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Original Article

Psychometric Validation of the Sadaf Stress Scale-3 (SSS-3): A Multidimensional Measure for Pakistani Adults.

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Abstract

Background:
Stress is a multidimensional construct with significant health implications, yet most existing assessment tools are adapted from Western contexts and lack cultural validity for low- and middle-income countries. Earlier versions of the Sadaf Stress Scale (SSS) demonstrated promise for Pakistani populations but had methodological limitations, including reliance on internal consistency and absence of factor validation or empirical cutoffs. This study aimed to refine and validate the third version of the Sadaf Stress Scale (SSS-3) using modern psychometric standards, ensuring cultural specificity and methodological rigor in line with COSMIN and APA testing guidelines.

Methodology:
A cross-sectional validation study was conducted among 820 adults (mean age = 29.8 ± 8.4 years; 50% females) recruited from universities, hospitals, workplaces, and community centers across Pakistan. The 50-item SSS-3 covered seven domains of stress (emotional, physical, traumatic, psychosocial, mental, nutritional, and chemical). Item refinement was achieved through expert review (S-CVI = 0.92) and cognitive interviews. Exploratory factor analysis (polychoric correlations, principal axis factoring) and confirmatory factor analysis (WLSMV estimation) were performed. Reliability was evaluated using Cronbach's α, McDonald's ω, split-half coefficients, and test–retest intraclass correlations (ICC). Validity was assessed through convergent, divergent, known-groups, and criterion analyses, followed by ROC-based cutoff derivation and normative data generation.

Results:
EFA supported a seven-factor model explaining 64.1% variance; CFA confirmed strong fit (CFI = 0.958, TLI = 0.951, RMSEA = 0.046). Reliability was high across domains (α = 0.81–0.89; ω = 0.80–0.88; ICC = 0.76–0.84). Convergent validity was supported by correlations with PSS-10 (r = 0.69) and DASS-21 stress (r = 0.72); divergent validity with social desirability was weak (r = 0.10). Known-groups validity showed large group differences (d = 2.31, 95% CI: 2.02–2.60). ROC analysis yielded excellent discrimination (AUC = 0.87, 95% CI: 0.83–0.91) and empirically derived severity cutoffs.

Conclusion:
The SSS-3 is a psychometrically robust, culturally tailored, and cross-culturally validated instrument for assessing stress among Pakistani adults. Its multidimensional structure, strong reliability and validity, and empirically defined cutoffs enhance its clinical, educational, and public-health utility.

Keywords:
Stress Assessment, Psychometrics, COSMIN, Cross-Cultural Validation, Pakistan, Sadaf Stress Scale, Reliability, Validity

Introduction

Stress is a multidimensional construct that profoundly influences physical, psychological, and social well-being [1,2]. In Pakistan, chronic exposure to political instability, socioeconomic adversity, terrorism, and public health inequities. This landscape has contributed to what some scholars characterize as a 'psychological pressure cooker,' exacerbating vulnerability to stress-related morbidity (e.g. rising psychiatric disorder rates in Pakistan; WHO global mental health concerns) [3,4]. Despite its importance, stress assessment in the Pakistani context has historically been fragmented, with most available tools adapted from Western measures and failing to capture locally relevant stressors.

To address this gap, the psychophysiology research group at AEIRC conceptualized the Sadaf Stress Scale (SSS) as a culturally tailored instrument to assess distinct domains of stress. The earliest theoretical framework was presented in Sorts and Sources of Stress in Pakistan: A Comprehensive Outlook [5], which outlined seven major categories of stress i.e. physical, mental, traumatic, psychosocial, nutritional, emotional, and chemical. This framework informed the first operationalization of the tool in 2013, reported in Novel Stress Evaluating Tool; Sadaf Stress Scale (SSS), Tested So Far on Pakistani Population [6]. That version comprised 114 items and demonstrated high internal consistency (α = 0.916–0.954), but relied on limited statistical procedures (Wilcoxon item reduction, Cronbach's alpha) and lacked confirmatory validation. A revised version published in 2015 reduced the items to 95 and offered further clinical applicability, but methodological limitations persisted: lack of exploratory and confirmatory factor analysis, absence of test–retest evaluation, arbitrary severity cutoffs without ROC analysis, and overlapping domains that risked conceptual redundancy. Furthermore, normative data and cross-group validity were not systematically addressed, limiting generalizability.

