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Psychometric Evaluation of the *12-Item HIV Stigma Scale* among People Living with HIV (PLHIV) on Antiretroviral Therapy (ART) in Mizoram, India

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Research Article

Keywords: HIV, stigma, psychometrics, short form, ART

Posted Date: September 9th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10894840/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

HIV-related stigma continues to undermine prevention efforts, treatment adherence, and the overall quality of life of people living with HIV (PLHIV). Stigma manifests in multiple dimensions and measuring these dimensions reliably is essential for both research and intervention evaluation. While the original 40-item HIV Stigma Scale (HSS) developed by Berger et al. has been widely used, its length can be burdensome in large-scale surveys. Shorter, validated instruments are therefore needed to capture stigma efficiently without compromising psychometric rigor.

Methods

This study employed a cross-sectional design involving 254 PLHIV currently on antiretroviral therapy (ART) in Mizoram, India. Participants were recruited through purposive sampling. The 12-item short version of the HIV Stigma Scale was administered, and psychometric properties were evaluated. Exploratory factor analysis and Confirmatory factor analysis (CFA) were performed to evaluate model fit indices and to examine dimensionality. Reliability was assessed using Cronbach's alpha, and validity was tested through discriminant and external criterion checks.

Results

Exploratory factor analysis replicated the hypothesized four-factor structure for Personalised Stigma, Disclosure Concerns, Public Attitudes, and Negative Self-Image, explaining 69.5% of the total variance. CFA confirmed excellent model fit (Comparative Fit Index = 0.942, Tucker–Lewis Index = 0.920, Root Mean Square Error of Approximation = 0.069). Reliability indices were satisfactory across all subscales (Cronbach's $\alpha = 0.73–0.83$), indicating internal consistency. Composite reliability values (ρc) were similarly robust, ranging from 0.74 to 0.83, and average variance extracted (AVE) values were above the recommended threshold of 0.49, supporting convergent validity. Discriminant validity was confirmed using the Fornell–Larcker criterion, with each subscale measuring distinct dimensions of stigma. External criterion validity was supported by significant correlations between stigma and psychosocial distress variables: depression ($r = 0.13$, $p < 0.05$), loss of meaning ($r = 0.17$, $p < 0.01$), and helplessness ($r = 0.15$, $p < 0.05$). These findings demonstrate that stigma is not only a multidimensional construct but also closely linked to psychological well-being.

Conclusions

The 12-item HIV Stigma Scale demonstrated strong psychometric validity and reliability when applied to a North-East Indian sample from the Mizo population, replicating international findings and confirming its cultural relevance. Its concise format and consistent performance highlight its utility for stigma research, program evaluation, and monitoring interventions aimed at reducing stigma and enhancing treatment adherence. Results highlight the critical role of stigma as a determinant of mental health and treatment outcomes among people living with HIV.

BACKGROUND

HIV-related stigma is widely recognized as one of the most persistent barriers to effective HIV prevention, testing, treatment adherence, and psychosocial well-being. Stigma manifests in multiple forms which enacted discrimination, anticipated rejection, and internalized shame and each of these dimensions undermines the effectiveness of public health interventions. Enacted stigma refers to overt acts of discrimination, such as exclusion from social groups or denial of services. Anticipated stigma involves the fear of rejection or discrimination if one's HIV status becomes known, often leading to secrecy and avoidance of disclosure. Internalized stigma, or self-stigma, occurs when individuals adopt negative societal attitudes and apply them to themselves, resulting in feelings of guilt, shame, and diminished self-worth. Together, these manifestations create a hostile environment that erodes the confidence of PLHIV and compromises their ability to engage fully in care [1].

The need to measure stigma systematically has been recognized for decades. Berger, Ferrans, and Lashley developed the 40-item HIV Stigma Scale, which remains one of the most widely used instruments globally [2]. Their psychometric assessment identified four domains of stigma: personalised stigma, disclosure concerns, negative self-image, and public attitudes. Personalised stigma captures the consequences of others knowing one's HIV status, such as losing friends or being avoided. Disclosure concerns reflect the effort to keep one's status secret and the perceived risks of telling others. Negative self-image measures internalized feelings of shame and guilt, while public attitudes assess perceptions of societal views toward PLHIV. Berger's scale demonstrated excellent reliability and validity, quickly becoming the gold standard for stigma measurement in both research and clinical contexts.

Despite its strengths, the 40-item scale is lengthy and can be burdensome in large-scale surveys or intervention studies. Administering the full instrument often requires 20–25 minutes, which may not be feasible in resource-constrained settings or when stigma measurement is only one component of a broader survey. Recognizing this limitation, Reinius et al. developed a 12-item short version of the HIV Stigma Scale, selecting three items from each of the four domains [3]. Their psychometric evaluation in Sweden confirmed the hypothesized factor structure and demonstrated excellent model fit indices (CFI = 0.963, TLI = 0.950, RMSEA = 0.071). Reliability across subscales remained acceptable ($\alpha > 0.70$), and although the short version showed slightly higher floor and ceiling effects, it retained construct validity. This shorter instrument has since been adopted in multiple studies, enabling efficient integration of stigma measurement into epidemiological and intervention research.

