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Cross-Cultural Adaptation and Validation of the Urdu Version of the Diastasis Recti Postpartum Questionnaire for Pakistani Postpartum Women

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ABSTRACT

***Background**: Diastasis recti abdominis (DRA) is common in postpartum women and is associated with pain, functional limitation, and psychological distress, yet few condition-specific patient-reported outcome measures (PROMs) are available in non-Western settings (1–7,9,11–13,27,28). **Objective**: To translate, culturally adapt, and psychometrically validate the Urdu version of the Physical and Mental Well-being related to Diastasis Recti Postpartum Questionnaire (PM-DRQ) in middle-aged Pakistani postpartum women with DRA. **Methods**: A cross-sectional validation study was conducted among 80 postpartum women aged 35–45 years with DRA ≥2.5 cm attending four maternity hospitals in Karachi, Pakistan. Translation followed international guidelines with forward–back translation, expert committee review, and cognitive debriefing (14–17,23–26). Participants completed the Urdu PM-DRQ, a visual analogue scale for pain, the Modified Oswestry Disability Index, and the Maternal Postpartum Quality of Life Questionnaire (9,10,14,18–20). Internal consistency, test–retest reliability, content, construct, criterion, and known-groups validity, and floor/ceiling effects were evaluated (14,18). **Results**: Cronbach's α was 0.89 for the total scale and 0.85 and 0.82 for physical and psychological domains, respectively. Test–retest ICC was 0.88. A two-factor structure explained 68.4% of variance with acceptable CFA fit (CFI 0.92, TLI 0.90, RMSEA 0.076). PM-DRQ scores correlated strongly with pain and disability and discriminated between DRA severity and low back pain subgroups (all $p<0.001$). No floor or ceiling effects were observed. **Conclusion**: The Urdu PM-DRQ is a reliable, valid, and culturally appropriate PROM for assessing physical and psychological impacts of DRA in Pakistani postpartum women.*

Keywords
Diastasis recti; postpartum; questionnaire validation; cross-cultural adaptation; Urdu; psychometrics.

INTRODUCTION

Diastasis recti abdominis (DRA) is a musculoskeletal condition characterized by pathological widening of the linea alba and separation of the rectus abdominis muscles, and represents an increasingly recognized contributor to postpartum morbidity affecting both physical function and psychological well-being (1,2). Contemporary epidemiological studies report substantial variability in DRA prevalence, with estimates ranging from approximately one-third of women at 12 months postpartum to more than three-quarters in specific cohorts, largely due to heterogeneity in diagnostic criteria, assessment timing, and measurement methods (3,4). The pathophysiological consequence of DRA involves progressive stretching and thinning of the linea alba during pregnancy, which may persist into the postpartum period, particularly among women with recognized risk factors such as advanced maternal age, multiparity, elevated body mass index, caesarean delivery, and increased fetal birth weight (5,6). Middle-aged postpartum women, particularly those aged 35–45 years, may be especially vulnerable because age-related declines in connective tissue elasticity, cumulative biomechanical loading across pregnancies, and comorbidities such as obesity interact to increase the likelihood of persistent DRA, core instability, and related symptoms (7).

Beyond structural changes of the abdominal wall, DRA is associated with a spectrum of functional and psychosocial sequelae, including low back pain, pelvic girdle dysfunction, urinary incontinence, reduced physical capacity, and dissatisfaction with body image (5–7,9–13). Observational and clinical studies have demonstrated that increased inter-recti distance is related to impaired trunk stability, altered load transfer, and reduced lumbopelvic control, which may contribute to chronic low back pain and limitations in daily activities among postpartum women (5,6,11,12). In parallel, growing evidence indicates that disturbed body image, reduced self-acceptance, and heightened psychological distress are common in women experiencing significant changes in their abdominal contour and physical function after childbirth (7,8,). These findings support a biopsychosocial perspective in which DRA is not solely an anatomical variation but a condition with meaningful implications for pain, function, self-perception, and mental health in the postpartum period (6, 8, 13-17).

