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Validation of the Bangla WHO-5 well-being index among gender and sexually diverse people in Bangladesh

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Abstract

Background One of the core features of mental health is psychological well-being, which includes enjoyment, pleasure, happiness, fulfillment, and resilience. Assessing psychological well-being might be a useful indicator in determining the effectiveness of a research study or the appropriateness of a clinical intervention. The gender and sexually diverse people (GSDP), including men who have sex with men (MSM), male sex workers (MSW), and transgender women (*hijra*), are subject to widespread stigma and discrimination in Bangladesh that imposes a great mental health burden by compromising their mental health and well-being. The Bangla WHO-5 Well-being Index may be considered a promising and useful instrument for assessing the well-being of GSDP. However, the psychometric properties of the Bangla WHO-5 Well-being Index on GSDP have never been explored in Bangladesh.

Methods Data were collected from 229 GSDP, including self-identified gay men, during their screening for enrollment in a Pre-exposure prophylaxis (PrEP) pilot intervention. The WHO-5 Well-being Index (WHO-5) was administered between February 2022 and August 2022. Confirmatory factor analysis, along with reliability and validity assessments of the WHO-5, were conducted using IBM SPSS software version 24 and AMOS 18.

Results The scale showed very good results with regard to internal consistency, where Cronbach's alpha value was found to be 0.856. With regard to divergent validity, the scale manifested a significant negative correlation with depression (r= -0.753, $p<0.01$), anxiety (r= -0.614, $p<0.01$), and stress (r= -0.702, $p<0.01$) subscales of the Bangla Depression Anxiety and Stress (DASS-21) scale. Convergent validity was supported by Average Variance Extracted (0.64) and Composite Reliability (0.89) values. The single-factor structure of the scale was confirmed by the confirmatory factor analysis ($\chi^2=8.244$, $\chi^2/df=1.648$, GFI = 0.989, RMSEA = 0.053, TLI = 0.986, CFI = 0.993, and SRMR = 0.0218).

Conclusions Findings of the present analysis indicate that the Bangla WHO-5 Well-being Index is a valid and reliable instrument to assess psychological well-being among GSDP in Bangladesh and is comparable with the original version of the scale in terms of psychometric properties.

Keywords Bangla, Gender and sexually diverse people, WHO-5 well-being, Psychometric properties, MSM, Reliability, Validity

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Background

The content of well-being is mainly related to health and quality of life, thus making it a two-dimensional concept, a subjective one, and an objective one [1]. The World Health Organization (WHO) defines wellbeing as "a positive state experienced by individuals and societies and is determined by social, economic, and environmental conditions" [2]. However, in scientific studies, well-being is primarily described as a positive state of mind that is influenced by psychological, biological, environmental, and social variables [3–6]. The scientific literature also denotes well-being as an absence of depressive symptoms and negative affect [7–9]. Therefore, reaching a universal definition of well-being is difficult and often subject to cultural and social determinants. As the concept of well-being is defined differently in scientific literature, its assessment may vary depending on the conceptual understanding. However, the five-item WHO-5 Well-being Index (WHO-5) is the most often used reliable and valid measure of well-being in studies [10, 11].

The WHO-5 is used to measure subjective well-being, which was essentially derived from the WHO 10-item well-being index (WHO-10) [12], which in turn was developed from an original 28-item scale [13]. Collecting data from eight different countries, the original WHO Well-being Index with 28 items has evolved over time and eventually reduced to a five-item WHO-5 Well-being Index [14, 15]. The WHO-5 scale has been translated into more than 30 languages since it was first published [16]. There is substantial evidence of the global use of WHO-5 in different fields, including mental health, endocrinology, geriatrics, neurology, cardiology, obstetrics, oncology, ophthalmology, pain, pediatrics, gynecology, and health economics across different regions [16]. One study assessed the cross-cultural validity of WHO-5, where 3762 participants from different European and non-European countries participated, and the analysis revealed the Mokken coefficients of scalability ranged between 0.42 and 0.84, demonstrating transcultural usability of the scale [17]. Similarly, WHO-5 validation studies in African countries found that the instrument had demonstrated good psychometric properties in different African populations as well, where internal consistency reliability ranged between 0.86 and 0.89, indicating that the scale is a reliable measure of subjective well-being among these populations [18, 19]. The WHO-5 has also been validated in a number of Asian countries, including Iran [20], Turky [21], Malaysia [22], China [23], Hong Kong [24], Japan [25], and Thailand [26], where the results showed that the scale is a reliable measure in terms of test-retest reliability and internal consistency reliability. Studies in south Asian regions have also extensively used WHO-5, where validation of the scale in Urdu [27], Bangla [28], Sinhala [29], and Kannada [30] speaking people demonstrated good psychometric properties with consistent unidimensional factor structure of the measure. Overall, there is a wide range of literature that supports the use of the WHO-5 Well-Being Index as an instrument to assess subjective well-being across different regions and cultures of the world. While considering the well-being of different populations, the GSDP live much more stressful lives than the general population because their behavior is considered abnormal in society and they are more prone to face stigma, discrimination, abuse, unemployment, financial difficulties, and legal complications [31–33]. Homosexuality faces significant social stigma and discrimination in Bangladesh, influenced by cultural, religious, and legal factors that negatively influence their mental health and well-being [34]. However, stigma and discrimination against GSDP have more to do with religious and socio-cultural context than legal aspect that can adversely affect their mental health [35, 36]. It is clearly evident in scientific literature that the GSDP are at greater mental health risk and poor quality of life due to cultural and social stressors existent in heteronormative social structure [37, 38].

