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PSYCHOMETRIC VALIDATION OF STANDARDIZED INSTRUMENTS ASSESSING FEMALE SEXUAL FUNCTION AND PSYCHOLOGICAL WELL-BEING AMONG REPRODUCTIVE-AGE WOMEN IN HARIDWAR, INDIA

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ABSTRACT
Reliable and valid measurement tools are essential for evaluating female sexual function and related psychological indices, particularly in culturally diverse contexts such as India. This study examined the psychometric properties of six standardized questionnaires - FSFI, DASS-21, WHOQOL-BREF, CSI-32, Body Self-Image Questionnaire (BSIQ-SF), and SESIFS-among reproductive-age women in Haridwar district. A total of 120 participants (mean age = 31.4 years; all married; middle socio-economic background) completed the instruments at baseline and again after two weeks. Reliability was assessed using Cronbach's alpha and Intraclass Correlation Coefficients (ICC), while validity was examined through Confirmatory Factor Analysis (CFA) and Pearson correlations for preliminary evidence of construct-related validity. Results demonstrated strong internal consistency (α = 0.86–0.93), high test–retest reliability (ICC = 0.87–0.92), and preliminary evidence of construct-related validity across all measures. These findings provide preliminary evidence that the selected questionnaires demonstrate satisfactory psychometric properties in this population. The findings provide a methodological basis for their use in future research involving reproductive-age women in similar Indian community settings, while larger and more diverse samples are needed for broader generalization, offering robust tools to evaluate the impact of Integral Yoga Protocol interventions on female sexual health and psychological well-being. CFA indicated acceptable model fit across all instruments (CFI = 0.91–0.96, RMSEA = 0.038–0.052); given the sample size relative to the number of estimated parameters in the more complex multi-factor models, these findings should be regarded as preliminary evidence of construct validity pending replication in a larger sample.

KEYWORDS: Female Sexual Function Index, Psychometric Validation, Reliability, Confirmatory Factor Analysis, Women's Health, Quality of Life

INTRODUCTION

Female Sexual Dysfunction (FSD) is a significant global health issue, affecting multiple domains of sexual activity such as desire, arousal, lubrication, orgasm, satisfaction, and pain (Rosen et al., 2000). A systematic review and meta-analysis of observational studies estimated that FSD affects approximately 41% of premenopausal women worldwide (McCool et al., 2016), and expert consensus statements from the International Consultation on Sexual Medicine place the overall burden of manifest sexual dysfunction in adult women at roughly 40–45%, with prevalence rising further with age (Lewis et al., 2004). Despite its high prevalence, FSD remains underdiagnosed and undertreated due to cultural taboos, stigma, and lack of awareness in both developed and developing countries.

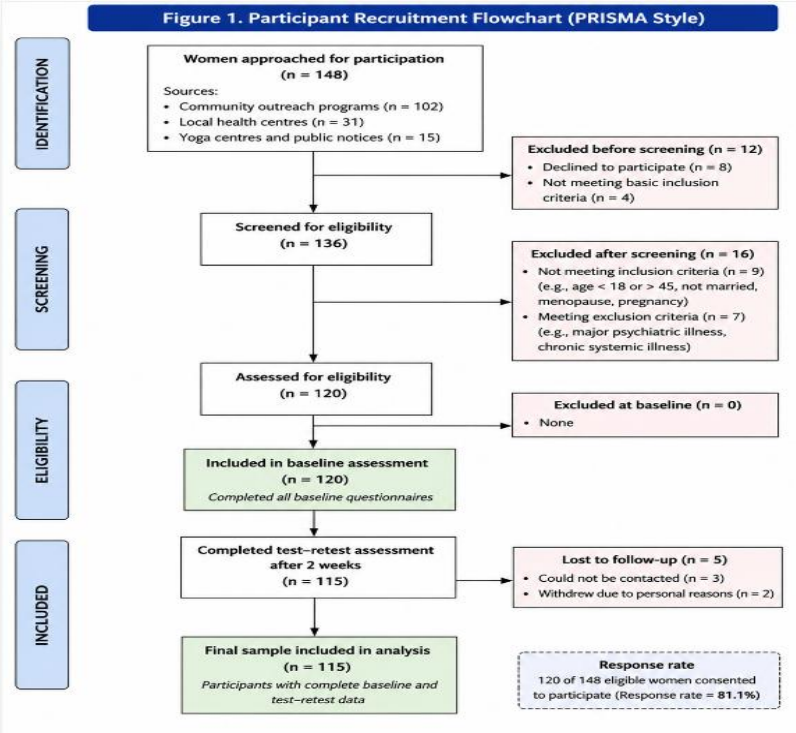
In India, research has revealed similar or even higher prevalence rates. A cross-sectional study of married women attending a tertiary-care clinic in South India reported FSD, as measured by the FSFI, in 73.2% of participants (Singh et al., 2009), while a community-based study of fertile women in Ahmadabad, Gujarat, found a prevalence of 55.55% (Mishra et al., 2016). Broader reviews of the Indian literature confirm that reported prevalence estimates vary by setting, instrument, and population, but are consistently high relative to Western benchmarks (Rao & Nagaraj, 2015). These findings highlight the need for reliable and culturally appropriate instruments to measure female sexual function and related psychological indices in Indian populations (Solanki et al., 2026).