Conventional diagnostic approaches to DRA predominantly rely on objective anatomical assessments, such as finger-width palpation, caliper-based measurements, and ultrasound imaging to quantify inter-recti distance (9,11,18-21). While these methods provide essential information regarding structural severity, they do not capture the subjective experience of symptoms, functional limitations, emotional distress, or quality of life disturbances reported by affected women (5,10,12,22-27). Instruments such as the Oswestry Disability Index (ODI) and its modified versions have been widely used to evaluate low back pain-related disability in various populations, including postpartum women with lumbopelvic

symptoms (9,19). Similarly, general postpartum quality of life measures, such as the Maternal Postpartum Quality of Life Questionnaire, assess broader aspects of maternal well-being, including physical functioning, emotional status, and social roles (10,20). However, these tools were not developed to specifically address DRA and therefore do not fully reflect the unique combination of abdominal wall dysfunction, core instability, body image concerns, and DRA-related functional limitations that characterize this condition (10,12,13). Recent narrative reviews and scoping syntheses have underscored the lack of condition-specific patient-reported outcome measures (PROMs) that integrate both physical and psychological dimensions of DRA, particularly in non-Western settings (14).

The absence of DRA-specific PROMs is particularly problematic in clinical practice and rehabilitation research, where accurate evaluation of treatment outcomes requires tools that are sensitive to the multifaceted impacts of DRA on pain, function, and mental well-being (5,6,27,28). In Pakistan, sociocultural norms around childbirth, modesty, and help-seeking may further influence how women perceive and report DRA-related symptoms, and may shape their access to rehabilitation services (9,27). Evidence from cross-cultural psychometric research shows that direct translation of PROMs developed in Western contexts, without systematic cultural adaptation, often leads to poor comprehensibility, cultural bias, and compromised measurement properties (15–17). For postpartum women, who navigate complex cultural expectations related to motherhood, physical recovery, and body image, the use of culturally inappropriate instruments risks underestimating distress and undervaluing key aspects of their lived experience (15,20,23–26). Therefore, the development or adaptation of PROMs for DRA in Pakistan must explicitly consider linguistic nuances, cultural relevance, and local patterns of symptom perception and reporting (15–17).

The Physical and Mental Well-being related to Diastasis Recti Postpartum Questionnaire (PM-DRQ) was conceived to address this gap as a condition-specific instrument grounded in a biopsychosocial framework. Items were adapted from the Oswestry Disability Index, capturing pain, activity limitations, and functional disability relevant to trunk and lumbopelvic function, and from established postpartum quality of life instruments, reflecting mood changes, sleep disturbances, social participation, body image, and treatment awareness in the postpartum period (10,19–22). This conceptual integration acknowledges that DRA often coexists with low back pain and pelvic instability, while also exerting independent effects on self-esteem and emotional well-being (5–8,21,22,27). To ensure that the PM-DRQ can be meaningfully used in Urdu-speaking Pakistani populations, it is essential to undertake a rigorous cross-cultural adaptation process that includes forward and back translation, expert review, cognitive debriefing, and comprehensive psychometric evaluation in the target population (14–18,23–26).

High-quality PROM validation requires examination of multiple measurement properties, including internal consistency, test–retest reliability, content validity, construct validity, criterion validity, and known-groups validity, as well as evaluation of floor and ceiling effects (14,18). For a DRA-specific PROM used in middle-aged postpartum women, it is especially important to establish whether the instrument adequately differentiates between women with varying degrees of DRA severity and coexisting low back pain, and whether it correlates appropriately with established measures of pain, disability, and postpartum quality of life (5,9,10,12,14,18). At present, no validated Urdu-language DRA-specific PROM is available for Pakistani postpartum women, limiting clinicians' ability to quantify disease burden, monitor response to intervention, and generate high-quality local evidence on DRA rehabilitation (9,27,28).

In this context, the present study aimed to translate and cross-culturally adapt the PM-DRQ into Urdu and to evaluate its psychometric properties among middle-aged Pakistani postpartum women diagnosed with DRA. Specifically, the study sought to assess the internal consistency, test–retest reliability, content validity, construct validity through exploratory and confirmatory factor analyses, criterion validity against established measures of pain, disability, and postpartum quality of life, and known-groups validity across DRA severity and low back pain status. The underlying research objective was to determine whether the Urdu version of the PM-DRQ provides a reliable, valid, and culturally appropriate tool for assessing the physical and psychological impact of DRA in Pakistani postpartum women aged 35–45 years.