The concepts of gender diversity, sexual orientation, and sexuality are complex ones and often taboo to talk about in a conservative society like Bangladesh. Consequently, GSDP of Bangladesh mostly hide themselves due to socio-cultural, religious, and legal unacceptance, but the transgender community is an exception. Transgender people are locally known as *hijras* who consider themselves to belong to the *hijra* culture, and traditionally they follow the guru-chela hierarchy [39]. They can be easily identified due to their distinctive dress up, physical appearance and behavior (hand clapping). Mostly *hijra* people are involved in traditional occupations such as ritualized dancing and singing at weddings and births, collecting money from shop owners etc., for livelihood [40]. However, a large proportion of the *hijra* population is involved in sex work amid the lack of employment opportunities and insufficient income generated from their traditional work [39]. Among other gender and sexual diverse people, *kothi* are feminine men who play the role of women in their sexual, emotional, and social relationships with other men [41]. Kothi usually prefers receptive role in insertive anal intercourse and sometimes dress up and behaves like a girl as well. Due to their feminine behavior, they are often subject to various forms of harassment and discrimination in society. On the other hand, the name *panthi* is given by the *kothi* where the *panthi* play an insertive role during anal intercourse with their sexual partner, *kothi* and *hijra*. In many cases, *panthi* are married and face difficulties in maintaining dual relationship with their wife and *hijra* or *kothi* sex partner [41, 42]. Regardless of gender role expression, sexual diverse people experience significant sociocultural stress

that predisposes them to poor psychological well-being. Therefore, the utility of a reliable and valid measure of psychological well-being among GSDP in Bangladesh context would be immense.

In Bangladesh, there is a dearth of literature regarding the mental health aspect of GSDP. For instance, Boys of Bangladesh and Roopbaan conducted a needs assessment survey in 2015 among lesbian, gay and bisexual people found that 54% of respondents live with a fear that others will find out about their sexual orientation; more than 40% of respondents reported being stressed about their sexuality; 41% of respondents have been discriminated by their friends or close people; often they are subject to bullying, blackmailing and physical and sexual abuse; and most of the respondents did not seek any legal help against such abuse and criminal offence [43]. Another study conducted on transgender community (*hijra*) in Khulna city revealed that 69.7% experienced psychological discomfort, 40.3% experienced loneliness, and 85.7% attempted suicide in their lifetime [44]. During the Covid-19 pandemic, Bondhu Social Welfare Society conducted a survey among transgender and *hijra* population in Bangladesh and found that 94% faced anxiety about money, 68% felt anxious about food safety, and 16% experienced mental abuse [45]. A 2022 study investigating the impact of Covid-19 on the transgender community from Dhaka city found that isolation due to lockdown and subsequent restrictions further worsened the mental health condition of *hijra* population [46].

One of the criticisms of the studies conducted in Bangladesh was that no structured, reliable, and valid instruments were used to assess psychological constructs such as depression, anxiety, stress, and well-being of gender and sexually diverse population. For example, the Khulna-based study among the transgender community utilized a single-item self-reported question to assess psychological discomfort, lacking a valid instrument to assess psychological distress [44]. It should be noted that reliable and valid measures are needed to accurately analyze research findings and generalize the results in another context, as the risk of drawing faulty conclusions using invalid tool needs to be taken into consideration. A scale designed and developed focusing on one cultural context may measure completely different construct in another cultural context, which may be more applicable to minority group [47]. However, the WHO-5 Well-being Index can be a suitable instrument for measuring psychological well-being among gender and sexually diverse population due to its widespread use. Originally, the WHO-5 was developed for general adult population, but subsequently it was adopted for different target population sub-groups, including diabetes, breast cancer, cardiac disease, neurological conditions, and pediatric and geriatric sub-populations [16]. The Bangla WHO-5 Well-being Index, validated among the general population, has demonstrated satisfactory psychometric properties, confirming its utility among Bangla-speaking individuals [28]. In spite of the global use of WHO-5, very few studies have been published so far in terms of using the instrument in assessing health and wellbeing of GSDP. Studies conducted on LGBT population using the WHO-5 Well-being Index in Germany, Brazil, China, and Singapore yielded the value of Cronbach's alpha varied between 0.83 and 0.93 [48–51]. In addition, one study examined the prevalence of chemsex in German-speaking countries, where a large proportion of participants (60%) were from LGBTQ community, who used the WHO-5 Well-being Index to assess the negative effect of chemsex on well-being [52]. However, to the best of our knowledge, the psychometric properties of the WHO-5 Well-being Index have yet not been explored among GSDP, especially in Bangladesh. Although gender and sexually diverse people face substantial healthcare disparities [53], the lack of evidence of a valid and reliable measure in assessing their psychological well-being may denote their underrepresentation in health research as well as heteronormative bias, where most health research are skewed toward heterosexual individuals. Thus, validation of WHO-5 Well-being Index among gender and sexually diverse individuals is crucial to ensure that this widely used questionnaire is an appropriate tool for assessing their subjective well-being and mental health status. In addition, a valid measure of psychological well-being can inform the development of targeted interventions to improve mental health among these populations. Considering the knowledge gap, the purpose of the present article is to validate the WHO-5 Well-being Index among GSDP of Bangladesh in order to ensure the scale's utility in clinical practice and research.