India has a concentrated HIV epidemic, with prevalence disproportionately high in certain regions and populations. According to the National AIDS Control Organisation (NACO), Mizoram consistently reports the highest state-level HIV prevalence in the country. Mizoram is a state in the northeastern part of India,

and it has the highest adult HIV prevalence of 2.73%, which is more than 13 times that of India (0.20%). An estimated 26,321 people living with HIV (PLHIV) reside in Mizoram [4]. These epidemiological patterns highlight the urgency of addressing stigma in this context, as stigma not only discourages testing and disclosure but also undermines adherence to ART, which is critical for viral suppression and achieving the UNAIDS 95-95-95 targets.

The state's unique sociocultural context which is marked by strong collectivist values, close-knit family structures, and religious influences that shapes both the experience and the expression of stigma. In collectivist societies, individual identity is closely tied to family and community reputation. Disclosure of HIV status therefore carries implications not only for the individual but also for their family, who may face secondary stigma. Close-knit community networks amplify the risk of gossip and social ostracism, making secrecy a common coping strategy. Religious influences further shape perceptions of HIV, often framing infection in moral terms that reinforce guilt and shame. Qualitative studies in Mizoram have documented that PLHIV frequently experience compounded challenges: fear of disclosure within tight community networks, social exclusion, and internalized guilt stemming from moral judgments [5]. These dynamics highlight the need for culturally sensitive measurement tools that can capture the nuances of stigma in this setting.

Accurate measurement of stigma in Mizoram is therefore critical for tailoring interventions. The HIV Stigma Scale provides a structured framework to capture the four domains of stigma—personalised stigma, disclosure concerns, public attitudes, and negative self-image. By quantifying these dimensions, researchers and policymakers can identify psychosocial correlates of stigma, evaluate its impact on adherence and mental health, and design stigma reduction programs that resonate with local cultural values.

This study evaluates the psychometric properties of the 12-item HIV Stigma Scale in a Mizoram sample of PLHIV currently on ART. First, it validates the 12-item HSS in an Indian sample, replicating international findings and confirming its reliability and validity. Second, it contextualizes stigma within the socio-cultural realities of Mizoram. Third, it demonstrates that stigma is significantly associated with psychosocial distress, reinforcing its relevance as a determinant of mental health and treatment adherence. By situating the instrument within the Mizoram HIV epidemic, the study contributes to strengthening the HIV response in high-burden regions where stigma remains a formidable obstacle to achieving UNAIDS 95-95-95 targets.

METHODS

Study Design and Setting

This study employed a cross-sectional design to evaluate the psychometric properties of the 12-item HIV Stigma Scale among PLHIV in Mizoram, India. The design was chosen because cross-sectional surveys are particularly suited for psychometric validation, allowing researchers to assess reliability, factor structure, and validity at a single point in time. By focusing on individuals currently receiving antiretroviral therapy (ART), the study ensured that participants had direct experience with HIV-related stigma in both healthcare and community contexts.

The study was conducted between March to July 2026, coinciding with routine ART clinic visits. This timing minimized participant burden and facilitated recruitment from established HIV care networks. The cross-sectional approach also allowed for the integration of psychosocial correlates into the analysis, thereby strengthening external validity.

Sample and Sampling Method

The study included 254 respondents, all of whom were PLHIV currently registered and receiving ART at ART centers in Mizoram. This sample size was deemed adequate for factor analysis, as psychometric literature recommends at least 5–10 participants per item [2]. With 12 items, the minimum recommended sample size was 120 [3]; our sample exceeded this threshold, providing robust statistical power for exploratory and confirmatory factor analyses.

Inclusion Criteria

Participants were eligible if they met the following criteria:

1. Adults aged 18 years or older.
2. Confirmed HIV-positive status.
3. Currently on ART for at least six months.
4. Resident of Mizoram.
5. Able to provide informed consent.

Exclusion Criteria

Individuals were excluded if they:

1. Had severe cognitive impairment or psychiatric illness that precluded reliable questionnaire completion.
2. Were acutely ill at the time of data collection.
3. Declined to participate.

A Purposive Sampling method was employed to ensure that participants represented the diversity of PLHIV accessing ART services in Mizoram. Clinic staff introduced the study to eligible patients, and those interested were referred to trained research assistants. This approach ensured representation of key populations disproportionately affected by HIV in Mizoram, including people who inject drugs and female sex workers, while also capturing experiences of

stigma among the general PLHIV population. This approach was chosen to capture variations in demographic characteristics and psychosocial experiences relevant to stigma.

Instrument:

12-item HIV Stigma Scale (HSS) [3]: This short form consists of four subscales: Personalised Stigma (3 items: loss of friends, avoidance, rejection), Disclosure Concerns (3 items: secrecy, risk of telling, careful disclosure), Public Attitudes (3 items: perceptions of dirtiness, outcast status, discomfort), Negative Self-Image (3 items: guilt, shame, diminished self-worth). Responses were recorded on a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree). Subscale scores ranged from 3 to 12, with higher scores indicating greater perceived stigma.

