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PSYCHOMETRIC EVALUATION OF THE BENGALI BRIEF PAIN INVENTORY IN A SAMPLE OF BANGLADESHI CANCER PATIENTS

MD. ASHIQUIR RAHAMAN* AND MOSAMMAT NAZMA KHATUN

Department of clinical psychology, University of Dhaka, Dhaka-1000, Bangladesh

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Abstract

Pain is a common complain among oncology patients, and success of its management requires accurate assessment. However, the status of pain treatment in Bangladesh is largely undocumented. The purpose of this study was to evaluate the psychometric properties of the Bengali version of Brief Pain Inventory (BPI-Bengali) in a Bangladeshi sample of cancer patients. BPI-Bengali and the Questionnaire on Stress in Cancer Patients Revised (QSC-R 23) were administered to a convenience sample of 60 adult oncology patients receiving pain treatment. Cronbach alpha coefficients were 0.89 and 0.94 for the severity and interference items respectively. The Pearson correlation coefficients for the test-retest stability were 0.65 ($p<0.01$) for the pain intensity scale and 0.88 ($p<0.01$) for the pain interference scale. Exploratory factor analysis (EFA) yielded two components, indicating pain severity and interference clusters by explaining 75% of the variance. The confirmatory factor analysis indicated the model as moderate fit to the data (CFI=0.89, RMSEA=0.16). Convergent validity of the pain severity and interference was demonstrated by significant correlations with stress level ($r=0.67$, $p<0.01$), ($r=0.66$, $p<0.01$). The findings of this study support the psychometric properties of Bengali BPI among cancer population in terms of validity, reliability and factor structure.

Introduction

Pain is an unpleasant and uncomfortable sensation that serves as an indicator that something might be amiss. The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage"[(1)]. Cancer patients may experience pain symptoms at any stage of their illness. As the disease progresses, roughly 5% to 10% of cancer survivors endure chronic severe pain that significantly hampers their daily functioning[(2)]. A substantial proportion of cancer patients, around 40%, grapple with pain in the intermediate stages of the disease, while a staggering 70-90% of those with advanced cancer endure pain[(3)]. Notably, Bangladesh is home to 1.3 to 1.5 million cancer patients, and every year, approximately 0.2 million new cases are diagnosed[(4)].

* Author for correspondence: ashiquir1001rahaman@gmail.com

Accurate assessment of pain involves not only measuring pain intensity but also understanding how pain impacts patients' psychological, social, spiritual, and existential well-being, as well as their adherence to and responsiveness to treatment. While traditional and reliable pain intensity assessment scales such as visual analog scales, numeric rating scales, and verbal rating scales are commonly used, they provide limited insights into how pain interferes with daily activities. Several existing pain measures, such as the McGill Pain Questionnaire[5], have been designed to evaluate pain in patients with nonmalignant diseases. However, the McGill Pain Questionnaire sometimes elicits ambiguous responses from many cancer patients[6].

Recognizing that impaired function is a primary consequence of the pain experience, Cleeland and colleagues developed the Brief Pain Inventory (BPI)[7]. The BPI has already been validated across different cultures and languages[8-10]. It is also highly sensitive to changes in pain due to treatment[11], and most patients with metastatic disease can readily complete the questionnaire[12]. The BPI has primarily been utilized in epidemiological studies of cancer pain in the United States[12], France[13], and China[9]. Furthermore, it has been employed for assessing pain associated with AIDS[14].

In Bangladesh, the status of pain treatment for cancer patients remains largely undocumented, and the available treatments are grossly inadequate to address the needs of the substantial number of cancer patients[15]. There is a distinct lack of questionnaires designed to assess the severity of pain and its impact on daily functioning in Bangladesh. Therefore, the psychometric evaluation of a standardized pain questionnaire in the Bengali language is imperative for the well-being of cancer patients in our country. Additionally, oncology professionals can employ this tool to gain a deeper understanding of cancer pain, ultimately leading to more effective treatment plans. Moreover, the BPI has been translated and validated in numerous languages[8-10] for not only cancer pain but also chronic nonmalignant pain[16]. Consequently, the psychometric evaluation of the BPI in Bengali will provide a valuable tool for assessing and managing chronic pain among Bengali-speaking individuals.

The main objective of this study is to assess the psychometric properties of BPI-Bengali in a sample of Bangladeshi cancer patients, focusing on its reliability, validity, and factor structure.