A growing body of Indian research has focused on adapting and validating psychometric instruments for local populations, including Hindi-language versions of depression, anxiety, and stress measures (Tripathi et al., 2024), and the Female Sexual Function Index (Solanki et al., 2026) and Hindi and English versions of the WHOQOL-BREF among Indian populations (Singh & Junnarkar, 2014). These studies demonstrate growing recognition of the importance of culturally appropriate tools, but comprehensive validation of multiple scales within the same population remains limited.

The present study was conducted in Haridwar district, Uttarakhand, chosen for both demographic and cultural relevance. Haridwar is a spiritual and cultural hub where yoga is widely practiced and socially accepted, making it a culturally relevant setting for evaluating health-related measurement instruments among local women. The district's population includes diverse socio-economic groups, but with strong cultural acceptance of yoga as a lifestyle practice, participants were more open to integrating yoga into health-related research.
Therefore, this paper focuses on the validation and reliability of six standardized questionnaires- FSFI, DASS-21, WHOQOL-BREF, CSI-32, Body Self-Image Questionnaire (BSIQ-SF), and SESIFS - among reproductive-age women in Haridwar district. By establishing their psychometric soundness in this context, the study provides a foundation for evaluating the impact of Integral Yoga Protocol interventions on female sexual health and psychological well-being in India.

Research Gap and Rationale for the Study

Although several studies have examined the psychometric properties of individual questionnaires related to female sexual function, psychological distress, quality of life, body image, and relationship satisfaction, these validation efforts have largely focused on a single instrument within specific clinical or community populations. For example, previous Indian studies have independently evaluated the reliability and validity of the Female Sexual Function Index (FSFI), the Depression Anxiety Stress Scale (DASS-21), and the WHOQOL-BREF (Rosen et al., 2000; Tripathi et al., 2024; Singh & Junnarkar, 2014; Solanki et al., 2026); however, a comprehensive psychometric assessment of multiple standardized instruments within the same population remains scarce. Consequently, researchers investigating the multidimensional determinants of women's sexual and psychological health often rely on separately validated measures without evidence of their collective performance in a unified cultural context.
To the best of the authors' knowledge, published evidence evaluating the psychometric properties of these six instruments - FSFI, DASS-21, WHOQOL-BREF, CSI-32, Body Self-Image Questionnaire-Short Form (BSIQ-SF) and the Sexual Self-Esteem and Sexual Function Scale (SESIFS) simultaneously within a single cohort of reproductive-age women in India appears to be limited. Simultaneous validation is particularly important because these instruments assess interrelated domains of physical, psychological, relational, and psychosocial well-being, and establishing their reliability and validity within the same sample enhances methodological consistency for future multidisciplinary research.
Furthermore, psychometric validation studies involving women from the state of Uttarakhand are relatively limited. Most available Indian validation studies have been conducted in metropolitan cities or tertiary healthcare settings located in other regions of the country, leaving an important geographical and cultural gap in the literature. Considering the socio-cultural diversity across Indian states, psychometric properties established in one population cannot be assumed to be directly applicable to another without empirical verification.
An additional gap exists in relation to yoga-based health research. Although yoga interventions have increasingly been investigated for improving women's physical, psychological, and sexual health, there remains a shortage of culturally validated outcome measures specifically evaluated for populations in which yoga constitutes an integral component of lifestyle and healthcare practices. Haridwar, internationally recognized as a major centre for yoga and traditional wellness practices, provides a unique cultural setting for such validation. Establishing the psychometric robustness of these instruments in this context is essential for accurately evaluating the effectiveness of future Integral Yoga Protocols and other yoga-based therapeutic interventions.
In view of these gaps, the present study was undertaken to comprehensively evaluate the reliability and validity of six standardized questionnaires among reproductive-age women in Haridwar district, Uttarakhand. By providing evidence of their psychometric soundness within this culturally distinctive population, the study contributes an important methodological foundation for future clinical investigations, epidemiological research, and intervention studies focusing on female sexual health and psychological well-being in India.