Depression Anxiety Stress Scales (DASS)-21 [6]: It is rated on a 4-point Likert-scale response option: from 0= "*Did not apply to me at all*" to 3= "*Applied to me very much*" and was utilized to measure depression, anxiety and stress. Each subscale contained 7 items including: depression, anxiety and stress. The Cronbach's α of the scale was found to be 0.93.

Demoralization Scale [7]: The scale was developed with the aim of measuring the dimensions and intensity of demoralization in patients with serious diseases. The instrument consists of 24 items divided into five factors: Loss of meaning and purpose (α = 0.87), Dysphoria (α = 0.85), Disheartenment (α = 0.89), Helplessness (α = 0.84), and Sense of failure (α = 0.71).4 The responses are categorized on a five- point Likert scale that measures the frequency (0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = all the time) of the experience over the last two weeks.

Sociodemographic information (sex, age, marital status, education, occupation, family type, household type, breadwinner status) was also recorded to contextualize stigma experiences.

Data Collection:

Data were collected through structured interviews conducted by trained research assistants at ART centers. Participants were approached during routine clinic visits. After obtaining informed consent, trained research assistants administered the questionnaires in Mizo or English, depending on participant preference. To minimize social desirability bias, interviews were conducted in private spaces within the clinic. Each session lasted approximately 30 minutes.

Data Processing:

Data were first entered into Microsoft Excel for preliminary organization, coding, and cleaning, which involved assigning variable codes, checking for inconsistencies, and correcting entry errors. The cleaned dataset was then exported into SPSS version 27 for descriptive statistical analysis, reliability and exploratory factor analysis (EFA). Confirmatory factor analysis (CFA) and advanced reliability checks, including composite reliability (ρc), were performed using SmartPLS 4 [8]. Double-entry verification was applied to ensure accuracy, and missing values were minimal (< 5%), handled through mean substitution consistent with psychometric validation practices.

Statistical Analyses:

Factor Analyses

An Exploratory Factor Analysis (EFA) was first conducted to examine the underlying structure of the stigma scale. The extraction was performed with *oblimin rotation* to allow for correlated factors. Sampling adequacy was evaluated using the Kaiser–Meyer–Olkin (KMO) measure and the Bartlett's test of sphericity, ensuring that the data were suitable for factor analysis.

Following EFA, a Confirmatory Factor Analysis (CFA) was carried out to test the hypothesized four-factor model. Model fit was assessed using multiple indices, including the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA), which together provide a robust evaluation of model adequacy.

Reliability

Internal consistency was evaluated using Cronbach's alpha, composite reliability (ρc), and the Average Variance Extracted (AVE) to ensure the constructs were measured with adequate reliability.

Validity

- **Discriminant validity** was examined using the Fornell–Larcker criterion, by comparing the square root of the Average Variance Extracted (√AVE) for each construct with the correlations among constructs.
- **External criterion validity** was assessed by correlating stigma scores with established psychological measures. Specifically, associations were tested with the DASS-21, which measures depression, anxiety, and stress, and the Demoralization Scale, which captures loss of meaning, dysphoria, disheartenment, helplessness, and feelings of failure.

Ethical Considerations

Ethical approval

was obtained from the Institutional Ethics Committee of Zoram Medical College (ZMC). Additional clearance was secured from participating ART centers.

Key ethical safeguards included:

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Key ethical safeguards included:

- Informed Consent: Written consent was obtained from all participants after explaining study objectives, procedures, risks, and benefits.
- Confidentiality: Data were anonymized using unique identifiers. Personal information was stored separately from survey responses.
- Voluntariness: Participation was entirely voluntary, with no impact on clinical care for refusal.
- Psychological Support: Participants who experienced distress during the survey were referred to counseling services available at ART centers.

The study adhered to the principles of the Declaration of Helsinki and followed national guidelines for biomedical research involving human participants.

RESULTS

Sample Characteristics

The study included 254 PLHIV currently on ART in Mizoram. The sample was nearly balanced by sex (52.8% male, 47.2% female), with a mean age of 39.6 years (SD = 10.9). Most respondents were married (44.1%), unemployed (38.2%), or engaged in elementary occupations (38.6%). Family structures were predominantly nuclear (69.7%), with a mean family size of 4.6 (SD = 2.4). Table 1 shows the details of characteristics of the respondents.