Methods

Participants

Participants were selected from a pilot intervention for PrEP and harm reduction services for chemsex among MSM, including MSW, and transgender women (*hijra*). These individuals have been receiving HIV prevention services from two drop-in centers (DICs) in Dhaka city, operated by an NGO named "Bandhu Social Welfare Society" and managed by International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b), as well as from a virtual outreach intervention for self-identified gay men under the Global Fund project. In a DIC, at-risk populations, including MSM, MSW, and *hijra,* come and receive HIV prevention services and health care treatment regarding sexually transmitted infections (STIs). For this article, data was collected from 229 gender and sexually diverse participants, including self-identified gay men, who were screened for enrollment in the PrEP

pilot intervention, using WHO-5 Well-being Index, between February 2022 and August 2022. As the literature suggests, several approaches can be taken for scale validation, particularly for factor analysis. Some sources recommend having 10 participants per item in the instrument, while others suggest that a minimum of 200 participants is required for a 10-item instrument [54, 55]. Given that this article employs factor analysis of 5-item instrument, a sample size of 229 is considered adequate for such advanced analysis. Among the 229 participants, there were 74 MSM, 109 MSW, and 46 *hijra* individuals. The demographic characteristics of participants are illustrated in Table 1.

Measures

WHO-5 well-being index

The WHO-5 is a short five-item self-administered psychometric scale that assesses psychological well-being over the past two weeks [12, 56]. The instrument consists of five statements, which are evaluated by participants on a six-point Likert scale. The ratings are ranged from 0 to 5, indicating the time duration of never to all the time. Over the last two weeks, participants are requested to rate statements including "I have felt cheerful and in good spirits; I have felt calm and relaxed; I have felt active and vigorous; I woke up feeling fresh and rested; and My daily life has been filled with things that interest me" [57]. Therefore, WHO-5's total score varies between 0 and 25, where 0 indicates absence of well-being and 25 indicates maximal well-being. Since quality of life measurements are traditionally expressed as 0 to 100% range, where 0 represents absence of quality of life and 100 represents maximal quality of life, the WHO-5's total score is multiplied by 4 to transform its value from 0 to100 range. A score below 50 is indicative of poor well-being and demands a through in-depth investigation of symptoms of depression, whereas a score below 28 is indicative of depression [58, 59]. The translation of the WHO-5 Well-being Index has also been completed in different languages, including Urdu, Arabic, German, Russian, Greek, and French [60]. The scale has also been used to assess psychological well-being in various studies worldwide [16]. In addition to measuring subjective well-being, the scale has also been used to assess other psychological constructs such as depression, resilience, and suicidal ideation [61–63]. The Bangla version of the WHO-5 scale used in this article was translated and validated by Faruk and colleagues in 2021 [28].

Table 1 Demographic profile of the participants

Variable	MSM *N* = 74 (%)	MSW *N* = 109 (%)	Transgender (hijra) *N* = 46 (%)
Education			
No formal education[a]	0 (0)	8 (7.3)	3 (6.5)
Primary	3 (4.1)	36 (33.0)	20 (43.5)
Secondary	4 (5.4)	13 (11.9)	9 (19.6)
Higher Secondary	10 (13.5)	24 (22.0)	4 (8.7)
Undergraduate	21 (28.4)	17 (15.6)	3 (6.5)
Graduate	36 (48.6)	11 (10.1)	7 (15.2)
Current Occupation			
Student	13 (17.6)	14 (12.8)	0 (0)
Service	38 (51.4)	53 (48.6)	9 (19.6)
Business	14 (18.9)	12 (11.0)	2 (4.3)
Sex work	0 (0)	10 (9.2)	9 (19.6)
Service and sex work	0 (0)	7 (6.4)	3 (6.5)
Business and sex work	1 (1.4)	3 (2.8)	1 (2.2)
Traditional cholla	0 (0)	0 (0)	5 (10.9)
Traditional cholla and sex work	0 (0)	1 (0.9)	16 (34.8)
Unemployed	8 (10.8)	9 (8.3)	1 (2.2)
Age M (SD)	28.88 (5.99)	26.92 (6.65)	28.04 (8.37)
Income M (SD)[b]	259.91 (219.74)	124.10 (111.16)	168.11 (129.65)

[a]No formal institutional education but the participant could read and write

[b]Monthly income in USD

Depression anxiety stress scale (DASS-21)

DASS-21 is a brief self-rated psychological assessment tool used widely to screen symptoms of depression, anxiety, and stress. Lovibond and his colleagues [64] developed the scale, and primarily it was consisted of 42-statements. The shorter twenty-one-item version (DASS-21) was derived from the original scale. The DASS-21 comprises three subscales, which are the depression subscale, the anxiety subscale, and the stress subscale [65]. The depression subscale measures the respondent's negative feelings, interest in work, and hope for the future over the last week. The anxiety subscale is designed to assess individual's anxiety related physiological symptoms, worrisome thinking and fear of uncertainty over the past week. The stress subscale measures participants' response to stressful situations, and feeling of restlessness and agitation over the last seven days [66]. Each subscale consists of seven statements that respondents rate on a 0 to 3 Likert scale. Due to the utility of DASS-21, the translation of this scale has already been completed into more than fifty languages (http://www2.psy.unsw.edu.au/groups/dass/translations.htm), including Bangla [67], and it has demonstrated good psychometric properties in validation studies [68–70]. However, not all validation studies have determined the scale's cut-off point [71].