Materials and Methods

For this study, a total of 60 respondents were selected from the National Institute of Cancer Research and Hospital (NICRH) in Dhaka. The participants were drawn from both the inpatient and outpatient departments. Inclusion criteria encompassed individuals who were: 1) 18 years of age or older; 2) diagnosed with cancer, whether primary or metastatic; 3) experiencing pain as a result of their cancer diagnosis; 4) receiving treatment for pain; and 5) able to provide informed consent. Excluded from the study were patients who had

undergone surgery or an invasive medical procedure in the past months, as their pain might result from the procedures rather than cancer. Additionally, adult cancer patients in the terminal stage, those unable to communicate, and those incapable of providing informed consent were also excluded from the study.

To collect demographic information, a demographic questionnaire form was utilized, including variables such as age, gender, education, religion, marital status, employment status, socio-economic status, cancer's origin, types of treatment received, and duration of the disease diagnosis. Among the participants, 56.7% were male, and the majority fell within the 31-45 years age group (46.67%). In terms of educational attainment, most participants had completed primary education (43.3%), followed by secondary education (35%), higher secondary education (13%), and graduation (5%). The primary cancer sites reported were lung (28.3%), breast (13.3%), lymph nodes (11.7%), and liver (11.3%).

The assessment of cancer patients' pain severity and pain-related interferences was carried out using the Bengali version of the Brief Pain Inventory (BPI-Bengali). The BPI is an 11-item, self-administered pain assessment tool that has undergone testing across various cultural groups and in patients with a range of diseases that induce chronic pain[8-10]. It comprises four pain severity items—pain at its worst, pain at its least, average pain, and pain now-requiring respondents to recall their pain experiences over the last 24 hours. The rating is on a 0 to 10 scale, where 0 indicates no pain and 10 indicates the worst possible pain. In addition to pain severity items, the BPI includes seven pain interference items that assess the impact of pain on various aspects of daily life. These interference items encompass general activity, mood, walking, normal work, relations, sleep, and enjoyment of life. Respondents are asked to recall the interference caused by pain in the last 24 hours and rate it on a 0 to 10 scale. Here, 0 denotes no interference, while 10 indicates complete interference due to pain. The Bengali version of the BPI used in this study was developed by the Department of Symptom Research, MD Anderson Cancer Center, The University of Texas. Charles S. Cleeland, the copyright holder of the BPI, granted the principal investigator written consent to use the instrument and publish the findings in a national journal.

To assess psychological distress among cancer patients, the Questionnaire on Stress in Cancer Patients Revised (QSC-R 23) was employed. This instrument, initially developed in 1985[17], underwent two subsequent revisions differing primarily in length[18]. The QSC-R 23 comprises 23 items designed to detail potentially stressful situations in various aspects of life using everyday language. The instrument was validated for use with the Bangladeshi cancer population[19].

Ethical approval for this study was obtained from both the National Institute of Cancer Research and Hospital in Dhaka and the ethics committee of the Department of Clinical Psychology at the University of Dhaka. Verbal and written informed consents were collected from all participants before data collection, with detailed explanations provided

regarding the study's nature, potential advantages, associated risks, and assurances of confidentiality.

Data analysis was conducted using SPSS version 20. This involved the calculation of correlation coefficients, exploratory factor analysis, and coefficient alpha, all using the same SPSS version. Structural equation modeling was carried out using AMOS 18. In the structural equation modeling, a path diagram was employed to assess the model fit of the data.

Results and Discussion

Reliability of the Scale: The reliability of the BPI-Bengali scale was assessed through two methods: test-retest reliability and internal consistency reliability. A sample of 30 clinical patients was administered the BPI-Bengali twice, with a three to four-day interval between administrations. Recognizing the inherent rapid fluctuations in pain levels among cancer patients due to the dynamic nature of the disease, its progression, and the impact of treatments[29], the present study opted for a short time interval of 3 or 4 days for the test-retest reliability assessment. The test-retest reliability analysis revealed significant correlations between the scores of the two administrations for both pain severity ($r=0.64$, $p<0.01$) and pain interference ($r=0.87$, $p<0.01$), indicating strong evidence of test-retest reliability. The internal consistency of the scale was evaluated using Ordinal alpha, with values of 0.88 for pain severity and 0.93 for pain interference. Both coefficients exceeded 0.75, demonstrating strong internal consistencies of the scales[20]. Table 1 demonstrates the reliability values of the BPI-Bengali scale.