Table 1: Sample Characteristics of Respondents (N = 254)

Variable	Category	n	%
Sex	Male	134	52.8
	Female	120	47.2
Age (years)	Mean (SD) = 39.6 (10.9)		
Marital Status	Married	112	44.1
	Single	61	24
	Divorced	45	17.7
	Widowed	29	11.4
	Separated	4	1.6
	Domestic Partnership	2	0.8
	Others	1	0.4
Number of Children	0	99	39
	1	52	20.5
	2	45	17.7
	3	32	12.6
	≥4	26	10.2
Education	Primary	24	9.4
	Middle School	67	26.4
	HSLC	73	28.7
	HSSLC	52	20.5
	Graduate & above	38	15
Occupation	Unemployed	97	38.2
	Elementary Occupation	98	38.6
	Skilled Worker	37	14.6
	Professional	22	8.7
Type of Household	Owned	149	58.7
	Rented	105	41.3
Family Type	Nuclear	177	69.7
	Joint	77	30.3
Family Size	Mean (SD) = 4.6 (2.4)		
Breadwinner	Self	104	40.9
	Spouse	43	16.9
	Others	107	42.1
No. of Breadwinners	1	102	40.2
	2	84	33.1
	≥3	68	26.7

This demographic profile highlights the socioeconomic vulnerabilities of PLHIV in Mizoram, with high unemployment, modest education, and reliance on extended family structures.

Construct Validity:

Exploratory Factor Analysis of the HIV Stigma Scale

Exploratory factor analysis was performed to explicate the underlying structure of the 12-item HIV Stigma Scale in the Mizoram sample. Table 2 shows the findings of the exploratory factor analysis (EFA). Correlations between items ranged from modest to strong, with communalities ranging from 0.53 to 0.81,

indicating that items shared sufficient variance with their respective factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.747, and Bartlett's test of sphericity was highly significant ($\chi^2 = 1048.66$, df = 66, p <0 .001), confirming the suitability of the data for factor analysis.

Exploratory factor analysis with Oblimin rotation yielded a clear four-factor solution, consistent with the theoretical model proposed by Berger et al. (2001) and replicated by Reinius et al. (2017). The eigenvalues for the four components were 3.82, 2.10, 1.30, and 1.12, together explaining 69.5% of the total variance.

Factor 1 (Concerns about Public Attitudes). Items loading strongly on this factor reflected societal perceptions of HIV, such as "Most people believe a person who has HIV is dirty" (loading = 0.85), "People with HIV are treated like outcasts" (0.88), and "Most people are uncomfortable around someone with HIV" (0.83). This factor captures the external stigma dimension, emphasizing how PLHIV anticipate or experience rejection from the broader community.

Factor 2 (Personalised Stigma). This factor comprised items reflecting direct interpersonal consequences of disclosure, including "People I care about stopped calling after learning I have HIV" (0.81), "I have lost friends by telling them I have HIV" (0.83), and "Some people avoid touching me once they know I have HIV" (0.81). These items highlight the lived experiences of rejection and social distancing, consistent with Berger's original conceptualization of personalised stigma.

Factor 3 (Negative Self-Image). Items loading on this factor captured internalized stigma, such as "I feel guilty because I have HIV" (–0.76), "People's attitudes about HIV make me feel worse about myself" (–0.80), and "I feel I'm not as good a person as others because I have HIV" (–0.84). These items reflect shame, guilt, and diminished self-worth, underscoring the psychological burden of stigma.

Factor 4 (Disclosure Concerns). This factor reflected secrecy and caution in disclosure, with items such as "I work hard to keep my HIV a secret" (0.70), "Telling someone I have HIV is risky" (0.90), and "I am very careful who I tell that I have HIV" (0.82). These loadings confirm that disclosure concerns remain a distinct dimension of stigma, particularly relevant in close-knit communities like Mizoram.

Table 2: Exploratory Factor Analysis of 12 items HIV Stigma Scale (HSS)

	Component 1	Component 2	Component 3	Component 4
Eigenvalues	3.818	2.102	1.304	1.120
Item				
Personalised stigma				
1. People I care about stopped calling after learning I have HIV	0.29	**0.81**	-0.18	0.02
2. I have lost friends by telling them I have HIV	0.19	**0.83**	-0.14	-0.01
3. Some people avoid touching me once they know I have HIV	0.12	**0.81**	-0.26	-0.05
Disclosure concerns				
4. I work hard to keep my HIV a secret	0.24	0.16	-0.30	**0.70**
5. Telling someone I have HIV is risky	0.26	-0.08	-0.10	**0.90**
6. I am very careful who I tell that I have HIV	0.31	-0.14	-0.07	**0.82**
Concerns about public attitudes				
7. Most people believe a person who has HIV is dirty	**0.85**	0.24	-0.29	0.30
8. People with HIV are treated like outcasts	**0.88**	0.21	-0.29	0.30
9. Most people are uncomfortable around someone with HIV	**0.83**	0.21	-0.39	0.26
Negative self-image				
10. I feel guilty because I have HIV	0.37	0.19	**-0.76**	0.24
11. People's attitudes about HIV make me feel worse about myself	0.53	0.14	**-0.80**	0.25
12. I feel I'm not as good a person as others because I have HIV	0.16	0.23	**-0.84**	0.08

Note. Extraction method: Principal Component Analysis with Oblimin rotation. Components 1–4 (eigenvalues = 3.818, 2.102, 1.304, 1.120) together explained 69.5% of the variance.

