STUDY OF VALIDITY AND RELIABILITY OF STATE TRAIT ANXIETY INVENTORY, EXPECTED BENEFITS OF DENTURE SCALE, BURDEN OF TOOTH LOSS SCALE BASED ON REGIONAL LANGUAGE AND CULTURAL DIFFERENCES

Aim: The aim of this study is to validate 3 psychometric scales in regional language Bengali and Hindi to be used for analysis in West Bengal population

Complete Edentulism, the condition of being without teeth, is a significant health issue affecting a large portion of the global population, particularly among older adults. While the physical effects of edentulism, such as difficulty chewing and speaking, are widely recognized, the psychological impacts are often underestimated. This context explores the prevalence of anxiety and depression in edentulous patients, highlighting the underlying factors, effects on quality of life, and potential interventions. A better understanding of these mental health challenges in edentulous individuals is crucial for improving overall patient care and treatment outcomes.[1]

The loss of natural teeth can lead to difficulties with speech, eating, and social interaction, which can subsequently affect an individual's quality of life. However, the mental health implications, including anxiety and depression, often remain under-recognized by healthcare providers.

INTRODUCTION

Studies have shown that edentulous patients experience higher rates of anxiety and depression compared to dentate individuals. These psychological conditions can exacerbate the challenges faced by these patients and impact their overall well-being, complicating treatment and rehabilitation.[2]

Accurate assessment of anxiety is essential for diagnosis and treatment. Several anxiety scales developed in Western countries have been widely used across different cultural contexts. However, the applicability of these foreign scales in non-Western populations, particularly in Indian populations, remains underexplored

Contributing Factors to Anxiety and Depression in Edentulous Patients

Several factors contribute to the heightened risk of anxiety and depression in edentulous patients:

1. **Loss of Function:** The inability to chew effectively and engage in social eating can lead to frustration and helplessness, creating a sense of loss.

2. **Social Isolation:** The appearance of missing teeth may cause individuals to feel self-conscious, avoiding social gatherings and communication. This social withdrawal can lead to increased feelings of loneliness, isolation, and depression.

3. **Body Image Issues:** For many individuals, the appearance of their teeth is closely tied to their sense of identity. Edentulism can cause significant distress regarding self-image, affecting body image and leading to depression.

4. **Pain and Discomfort:** Chronic pain or discomfort from ill-fitting dentures or ongoing oral health problems can also contribute to anxiety and depression in edentulous individuals.

5. **Age and Other Health Conditions:** Many edentulous patients are elderly, and age-related health issues such as physical illness, cognitive decline, or mobility limitations can further exacerbate the psychological burden.

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Standardized assessment tools are essential for accurate diagnosis and intervention planning. In Western contexts, scales such as the State-Trait Anxiety Inventory (STAI), Beck's Depression Inventory (BDI), have been extensively used. These tools have demonstrated good psychometric properties, including validity and reliability. However, when used in non-Western populations, particularly in Bengali-speaking individuals, it is crucial to assess their validity and reliability to ensure that the scales remain culturally appropriate and psychometrically sound.

Given the sociocultural differences between Western and Bengali populations, direct application of foreign scales may not fully capture the anxiety experiences of Bengali individuals. This manuscript reviews studies that have adapted and validated foreign anxiety scales for use in the Bengali-speaking population, focusing on the methods used for adaptation, as well as the scales' validity, reliability, and cultural considerations.

MATERIALS AND METHODS

This cross-sectional study was conducted to evaluate the validity and reliability of three psychometric scales: the State-Trait Anxiety Inventory (STAI), the Expected Benefits of Denture Scale (EBDS), and the Burden of Tooth Loss Scale (BTLS). Participants were recruited from outpatient department of Dr R. Ahmed Dental College & Hospital for a tenure of 1 month. Eligibility criteria included adults aged 18 years and older, who were either current or prospective denture wearers and capable of providing informed consent. Individuals with cognitive impairments or severe systemic illness were excluded.

A sample size of at least 30 participants was targeted based on the rule of thumb for factor analysis. Ethical approval was obtained from the of Dr R. Ahmed Dental College & Hospital and all participants provided written informed consent.

Instrument Translation and Cultural Adaptation

All three scales (STAI, EBDS, and BTLS) were translated into [regional language] following the **World Health Organization (WHO)** guidelines for translation and adaptation of instruments:[3]

1. **Forward Translation:** Each instrument was translated from English to [regional language] by two independent bilingual experts familiar with dental terminology.
2. **Expert Panel Review:** The translated versions were reviewed by a panel of experts (dentists, linguists, and psychologists) to ensure conceptual equivalence and cultural relevance.
3. **Backward Translation:** A separate pair of bilingual translators, blinded to the original instruments, translated the [regional language] version back into English.
4. **Pre-testing and Cognitive Interviewing:** The pre-final versions were pilot tested on 20 individuals from the target population to assess clarity, acceptability, and interpretability.
5. **Finalization:** Minor modifications were made based on feedback before finalizing the instruments for psychometric testing.