MATERIALS AND METHODS

This study employed a cross-sectional psychometric validation design to translate, culturally adapt, and evaluate the Urdu version of the Physical and Mental Well-being related to Diastasis Recti Postpartum Questionnaire (PM-DRQ) in middle-aged postpartum women with clinically confirmed DRA. The design was selected to allow simultaneous assessment of multiple measurement properties, including reliability and different forms of validity, within a single cohort of postpartum women receiving routine care. Data were collected between March and August 2024 from the physical therapy departments of four major maternity hospitals in Karachi, Pakistan: Jinnah Postgraduate Medical Centre, National Medical Centre, Ashfaque Memorial Hospital, and Naila Maternity and General Hospital. These hospitals provide a mix of public and private obstetric services and serve socioeconomically diverse populations, thereby supporting recruitment of a clinically representative sample of Pakistani postpartum women with DRA.

Eligible participants were postpartum women aged 35–45 years with at least one prior childbirth, a minimum postpartum duration of one month, and clinically diagnosed DRA defined as an inter-recti separation of at least 2.5 cm at or around the umbilicus on standardized palpation. Women were required to be able to read and understand Urdu to ensure accurate self-completion of the translated questionnaire, with or without additional English language proficiency. Women were excluded if they had a history of major abdominal surgery other than caesarean section, diagnosed abdominal hernia, open abdominal wounds, conditions that could substantially distort abdominal wall anatomy, or visible severe psychiatric disorders that could impair comprehension or compliance with study procedures. Pregnant women and those reporting intolerable discomfort during abdominal palpation were also excluded to avoid confounding by current gestational changes and to protect participant safety. This eligibility framework was designed to create a clinically homogeneous cohort of middle-aged postpartum women with persistent DRA while minimizing confounding from unrelated abdominal pathology.

Participants were recruited using consecutive convenience sampling from women attending postpartum follow-up visits and physiotherapy referrals at the participating hospitals. Trained research assistants screened clinic lists and approached potentially eligible women in waiting areas after their clinical consultations. Women meeting the inclusion criteria received oral and written information about the study in Urdu, including its purpose, procedures, risks, and benefits. Written informed consent was obtained from all participants before any study-specific assessments were performed. To minimize selection bias, recruitment was conducted across all clinic days during the study period, and all eligible women who agreed to participate were enrolled until the target sample size was reached. Cognitive debriefing for pre-testing and the main validation cohort were drawn from the same source population but involved distinct groups of participants.

The PM-DRQ was developed as a condition-specific questionnaire to capture physical and psychological consequences of DRA in postpartum women. The initial version comprised 15 items grouped conceptually into two domains: a physical domain addressing abdominal discomfort, low back pain, activity restrictions, difficulties with lifting and childcare tasks, and mobility limitations; and a psychological domain addressing mood changes, sleep disturbances, social participation, body image concerns, and awareness of treatment options (10,19–22). Items were adapted from existing validated instruments, including the Oswestry Disability Index and postpartum quality of life measures, with wording modified to explicitly reference DRA-related experiences and postpartum context (10,19–22). All items used a Likert-type response scale ordered from no difficulty or impact to severe difficulty or impact, with higher scores indicating greater DRA-related burden. Domain scores and a total PM-DRQ score were computed by summing item responses, with higher scores reflecting worse physical and psychological well-being.

Translation and cross-cultural adaptation followed internationally recognized guidelines for the adaptation of self-report measures (16,17). Two independent bilingual translators whose mother tongue was Urdu produced forward translations of the original English PM-DRQ into Urdu. One translator had a clinical physiotherapy background and was familiar with DRA and postpartum rehabilitation, while the second translator was a professional language specialist without medical training. Both were instructed to prioritize conceptual equivalence and cultural appropriateness over literal translation. A reconciliation meeting involving the translators and the research team synthesized the two forward versions into a single provisional Urdu version, resolving discrepancies by consensus and modifying wording to reflect culturally relevant expressions used by Pakistani postpartum women. Two independent native English speakers, blinded to the original instrument and study objectives, performed back translations of the reconciled Urdu version into English. Neither back translator had a medical background. The original English version, forward translations, reconciled Urdu version, and back-translated versions were reviewed by an expert committee comprising physiotherapists with expertise in women's health, obstetricians familiar with postpartum care, a clinical psychologist with experience in maternal mental health, language experts, and the principal investigators (14–17,23–26). The committee evaluated semantic, idiomatic, experiential, and conceptual equivalence, ensuring that the Urdu items preserved the intended meaning of the original PM-DRQ while being easily understood within the Pakistani cultural context.

