Modified Dental Anxiety Scale and its Psychometric Properties in an Adult Population in Port Harcourt, Rivers State, Nigeria

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ABSTRACT

Background: The validation of an instrument is necessary before it can be introduced for use in any community. The aim of the study was to evaluate the psychometric properties of the Modified Dental Anxiety Scale in an adult Nigerian population and to assess the validity and internal consistency of the measure.

Methods: The Modified Dental Anxiety Scale questionnaire was administered to 160 University students. Data were analyzed using Statistical Package for Social Sciences version 20.0 and means compared using Student t-test and analysis of variance. The internal consistency of MDAS was established using Cronbach's alpha.

Results: Of the 160 participants, 50.6% (81) were male and 49.4% (79) were female. The prevalence of dental anxiety (MDA score $\geq$ 19) was 21.2% (34). This was higher in females (11.2%) than in males (10%). Respondents were most anxious about having their tooth drilled. The Cronbach's alpha for each of the MDAS item ranged from 0.695 to 0.872 with an overall average of 0.79. The average inter-item correlation was 0.63, which was satisfactory. The total mean MDA score was significantly (P= 0.024) higher in females 14.95 (±4.54) than in males 13.27 (±5.00). Regarding age, there was statistically significant decrease in mean MDA score with age (P = 0.033).

Conclusion: MDAS showed good psychometric properties with satisfactory face and content validity, excellent completion of scale items as well as good internal consistency in adult population in Port Harcourt, Nigeria.

Keywords: Correlations, Dental anxiety, Modified Dental Anxiety Scale, Psychometric

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INTRODUCTION

Dental anxiety and fear continue to raise significant problems both to the patient and the dentist. A number of people still avoid dental treatment due to anxiety and the perception that dental interventions are invasive and painful, despite improvement in psychological, behavioral and in the modern techniques of diminishing or eliminating pain.[1,2]

Dental fear and anxiety is linked to avoidance of dental treatment, often resulting in pain and the need to undergo more invasive treatment when the patients eventually visit the dentist.[3] Furthermore, the tendency to receive symptom-oriented treatment rather than preventive treatment; is related to higher levels of dental fear, leading to a "vicious cycle" in which dental fear continues to be predictive of avoidance, greater dental treatment needs, symptom-oriented care, and continued fear.[4] When anxious patients do appear for dental treatment, they may pose special treatment considerations for the practitioner.[3] Therefore, identification and reduction of dental anxiety through adequate evaluation of the condition and development of strategies for its management is imperative. This could only be achieved through accurate measurement of dental anxiety.[4]

Various scales and psychological tests are available for the evaluation of dental anxiety; the most widely used is the Corah Dental Anxiety Scale (CDAS).[5-8] CDAS is 4 item questionnaire scored by summing individual item scores (from a=1 to e=5) for a total score from 4 to 20.[5-8] It is brief, easy to administer, reliable, valid and sensitive. CDAS is designed to measure anxiety about dental treatment.

The dental anxiety is conceptualized as the patient's response to the specific dental situations: emotional response to the prospect of a dental visit the previous day, then when in the waiting room, receipt of drilling, and scaling.[5]

Although CDAS is widely used, it has been criticized for inconsistent response format of its items and a range of total scores that are too narrow. The Modified Dental Anxiety Scale (MDAS) was introduced to overcome this limitation.[9] The MDAS increases the number of items from four to five by introducing an additional item that asks about responses to administration of local anesthetic.[9] which is a focus for some patients' anxiety.[10] It also introduced a change in the response format, such that it becomes consistent[7]. MDAS is a brief, 5 item Likert scale questionnaire with a consistent answering scheme for each item ranging from "not anxious' to "extremely anxious". It is scored by summing individual item scores (from a=1 to e=5) for a total score from 5 to 25.[9]

The MDAS is the most frequently used dental anxiety questionnaire in the UK.[11] It has good psychometric properties, is quick to complete and easy to score.[12,13] The internal consistency is high with Cronbach's alpha between 0.8 and 0.95.[2,5,14] The MDAS has been found to be reliable and valid in several samples from the United Kingdom (Wales, Ireland, England, Scotland),[9] Romania,[5] Turkey[15] and California,[16] as well as sample of Spanish-speaking individuals in the United States.[14]

