off values (≥13 and ≥15) are frequently used for statistics obtained from Corah's scale.[24,25] According to Humphris et al,[8] the cut-off of 19 was selected for the MDAS formerly on experimental ground, and made available better assurance in the interpretation of the percentage that score at or above this point. Nonetheless, Aartman,[26] are of the

Table 5: Individual item and total MDA scores according to age

Questionnaire item	*18-29 years (SD)*	*30-49 years (SD)*	*50-69 years (SD)*	*>70 years (SD)*	*p-value (ANOVA)*
Anticipating visit to dental clinic	2.47 (1.23)	2.27 (1.21)	2.33 (1.22)	2.17 (1.33)	NS
Waiting in the dentist's office for treatment	2.63 (1.25)	2.41 (1.22)	2.40 (1.17)	2.33 (1.21)	NS
Waiting in the dental chair for drilling of teeth	3.12 (1.33)	3.02 (1.19)	2.97 (1.19)	3.00 (1.67)	NS
Waiting in the dental chair for scaling of teeth	2.51 (1.28)	2.46 (1.26)	2.21(1.31)	2.00 (0.89)	NS
Waiting in the dental chair to have local anesthetic injection in the gum	2.96 (1.29)	3.06 (1.25)	2.83 (1.19)	3.17 (1.60)	NS
Total score	13.70 (4.75)	13.23 (4.59)	12.72 (4.83)	12.67 (5.43)	NS

NS: not significant

opinion that these different cut-off points are not considered very valuable, since there is a background knowledge that the different cut-off points vary from study to study. Again, there are many studies that have used other recognized scales, such as the Dental Fear Scale; and some studies, such as Bare and Dundes[27] used custom-made scales to measure dental anxiety.[15] However, the prevalence of dental phobia is somewhat similar to findings in other countries. Moore et al[28] found the prevalence of 10.2% in a study of adult population in Denmark. The prevalence of 10.2% was reported among the adult population living in Metropolitan Toronto.[29]

The result of this study indicates the reliability of MDAS among the Nigerian population in terms of the internal consistency. These data support the performance of the MDAS as a measure of dental anxiety. This finding is consistent with previous reports. Tunc et al[30] established an alpha coefficient of above 8 among the Turkish population, while Appkukuttan et al[31] found a similar reliability coefficient for the Tamil version of MDAS. This study suggests that internal consistency, as a measure of the reliability of the MDAS, is good.

Factor analysis of MDAS indicates that all items represent one construct which can be understood as providing a dimension of dental anxiety ranging from low to high. The items appearing to describe a unidimensional construct concur with findings among the UK general public population norm,[32] in which a strong one-dimensional factor was found to be underlying all items. Item 5 had the least factor loadings, while item 2 had the highest factor loading. Item 5, though with the least factor loading, cannot be said to be deficient because the value is far above 4, which is the least recommended in social sciences. Furthermore, in terms of rank, item 3 was the most feared, while item 1 was the least most feared. These data confirm the finding that extreme dental anxiety for participants was characterized by fear of drilling among the Danish adults.[28]

The results of this work showed that female participants reported higher MDAS scores and, therefore, are likely to demonstrate greater levels of dental anxiety than the males. This confirms the claim of Ofori et al[16] that females are more likely to report higher dental anxiety and fear scores than males. Malvania and Ajithkrishnan[33] found females to be significantly more anxious than their male counterparts. When the individual item was examined, expectedly, there was significant difference between males and females in their response to item 3 and 5 of the MDAS, with the female participants reporting significantly higher scores than the males. The same trend was observed for the other items except that they did not reach significant levels. The observed difference between males and females might be due to actual difference in the anxiety levels between genders; a greater willingness among females to admit feelings of anxiety; and both influences acting in alliance.[34] Liddell and Locker[35] assert that perceived deficiency of control was the second largest predictor of dental fear and anxiety. However, women demonstrated significantly greater desire for control than men. Gadbury-Amyot and Williams[36] add that women seem to be at a greater minus than men in their observed capacity to manage in a dental condition because of their greater wish for control, coupled with a poorer perception of real control. This circumstance generates a psychological strain in women, bringing about greater fear and anxiety. The finding of this study implies that gender should be taken seriously in dental anxiety management.

In this study, age of participants did not reveal statistically significant differences in terms of MDAS. Although there was an inverse relationship between age and MDAS scores, in which dental anxiety scores were decreasing with the age. For example, participants in the lowest age group (18-29) reported the highest MDAS score ($\bar{X} = 13.70; SD = 4.75$), while the participants in the highest age group (70 and above) reported the lowest MDAS score ($\bar{X} = 12.67; SD = 5.43$). Almost similar results have been reported by Udoye et al[20] who found that the highest dental anxiety scores were reported by those in the age group 24 to 34 years, while those in the oldest group showed the lowest dental anxiety score.

This observed difference was not statistically different. The finding in this study is supported by previous studies, such as Thomson et al[12] and Stabholz and Peretz,[37] who did not establish a significant relationship between age and dental anxiety but reported that dental anxiety was higher among people in the lower age. The reason projected for the decrease in dental anxiety with age may have to do with the ability of older people to cope with dental experiences or that the ageing development may itself be characterized by overall waning in anxiety.[35] It may also be due to improved standing and the capacity of individual to rationalize experiences by means of increasing age.[38]

CONCLUSION

This study found that the prevalence of dental anxiety in Nigeria is similar to what obtains in some other countries of the world. The MDAS as a measuring tool can assist healthcare professionals, such as the dental surgeon, clinical psychologists, psychiatrists and therapists operating at the various anxiety management centers, to classify these patients with respect to their levels of dental anxiety. Individuals or patients whose MDAS scores lie at or above 19 may have the propensity to display symptoms of dental phobia and may require immediate and appropriate treatment.

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