The factor analysis confirmed the hypothesized four-factor structure of the 12-item HIV Stigma Scale in Mizoram, explaining nearly 70% of variance. The clean item loadings, strong communalities, and satisfactory sampling adequacy support the construct validity of the instrument. These findings replicate the psychometric robustness reported in Western [2] and Swedish [3] samples, while demonstrating applicability in the Indian context.

Confirmatory Factor Analysis

To further evaluate the construct validity of the 12-item HIV Stigma Scale, a confirmatory factor analysis (CFA) was conducted to test the hypothesized four-factor model comprising Personalised Stigma (PS), Disclosure Concerns (DC), Negative Self-Image (NS), and Public Attitudes (PA).

The model demonstrated a statistically significant chi-square, $\chi^2(48) = 106.80$, $p < 0.001$; however, the chi-square/df ratio was 2.23, which falls within the acceptable threshold (< 3), indicating adequate fit. The RMSEA was 0.069 (90% CI = 0.052–0.087), suggesting reasonable error of approximation. Additional fit indices further confirmed model adequacy: GFI = 0.94, AGFI = 0.90, SRMR = 0.06, NFI = 0.90, TLI = 0.92, and CFI = 0.94. Collectively, these values exceed recommended cutoffs (≥ 0.90), demonstrating strong incremental fit. Compared to the null model ($\chi^2/df = 16.26$, RMSEA = 0.245), the estimated model provided a substantially improved representation of the data. Information criteria (AIC = 166.80; BIC = 272.92) also supported the parsimony of the model. Taken together, these findings indicate that the four-factor model offers a robust and reliable fit to the observed data.

As shown in Figure 1, factor loadings were consistently strong across all items, ranging from 0.61 to 0.91, indicating that each item contributed meaningfully to its respective latent construct. For instance, items under Disclosure Concerns showed particularly high loadings ("Telling someone I have HIV is risky" = 0.91; "I am very careful who I tell that I have HIV" = 0.78), reflecting the salience of secrecy and disclosure fears in the Mizoram sample. Similarly, Negative Self-Image items ("I feel I'm not as good a person as others because I have HIV" = 0.84; "People's attitudes make me feel worse about myself" = 0.63) captured internalized stigma reliably.

Inter-factor correlations were moderate, ranging from –0.08 to 0.37, suggesting that while the four dimensions are distinct, they are moderately related and together represent a higher-order construct of generalized perceived stigma. This pattern mirrors findings from Berger et al. [2] and Reinius et al. [3], reinforcing the cross-cultural robustness of the HIV Stigma Scale.

Correlations With Related Measures

In addition to factor analysis, construct validity was assessed by examining the relationship of the 12-item HIV Stigma Scale with measures of related psychosocial constructs. Depression, anxiety, stress, loss of meaning, dysphoria, disheartenment, helplessness, and sense of failure were used to evaluate external criterion validity. Table 3 reports the correlations between these measures, and the total stigma score as well as the four subscale scores.

The relationships among these measures matched theoretical predictions. Depression scores were positively correlated with overall stigma and most strongly with the Negative Self-Image subscale (r = 0.13, p < 0.05), confirming that internalized stigma contributes to depressive symptoms. Similarly, loss of meaning was significantly associated with both the total stigma score (r = 0.12, p < 0.05) and the Negative Self-Image subscale (r = 0.17, p < 0.01), indicating that existential distress is closely linked to stigma. Helplessness also showed a significant positive correlation with Negative Self-Image (r = 0.15, p < 0.05), underscoring the psychological burden of stigma.

Other measures, including anxiety, stress, dysphoria, disheartenment, and sense of failure, showed weaker or non-significant associations with stigma scores. These patterns suggest that while stigma is broadly related to psychological distress, its strongest associations are with constructs reflecting self-image and meaning in life.

Table 3: Correlations between other measures and Total HIV stigma (12 items) score and subscales score

Added Measures	Total HIV Stigma (12 items)	Subscale 1 Personalised Stigma (3 items)	Subscale 2 Disclosure Concerns (3 items)	Subscale 3 Public Attitudes (3 items)	Subscale 4 Negative self-image (3 items)
Depression	0.11	0.11	-0.02	0.07	**0.13***
Anxiety	0.02	0.02	-0.01	0.04	0.02
Stress	0.10	0.11	-0.02	0.08	0.10
Loss of meaning	**0.12***	0.09	-0.05	0.11	**0.17****
Dysphoria	0.07	0.02	-0.02	0.10	0.08
Disheartenment	0.05	0.02	-0.04	0.08	0.07
Helplessness	0.12	0.08	0.05	0.04	**0.15***
Sense of failure	-0.02	0.01	-0.09	-0.02	0.05

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Taken together, these findings provide evidence of external criterion validit**y** for the 12-item HIV Stigma Scale in Mizoram. The scale not only captures the multidimensional structure of stigma but also demonstrates meaningful associations with mental health outcomes, consistent with prior research in other contexts [2,3].