Our investigation reveals that such data on validity, reliability and psychometrics are not

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available in Port Harcourt, South-South, Nigeria, despite the fact that some studies have accessed dental anxiety among Nigerians using the CDAS [17] and MDAS [18]. This study, therefore, aimed to evaluate the psychometric properties of the MDAS in an adult Nigerian population, and to assess the validity and internal consistency of the measure. If the MDAS measure is found to have satisfactory psychometric properties, it will facilitate comparison of research outcomes in dental public health between Nigeria and the rest of the world.

METHODS

Study population and data collection

The study population consisted of undergraduate University students at the University of Port Harcourt. A minimum sample size of 100 participants was estimated to be adequate for this study. The assumptions made were: the proportion of individuals with dental anxiety using MDAS in a previous study = 7%,[19] precision (d) = 5% and confidence interval = 95%. However, this cross-sectional validation study was performed on 160 homogenous population of undergraduates conveniently selected at the University of Port Harcourt, Rivers state, Nigeria. The response rate was 100%. The study was approved by the Research and Ethics Committee, university of Port Harcourt and informed consent obtained from the participants, participation was voluntary and participants were assured of anonymity and confidentiality. Structured self-administered questionnaire containing information on age, gender and the MDAS was completed by the students in their hostels.

Instrument

The MDAS was used to evaluate participants' level of dental anxiety. The scale contains five multiple choice items dealing with the patient's subjective reaction to dental situation[7]. This includes anticipating visit to the dental clinic, waiting in the dentist's office for treatment, waiting in the dental chair for drilling of teeth, waiting in the dental chair for scaling the teeth and response to the administration of local anesthetic, Each item contains five possible options that are arranged in ascending order, from "a" (not anxious) to "e" (extremely anxious) and each carries a possible minimum score of 1 and maximum score of 5, resulting in a total possible minimum score of 5 and a total possible maximum score of 25 for the whole scale (See table 1). A MDA score $\geqslant$ 19 is accepted as the cut-off point in literature, therefore, an individual with this score is considered to be dentally anxious[9]. The cut-off point was adopted for this study. The score for the response was Not anxious, 1; slightly anxious, 2; fairly anxious, 3; very anxious, 4 and extremely anxious, 5.

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Table 1. The MDAS items

Item no	Description	Response
1	If you go to the Dentist for treatment tomorrow, how would you feel?	
2	If you were sitting in the waiting r oom waiting for treatment, how would you feel?	Not anxious Slightly anxious
3	If you were about to have a tooth drilled, how would you feel?	Fairly anxious
4	If you were about to have your teeth scaled and polished, how would you feel?	Very anxious Extremely anxious
5	If you were about to have a local anaesthetic injection in your gum, above an upper back tooth, how would you feel?	

Response is the same for all items

Data analysis

Statistical analysis was done using Statistical Package for Social Sciences (SPSS version 20, IBM Statistics New York, USA). Student t-test and analysis of variance (ANOVA) was employed to compare mean MDA score between variables at 95% confidence interval and significant level at *P* < 0.05. The MDAS items were presented to 20 final year medical students in the Faculty of Clinical Science, University of Port Harcourt for face and content validity. The face and content validity was measured by assessing the students' response to the constituent items, ease of administration and the correlation of their response to each other. All the questionnaire were properly filled and returned complete indicating that the MDAS self-administered questionnaire has a very low item non-response. The internal consistency and reliability of MDAS was established using the inter-item correlation and Cronbach's alpha.

RESULTS

Sample demographics and prevalence of dental anxiety

A total of 160 participants were involved in the study. Of the 160 participants, 50.6% (81) were male and 49.4% (79) were female. Regarding age, participants 16-20 years were 13.1% (21), 21-25 years 74.4% (119) and those who were 26 years and above were 12.5% (20). The prevalence of dental anxiety (MDA score ≥ 19) was 21.2% (34). This was higher in females (11.2%) than in males (10%), Table 2.