Informal conversation and field notes

Apart from data collection using structured questionnaire, informal conversation was carried out with participants to explore the contributory factors underneath

their mental health condition. The conversations were mainly focused on participants' sociocultural dynamics, mental health, experience of subjective well-being, sexual practices and preferences, drug use patterns, sexual risk behaviors, and other related issues experienced by them. Besides, the clinical psychologist had maintained field diaries based on day-to-day counselling sessions, which provided additional qualitative information. Additionally, during the ongoing monitoring and evaluation component of the intervention, participants' experiences were solicited and informal conversations were facilitated.

Procedures

The analysis of the present article was carried out as part of a pilot intervention for PrEP and harm reduction services for chemsex among MSM (including MSW) and transgender women (*hijra*) in Bangladesh. The original screening tool consisted of 188 variable-response items. The psychological assessment part of the screening was carried out by a clinical psychologist trained in working with GSDP. Data was collected from two DICs in Dhaka city, including the virtual outreach intervention for self-identified gay men. Primarily, peer educators of DICs visited fields to educate and aware participants about PrEP and chemsex intervention. Interested candidates would then come to the DIC either with their respective peer educators or through self-referral. After arrival in DIC, candidates were informed details about the intervention by a physician and a clinical psychologist. Then the physician collected the clinical information including physical examination, and the clinical psychologist assessed the mental health and drug taking status using DASS-21, WHO-5 Well-being Index, and the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST 3.0), and the medical technologist collected the biological samples for baseline investigation with prior informed consent.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 23 and AMOS 18. For the sociodemographic variables, descriptive statistics including frequencies, percentages, means, and standard deviations were performed. For item analysis, inter-item-correlation and corrected item total statistics were computed for each item. The Cronbach's alpha coefficient was computed to determine the scale's internal consistency reliability. Pearson correlation coefficient was carried out to assess the degree of relation between WHO-5 total score and DASS-21 total score for divergent validity. Confirmatory factor analysis was performed using goodness of fit method to determine the appropriateness of the single factor structure.

Ethics

The participants were explained thoroughly about the nature and process of the intervention, potential risk and benefits involved with participation, data and specimen collection process, and confidentiality and anonymity with publication. Both verbal and written informed understood consent was taken from participants prior to enrollment in the PrEP intervention. Participation was completely voluntary, and no transport allowance or other monetary compensation was provided to the participants. The data used in this article were retrieved from the PrEP intervention clinic register form maintained by icddr,b and preserved in the individual client file. Data entry and analysis were conducted in an anonymized manner. This article received ethical approval for publication from the ethical review committee (ERC) of the Institutional Review Board of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b).

Results

Item analysis

Item analysis was conducted using two methods, namely inter-item correlation and corrected item total correlation. The values of inter-item correlation of the scale ranged from $r = 0.464$ to $r = 0.631$, where all were significant at $p < 0.01$, demonstrating a good internal consistency of the scale items and coherence of measuring a similar construct [72]. While considering corrected item-total correlation as an indicator of internal consistency, a value lower than 0.30 is considered unacceptable from statistical point of view [73]. However, every item of the present scale yielded a corrected item-total correlation value of above 0.30 and precisely in a range between 0.635 and 0.726. The findings of item analysis are presented in Table 2.

Internal consistency reliability

The present article used the measure of Cronbach's α as an indicator of internal consistency reliability of the scale. For the present scale, the value of Cronbach Alpha was found to be 0.856, which is an indicator of a very good internal consistency reliability [74].

Divergent validity

To assess divergent validity, the Bangla WHO-5 and the Bangla version of DASS-21 [67] were administered to participants simultaneously. The correlation between the two measures denotes divergent validity of the scale because subjective well-being can be negatively impacted by psychological distress such as depression, anxiety, and stress [75]. The WHO-5 demonstrated a large, significant negative correlation with depression ($r = -0.753$, $p < 0.01$), anxiety ($r = -0.614$, $p < 0.01$), and stress ($r = -0.702$, $p < 0.01$) sub-scales of the Bangla version of DASS-21

Table 2 Descriptive statistics and item analysis of the Bangla WHO-5

	Descriptive statistics			Inter-item correlation					Item-total statistics	
	Mean (SD)	Skewness	Kurtosis	Item 1	Item 2	Item 3	Item 4	Item 5	Corrected item-total correlation	Cronbach's α if item delated
Item 1	2.96 (1.44)	−0.24	−0.98	1					0.636	0.835
Item 2	3.01 (1.42)	−0.18	−0.91	0.525	1				0.645	0.833
Item 3	3.30 (1.49)	−0.55	−0.73	0.464	0.467	1			0.635	0.836
Item 4	3.00 (1.64)	−0.33	−1.08	0.521	0.596	0.571	1		0.726	0.812
Item 5	3.20 (1.58)	−0.52	−0.81	0.572	0.516	0.568	0.631	1	0.714	0.815

Table 3 Goodness of fit indices for single factor structure of WHO-5 on GSDP

Indices	χ2	Df	*p*	χ2/df	RMSEA	CFI	TLI	SRMR
Values	8.244	5	0.143	1.648	0.053	0.993	0.986	0.0218

scale [76]. The significant negative correlational values establish the divergent validity of the scale.