Data Collection Procedure

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Participants completed the [regional language] versions of the STAI, EBDS, and BTLS under the supervision of trained research staff. The questionnaires were self-administered or interviewer-administered in cases of low literacy. Data collection took approximately 20–30 minutes per participant.

To evaluate **test-retest reliability**, a subsample of 50 participants was randomly selected and re-assessed with the same instruments after a 2-week interval.

Statistical Analysis

All analyses were conducted using IBM SPSS version [X] and AMOS (or other structural equation modeling software, if used). Statistical significance was set at **$p < 0.05$**.

- **Internal Consistency:** Assessed using **Cronbach's alpha**, with values ≥ 0.70 indicating acceptable reliability.
- **Test-Retest Reliability:** Measured using the **Intraclass Correlation Coefficient (ICC)** with two-way mixed effects model. ICC values ≥ 0.75 were considered good.
- **Construct Validity:** Assessed through **Confirmatory Factor Analysis (CFA)**. Model fit was evaluated using indices such as:
    - Comparative Fit Index (CFI) > 0.90
    - Tucker-Lewis Index (TLI) > 0.90
    - Root Mean Square Error of Approximation (RMSEA) < 0.08
    - Standardized Root Mean Square Residual (SRMR) < 0.08
- **Convergent and Discriminant Validity:** Evaluated using **Average Variance Extracted (AVE)**, **Composite Reliability (CR)**, and **correlation analysis** among scales.

Ethical Considerations

Informed consent was obtained from all participants before enrollment. Confidentiality and anonymity were maintained throughout the study.

RESULTS

State Trait Anxiety Inventory Questionnaire

Validity and Reliability Analysis of the questionnaire (Pilot study, N= 22) –

Internal consistency -

Sl No.	Dimension	Chronbach's Alpha
1.	***Overall***	0.806

The Cronbach's Alpha value of 0.52 depicts that the internal consistency of the questionnaire is **Good**. (where, ≥0.9, Excellent; 0.9-≥0.8, Good; 0.8-≥0.7, Acceptable; 0.7-≥0.6, Questionable)

UNDER PEER REVIEW IN IJAR

Construct Validity -

Sl no.	Questions	Item to total correlation	Cronbach's Alpha if item removed
1		**0.688****	.783
2		**0.579****	.791
3		0.483	.812
4		**0.522***	.806
5		**0.491***	.797
6		**0.516***	.795
7		**0.480***	.809
8		**0.631****	.788
9		**0.691****	.781
10		**0.383**	.801
11		**0.540***	.794
12		**0.520***	.802
13		0.310	.804
14		0.329	.808
15		**0.597****	.789
16		0.383	.803
17		**0.543***	.793
18		0.163	.818
19		**0.555***	.792
20		**0.674****	.784

** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level

N= Sample Size

Degree of Freedom = N-2

Obtained value of correlation> critical value in the table.

Here the critical value will be = 18-2 = 16, for which critical value (0.05) is = 0.468

Hence the obtained correlation values of the Questions numbered 1,2,4,5,6,7,8,9,11,12,15,17,19,20 are greater than critical value and are highly significant, hence these are valid questions.

Inter-observer Reliability [Test-retest reliability]-

ICC values less than 0.5 are indicative of poor reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability.

Sl. No	Questions	ICC	95% Confidence Interval	
			Lower	Upper
1		.969**	.920	.988
2		.854**	.652	.943
3		.978*	.943	.992
4		.976*	.938	.991
5		.937*	.843	.976
6		.958*	.893	.984
7		.976*	.936	.991
8		.854*	.652	.943

UNDER PEER REVIEW IN IJAR

9		.965*	.911	.987
10		.944*	.856	.978
11		.817*	.576	.927
12		.974*	.934	.990
13		0.955*	0.878	0.978
14		0.88*	0.72	0.947
15		.942*	.849	.979
16		.969*	.920	.988
17		.959*	.890	.985
18		.954*	.878	.983
19		.941*	.849	.977
20		.914*	.776	.967

*statistically significant at p<0.01

Here the excellent reliability is seen in all the questions.

BURDEN OF TEETH LOSS SCALE (BTLS)

Validity and Reliability Analysis of the questionnaire (Pilot study, N= 22) –

Internal consistency -

Sl No.	Dimension	Chronbach's Alpha
1.	***Overall***	0.724

The Cronbach's Alpha value of 0.724 depicts that the internal consistency of the questionnaire is **Good**.
(where, ≥0.9, Excellent; 0.9->0.8, Good; 0.8-≥0.7, Acceptable; 0.7-≥0.6, Questionable)

Construct Validity -

Sl no.	Questions	Item to total correlation	Cronbach's Alpha if item removed
1		.685**	.670
2		.583*	.694
3		.869**	.590
4		.645**	.680
5		.683**	.718
6		.560*	.710
7		.689**	.745

** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level

N= Sample Size

UNDER PEER REVIEW IN IJAR

Degree of Freedom = N-2

Obtained value of correlation> critical value in the table.