Objectives

- To assess the internal consistency (Cronbach's alpha) of FSFI, DASS-21, WHOQOL-BREF, CSI-32, BSIQ-SF, and SESIFS.
- To evaluate test–retest reliability.
- To examine construct validity using factor analysis.
- To examine construct-related validity through correlations among theoretically related constructs (e.g., FSFI with SESIFS, FSFI with CSI-32, DASS-21 with WHOQOL-BREF, and BSIQ-SF with SESIFS).

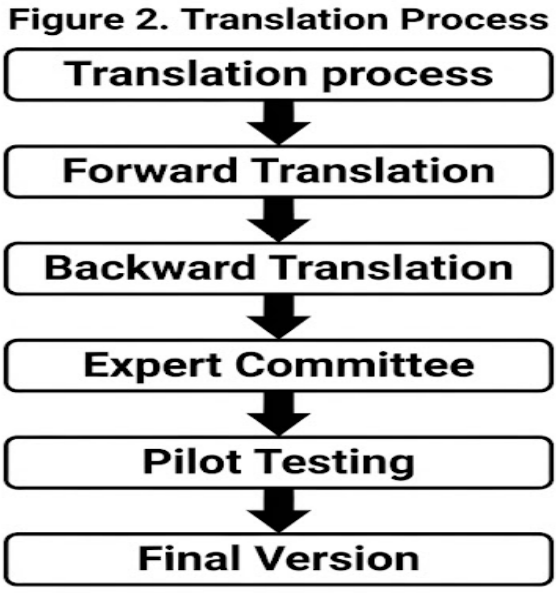
METHODOLOGY

Study Design

This study employed a prospective psychometric validation design with a two-week test–retest interval, conducted among reproductive-age women in Haridwar district, Uttarakhand.

Sampling and Participants

The study was conducted among 120 reproductive-age women (20–40 years) residing in Haridwar district, Uttarakhand. Of the 148 eligible women approached, 120 consented to participate (response rate = 81.1%). Participants were recruited through community outreach programs and local health centers using purposive sampling: eligible women were identified through these venues and screened against the inclusion and exclusion criteria below before being invited to complete the questionnaires at baseline and again after two weeks for test–retest reliability assessment.

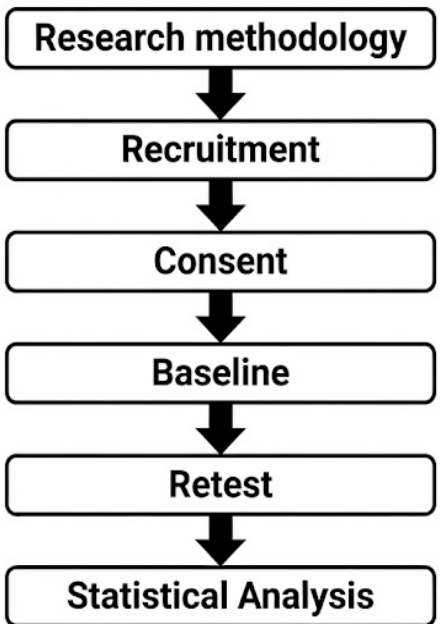


Inclusion criteria:
- Married women aged 20–40 years.
- Residents of Haridwar district for at least 5 years.
- Willingness to participate and provide informed consent.

Exclusion criteria:
- Women with severe psychiatric illness or cognitive impairment.
- Pregnant women or those with chronic medical conditions (e.g., cancer, advanced diabetes).
- Those unwilling to participate in follow-up testing.