Discriminant Validity

The Fornell-Larcker criterion was satisfied for all subscales. The correlations between the subscales of HIV Stigma Scale are illustrated in Table 4. Personalised Stigma (√AVE = 0.72) exceeded correlations with Disclosure Concerns (–0.08), Negative Self-Image (0.28), and Public Attitudes (0.35).

Disclosure Concerns (√AVE = 0.73) exceeded correlations with Negative Self-Image (0.24), Public Attitudes (0.37), and Personalised Stigma (–0.08). Public Attitudes (√AVE = 0.79) exceeded correlations with Disclosure Concerns (0.37), Negative Self-Image (0.62), and Personalised Stigma (0.35). Negative Self-Image (√AVE = 0.70) exceeded correlations with Disclosure Concerns (0.24), Public Attitudes (0.62), and Personalised Stigma (0.28).

Table 4: Fornell-Larcker criterion

Subscale	PS	DC	PA	NS
PS (Personalized Stigma)	**0.72**			
DC (Disclosure Concerns)	–0.08	**0.73**		
PA (Public Attitudes)	0.35	0.37	**0.79**	
NS (Negative Self-Image)	0.28	0.24	0.62	**0.70**

All constructs meet the criterion, confirming strong discriminant validity, each subscale measures a distinct aspect of HIV-related stigma. This confirms that each subscale measures a distinct dimension of HIV stigma.

Reliability and psychometric properties

The 12-item HIV Stigma Scale demonstrated strong and consistent psychometric performance in the Mizoram sample. Table 5 presents the descriptive statistics for items and subscales in the 12-item HIV Stigma Scale. Each of the four subscales showed acceptable internal consistency, with Cronbach's alpha values ranging from 0.73 to 0.83, indicating that the items within each dimension reliably measured the intended construct. Composite reliability values (ρc) were similarly robust, ranging from 0.74 to 0.83, and average variance extracted (AVE) values were above the recommended threshold of 0.49, supporting convergent validity.

At the subscale level, Personalised Stigma had a mean score of 5.26 (SD = 1.70), with corrected item-total correlations consistently above 0.57, confirming that items such as "I have lost friends by telling them I have HIV" and "People I care about stopped calling after learning I have HIV" contributed meaningfully to the scale. Disclosure Concerns showed the highest mean score (9.63, SD = 1.65), reflecting the pervasive fear of disclosure among respondents. Items such as "Telling someone I have HIV is risky" and "I am very careful who I tell that I have HIV" had corrected item-total correlations above 0.43, demonstrating adequate reliability despite the sensitive nature of disclosure.

Table 5: Descriptive statistics for items and subscales in the 12 items HIV Stigma Scale

	Mean item score (SD)	Corrected item-total correlation	Mean subscale score (SD)	Reliability, α	Composite reliability(rho_c)	Average variance extracted (AVE)	F e
Personalised stigma				0.76	0.76	0.51	(
1. Some people avoid touching me once they know I have HIV	1.91(0.78)	0.58	5.26(1.70)				
2. People I care about stopped calling after learning I have HIV	1.60(0.62)	0.60					
3. I have lost friends by telling them I have HIV	1.75(0.67)	0.58					
Disclosure concerns				0.73	0.74	0.53	(
4. Telling someone I have HIV is risky	2.95(0.79)	0.43	9.63(1.65)				
5. I work hard to keep my HIV a secret	3.30(0.68)	0.67					
6. I am very careful who I tell that I have HIV	3.37(0.57)	0.54					
Concerns about public attitudes				0.83	0.83	0.62	(
7. People with HIV are treated like outcasts	2.74(0.75)	0.67	8.10(1.93)				
8. Most people believe a person who has HIV is dirty	2.71(0.75)	0.73					
9. Most people are uncomfortable around someone with HIV	2.65(0.74)	0.64					
Negative self-image				0.74	0.74	0.49	(
10. I feel guilty because I have HIV	2.85(0.74)	0.54	8.17(1.85)				
11. People's attitudes about HIV make me feel worse about myself	2.76(0.74)	0.61					
12. I feel I'm not as good a person as others because I have HIV	2.57(0.80)	0.55					

The Public Attitudes subscale had a mean score of 8.10 (SD = 1.93) and the strongest reliability (α = 0.83), with items like "People with HIV are treated like outcasts" and "Most people believe a person who has HIV is dirty" showing corrected item-total correlations above 0.64. This reflects the salience of societal

stigma in Mizoram's context. Negative Self-Image had a mean score of 8.17 (SD = 1.85), with reliability indices (α = 0.74) confirming that items such as "I feel guilty because I have HIV" and "I feel I'm not as good a person as others because I have HIV" captured internalized stigma consistently.

Floor and ceiling effects were modest across the scale, suggesting that the instrument was sensitive enough to detect variations in stigma experiences without clustering responses at the extremes. The highest ceiling effect was observed in the Disclosure Concerns subscale (19.7%), reflecting the near-universal tendency among respondents to conceal their HIV status.