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Table 2. Demographics and dental anxiety status of participants

Sample characteristics	Frequency	Percent
Gender		
Male	81	50.6
Female	79	49.4
Age (years)		
16-20	21	13.1
21-25	119	74.4
₂₅	20	12.5
Dental anxiety		
⩾ 19	34	21.2
< 19	126	78.8
Anxious male	16	10.0
Anxious female	18	11.2

Internal Consistency and Reliability of the MDAS

Table 3 shows mean score and standard deviation for each MDAS item. Respondents were most anxious about having their tooth drilled; this was closely followed by the feeling of having local anesthetic injection and then waiting to receive scaling and polishing. The internal consistency of the MDAS was determined using Cronbach's alpha and inter-item correlation. The Cronbach's alpha for each of the MDAS item ranged from 0.695 to 0.872 with an overall average of 0.79. The inter-item correlation ranged from 0.541 to 0.691 with an overall average of 0.63 which was satisfactory

Table 3. Cronbach's Alpha and inter-item correlation for the MDAS

Item description	Mean (SD)	Inter-item correlation	Cronbach's alpha
If you went to the Dentist for treatment tomorrow, how would you feel?	2.26 (1,23)	0.672	0.788
If you were sitting in the waiting room waiting for treatment, how would you feel?	2.42 (1,20)	0.541	0.812
If you were about to have a tooth drilled, how would you feel?	3.51 (1.31)	0,567	0.806
If you were about to have your teeth scaled and polished, how would you feel?	2.55 (1.50)	0.681	0.695
If you were about to have a local anaesthetic injection in your gum, above an upper back tooth, how would you feel?	3.50 (1.50)	0.694	0.872

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MDA score according to gender and age

The MDA score for each item according to gender is shown in Table 4. The total mean score was significantly (*P= 0.024)* higher in females 14.95 (±4.54) than in males 13.27 (±5.00). Similarly, females had higher mean score for all the MDAS items than men.

However, it can be observed that for item 1 and 2, there was no significant difference between male and female. Item 3 suggests that females reported significant higher dental anxiety than males (*P= 0.01)*. The same trend was observed for items 4 and 5 (*P= 0.03 and 0.017, respectively)*.

Table 4. Mean MDA scores for individual item in relation to gender

MDAS items	Male	Female	*P*-value
	Mean (SD)		**(t-test)**
Anticipating dental visit	2.17 (1.19)	2.32 (1.27)	0.06
Waiting in dentist office for treatment	2.30 (1.20)	2.53 91.21)	0.1
Waiting for the drill	3.36 (1.42)	3.65 (1.23)	0.01
Waiting for scaling	2.32 (1.31)	2.78 (1.66)	0.03
Waiting to receive injection of local anaesthetics	3.33 (1.66)	3.67 (1.33)	0.017
Total	13.27 (5,00)	14.95 (4.54)	0.024

NS: not significant (*P* > 0.05)

Regarding age, based on the individual MDAS item, there was no significant difference in the dental anxiety level observed among the different age groups. The pattern was however different for the total mean MDA score. Respondents 16-20 years had the highest mean MDA score of 16.53 (±4.47); this was followed by 21-25 years and those that are 26 years and above. There was statistically significant decrease in mean MDA score with increasing age (*P* = 0.033), Table 5.

Table 5. Mean MDA scores for individual item in relation to age

MDAS items	16-20 years	21-25 years		*P*-value
	Mean (SD)			**(ANOVA)**
Anticipating dental visit	3.05 (1.01)	2.40 (1.35)	2.08 (1.18)	0.1
Waiting in dentist office for treatment	3.10 (1.26)	2.40 (1.09)	2.29 (1.18)	0.3
Waiting for the drill	3.76 (1.22)	3.50 (1.47)	3.45 (1.33)	0.08
Waiting for scaling	3.05 (1.32)	3.00 (1.56)	2.39 (1.30)	0.1
Waiting to receive injection of local anesthetics	3.57 (1.29)	3.30 (1.66)	3.52 (1.53)	0.4
Total	16.53 (4.47)	14.60 (4.32)	13.73 (4.86)	0.033

NS: not significant (*P* > 0.05)

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DISCUSSION

The validation of an instrument is deemed appropriate before it can be introduced for use in any community. Our study is aimed at validating the MDAS measure in an adult Nigerian population. The quantification of the MDAS in this study involved the use of both the ordinal Likert scale with a total additive score and a categorization into dichotomous scoring of "Dentally anxious" or "non-dentally anxious".