Sample size considerations.
A total of 120 participants were enrolled. This sample size is adequate for estimating internal consistency and test–retest reliability coefficients, but it is comparatively modest for the six separate confirmatory factor analyses reported in this study, some of which involve multi-factor models (e.g., the six-domain FSFI structure). Commonly cited guidance for CFA suggests a minimum of 5–10 respondents per estimated parameter, with more conservative recommendations of ≥200 total cases for stable multi-factor solutions (Comrey & Lee, 1992; MacCallum et al., 1999). This constraint is addressed further in the Limitations section.

Figure 3. Research methodology



Ethical Considerations
The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment, following an explanation of the study's purpose, procedures, voluntary nature, and confidentiality of safeguards. Given the sensitive subject matter, particular care was taken to administer the questionnaires in a secluded setting, and participants were informed of their right to withdraw at any stage without consequence.

Translation and Adaptation Process
Since several scales were originally developed in English, a forward–backward translation method was used to adapt them into Hindi for cultural relevance.

Forward translation: Two bilingual experts translated the questionnaires into Hindi.

Back translation: Independent translators re-translated the Hindi versions back into English.

Expert committee review: A panel of psychologists and yoga researchers compared versions to reconcile discrepancies and ensure semantic and conceptual equivalence.

Pilot testing: The adapted questionnaires were tested on a separate group of 20 women from Haridwar to assess clarity, cultural appropriateness, and comprehension; minor item-level modifications were made based on this feedback before the main study began.

Procedure

Participants completed all six questionnaires FSFI (Rosen et al., 2000)**,** DASS-21 (Lovibond & Lovibond, 1995)**,** WHOQOL-BREF (WHOQOL Group, 1998)**,** CSI-32 (Funk & Rogge, 2007)**,** BSIQ-SF (Rowe et al., 1999)**,** and SESIFS (Lordello et al., 2014) - on two occasions, two weeks apart, to allow assessment of both internal consistency and test–retest reliability.

Statistical Analysis

Data were analyzed using SPSS (Version 26) and AMOS (Version 24).

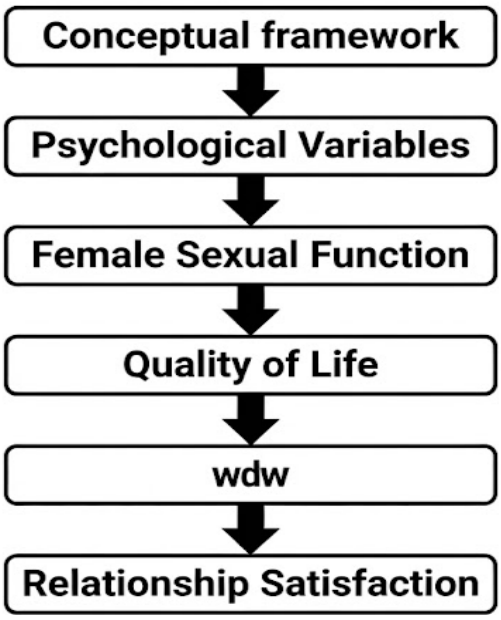
Internal consistency was assessed using Cronbach's alpha.

Test–retest reliability was assessed using Intraclass Correlation Coefficients (ICC) (Koo & Li, 2016).

Construct validity was examined through Confirmatory Factor Analysis (CFA). Model fit was evaluated using χ^2/df, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR), using conventional cut-off criteria ($\chi^2/df < 3$; CFI and TLI $\geq .90$; RMSEA $\leq .08$; SRMR $\leq .08$ as acceptable, with stricter values indicating excellent fit) (Hu & Bentler, 1999).

Construct-related validity was examined using Pearson correlation coefficients between theoretically related constructs, including FSFI with SESIFS, FSFI with CSI-32, DASS-21 with WHOQOL-BREF, and BSIQ-SF with SESIFS, with effect sizes interpreted according to conventional benchmarks for correlation magnitude (Cohen, 1988). Exact p-values are reported throughout except where they fall below .001.