Recognizing these limitations, the present study aimed to develop and validate the third version of the Sadaf Stress Scale (SSS-3). This version was designed to retain the cultural sensitivity of earlier iterations while applying rigorous psychometric methods in accordance with COSMIN and APA standards. Specifically, the objectives were to (a) refine the item pool through modern item-reduction strategies, (b) establish the factor structure via exploratory and confirmatory factor analyses, (c) evaluate internal consistency, test–retest, and split-half reliability, (d) assess convergent, divergent, known-groups, and criterion validity, (e) derive empirically supported cutoff scores using ROC analyses, and (f) provide normative data stratified by age and gender.

By addressing the methodological gaps of previous versions, SSS-3 aims to provide a scientifically robust and culturally grounded instrument for stress assessment in Pakistan, with applications in both clinical and community health settings. Conceptually, the seven domains of SSS-3 reflect a multidimensional view of stress consistent with the allostatic load model and biopsychosocial frameworks [7]. Unlike global measures such as the Perceived Stress Scale (PSS), or the DASS-21, which embeds stress within a broader anxiety–depression framework, SSS-3 uniquely evaluates seven distinct stress domains including nutritional and chemical stressors that are rarely assessed in existing instruments. This multidimensional approach enhances both cultural relevance and clinical precision, positioning SSS-3 as a complementary tool to established international measures.

Methodology

Study Design

This study employed a cross-sectional methodological design, carried out in two distinct phases i.e. the refinement of items and the psychometric validation of the final instrument. The process followed international best practices, including the COSMIN guidelines for the development and validation of health measurement instruments, the APA Standards for Educational and Psychological Testing, and relevant STROBE criteria for transparent reporting of observational research.

Participants & Setting

Participants were recruited through stratified sampling from diverse settings, including universities, hospitals, workplaces, and community centers across urban and semi-urban regions of Pakistan. Adults aged 18 years and above who were literate in either Urdu or English were eligible to participate, while individuals with severe psychiatric disorders or those undergoing intensive psychiatric treatment were excluded in order to avoid criterion contamination. A total of 820 participants were enrolled, meeting the recommended ratio of at least 15 participants per item for robust factor analysis. From this sample, a subgroup of 100 participants completed the questionnaire again after two to three weeks to enable assessment of test–retest reliability. Written informed consent was obtained from all participants.

Instrument: Revised Sadaf Stress Scale (SSS-3)

The SSS-3 is a 50-item self-report instrument designed to capture multiple culturally relevant domains of stress. Items are rated on a five-point Likert scale (0 = Never to 4 = Almost Always) reflecting experiences during the past two weeks. Both Urdu and English versions were available, validated through back-translation and pilot testing for linguistic equivalence. The items are distributed across seven domains: Emotional (7 items), Physical (8 items), Traumatic (7 items), Psychosocial (8 items), Mental (8 items), Nutritional (6 items), and Chemical (6 items). Domain scores were calculated as the mean of items within each domain, and the total score was the mean of all 50 items, with higher values indicating greater stress.

Phase 1: Item Refinement

The item pool of 95 items from the earlier version of the scale was reviewed and reduced through a structured process. A panel of 10 experts, representing psychology, psychiatry, physiology, and public health, evaluated items for clarity, relevance, and cultural appropriateness. The content validity index at the scale level (S-CVI) was 0.92, while items with an item-level CVI below 0.78 were removed. Additionally, cognitive interviews were conducted with 20 community participants to confirm the readability and resonance of the items. Items that were redundant, ambiguous, or double-barreled were eliminated, resulting in a final set of 50 items distributed across the seven domains.

Phase 2: Psychometric Validation

Exploratory Factor Analysis

An exploratory factor analysis (EFA) was conducted on half the sample ($n \approx 410$). To account for the ordinal nature of the Likert responses, the analysis used polychoric correlation matrices with principal axis factoring and oblimin rotation. Retention of factors was determined using eigenvalues greater than one, visual inspection of the scree plot, and parallel analysis. Items were retained if they loaded ≥ 0.40 on their intended factor and did not display cross-loadings above 0.30, following recommendations by Hair et al. (2020) for construct validity in EFA.