Table 1. Reliability Analysis of the Bengali Version of BPI

	Test-retest reliability (n= 30)	Internal consistency reliability (n=60)		
	Pearson correlation coefficient	Corrected item total correlation	Alpha if item deleted.	Cronbach's alpha
Pain severity	0.64**			0.88
Most severe	0.53**	0.58	0.91	
Least	0.58**	0.81	0.82	
Average	0.68**	0.85	0.82	
Now	0.56**	0.81	0.83	
Pain interference	0.87**			0.93
General activity	0.93**	0.67	0.94	
Mood	0.90**	0.71	0.93	
Walking ability	0.89**	0.78	0.92	
Normal work	0.73**	0.88	0.91	
Relationship	0.23	0.90	0.92	
Sleep	0.65**	0.80	0.92	
Enjoyment of life	0.76**	0.85	0.92	

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

Factor Analysis: The structure of the BPI-Bengali underwent testing through exploratory factor analysis (EFA) utilizing Principal Component Analysis (PCA) with direct oblimin rotation. Prior to PCA, an assessment of data suitability for factor analysis was conducted, revealing a correlation matrix where 100% of the inter-item correlations achieved statistical significance, and all coefficients were 0.3 and above. The Kaiser-Meyer-Oklin value, measuring sampling adequacy, was determined to be 0.87, surpassing the recommended threshold of 0.6[21,22]. Bartlett's test of sphericity also yielded statistical significance ($\chi 2$=624.02, p<0.001), indicating the appropriateness of the data for factor analysis. In the initial analysis, two components with eigenvalues exceeding one were identified, collectively explaining 75.23% of the total variance. The pattern matrix, presented in Table 2, illustrates the factor loadings for each variable. Notably, severity-related items exhibited high loadings on one factor, while interference-related items demonstrated loadings on the other factor.

Table 2. Factor loadings using principal component factor analysis and oblimin rotation (Pattern Matrix)

	BPI-Bengali	
	Factor I	Factor II
	Eigen value = 6.99 (63.55%)	Eigen value = 1.28 (11.68%)
Pain severity		
Most severe	0.13	**0.64**
Least	-0.13	**0.99**
Average	0.20	**0.78**
Now	-0.00	**0.90**
Pain interference		
General activity	**0.78**	-0.04
Mood	**0.79**	-0.02
Walking ability	**0.84**	0.01
Normal work	**0.92**	-0.01
Relationship	**0.92**	0.01
Sleep	**0.72**	0.22
Enjoyment of life	**0.89**	0.01

Additionally, to test the goodness of fit for the two-factor model (Pain Severity and Pain Interference), confirmatory factor analysis (CFA) was conducted using AMOS 18. The independent model, positing that all variables are uncorrelated, was rejected for the BPI-Bengali model (normed $\chi 2$=2.64, p=0.00). Notably, the CFA of the two-factor model indicated potential correlations between error terms, specifically observed for item pairs: item no 10 and 11, item no 7 and 8, item no 3 and 8, and item no 3 and 11. Incorporating these identified correlations into the model resulted in a better fit. The detailed findings,

including parameter estimates and fit indices, are presented in Table 3. Additionally, the refined model is presented in Fig. 1.

Table 3. Goodness of fit indices for two-factor model of BPI-Bengali

	X^2	df	P	X^2/df	RMSEA	CFI	NFI
Original model	113.66	43	0.00	2.64	0.16	0.88	0.83
Modified model	49.47	32	0.02	1.53	0.09	0.97	0.92