Figure 4



RESULTS

Table 1: Reliability

Scale	Cronbach's Alpha	Test–Retest ICC
FSFI	0.89	0.91
DASS-21	0.91	0.88
WHOQOL-BREF	0.87	0.90
CSI-32	0.93	0.92
BSIQ-SF	0.90	0.89
SESIFS	0.86	0.87

All six instruments demonstrated strong internal consistency ($\alpha = 0.86–0.93$) and high test–retest reliability (ICC = 0.87–0.92) over the two-week interval, indicating that each scale produced stable, internally coherent scores in this sample. The observed coefficients were within or above commonly accepted ranges for research use (Koo & Li (2016).

Construct validity. CFA fit indices were consistent with the expected factor structures for all six instruments: the six-domain structure of the FSFI, the three-domain structure of DASS-21, the four-domain structure of WHOQOL-BREF, the single relationship-satisfaction factor of CSI-32, the body-image dimensions of BSIQ-SF, and the three-component structure (self-esteem, self-image, sexual function) of SESIFS.

Table 2: Construct Validity (CFA Fit Indices)

Scale	χ^2/df	CFI	TLI	RMSEA	SRMR
FSFI	2.1	0.94	0.93	0.045	0.041
DASS-21	1.9	0.95	0.94	0.038	0.039
WHOQOL-BREF	2.3	0.92	0.91	0.050	0.046
CSI-32	2.0	0.96	0.95	0.042	0.040
BSIQ-SF	2.2	0.93	0.92	0.047	0.043
SESIFS	2.4	0.91	0.90	0.052	0.048

Fit indices for all six models fell within the acceptable-to-excellent range against conventional criteria (Hu & Bentler, 1999), providing preliminary support for the expected factor structures in this sample..

Construct-Related Validity

Table 3: Construct-Related Correlations (Pearson Correlations)

Variables	r	p
FSFI & SESIFS	0.62	< .01
FSFI & CSI-32	0.55	< .01
DASS-21 & WHOQOL-BREF	−0.58	< .01
BSIQ-SF & SESIFS	0.49	< .01

FSFI scores correlated positively with SESIFS scores ($r = .62$, $p < .01$), a large effect by conventional benchmarks (Cohen, 1988), consistent with the expectation that women reporting better sexual function also report higher sexual self-esteem and body-image satisfaction. FSFI also correlated positively with the CSI-32 satisfaction domain ($r = .55$, $p < .01$), a moderate-to-large effect, suggesting that sexual functioning and relationship satisfaction are related but distinguishable constructs. DASS-21 scores correlated negatively with WHOQOL-BREF scores ($r = -.58$, $p < .01$), a moderate-to-large effect consistent with the well-established inverse relationship between psychological distress and quality of life. Finally, BSIQ-SF correlated positively with SESIFS ($r = .49$, $p < .01$), a moderate effect indicating that positive body image is associated with higher sexual self-esteem. Taken together, the observed correlations were moderate to large in magnitude and were in the theoretically expected directions, providing preliminary evidence of construct-related validity among the measures in this sample..

Table 4: Descriptive Statistics of Scales

Scale	Mean	SD	Min	Max
FSFI	22.4	5.1	12	34
DASS-21	18.7	6.3	7	32
WHOQOL-BREF	72.5	10.2	50	95
CSI-32	110.3	15.6	85	145
BSIQ-SF	78.9	9.8	60	95
SESIFS	65.4	8.7	48	82

Descriptive statistics indicated moderate levels of sexual function (FSFI M = 22.4) and psychological distress (DASS-21 M = 18.7), alongside relatively high quality of life (WHOQOL-BREF M = 72.5). Couple satisfaction (CSI-32 M = 110.3) and body-image scores (BSIQ-SF M = 78.9) were likewise above the scale midpoint, while sexual self-esteem (SESIFS M = 65.4) indicated moderate confidence. These values provide a baseline psychosocial profile for reproductive-age women in this sample and a reference point for future intervention studies in the same population.

Table 5: Reliability by Subscale

Scale	Subscale	Cronbach's Alpha
FSFI	Desire	0.82
FSFI	Arousal	0.85
FSFI	Lubrication	0.84
FSFI	Orgasm	0.83
FSFI	Satisfaction	0.86
FSFI	Pain	0.81

DASS-21	Depression	0.90
DASS-21	Anxiety	0.88
DASS-21	Stress	0.91

Subscale-level reliability was consistently strong: FSFI domains ranged from α = 0.81–0.86, indicating that each dimension of sexual function was measured with acceptable internal consistency, while DASS-21 subscales ranged from α = 0.88–0.91. These subscale-level results reinforce the overall reliability findings and suggest that the instruments perform consistently at both the total-score and domain levels in this sample.