Pre-testing of the pre-final Urdu PM-DRQ was conducted in a separate group of 15 postpartum women aged 35–45 years with DRA, recruited using the same eligibility criteria and procedures as the main study. Cognitive interviews used a combination of think-aloud and targeted probing, asking participants to explain their understanding of each item and to comment on the clarity, relevance, and cultural acceptability of the wording and response options. Feedback was documented verbatim and analyzed qualitatively to identify recurring comprehension problems, ambiguous or stigmatizing terms, and suggestions for improvement. Minor refinements were made to three items to replace overly intense wording (for example, substituting "unbearable pain" with "severe pain"), to incorporate culturally relevant examples of social activities (such as family gatherings and religious events), and to clarify that treatment options included both traditional and modern approaches, without altering the underlying construct or response structure. The expert committee reviewed and approved the final Urdu version of the PM-DRQ for psychometric testing.

For the main validation study, 80 postpartum women meeting eligibility criteria completed the Urdu PM-DRQ and additional measures during a single face-to-face session in a quiet consultation room within the physical therapy departments. Data collection was performed by physiotherapists and trained research assistants using a standardized protocol. Demographic and clinical information included age, parity, education, occupation, mode of delivery, time since last delivery, and presence of low back pain. Clinical assessment of DRA involved standardized finger-width palpation of the inter-recti distance at three locations (4.5 cm above the umbilicus, at the umbilicus, and 4.5 cm below the umbilicus) with participants in a crook-lying position performing a gentle head lift, supplemented by digital caliper measurements at the same landmarks to obtain continuous inter-recti distance values (5,6,11,12). For criterion validity, participants also completed a 10 cm visual analogue scale (VAS) for current abdominal or low back pain intensity, the Urdu version of the Modified Oswestry Disability Index, and the Maternal Postpartum Quality of Life Questionnaire, from which a mental well-being–focused subscale score was derived to represent psychological quality of life (9,10,19,20). Research assistants were trained to provide neutral clarifications on language and format but not to interpret item content, reducing interviewer-induced bias. Questionnaire packets were checked for completeness at the time of administration, and participants were encouraged to complete any missed items, thereby minimizing missing data and permitting complete-case analysis.

To evaluate temporal stability, a randomly selected subset of 30 participants (37.5% of the main cohort) completed the Urdu PM-DRQ again 7–14 days after the initial assessment. Follow-up administration was conducted via structured telephone interview in Urdu by trained research staff using the same item wording and response options, with scores recorded directly into data capture forms. The retest interval was chosen to be sufficiently short to reduce the likelihood of true clinical change yet long enough to minimize recall of prior responses (14,18). Test–retest participants were comparable to the rest of the sample in age, parity, DRA severity, and presence of low back pain, thereby supporting the generalizability of reliability estimates.

The target sample size was based on established recommendations for psychometric validation studies, which suggest recruiting at least five to ten participants per questionnaire item for factor analysis and reliability testing (18). With 15 PM-DRQ items, the minimum recommended sample ranged from 75 to 150 participants; the final sample of 80 women (5.3 participants per item) met the lower bound of this recommendation and was considered adequate for initial validation, including exploratory factor analysis and estimation of reliability indices (14,18). The full dataset of 80 participants was randomly split into two equal subsamples of 40 women each, one used for exploratory factor analysis (EFA) to identify the underlying factor structure and one used for confirmatory factor analysis (CFA) to test the stability of this structure in an independent subset. Random allocation was performed using a computer-generated random sequence applied to participant identification numbers.