Convergent validity

Convergent validity was assessed using Average Variance Extracted (AVE) and Composite Reliability (CR). According to Hair et al. (2010), the required levels for demonstrating convergent validity are an AVE of 0.5 or higher and a CR of 0.6 or higher [77]. For the present scale, the CR and AVE were 0.89 and 0.64, respectively, demonstrating the convergent validity of the Bangla WHO-5 Well-being Index among GSDP.

Factor analysis

Before factor analysis, suitability of the present data for factorability was determined by conducting the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy [78] and Bartlett's test of Sphericity. For the present scale, the KMO value of 0.856 indicated suitability for factor analysis that exceeded the recommended value of 0.6 [79]. In addition, the Bartlett's test of Sphericity also supported suitability for factor analysis ($\chi2 = 464.973$, $p \leq 0.001$). The inspection of correlation matrix indicated that correlation values of all items were above 0.3, thus supporting the decision that factor analysis can be performed on this sample of WHO-5 items [79].

Confirmatory factor analysis (CFA) was conducted using AMOS 18 [80] to test the suitability of the single factor structure mostly cited in literature [18, 20–22]. Goodness of fit method was considered in CFA. Goodness-of fit is generally evaluated using various model fit indices depending on the hypothesis regarding the model structure [81]. However, the present article assessed the appropriateness of model fit using multiple indices including Chi-square (χ2) statistic, the ratio of the chi-square statistic to the respective degrees of freedom (χ2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean square residual (SRMR). Throughout literature, the most cited values for goodness of fit indices were χ2 with $p \geq 0.01$, $\chi2/df \leq 2$, RMSEA ≤ 0.06, CFI ≥ 0.95, TLI ≥ 0.95, and SRMR ≤ 0.08 [82, 83].

The model fit indices for Bangla WHO-5 Well-being Index denote good fit for GSDP in Bangladesh (Table 3).

Figure 1 shows the factor loadings of the single factor construct of the WHO-5 Well-being Index on GSDP. Figure 1 illustrates that all standardized factor loadings exceeded the value of 0.50, indicating an acceptable single factor structure of the Bangla WHO-5 Well-being index.

Subjective responses to well-being and its reflection on the WHO-5 score

In addition to assessing well-being using WHO-5 Well-being Index, informal qualitative discussions were performed to explore the mental health and well-being of the participants during assessment. Participants' responses regarding well-being and their reflection on WHO-5 score are illustrated through some case vignettes.

Case vignette one

Liza (pseudonym) is 38-year-old transgender women (*hijra*) who earns her livelihood through sex work. She could not complete primary education due to the economic hardship of her family; however, she could read and write. Although she lived in Dhaka alone, her mother and younger sisters in village completely relied on her economically. Being a hijra and sex worker, Liza faced a lot of discrimination and injustice in her community on a daily basis. The economic hardship and the maltreatment by the people in community made her wonder why she is like this. She could not accept herself the way she is. As a result, most of the time Liza felt emotionally down. In addition, a few days before the assessment, Liza went through an incidence of physical and sexual violence by a