SUMMARY OF RESULTS

Descriptive statistics indicated moderate sexual function and psychological distress alongside relatively high quality of life and couple satisfaction. Reliability analysis confirmed strong internal consistency and test–retest stability across all six scales, at both the total-score and subscale level. Construct validity, assessed via CFA, showed acceptable-to-excellent fit for all six theoretical structures. Construct-related validity analyses showed moderate-to-large correlations between theoretically related constructs, in the expected directions.

DISCUSSION

The present study evaluated the psychometric properties of six standardized instruments assessing female sexual function, psychological distress, quality of life, relationship satisfaction, body self-image, and sexual self-esteem among reproductive-age women in Haridwar, India. Overall, the instruments demonstrated good internal consistency (Cronbach's α = 0.86–0.93) and high two-week test–retest reliability (ICC = 0.87–0.92), indicating that the measures produced consistent and temporally stable scores in the present sample. The findings therefore provide preliminary evidence supporting the use of the selected instruments for research involving reproductive-age women in this setting. However, the results should be interpreted in the context of the sample size and the complexity of the factor models examined..

Comparison with Previous Indian Studies

The reliability findings are broadly comparable with previous Indian psychometric research, although direct comparisons should be made cautiously because of differences in population, setting, language version, and methodology. A recent validation of the Hindi Female Sexual Function Index (FSFI-H) among Indian women reported Cronbach's α = 0.89 and a two-week test–retest ICC = 0.91, closely corresponding to the present FSFI estimates (α = 0.89; ICC = 0.91) (Solanki et al., 2026). Similarly, previous Indian research has demonstrated acceptable psychometric performance of the Hindi DASS-21 (Tripathi et al., 2024), while the WHOQOL-BREF has also shown satisfactory reliability and validity in Indian populations (Agnihotri et al., 2010). Taken together, these findings suggest that the reliability estimates observed in the present study are broadly consistent with existing Indian evidence while extending the evaluation to a set of instruments examined concurrently within the same population.

Confirmatory Factor Analysis

The confirmatory factor analysis showed generally acceptable model fit across the six instruments. CFI values ranged from 0.91 to 0.96, TLI values from 0.90 to 0.95, RMSEA values from 0.038 to 0.052, and SRMR values from 0.039 to 0.048. These findings provide preliminary support for the expected factor structures of the instruments in the present sample. However, given the relatively modest sample size, particularly for the more complex multi-factor models, the CFA findings should be interpreted cautiously and replicated in larger samples.

Evidence of Construct-Related Validity

The correlations among theoretically related constructs were in the expected directions. FSFI was positively correlated with SESIFS ($r = 0.62$, $p < 0.01$) and CSI-32 ($r = 0.55$, $p < 0.01$), while DASS-21 was negatively correlated with WHOQOL-BREF ($r = -0.58$, $p < 0.01$). BSIQ-SF was positively correlated with SESIFS ($r = 0.49$, $p < 0.01$). These findings indicate that the instruments showed theoretically expected relationships with related constructs and provide preliminary evidence supporting their validity in the present sample. However, these correlations should be interpreted as associations rather than causal relationships.

Cultural Factors

Cultural context is particularly relevant when assessing sensitive domains such as female sexuality. The use of Hindi-language questionnaires, a structured translation and back-translation procedure, and administration in a private setting may have supported comprehension and response comfort. However, cultural attitudes, stigma, and social desirability were not directly measured in this study. Therefore, the influence of the Haridwar cultural context on participants' responses should be considered a contextual possibility rather than a demonstrated determinant of the psychometric findings.

Limitations

Several limitations should be considered when interpreting these findings.

First, the sample size (n = 120), while adequate for estimating reliability coefficients, is comparativelymodest for the six separate confirmatory factor analyses reported here, some of which involve multi-factor models (e.g., the

six-domain FSFI structure). Parameter-to-sample-size guidance for CFA recommends a minimum of 5–10 respondents per estimated parameter, with more conservative recommendations of ≥200 total cases for stable multi-factor solutions (Comrey & Lee, 1992; MacCallum et al., 1999). Applying this guidance, the present sample size falls below recommended thresholds for the more complex models (FSFI, WHOQOL-BREF), and the corresponding fit indices should accordingly be treated as preliminary or hypothesis-generating rather than confirmatory evidence of construct validity. The single- and three-factor models (CSI-32, DASS-21, SESIFS) are less affected by this constraint given their simpler structure and correspondingly lower parameter count, though replication remains warranted across all six instruments before the fit indices reported here are treated as conclusive.