DISCUSSION

Key Findings in Mizoram

This study confirmed that the 12-item HIV Stigma Scale is valid and reliable in the Mizoram context, with a stable four-factor structure and acceptable reliability indices. The CFA demonstrated excellent model fit, indicating that the latent constructs adequately captured the multidimensional nature of stigma among PLHIV in Mizoram. Strong factor loadings and moderate inter-factor correlations suggest that while each dimension represents a distinct aspect of stigma, they collectively form a coherent higher-order construct of generalized perceived stigma. This finding reinforces the conceptual integrity of the scale and its applicability across cultural contexts.

Stigma was significantly associated with depression, loss of meaning, and helplessness, highlighting its impact on mental health and ART adherence. Disclosure concerns and public attitudes emerged as particularly salient dimensions, reflecting the tight-knit community structures and moral judgments prevalent in Mizoram.

Comparison with Global Findings

The results are consistent with international studies validating the short-form HIV Stigma Scale. In Sweden, Reinius et al. [3] found that the 12-item scale replicated the factor structure of the original 40-item instrument, with Cronbach's α values above 0.7 and strong construct validity. Similarly, our Mizoram sample demonstrated reliability across all subscales, though item-total correlations were slightly lower, possibly reflecting cultural differences in stigma expression.

In sub-Saharan Africa, studies have reported that stigma strongly predicts poor ART adherence and mental health outcomes. For example, Turan et al. [10] in Kenya found that anticipated stigma was associated with lower adherence and increased depressive symptoms. In South Africa, Pantelic et al. [11] documented that internalized stigma correlated with hopelessness and reduced engagement in care. These parallels reinforce our finding that negative self-image and disclosure concerns are critical pathways through which stigma undermines HIV response.

In Asian contexts, similar coexistence of collectivist values and emerging individualism has been observed. A study in China [12] reported that family-based stigma and fear of disclosure were major barriers to ART adherence, echoing our Mizoram findings where family structures play a central role. In Vietnam, Nguyen et al. [13] highlighted that stigma reduction through community mobilization improved ART uptake, suggesting that peer-led interventions could be effective in Mizoram as well.

Implications for Mizoram's HIV Response

The convergence of findings across countries underscores that stigma is a universal barrier, but its manifestations are shaped by local sociocultural contexts. In Mizoram, where HIV prevalence is the highest in India, stigma reduction must be prioritized alongside biomedical interventions.

- **ART adherence:** Disclosure concerns must be addressed in counseling, as secrecy and fear of rejection directly undermine treatment continuity.
- **Community interventions:** Peer-led outreach and drop-in centers, proven effective in other Asian and African contexts, should be scaled up in Mizoram to reduce isolation and normalize HIV.
- **Stigma-reduction campaigns:** Public attitudes remain a major challenge. Campaigns through churches, youth groups, and local media can challenge misconceptions, similar to successful initiatives in Kenya and South Africa.
- **Mental health integration:** Given the strong link between stigma and depression, psychosocial support should be integrated into ART services.

Limitations

Despite the strengths of this study, several limitations should be acknowledged:

1. The study employed a cross-sectional approach, which restricts causal inference. While associations between stigma, psychosocial distress, and adherence were observed, the temporal direction of these relationships cannot be established.
2. Purposive sampling was used to recruit participants from ART centers and HIV support organizations. This may limit generalizability, as individuals not engaged in care or those outside formal support networks were not represented. The sample may therefore under-represent PLHIV who are most marginalized or disengaged from services.
3. Data on stigma and psychosocial factors were self-reported. Such measures are vulnerable to recall bias and social desirability bias, particularly in a context where disclosure is sensitive.
4. The study was conducted in Mizoram, a state with unique sociocultural characteristics. While this provides valuable contextual insights, findings may not be directly transferable to other regions of India or globally. Replication in diverse settings is necessary to confirm broader applicability.

5. Instrument limitations: Although the 12-item HIV Stigma Scale demonstrated satisfactory psychometric properties, the short form inevitably reduces sensitivity compared to the original 40-item scale. Certain nuanced aspects of stigma, such as regrets over disclosure or fear of secondary stigma affecting family members, may not be fully captured.

CONCLUSION

This study validated the 12-item HIV Stigma Scale among Mizo speaking PLHIV currently on ART in Mizoram, India, confirming its reliability, construct validity, and discriminant validity. The four-factor structure-personalised stigma, disclosure concerns, public attitudes, and negative self-image was replicated, explaining nearly 70% of variance. Stigma was significantly associated with depression, loss of meaning, and helplessness, underscoring its detrimental impact on mental health and treatment adherence.

Comparisons with international studies reveal striking similarities: in Sweden, the short-form scale demonstrated strong psychometric properties [3]; in Kenya and South Africa, stigma was linked to poor ART adherence and hopelessness [10,11]; in China and Vietnam, disclosure concerns and public stigma were major barriers to care [12,13]. These parallels confirm that stigma is a universal barrier, though its manifestations are shaped by local sociocultural contexts.