Data were entered into an electronic database with double-entry verification and cross-checking to minimize transcription errors and ensure data integrity. All statistical analyses were conducted using SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized sociodemographic and clinical characteristics, with continuous variables reported as means and standard deviations and categorical variables as frequencies and percentages. For EFA, principal component analysis with varimax rotation was applied to the PM-DRQ item scores in the first subsample to explore the latent structure. Sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) measure, and Bartlett's test of sphericity tested the appropriateness of factor analysis (14,18). Factors with eigenvalues greater than 1.0 were retained, and items with factor loadings of at least 0.40 on a given factor were considered meaningful contributors. The second subsample was used to conduct CFA, applying a two-factor measurement model corresponding to the physical and psychological domains identified by EFA. Model fit was evaluated

using multiple indices, including the chi-square to degrees-of-freedom ratio, Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA), with conventional thresholds used to judge acceptable fit (14,18).

Internal consistency reliability of the total scale and each domain was assessed using Cronbach's alpha coefficients with 95% confidence intervals, with values of 0.70 or higher considered acceptable and values of 0.80 or higher considered good (14,18). Item–total correlations were calculated to examine the contribution of individual items to the overall scale; items with correlations below 0.30 were considered for potential removal. Test–retest reliability was evaluated in the subset of 30 participants using two-way mixed-effects intraclass correlation coefficients (ICC, absolute agreement) for the total and domain scores, with ICC values of at least 0.75 interpreted as indicating substantial reliability (14,18). Content validity was examined by an expert panel comprising women's health physiotherapists, obstetricians, and clinical psychologists who independently rated each item for relevance on a four-point Likert scale. Item-level content validity indices (I-CVI) were computed as the proportion of experts rating each item as 3 or 4, and the scale-level content validity index (S-CVI) was calculated as the average I-CVI across items, with values of 0.78 or higher interpreted as acceptable (14,15,18,23–26).

Criterion validity was assessed using Pearson correlation coefficients between PM-DRQ total and domain scores and scores on VAS pain intensity, Modified Oswestry Disability Index, and the maternal mental well-being subscale of the postpartum quality of life questionnaire, with hypotheses that physical domain scores would correlate more strongly with pain and functional disability and psychological domain scores more strongly with mental well-being (9,10,14,18–20). Known-groups validity was examined by comparing PM-DRQ scores between subgroups defined a priori by DRA severity (moderate 2.5–4.0 cm vs severe >4.0 cm inter-recti distance) and presence versus absence of low back pain, using independent-samples t-tests. It was hypothesized that women with more severe DRA and those with concurrent low back pain would have significantly higher PM-DRQ scores, reflecting greater symptom burden and functional limitation (5–7,9,12,27,28). Floor and ceiling effects were evaluated by calculating the proportion of participants with minimum and maximum possible total scores; effects were considered present if more than 15% of respondents achieved the lowest or highest score (14,18). All statistical tests were two-sided with a significance level of $p<0.05$.

The study was conducted in accordance with the Declaration of Helsinki and received ethical approval from the institutional review board of Lincoln University College, Malaysia (Ref. No: LUC/MKT/IND/SP/01/861), and the Institutional Review Board of Jinnah Sindh Medical University, Karachi, Pakistan (Ref. No: JSMU/IRB/2025/1023). All participants provided written informed consent after being assured of voluntary participation, confidentiality of their data, and the right to withdraw at any time without affecting their access to clinical care. Data were stored in password-protected files accessible only to authorized research staff, and analysis procedures were documented using saved syntax files to support reproducibility.

RESULTS

The sample comprised 80 middle-aged postpartum women with clinically confirmed DRA, as summarized in Table 1. The mean age was 39.2 years (SD 3.1), and the cohort was predominantly multiparous; 36 women (45.0%) had 2–3 births and 28 (35.0%) were grand multiparous with four or more births, while 16 (20.0%) were primiparous. The mean time since delivery was 8.4 months (SD 6.2), spanning from very early postpartum (1 month) to two years. Caesarean section was the most frequent mode of delivery (54 women, 67.5%), with fewer women having normal vaginal delivery (18, 22.5%), vacuum-assisted delivery (6, 7.5%), or forceps-assisted birth (2, 2.5%). The mean inter-recti distance at the umbilical level was 3.2 cm (SD 0.8), meeting the DRA definition in all participants. More than half of the sample reported low back pain (46 women, 57.5%), consistent with prior evidence linking DRA with lumbopelvic symptoms (5–7,9,11–13,27,28).