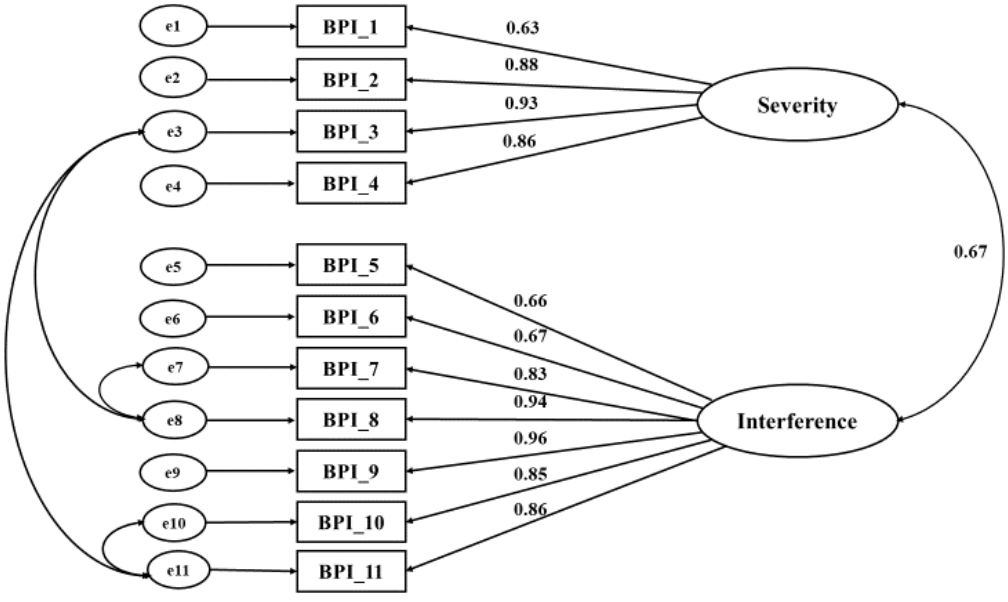

Fig. 1. The two-factor model of the BPI-Bengali

Convergent Validity: Convergent validity for the pain severity and interference scales was established through significant correlations between pain severity ($r=0.66$, $p<0.01$) and pain interference ($r=0.83$, $p<0.01$) item scores and scores on the Questionnaire on Stress in Cancer Patients Revised (QSC-R 23) scale, used by 60 patients.

The primary aim of this study was to evaluate the psychometric properties of the BPI-Bengali within the context of the Bangladeshi Cancer Population. In pursuit of this goal, we engaged a cohort of 60 adult cancer patients experiencing pain and administered the BPI-Bengali. The resulting dataset enabled us to assess the instrument's reliability and validity.

Reliability, a fundamental aspect of any measurement tool, was meticulously examined. Internal consistency, a measure of how closely related the items within a scale are, was evaluated. The BPI-Bengali demonstrated very good internal consistency, as evidenced by the Ordinal alpha coefficient values. Importantly, these values exceeded the

0.75 threshold, indicative of strong internal consistencies for both pain severity and interference items[20]. This level of internal consistency was not only comparable but, in some instances, surpassed the findings reported by other researchers[13, 25]. It underscores the reliability of the BPI-Bengali in assessing pain severity and its impact, which is critical for its utility as a research and clinical tool.

Furthermore, test-retest reliability was scrutinized using Pearson correlation coefficients, revealing substantial correlations between scores from two separate administrations of the pain severity (r=0.64) and interference (r=0.87) scales. These findings provide compelling evidence of the BPI-Bengali's robust test-retest reliability, demonstrating that patients' responses were consistent over a short interval. This aligns with previous research conducted in diverse cultural contexts, reinforcing the instrument's reliability[24-26].

Construct validity, another essential property of measurement tools, was assessed through factor analysis and convergent validation. Exploratory factor analysis initially revealed the presence of two factors, each with eigenvalues greater than one. While parallel analysis did not unequivocally confirm the two-factor structure, the patterns of factor loadings closely resembled those found in prior studies[27]. Subsequently, confirmatory factor analysis was performed to evaluate the hypothesized two-factor model, which considers pain severity and pain interference as distinct factors. The results indicated a moderate fit to the data, with CFI = 0.97, NFI = 0.92, and RMSEA = 0.09. The partial confirmation of the two-factor structure might be attributed to the sample size, underscoring the need for larger samples in future studies[28]. Nevertheless, the overall construct validity of the BPI-Bengali is supported by this analysis.

To further validate the BPI-Bengali, we explored convergent validity by examining the relationship between pain severity and interference scales and QSC-R 23 scale. The strong and significant correlations found (pain severity: r=0.66, pain interference: r=0.83) at the 0.01 significance level demonstrate that the BPI-Bengali aligns well with an established measure of psychological distress, substantiating its convergent validity.

One noteworthy advantage of the BPI-Bengali is its simplicity of administration. The questionnaire is designed to be self-administered and can typically be completed within a brief 5 to 7-minute timeframe. This makes it a practical tool for patients to use independently. For patients who may have difficulty reading or writing, clinician-administered usage is a viable option, ensuring accessibility for a wide range of individuals.

While our study provides valuable insights into the psychometric properties of the BPI-Bengali, it is essential to acknowledge its limitations. The study was conducted with a heterogeneous convenience sample, encompassing both inpatients and outpatients, and was relatively small in scale. However, it is important to note that the variation in pain ratings observed in our study falls within the expected range for such investigations. To build upon this foundational work, future research endeavors should consider examining

changes in BPI-Bengali scores over time, particularly from baseline to intervention. Additionally, this study paves the way for future investigations within this field. The refinement and enhancement of measurement scales, such as the BPI-Bengali, remain ongoing and essential for advancing our understanding of pain in the context of cancer patients' experiences and treatment.

In conclusion, this study serves as a significant contribution to the field of pain assessment and management in the Bangladeshi Cancer Population, providing valuable insights into the psychometric properties of the BPI-Bengali. The results support its reliability and validity, making it a valuable tool for both research and clinical applications.

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