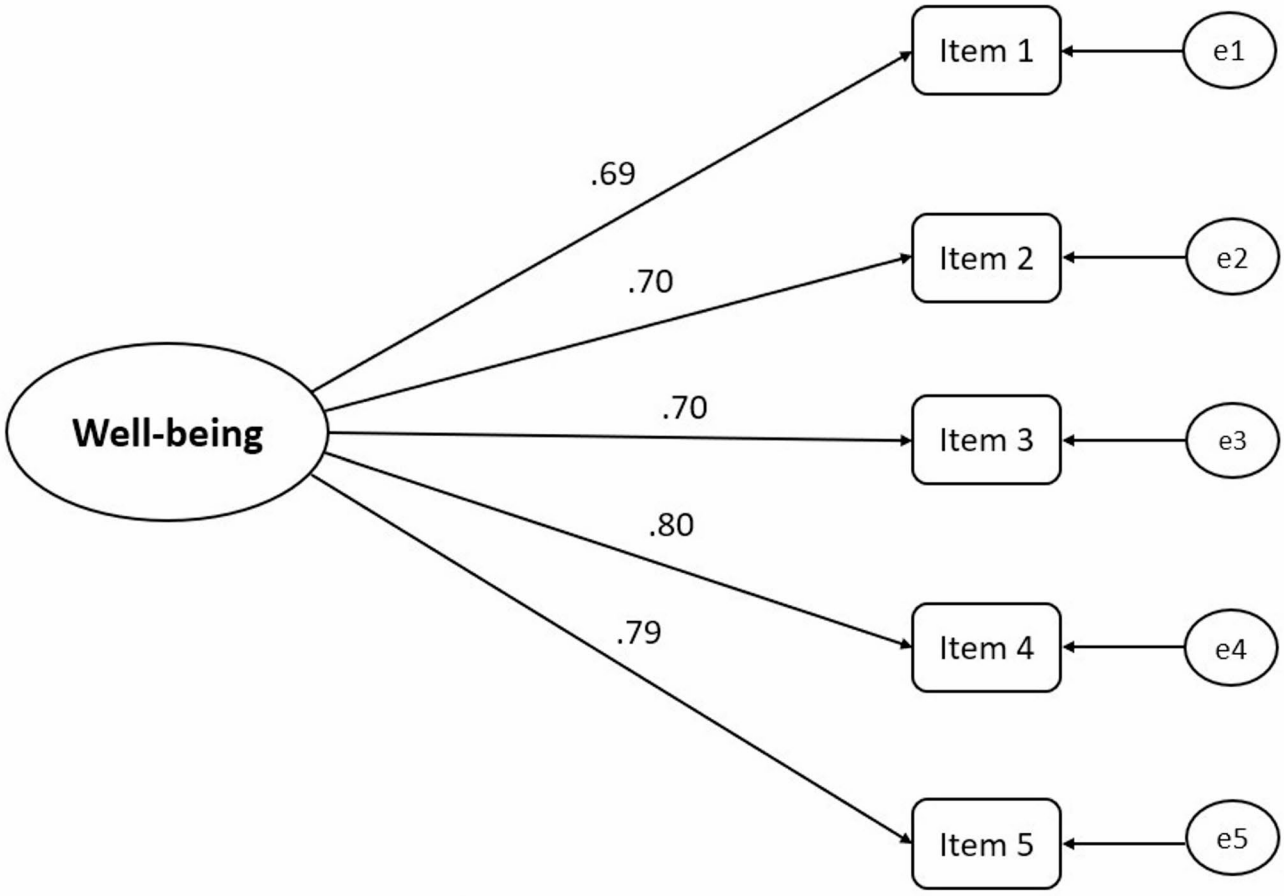

Fig. 1 Factor loadings of the single factor structure of the Bangla WHO-5 Well-being Index on GSDP. The standardized estimates of confirmatory factor analysis model on Bangladeshi gender and sexually diverse population

gang, which was traumatic and life threatening. In baseline assessment, Liza took the WHO-5 questionnaire and scored 16, indicating that her subjective well-being was impaired, which was consistent with her subjective experiences and consecutive responses.

Case vignette two

Billal (pseudonym) is 20-year-old college student lived with his parents. He found himself as a feminine male (*kothi*), where putting makeups and wearing feminine cloths were very close to his heart. When he looked at the mirror wearing sharee and other feminine cloths, he found himself complete and integrated. However, his feminine behaviors were not always welcomed in his family because his family members were very conservative. Billal's mother was religiously very orthodox in nature, and it was very shocking for her when she came to know about her son's feminine identity. His mother constantly rebuked him for his behavior, and Billal found his house a very discomforting place where no one understood him, and he could not share his feeling with anyone, not even with his father, because of his patriarchal mentality. He had few college friends with whom he used to talk occasionally, but he hesitated to share his inner core feelings with them due to the fear of being judged and misunderstood. As a result, Billal mostly remained sad and depressed because he was unable to find a place where he could express his desires and feelings, and often, suicidal thoughts popped into his mind. Billal took the WHO-5 questionnaire during baseline assessment and scored 24, which was an indicator of his compromised well-being as reflected in his subjective experience.

Case vignette three

Azad (pseudonym) is 22-year-old undergraduate student who found himself as a self-identified gay person. He lived with his family, and his parents were quite supportive. They knew about Azad's sexual orientation and accepted it nicely. Azad had also been able to maintain good friend circle in gay community and in university. He was ambitious about his career and hopeful to maintain a decent CGPA at University. Although Azad was very much aware about the punitive law and social discrimination against homosexuality, he had been able to deal

with them with the support of his family and friends from community. There was a time when Azad remained confused and puzzled about his sexuality, which made him feel sad, but over time, he gained a positive sense about himself and coped adaptively with the internal dilemmas. At the time of baseline assessment Azad took the WHO-5 questionnaire and scored 80, indicating good subjective well-being that was consistent with the verbal expression of his sense of well-being.

In each of these case vignettes, the subjective response to well-being was different, reflecting the unique life experiences and circumstances of each individual. The WHO-5 score of each of the individual also depicted a state of well-being which was consistent with subjective experiences that denoted the accuracy of the WHO-5 scale in assessing subjective well-being. Altogether, depending on the present mental state, the WHO-5 score provides a quantitative measure of subjective well-being, which can be used to monitor changes over time and to identify individuals who may benefit from additional support or treatment.