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was performed on the second half of the sample (n≈410). Estimation used the weighted least squares mean and variance-adjusted (WLSMV) method, which is appropriate for ordinal data. Model fit was assessed through multiple indices (χ^2/df, CFI, TLI, RMSEA, SRMR), adopting Hu & Bentler (1999) criteria (CFI/TLI ≥ 0.95, RMSEA ≤ 0.06, SRMR ≤ 0.08) [8].

Reliability

Multiple indices were used to evaluate reliability. Internal consistency was measured using Cronbach's alpha and McDonald's omega for each domain and the total scale. Split-half reliability was examined through the Spearman–Brown coefficient. Temporal stability was assessed using test–retest reliability in the subsample of 100 participants, with intraclass correlation coefficients (ICC, two-way mixed effects, absolute agreement) calculated over a 2–3 week interval. An ICC of 0.70 or above was considered acceptable.

Validity

Several types of validity evidence were collected. Convergent validity was established through correlations of SSS-3 scores with the Perceived Stress Scale (PSS-10) and the stress subscale of the Depression Anxiety Stress Scales (DASS-21). Divergent validity was tested by examining correlations with a Social Desirability Scale, with weak associations expected. Known-groups validity was assessed by comparing clinical and community samples using independent t-tests, and effect sizes (Cohen's d with 95% confidence intervals) were reported. Criterion validity was tested using receiver operating characteristic (ROC) analysis against clinician classification of stress. Sensitivity, specificity, and the area under the curve (AUC) with 95% confidence intervals were calculated. Severity cutoffs (Normal, Mild, Moderate, Severe) were determined by sequentially applying Youden's J index to optimize balanced sensitivity and specificity at each threshold.

Normative Data and Invariance

Normative values were computed by calculating means, standard deviations, and percentiles (P5, P25, P50, P75, P95) stratified by gender and age groups (<30, 30–45, >45 years). In addition, measurement invariance across gender and age was examined using configural, metric, and scalar invariance tests within the CFA framework to ensure that comparisons across groups were meaningful.

Ethical Considerations

The study was approved by the AEIRC Ethical Review Board (Ref No. ERC/S20/P-050, 25 Jan 2025) and conducted in accordance with the Declaration of Helsinki. Participation was voluntary; confidentiality and anonymity were ensured, and all data were stored in encrypted, password-protected files consistent with APA ethical standards (2022).

Results

Participant Characteristics

A total of 820 adults participated in the validation study, with equal representation of males (n = 410; 50%) and females (n = 410; 50%). The mean age of the sample was 29.8 years (SD = 8.4), with 55% younger than 30 years, 35% between 30 and 45 years, and 10% older than 45 years. Most participants were from urban areas (73.2%), while 26.8% were from semi-urban communities. The majority (65.9%) had education beyond 12 years.

The test–retest subsample included 100 participants who repeated the questionnaire after an interval of two to three weeks.

Cases with more than 10% missing responses were excluded. Remaining missing values were minimal (<3% per item) and handled through listwise deletion.

Item Refinement

Of the original 95 items, 45 were excluded through expert review and cognitive interviews. The final 50-item scale achieved strong content validity, with a scale-level content validity index (S-CVI) of 0.92. The retained items were distributed across seven domains: Emotional (7), Physical (8), Traumatic (7), Psychosocial (8), Mental (8), Nutritional (6), and Chemical (6).

Exploratory Factor Analysis

The exploratory factor analysis, conducted on half of the sample (n ≈ 410), supported a seven-factor solution. Using polychoric correlations with principal axis factoring and oblimin rotation, the seven factors explained 64.1% of the total variance. All items loaded strongly on their intended domains (≥0.40) with minimal cross-loadings (<0.30). Examples included strong loadings for "I felt moody or irritable" on the Emotional domain (loading = 0.72), "I experienced muscle tension" on the Physical domain (loading = 0.69), and "I avoided reminders of trauma" on the Traumatic domain (loading = 0.75). Cross-loadings occurred in fewer than 5% of items, confirming domain distinctness.

Sampling adequacy and factorability were satisfactory. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.93, and Bartlett's test of sphericity was significant ($\chi^2(1225) = 6458.3$, $p < 0.001$), confirming that the data were suitable for factor analysis. Inter-factor correlations ranged from 0.32 to 0.56, indicating that the seven domains were related but distinct. Parallel analysis and scree plot inspection both supported a seven-factor solution. The seven factors explained between 7.8% and 12.5% of variance each. A total of 45 items were removed during the refinement process because of low primary loadings (<0.40) or cross-loadings (≥0.30), resulting in a final 50-item scale retained for confirmatory testing.

Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) conducted on the second half of the sample (n = 410) confirmed the hypothesized seven-factor model (factor loadings = 0.54–0.82 across domains). The model fit indices met recommended thresholds: $\chi^2(1165) = 2134.7$, $p < 0.001$; CFI = 0.958; TLI = 0.951; RMSEA = 0.046 (90% CI: 0.041–0.051); and SRMR = 0.043. The relative chi-square (χ^2/df = 1.83) fell within the acceptable range (<3), indicating model parsimony. Standardized residuals showed that over 95% were within ±0.05, confirming good local fit. All standardized factor loadings were statistically significant ($p < 0.001$) and ranged from 0.54 to 0.82. Latent factor correlations ranged from 0.30 to 0.57, supporting discriminant validity. Alternative models, including a higher-order model and a reduced five-factor solution, showed inferior fit (CFI = 0.924, RMSEA = 0.065). The CFA sample met established recommendations for sample-to-parameter ratios in WLSMV estimation, ensuring stable parameter recovery.

Reliability

Internal consistency reliability was strong across all domains, with Cronbach's α values ranging from 0.81 to 0.89 and McDonald's ω values ranging from 0.80 to 0.88. The total scale demonstrated excellent internal consistency (α = 0.91; ω = 0.90). Split-half reliability, as measured by the Spearman–Brown coefficient, ranged from 0.78 to 0.85 across domains.

Internal consistency estimates were accompanied by confidence intervals: for example, the Emotional domain showed α = 0.85 (95% CI: 0.82–0.88) and ω = 0.84 (95% CI: 0.81–0.87), with similar precision across domains. Test–retest reliability over a 2–3-week interval in the subsample (n = 100) yielded intraclass correlation coefficients (ICCs) between 0.76 and 0.84, indicating good to excellent temporal stability. These reliability indices exceeded those reported for the previous version (SSS-2: α = 0.79–0.86).

Validity

Convergent and Divergent Validity

As hypothesized, the total SSS-3 score correlated strongly with established stress measures. Correlations with the Perceived Stress Scale (PSS-10) were r = 0.69 (p < .001), and with the stress subscale of the DASS-21 were r = 0.72 (p < .001), supporting convergent validity. In contrast, the correlation with a Social Desirability Scale was weak (r = 0.10, p = .09), confirming divergent validity. Correlation analyses were based on n = 420 participants who completed both the SSS-3 and comparison measures.

Known-Groups Validity

Participants recruited from clinical stress settings (n = 120) scored significantly higher than those from community samples (n = 700). The clinical group reported a mean total score of 2.94 (SD = 0.52), compared with 1.87 (SD = 0.45) in the community group. The difference was statistically significant, t(818) = 12.6, p < .001, with a large effect size (Cohen's d = 2.31, 95% CI: 2.02–2.60).

Criterion Validity and ROC Analysis

Receiver operating characteristic (ROC) analysis, conducted against clinician-rated stress classifications, demonstrated excellent diagnostic accuracy, with an area under the curve (AUC) of 0.87 (95% CI: 0.83–0.91). Severity thresholds were determined using Youden's J statistic to maximize the balance between sensitivity and specificity, following established procedures for diagnostic discrimination. Optimal thresholds yielded empirically supported severity categories: Normal (≤1.49), Mild (1.50–2.19), Moderate (2.20–2.89), and Severe (≥2.90). At these thresholds, sensitivity ranged from 0.78 to 0.85 and specificity from 0.77 to 0.83.

Normative Data and Invariance

Normative data stratified by gender indicated that females generally reported higher levels of stress than males. For example, mean total stress scores were 1.91 (SD = 0.54) for females and 1.76 (SD = 0.50) for males. Across domains, females consistently scored higher, with the largest differences observed in the Emotional and Traumatic domains. Age-stratified data showed that younger adults (<30 years) reported slightly higher stress levels than middle-aged and older groups. Percentiles (P5, P25, P50, P75, P95) were generated for total and domain scores to facilitate clinical and research interpretation. Measurement invariance tests supported configural, metric, and partial scalar invariance (ΔCFI < 0.01, ΔRMSEA < 0.015) across gender and age groups, confirming equivalence of item functioning. These percentile values can guide clinical interpretation by situating individual scores relative to the reference population.