Second, recruitment proceeded through community outreach and local health centers, followed by screening against inclusion and exclusion criteria - a purposive rather than a probability-based sampling procedure. This limits the extent to which findings can be generalized to the broader population of reproductive-age women in Haridwar, or in India more widely, and should be kept in mind when interpreting the descriptive statistics reported above.

Third, the study was conducted in a single district, which may not capture the diversity of Indian women across different states, languages, and socio-economic backgrounds.

Fourth, reliance on self-report questionnaires introduces the possibility of socially desirable responding or underreporting of sensitive issues, a concern that is heightened for a topic as culturally sensitive as sexual function.

Fifth, the two-week test–retest interval, while conventional, is not equally well suited to all six instruments: DASS-21 asks about symptoms over the preceding week, whereas FSFI asks about the preceding four weeks. A fixed interval applied uniformly across instruments with different reference periods may understate or overstate test–retest stability for some scales relative to others, and this should be considered in future work.

Finally, while translation and adaptation followed by a structured forward–backward procedure, subtle cultural nuances may still affect the interpretation of individual items in ways that a committee review process cannot fully rule out.

Future Research

Future studies should extend validation efforts to larger, multi-state samples to better establish the generalizability of these instruments across India's diverse cultural and linguistic contexts and should aim for probability-based sampling where feasible. Larger samples would also allow more stable confirmatory factor analyses, ideally with pre-registered parameter-to-sample-size justification. Longitudinal studies are needed to assess the stability of these instruments over longer periods and their sensitivity to interventions such as yoga. Further research might also usefully explore cross-cultural comparisons between Indian and international populations, and the integration of qualitative methods to capture more nuanced experiences of female sexual health that self-report instruments alone may not detect.

CONCLUSION

This study provides evidence that six standardized questionnaires - FSFI, DASS-21, WHOQOL-BREF, CSI-32, BSIQ-SF, and SESIFS - function as psychometrically sound instruments for assessing female sexual function and related psychological indices among reproductive-age women in Haridwar district. Internal consistency was strong and test–retest reliability was high across all six scales. Construct validity and construct-related validity findings were encouraging but should be considered preliminary for the more complex multi-factor instruments (FSFI, WHOQOL-BREF) given sample-size constraints relative to the number of estimated parameters.; findings for the simpler single- and three-factor models (CSI-32, DASS-21, SESIFS) carry somewhat greater confidence. Replication in larger samples is needed before these instruments' suitability for this population can be considered conclusively established.

By validating these instruments in Haridwar - a district with a distinctive cultural relationship to yoga practice - the study establishes a groundwork for their use in subsequent research on yoga-based interventions for female sexual health, including future evaluation of Integral Yoga Protocols. It is worth emphasizing that the present study validated the measurement tools themselves; it did not test a yoga intervention, and no claims about the effectiveness of yoga on sexual function or psychological well-being follow these results. That question remains for the intervention studies; This validation work is intended to support future intervention research..

The reliably measured constructs here - sexual function, psychological distress, quality of life, body image, and couple satisfaction - offer a coherent set of outcome measures that could be of use to researchers and clinicians working in similar Indian community settings, pending replication in larger and more diverse samples. Whether these instruments are ready for integration into routine clinical screening or public health programming is a separate question from whether they are psychometrically valid in a research sample of this size and would need further work - larger multi-site samples, probability-based sampling, and evaluation against real-world screening thresholds - before that step is warranted.

The present study provides one of the first comprehensive psychometric evaluations of six internationally recognized questionnaires among reproductive-age women in Uttarakhand, thereby contributing an important methodological foundation for future intervention-based research on women's sexual and psychological health.

In summary, this study contributes a validated set of measurement tools for an under-researched population and lays groundwork for future research connecting psychometric assessment with yoga-based and other holistic approaches to women's sexual health in India.

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Conflict of Interest
The authors Declare no confict of interest**.**

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