Discussion

The present article aimed to explore the psychometric properties of the Bangla WHO-5 Well-being Index in a sample of GSDP in Bangladesh. Given that GSDP often face various adverse circumstances, including stigma, and discrimination, their well-being and mental health are frequently at risk [84–87]. Understanding the well-being of this population is crucial, and reliable, validated tools are necessary for accurate assessment. In this article, a total of 229 GSDP individuals, including self-identified gay men, completed the Bangla WHO-5 Well-being Index during their enrollment in a PrEP intervention. Our analysis revealed strong internal consistency for the scale items, with inter-item correlations ranging from 0.464 to 0.631, indicating good internal consistency of the scale [72]. Additionally, the scale demonstrated a Cronbach's alpha coefficient of 0.856, which is considered indicative of good internal consistency [88]. These findings support the notion that the items within the scale are internally consistent. Notably, the internal consistency observed in our article aligns with previous validation studies, where Cronbach's α values ranged from 0.81 to 0.90 [89–91], further validating the robustness of the scale in this context. This finding also indicates that while well-being of GSDP can be influenced by external stressors (e.g., discrimination, stigmatization), individuals also demonstrate stability in their emotional responses. This aligns with Self-determination Theory (SDT), which argues that psychological well-being depends on the satisfaction of basic psychological needs (autonomy, competence, relatedness) that may be disrupted in marginalized groups. The reliability of the WHO-5 shows that it can capture both the immediate fluctuations and the underlying, stable aspects of well-being in GSDP individuals.

Divergent validity of the Bangla WHO-5 was ascertained by correlating the scale with the DASS-21, as subjective wellbeing and psychological distress (depression, anxiety and stress) are inherently distinct constructs that should not co-occur simultaneously. Significant negative correlations between the Bangla WHO-5 and the Bangla DASS-21's [67] subscales confirmed this validity, with correlation coefficients of –0.753 for depression, –0.614 for anxiety, and – 0.702 for stress [93]. These findings are critical as they demonstrate that higher well-being scores on the Bangla WHO-5 are associated with lower levels of psychological distress, as measured by the DASS-21. This inverse relationship is consistent with theoretical expectations and prior research [28], supporting the scale's ability to discriminate between well-being and distress effectively. The CR and AVE values reported for the Bangla WHO-5 (0.89 and 0.64, respectively) exceed the recommended thresholds [77]. Studies have shown that higher AVE and CR values are often indicative of well-validated constructs. For instance, research on physical and social support report AVE values above 0.5 and CR values well above 0.7, demonstrating robust convergent validity [94]. These high values are consistent with the findings for the Bangla WHO-5, further supporting its validity. The construct validity of the Bangla WHO-5, confirmed by its convergent and divergent validity with related constructs (e.g., depression, anxiety, stress), reflects its capacity to capture the construct of well-being in a population that may face chronic stressors that threaten mental health. Theoretical models, such as Minority Stress Theory, suggest that internal and external stressors negatively affect the mental health of marginalized individuals, but those who maintain positive emotional states despite these stressors exhibit resilience. The Bangla WHO-5 captures this emotional construct, offering a lens through which well-being can be understood in such contexts. Confirmatory factor analysis (CFA) was conducted to evaluate the single-factor model of the Bangla WHO-5 Well-being Index, as supported by most literature [15, 20, 88, 90, 95–97]. Multiple fit indices were utilized to ensure a comprehensive evaluation and to avoid any inappropriate conclusions [98]. The CFA results indicated a satisfactory model fit, with $\chi2 = 8.244$ ($p > 0.01$), $\chi2/df = 1.648$, RMSEA = 0.053, CFI = 0.993, TLI = 0.986, and SRMR = 0.0218. These fit indices suggest that the single-factor construct of the Bangla WHO-5 is appropriate for use among GSDP. The fit indices achieved in this analysis align with established thresholds for a good model fit, indicating that the data fit the hypothesized single-factor model well. The values, such as the CFI and TLI being close to 1, and the RMSEA and SRMR being below 0.06 and 0.08 respectively, are

indicative of a well-fitting model. Interestingly, while some studies have required correlating certain covariances to achieve acceptable model fit [28, 29, 92], this was not necessary in our analysis. The model fit indices were satisfactory without additional modifications, which supports the robustness of the single-factor structure observed. This finding is consistent with other studies that did not require such adjustments to achieve a good model fit [15, 24]. However, it is important to recognize that while the CFA results are promising, further validation in diverse samples and settings would strengthen the evidence for the Bangla WHO-5's applicability, as the generalizability of the findings is limited by the convenience sampling used. Future research should continue to explore its validity across different subgroups within the GSDP community to ensure its broad applicability and reliability. This includes conducting longitudinal studies to track well-being over time and examining its relationship with external stressors, resilience, and coping mechanisms specific to marginalized populations. Furthermore, the validated tool can guide the development of targeted mental health interventions tailored to the unique needs of the GSDP. For example, well-being scores can serve as baseline measures to identify specific psychological needs, thereby informing the design of resilience-building programs, stress management workshops, peer support groups, and culturally sensitive psychosocial support programs. Additionally, the WHO-5 offers a user-friendly and psychometrically sound measure for assessing emotional distress and diminished well-being, facilitating timely interventions. In resource-limited settings, such as Bangladesh, where mental health services are scarce and stigma surrounding mental health is pervasive, the simplicity and ease of use of the WHO-5 make it particularly valuable. It can be utilized for routine screening in primary care facilities, community-based clinics, and non-governmental organizations (NGOs) that serve marginalized populations. Community leaders and peer-support networks can also utilize the WHO-5 to monitor well-being trends, evaluate the impact of interventions, and empower individuals to take an active role in managing their mental health.