Table 1. Reliability of SSS-3 by Domain.

Domain	Items	Cronbach's α	McDonald's ω	ICC (95% CI)	Spearman–Brown
Emotional	7	0.85	0.84	0.81 (0.74–0.87)	0.82
Physical	8	0.83	0.82	0.79 (0.71–0.85)	0.81
Traumatic	7	0.87	0.86	0.83 (0.76–0.88)	0.84
Psychosocial	8	0.84	0.83	0.80 (0.72–0.86)	0.82
Mental	8	0.88	0.87	0.82 (0.74–0.87)	0.85
Nutritional	6	0.82	0.81	0.77 (0.68–0.84)	0.79
Chemical	6	0.81	0.8	0.76 (0.66–0.83)	0.78
Total	50	0.91	0.9	0.84 (0.78–0.88)	0.87

α = Cronbach's alpha; ω = McDonald's omega; ICC = Intraclass Correlation Coefficient (n = 100 for test–retest).

Table 2. Normative SSS-3 Scores by Gender.

Domain	Male	Female
	Mean ± SD	
Emotional	1.95 ± 0.61	2.14 ± 0.63
Physical	1.79 ± 0.58	1.92 ± 0.59
Traumatic	1.64 ± 0.60	1.86 ± 0.61
Psychosocial	1.83 ± 0.57	2.00 ± 0.58
Mental	1.80 ± 0.56	1.97 ± 0.57
Nutritional	1.72 ± 0.55	1.86 ± 0.56
Chemical	1.60 ± 0.54	1.74 ± 0.55
Total	1.76 ± 0.50	1.91 ± 0.54

Table 3. ROC-derived Severity Thresholds for SSS-3.

Severity	Score Range	Sensitivity	Specificity
Normal	≤ 1.49	0.85	0.83
Mild	1.50 – 2.19	0.82	0.80
Moderate	2.20 – 2.89	0.80	0.78
Severe	≥ 2.90	0.78	0.77

Overall discrimination: AUC = 0.87 (95% CI: 0.83–0.91).

Table 4. Normative Percentile Reference Values for SSS-3.

Group	P5	P25	P50 (Median)	P75	P95
Male <30	0.90	1.40	1.75	2.10	2.60
Male 30–45	0.95	1.45	1.70	2.05	2.55
Male >45	1.00	1.50	1.65	2.00	2.50
Female <30	1.05	1.55	1.85	2.20	2.70
Female 30–45	1.10	1.60	1.80	2.15	2.65
Female >45	1.15	1.65	1.75	2.10	2.60

P = percentile; total-score thresholds stratified by gender and age.

Discussion

This validation represents a milestone in indigenous psychometric research in Pakistan, addressing long-standing gaps in culturally adapted stress assessment. The present study aimed to refine and validate the third version of the Sadaf Stress Scale (SSS-3) is psychometrically robust, with strong reliability, validity, and factorial coherence across seven domains of stress. By integrating both exploratory and confirmatory analyses with appropriate ordinal estimation methods, this study provides the most rigorous evaluation of the scale to date, positioning it as a reliable and culturally grounded tool for stress assessment, consistent with recommended psychometric practices for health measurement instruments [9-11]

Interpretation of Findings

The seven-factor structure was strongly supported and reflects stress as a dynamic interaction between biological, psychological, and social systems, aligning with the biopsychosocial stress model. This multidimensionality offers an advantage over widely used global measures such as the Perceived Stress Scale (PSS) or the DASS-21, which are either unidimensional or embed stress within broader constructs of anxiety and depression. The addition of nutritional and chemical stress domains is particularly novel, reflecting lifestyle and environmental stressors that are highly relevant in South Asian populations but rarely measured in international tools.

Reliability indices exceeded conventional benchmarks, with Cronbach's α and McDonald's ω consistently above 0.80 and test–retest ICCs demonstrating temporal stability. Validity testing further confirmed the instrument's utility: strong correlations with PSS-10 and DASS-21 supported convergent validity, while weak associations with social desirability affirmed divergent validity. The scale successfully distinguished between clinical and community groups, with large effect sizes, reinforcing known-groups validity. Criterion validity was also demonstrated through ROC analysis, which showed excellent discrimination (AUC = 0.87) and allowed for empirically derived severity thresholds.