In Mizoram, stigma is compounded by close-knit community structures, moral judgments, and socioeconomic vulnerabilities [14]. Addressing stigma is therefore essential to strengthen the HIV response in the state. Policy implications include integrating stigma assessment into ART services, scaling up peer-led community interventions, embedding mental health support into HIV care, and implementing stigma-reduction campaigns through churches, youth groups, and local media.

By situating stigma measurement within Mizoram's high-burden epidemic, this study provides a practical tool for monitoring stigma and evaluating interventions. The brevity of the 12-item HIV Stigma Scale makes it suitable for routine use in ART centers and community surveys. Ultimately, reducing stigma is not only a psychosocial imperative but also a public health necessity for Mizoram to achieve the UNAIDS 95-95-95 targets and improve the quality of life of PLHIV.

Declarations

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Authors' contributions

- **Lalramhluni Pachuau**: Conceived and designed the study, supervised data collection, performed statistical analyses, and drafted the initial manuscript.
- **C Lalfamkima Varte**: Contributed to data collection, managed participant recruitment, assisted with statistical analysis, and participated in manuscript writing.
- **Richard L Chawngthu**: Contributed to data collection, managed participant recruitment, assisted with statistical analysis, and participated in manuscript writing.

All authors read and approved the final manuscript. Each author agrees to be accountable for all aspects of the work, ensuring that questions related to accuracy or integrity are appropriately investigated and resolved.

Acknowledgements

The authors would like to thank the staff of the ART centres and HIV support organizations in Mizoram for their assistance in participant recruitment and data collection. We are grateful to all study participants for their time and willingness to share their experiences. We also acknowledge the contributions of research assistants who facilitated translation and administration of the questionnaires.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted as part of academic research activities supported by institutional resources.

Ethics approval and consent to participate

All procedures performed in this study complied with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of Zoram Medical College. Written informed consent was obtained from all participants prior to data collection. For participants under 18 years of age, consent was obtained from parents or legal guardians alongside assent from the adolescents themselves. Participants were informed of their right to withdraw at any time without consequence.

Consent for publication

Not applicable. No identifying information is included in this manuscript.

Competing interests

The authors declare that they have no competing interests.

Data availability

The datasets generated and analyzed during the current study are not publicly available due to restrictions related to participant confidentiality and sensitive health information. De-identified data may be made available from the corresponding author upon reasonable request, subject to approval by the Institutional Ethics Committee of Mizoram University and compliance with applicable data protection regulations.

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Figures

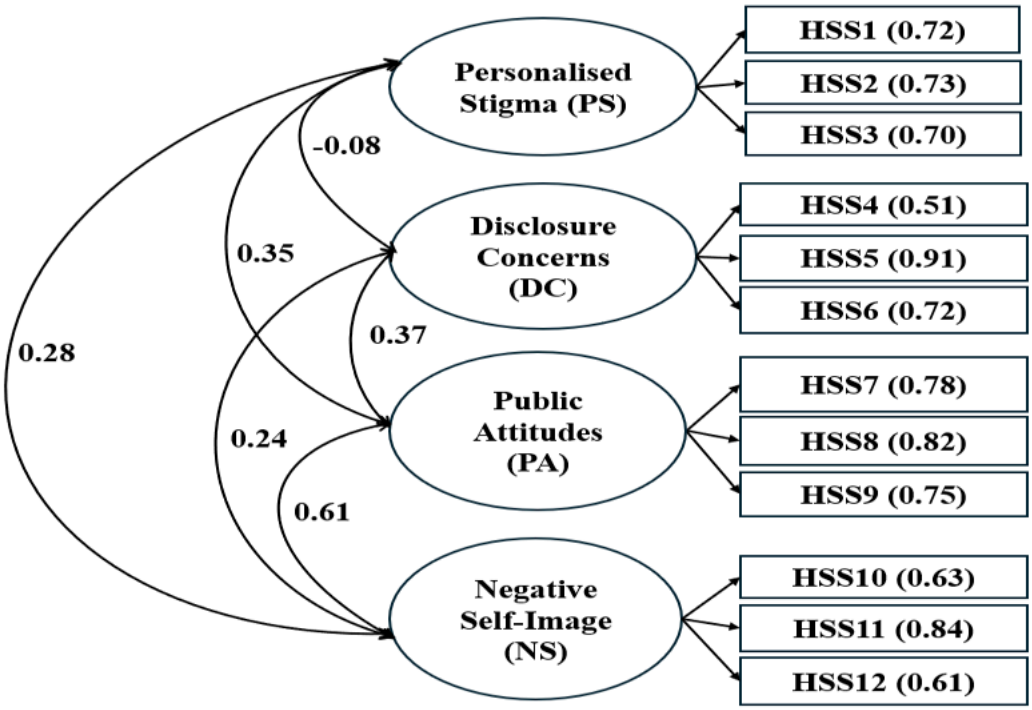


Figure 1

Confirmatory Factor Analysis of 12-item HIV Stigma Scale (HSS)