The present article is not beyond any limitation. First, the results of this analysis were based on participants collected from two DIC's of Dhaka city and virtual outreach intervention for self-identified gay men through convenient sampling process. This may compromise the generalizability of the findings to other GSDP in Bangladesh. However, as the GSDP with different background and different districts come to Dhaka based DICs to receive HIV prevention services, the sample of the present article perhaps be considered a satisfactory representation of the culture of Bangladeshi gender diverse population. Second, no separate CFA was performed on sub-sample of population including MSM, MSW, and transgender (*hijra*), due to small number involved ($n = 46$ for *hijra*). In future, with large sample size and probability sampling, it is recommended to conduct separate CFA for different groups to validate the scale comprehensively. The third limitation of the article was that the test-retest reliability could not be evaluated due to the transient nature of participants. Finally, the article did not determine cut-off points due to the absence of clinical sample. Future studies are recommended to employ probability sampling methods and include clinical samples to establish normative data for the Bangla WHO-5 Well-being Index. Additionally, longitudinal studies utilizing mixed-methods approaches would provide valuable insights by enabling the tracking of well-being over time and offering a deeper understanding of the lived experiences of GSDP. Such studies would also help elucidate the contextual factors that influence their well-being, contributing to development of a more nuanced and effective mental health interventions tailored to their specific needs.

Clinical relevance and future recommendations

Global evidence has persistently demonstrated the existence of health disparities among gender and sexually diverse people where they are more likely to develop certain mental health conditions, less privileged to access mental health services, and have worse health outcome [32, 39]. Especially in a low-and middle-income country like Bangladesh, the mental health status of these people are even more frightening than the global scenario due to the scarcity of skilled mental health professionals and inadequate resource distribution [99]. The impressive psychometric properties of the present scale demonstrate that the Bangla WHO-5 well-being index is a reliable and valid instrument that can accurately assess the subjective well-being state of GSDP in Bangladesh. This instrument can also facilitate the development of targeted mental health intervention for GSDP and monitor their changes of well-being over time to evaluate the effectiveness of intervention. In a busy DIC based HIV prevention clinic setting where resources are very limited, this brief and easy to administer instrument can substantially be used by the existing medical assistant cum counsellor upon completion of their basic mental health training. This task-shifting approach can help to better understand and address the mental health and well-being concerns specific to GSDP in Bangladesh. Nevertheless, a referral linkage can be established with tertiary mental health services, including National Institute of Mantal Health and Hospital (NIMH), upon assessment of people with severe mental health problem for specialized support. Moreover, this psychometrically sound instrument can provide empirical evidence that highlights the mental health challenges faced by this population in Bangladesh.

This evidence can be used to advocate for policy changes and initiatives that promote mental well-being, inclusive mental health services, and human rights protections for gender and sexually diverse marginalized population. Therefore, further testing of the WHO-5 well-being index in more representative gender and sexually diverse samples is needed to examine the scale's screening utility and to determine the cut-off value.

Conclusions

The Bangla WHO-5 has demonstrated satisfactory psychometric attributes in terms of internal consistency, divergent validity and factor structure on a sample of Bangladeshi GSDP. This further emphasizes the potentiality of the scale's usefulness in assessing psychosocial well-being of a socially marginalized group of people. The scale is easy to understand and administer (takes about 3 to 5 min). The scale is expected to yield more research in pursuit of understanding the levels of well-being for GSDP in Bangladesh. The scale can also be used as an outcome measure of well-being over time in clinical practices in existing healthcare settings. While the findings of this article provide important insights into the well-being of GSDP in Bangladesh, the use of convenience sampling limits the extent to which these results can be generalized to the broader GSDP population. Future research employing probability sampling methods or more diverse samples that better represent different subgroups within the GSDP community is necessary.

Abbreviations

CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DASS	Depression Anxiety Stress Scale
DIC	Drop-in Center
EFA	Exploratory Factor Analysis
GSDP	Gender and Sexually Diverse People
HIV	Human Immunodeficiency Virus
MSM	Men Who Have Sex with Men
MSW	Male Sex Worker
NGOs	Non-Government Organizations
PCA	Principal Component Analysis
PrEP	Pre-exposure Prophylaxis
RMSEA	Root Mean Square Error of Approximation
STIs	Sexually Transmitted Infections
SRMR	Standardized Root Mean Square Residual
TLI	Tucker-Lewis Index
WHO	World Health Organization

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Author contributions

Md. Ashiquir Rahaman drafted the manuscript and revised it with inputs from all co-authors. Sharful Islam Khan is the senior and corresponding author of this manuscript and was responsible for the overall supervision of data collection, management, and analysis, and drafting of the manuscript. Golam Sarwar also supervised overall data collection and assisted in the drafting of the manuscript. Md. Omar Faruk also managed data analysis and helped in writing the manuscript. All the co-authors have read, review and approved the final manuscript.

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Data availability

The datasets generated and analyzed during the current study are not publicly available as per the data policy of icddr, b but are available from the corresponding author on reasonable request.

Declarations

Competing interests

The authors declare no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethical approval was obtained by the Ethical Review Committee (ERC) of the Institutional Review Board of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b). Informed and understood consents were obtained, provided that the participant has given their permission, from all the participants prior to the enrollment in the PrEP intervention and data collection. As this study involved human participants, all of the procedures were followed in accordance with the relevant ethical guidelines, such as the Declaration of Helsinki.

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