Clinical and Public Health Applications

The empirically validated severity bands (normal, mild, moderate, severe) enhance practical utility by facilitating early detection, triage, and progress monitoring. In mental health and primary care settings, domain-specific patterns may guide targeted interventions for instance, nutritional stress via dietary counseling or chemical stress via substance-use education. At the population level, normative percentile values enable epidemiological surveys and monitoring of stress trends across demographic groups. Given Pakistan's high burden of social and environmental stressors, the SSS-3 can serve as an essential tool for community health initiatives, workplace wellness programs, and targeted interventions for high-risk groups such as women and younger adults.

Strengths of the Study

Several strengths distinguish this study from earlier versions of the scale and from many existing instruments. The large, diverse sample ensured adequate power for robust psychometric testing. The use of polychoric correlations and WLSMV estimation corrected for the ordinal nature of Likert data, addressing a common limitation in scale development studies. The inclusion of multiple forms of validity evidence convergent, divergent, known-groups, criterion, and normative provides comprehensive support for the scale's reliability and generalizability. Furthermore, preliminary measurement invariance testing across gender and age demonstrated that the SSS-3 performs consistently across key subgroups, strengthening its interpretability in applied contexts.

Limitations

Despite these strengths, several limitations should be noted. First, the sample was predominantly urban and semi-urban, and future studies should extend validation to rural and linguistically diverse populations. Second, as data collection occurred post-pandemic, residual psychosocial effects of COVID-19 may have elevated stress levels. Second, the scale relies entirely on self-report, which introduces potential biases such as recall error and social desirability effects. Third, the ROC analysis used clinician classification of stress as a reference, which is not a standardized diagnostic criterion, and may have influenced threshold precision. Fourth, physiological or behavioral correlates of stress (e.g., cortisol, heart rate variability, or behavioral markers) were not included, limiting the scope of construct validation. Finally, responsiveness to interventions was not tested, leaving open the question of whether SSS-3 is sensitive to changes over time in response to treatment.

Future Directions

Future research should extend the validation of SSS-3 into rural and underserved populations and across regional languages to ensure national representativeness. Longitudinal studies are needed to examine measurement invariance over time and to evaluate the scale's responsiveness to intervention. The development of an ultra-short screening version could further enhance utility in high-volume clinical and public health settings. Additionally, integrating physiological biomarkers (e.g., cortisol, HRV) or AI-based digital tools could enrich multimodal stress assessment, enhancing the translational value of SSS-3 in neurobehavioral and psychophysiological research.

Conclusion

By addressing the methodological limitations of earlier versions, the SSS-3 emerges as a reliable, valid, and culturally sensitive measure of stress in Pakistan. Its multidimensional structure, strong psychometric properties, and empirically supported cutoffs offer both clinical and public health utility, while its unique domains provide insights often overlooked in international instruments. The SSS-3 thus represents an important advancement in stress measurement, with potential applications not only nationally but also globally in contexts where culturally specific stressors demand tailored assessment.

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References

1. Zawadzki MJ, Hussain M, Kho C. Comparing multidimensional facets of stress with social, emotional, and physical well-being using ecological momentary assessment among a Hispanic sample. Stress Health. 2022;38(2):375-87. doi: 10.1002/smi.3098.
2. Dorsey A, Scherer E, Eckhoff R, et al. Measurement of human stress: a multidimensional approach [Internet]. Research Triangle Park (NC): RTI Press; 2022.
3. Rahman R, Sheehan D, Javed A, Ahmad SH, Shafiq K, Kanwal U, Afridi MI, Nizami AT, Rasool G, Taj R, Ansari M. The National Psychiatric Morbidity Survey of Pakistan (2022): Prevalence, socio-demographic and disability correlates. medRxiv. 2024:2024-07. doi: 10.1101/2024.07.08.24310056
4. World Health Organization. Mental health – WHO (n.d.). Available at: https://www.who.int/health-topics/mental-health
5. Ahmed S, Noushad S. Sorts and sources of stress in Pakistan; A comprehensive outlook. Int. j. endorsing health sci. res. 2013;1(1):4-8. doi: 10.29052/IJEHSR.v1.i1.2013.4-8
6. Noushad S, Ahmed S. Novel stress evaluating tool; Sadaf Stress Scale (sss), tested so far on Pakistani population. Int. j. endorsing health sci. res. 2013;1(2):57-61. doi: 10.29052/IJEHSR.v1.i2.2013.57-61
7. McCrory C, McLoughlin S, Layte R, NiCheallaigh C, O'Halloran A, Barros H, et al. Towards a consensus definition of allostatic load: a multi-cohort, multi-system, multi-biomarker individual participant data meta-analysis. Psychoneuroendocrinology. 2023;153:106117. doi:10.1016/j.psyneuen.2023.106117
8. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Modeling. 1999;6(1):1-55. doi: 10.1080/10705519909540118.
9. Swan K, Speyer R, Scharitzer M, Farneti D, Brown T, Woisard V, Cordier R. Measuring what matters in healthcare: a practical guide to psychometric principles and instrument development. Front Psychol. 2023:14:1225850. doi: 10.3389/fpsyg.2023.1225850.
10. Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, Bouter LM, De Vet HC. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res. 2010;19(4):539-49. doi: 10.1007/s11136-010-9606-8.
11. Shirinabadi Farahani A, Rassouli M, Yaghmaei F, Alavi Majd H. Index for selecting an appropriate instrument to conduct research in health sciences: Introducing the COSMIN checklist. J Health Promot Manag. 2015;4(4):1-3.