There is no consensus on the criteria to be used in assessing the validity, reliability and responsiveness of MDAS. The criteria adopted for the present study was selected based on popularity of usage found during our literature search.[5,9,10,13,14] This study showed satisfactory face and content validity of the MDAS measure in the sampled population. The questionnaire was quite easy to administer and completed in a relatively short period of time. The small number of constituent items could have contributed to encouraging a good participation rate and the ease of administration. All the questionnaire were properly filled and returned complete indicating that the MDAS self-administered questionnaire has a very low item non-response. Based on our results, it seems reasonable to suggest, that the MDAS questionnaire can be understood by any average educated individual.

In the present study, MDAS showed adequate reliability in terms of its internal consistency and inter-item correlation. This indicates that internal consistency as a measure of reliability of the MDAS is good and supports the performance of MDAS as a measure of dental anxiety. The Cronbach's alpha score for the MDAS was high (0.79). The Cronbach's

alpha value obtained in this study for the MDAS is comparable to the value of between 0.8 and 0.95 reported in other studies.[2,5,14] The inter-item correlation for each of the MDAS item was satisfactory and within the acceptable boundaries with Cronbach's alpha value between 0.79-0.87, this suggests that the MDAS is appropriate for use among Nigerians.

The prevalence of dental anxiety in the present study is 21.2%, this was high when compared to other studies conducted in Nigeria. Udoye *et al*[17] and Arigbede *et al*[18] reported prevalence of 7.5% and 7%, respectively among dental patients in Nigerian teaching hospitals. The variation may be attributed to difference in the study population. The presentation of dental anxiety may be different between the general population and hospital based patients. Therefore, a larger study is suggested to investigate and compare pattern of presentation of dental anxiety between hospital patient and general population. However, the prevalence obtained in this study is comparable to prevalence values obtained from other studies. Whereas in Norway[19] and Ireland,[20] Anstrom *et al* and Brady *et al* reported a prevalence of 17% in their studies, Kirova *et al*[21] reported a prevalence of 30% among Bulgarian adults.

The results of our study showed that female respondents reported higher MDA score for all MDAS items and, therefore, are more likely to demonstrate higher level of anxiety than male. There was statistically significant difference between females and males in their response to items 3, 4 and 5 of the MDAS, with female samples reporting significantly higher scores than male. The

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same trend was observed for items 1 and 2 except that they did not reach significant level. The total mean MDA score was also significantly higher in women than in men. The findings of this work are corroborated by the results of other studies.[22-25] Medical and psychological research on human responses to pain stimuli has generally found that women report higher levels of anxiety and exhibit less tolerance for pain at given stimulus intensities than men.[26] The higher level of dental anxiety observed in women may also be due to the fact that women are more likely to self-report, whereas men may not express their fear as openly as women.[17]

The relationship between dental anxiety and age is described as inverse, indicating that dental anxiety decreases with age.[9] This finding is supported by a number of studies which reported that dental anxiety is higher among people in the lower age,[23-25] but did not establish significant relationship between dental anxiety and age. In the present study dental anxiety was found to decrease significantly with age. The decrease can be attributed to the ageing process itself characterized by general decline in anxiety.[26] It may also be due to the capacity of individuals to rationalize the experiences by means of increasing age.[27]

The potential limitation of this study was that our sample was a convenient one and this might limit the generalization of the results. Therefore, it would be desirable to replicate the study using large randomly selected samples.

CONCLUSION

In conclusion, MDAS showed good psychometric properties with satisfactory face and content validity, excellent completion of scale items as well as good internal consistency in adult population in Port Harcourt, Nigeria. Therefore, its use in the general population is recommended. Furthermore, age and gender are important determinants of dental anxiety and should be taken seriously in its management.

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