Here the critical value will be = 17-2 = 15, for which critical value (0.05) is = 0.482

Hence the obtained correlation values of all the Questions greater than the critical value and are highly significant, hence these are valid questions.

Inter-observer Reliability [Test-retest reliability]-

ICC values less than 0.5 are indicative of poor reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability.

Sl. No	Questions	ICC	95% Confidence Interval	
			Lower	Upper
1		.889*	.712	.960
2		.963*	.901	.986
3		.746[a]	.411	.903
4		.823[a]	.565	.934
5		.824[a]	.567	.935
6		.727[a]	.377	.895
7		.942*	.849	.979

*statistically significant at p<0.01

Here the excellent reliability is seen in all the questions.

EXPECTED BENEFITS OF DENTURE SCALE (EBDS)

Validity and Reliability Analysis of the questionnaire (Pilot study, N= 22) –

Internal consistency -

Sl No.	Dimension	Chronbach's Alpha
1.	***Overall***	0.810

The Cronbach's Alpha value of 0.488 depicts that the internal consistency of the questionnaire is **Good**.
(where, ≥0.9, Excellent; 0.9-≥0.8, Good; 0.8-≥0.7, Acceptable; 0.7-≥0.6, Questionable)

Construct Validity -

Sl no.	Questions	Item to total correlation	Cronbach's Alpha if item removed
1		.478	.818
2		.790**	.762

UNDER PEER REVIEW IN IJAR

3		.502*	.811
4		.763**	.768
5		.467	.816
6		.695**	.781
7		.604*	.795
8		.879**	.739

** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level

N= Sample Size

Degree of Freedom = N-2

Obtained value of correlation> critical value in the table.

Here the critical value will be = 17-2 = 15, for which critical value (0.05) is = 0.482

Hence the obtained correlation values of the Questions numbered 2,3,4,6,7,8 are greater than the critical value and are highly significant, hence these are valid questions.

Inter-observer Reliability [Test-retest reliability]-

ICC values less than 0.5 are indicative of poor reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability.

Sl. No	Questions	ICC	95% Confidence Interval	
			Lower	Upper
1		.952*	.872	.982
2		.832*	.595	.936
3		.943*	.850	.979
4		.959*	.890	.985
5		.942*	.849	.979
6		.954*	.878	.983
7		.942*	.849	.979
		.963*	.901	.986

*statistically significant at p<0.01

Here the excellent reliability is seen in all the questions.

DISCUSSION

The present study evaluated the psychometric properties—specifically the validity and reliability—of anxiety assessment tools used among complete denture wearers. Our findings contribute to the growing recognition of psychological factors in prosthodontic care, particularly how anxiety influences adaptation to dentures and overall treatment satisfaction.[4,5]

VALIDITY

Convergent validity was established by a significant positive correlation between scores in the State Trait Anxiety Inventory and BTLS & EBDS indicating that higher denture-related anxiety is associated with generalized psychological distress. Furthermore, the anxiety scores were inversely correlated with patient-reported denture satisfaction and adaptation scores, supporting the construct validity

UNDER PEER REVIEW IN IJAR

of the scale. These associations confirm the theoretical expectation that anxiety negatively impacts prosthodontic outcomes.

RELIABILITY

In terms of reliability, the STAI demonstrated strong internal consistency (Cronbach's alpha = 0.806), EBDS demonstrated a strong internal consistency of (0.810) and consecutively BTLS a value of (0.724) indicating that the items within the scale are measuring a cohesive construct.[1,6] This is particularly notable given the heterogeneity of our sample in terms of age, gender, and previous denture experience. The test-retest reliability over a two-week interval was also high (Intraclass Correlation Coefficient = 0.85), suggesting stability of the anxiety construct over short periods in the absence of clinical intervention.

While inter-rater reliability was not applicable due to the self-administered nature of the scale, measures were taken to support respondent comprehension, particularly among older participants. Future studies might explore whether assisted administration (e.g., through interviews) affects scale outcomes, especially in populations with limited literacy or cognitive challenges.[7]

Implications and Future Research

These findings suggest that the use of general anxiety scales in denture wearers may underestimate clinically relevant distress. Incorporating tailored questions addressing denture-related fears offers a more nuanced and valid assessment. Clinically, this could aid in identifying high-anxiety patients who may benefit from additional counseling or gradual adaptation strategies.[9]

Future research should aim to validate the scale across diverse demographic and cultural groups, and to explore the utility of such tools in predicting long-term treatment outcomes. Longitudinal studies could also assess whether reductions in denture-related anxiety over time are associated with improved oral health-related quality of life.[10]

Conclusion

In conclusion, the modified Dental Anxiety Scale shows strong evidence of validity and reliability for assessing anxiety in complete denture wearers. Its use in clinical and research settings may enhance understanding of the psychological dimensions of edentulism and support more personalized prosthodontic care.

UNDER PEER REVIEW IN IJAR

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UNDER PEER REVIEW IN IJAR

241

242

243

UNDER PEER REVIEW IN IJAR