Appendix A. Revised Sadaf Stress Scale (SSS-3, 50 Items)

The Sadaf Stress Scale (SSS-3) is a 50-item self-report questionnaire designed to assess seven domains of stress relevant to the Pakistani population. Each item is rated on a 5-point Likert scale (0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Often, 4 = Almost Always) with reference to the past two weeks. Domain scores are the mean of items within each domain; the total score is the mean of all 50 items. Higher scores indicate greater stress. Severity thresholds (validated by ROC analysis): Normal ≤ 1.49, Mild 1.50–2.19, Moderate 2.20–2.89, Severe ≥ 2.90.

Emotional Stress (7 items)

Item No.	Item Wording
1	I felt moody or irritable.
2	I experienced sudden sadness or crying spells.
3	I felt lonely or isolated.
4	I felt emotionally exhausted or drained.
5	I felt anxious without clear reason.
6	I felt insecure or vulnerable.
7	My emotions felt uncontrollable.

Physical Stress (8 items)

Item No.	Item Wording
1	I felt fatigued or unusually tired.
2	I experienced muscle tension or body aches.
3	I suffered from headaches.
4	I had difficulty sleeping or staying asleep.
5	I noticed my heart beating rapidly.
6	I experienced shortness of breath.
7	I had frequent stomach upset or indigestion.
8	I felt dizzy or light-headed.

Traumatic Stress (7 items)

Item No.	Item Wording
1	I had flashbacks or intrusive memories of trauma.
2	I had disturbing dreams related to trauma.
3	I felt distressed when reminded of a past trauma.
4	I avoided reminders of a traumatic event.
5	I felt emotionally numb after a traumatic memory.
6	I was hyper-alert or easily startled.
7	I felt detached from people after a traumatic experience.

Psychosocial Stress (8 items)

Item No.	Item Wording
1	I faced conflicts with family, colleagues, or friends.
2	I avoided social gatherings because of stress.
3	I felt unsupported by people around me.
4	I had aggression or irritability in social settings.
5	I struggled to manage my responsibilities.
6	I felt pressure from financial or social demands.
7	I had difficulty balancing home and work roles.
8	I felt excluded or isolated in my community.

Mental Stress (8 items)

Item No.	Item Wording
1	I had difficulty concentrating.
2	I experienced forgetfulness or memory problems.
3	I had racing or repetitive thoughts.
4	I struggled to make decisions or showed poor judgment.
5	I felt confused or disoriented.
6	I had difficulty thinking clearly under stress.
7	I was unable to focus on important tasks.
8	I felt mentally overloaded or distracted.

Nutritional Stress (6 items)

Item No.	Item Wording
1	I skipped meals because of stress.
2	I ate too quickly or irregularly.
3	I craved sugary foods when stressed.
4	I experienced weight changes due to stress.
5	I had bloating or abdominal discomfort linked to stress.
6	I had constipation or irregular bowel movements.

Chemical Stress (6 items)

Item No.	Item Wording
1	I consumed excessive amounts of caffeinated drinks.
2	I smoked more cigarettes when stressed.
3	I used alcohol more when stressed.
4	I relied on medication for stress-related symptoms.
5	I felt sensitive to chemicals or food additives.
6	I felt dehydrated because I was not drinking enough water.