Table 2 presents internal consistency and test–retest reliability indices. Cronbach's α for the total PM-DRQ was 0.89 (95% CI 0.85–0.92), indicating excellent homogeneity of the 15-item scale. Domain-level reliability was also high, with $\alpha = 0.85$ (95% CI 0.80–0.89) for the physical domain and $\alpha = 0.82$ (95% CI 0.76–0.87) for the psychological domain, demonstrating that each subscale is sufficiently coherent to be interpreted independently (14,18). The item–total correlation range (0.52–0.78) shows that all items contributed meaningfully to the total score; none fell below the commonly accepted minimum of 0.30. Temporal stability over approximately 10 days was excellent, with ICC = 0.88 (95% CI 0.82–0.93) for the total score, 0.86 (95% CI 0.79–0.91) for the physical domain, and 0.84 (95% CI 0.76–0.90) for the psychological domain (all $p<0.001$), indicating that observed score changes are unlikely to be due to measurement error alone (14,18).

Table 3 displays the factor loadings from exploratory factor analysis. The two-factor solution accounted for 68.4% of the total variance, with Factor 1 (physical well-being) contributing 45.2% and Factor 2 (psychological well-being) contributing 23.2%. All physical items (P1–P10) loaded strongly on Factor 1, with loadings between 0.58 and 0.84, indicating that they coherently captured a common physical functioning construct. Psychological items (M1–M5) loaded between 0.62 and 0.79 on Factor 2, supporting a distinct but related psychological well-being construct. No meaningful cross-loadings were observed, aligning the empirical structure with the theoretical two-domain model underpinning the PM-DRQ (14,18). In CFA, which was not tabulated but described, $\chi^2/df = 2.11$, CFI = 0.92, TLI = 0.90, and RMSEA = 0.076 (90% CI 0.054–0.098), confirming acceptable model fit for the two-factor structure.

Criterion validity results in Table 4 show that the PM-DRQ behaves as expected when compared with established external measures. The total PM-DRQ score correlated strongly and positively with VAS pain ($r = 0.76$) and the Modified Oswestry Disability Index ($r = 0.72$), with $p<0.001$ for all correlations, indicating that higher DRA-related impact scores are associated with greater pain and functional disability (9,10,14,18–20). The physical domain showed the strongest correlation with pain ($r = 0.81$) and disability ($r = 0.69$), whereas the psychological domain displayed a higher absolute correlation with mental well-being ($r = –0.69$), reinforcing the intended domain-specific construct distinctions. The negative sign reflects that higher PM-DRQ psychological scores (more impairment) are associated with lower mental well-being scores.

Known-groups validity results in Table 5 demonstrate that the instrument discriminates well between clinically distinct subgroups. Women with severe DRA (>4.0 cm, n = 12) had markedly higher mean PM-DRQ total scores (48.6 ± 7.2) than those with moderate DRA (2.5–4.0 cm, n = 68, 36.8 ± 6.9), with a mean difference of 11.8 points (95% CI 7.1–16.5), $t = 4.82$, $p<0.001$, and a very large effect size (Cohen's $d = 1.60$). Similarly, women reporting low back pain (n = 46) scored higher (42.1 ± 8.1) than those without low back pain (n = 34, 34.2 ± 7.4), with a mean difference of 7.9 points (95% CI 4.3–11.4), $t = 4.35$, $p<0.001$, and a large effect size ($d = 1.05$). These findings support the instrument's sensitivity to both DRA severity and coexisting musculoskeletal symptoms (5–7,9,12,27,28). Finally, the absence of floor or ceiling effects (no minimum scores; only 3.75% in the highest 10% of scores) indicates that the PM-DRQ provides a suitable measurement range for this clinical population (14,18).

A total of 95 postpartum women were screened, of whom 15 participated in pre-testing and 80 completed the main validation phase. No missing data occurred due to on-site completeness checks during questionnaire administration. The sociodemographic and clinical characteristics of participants are summarized in Table 1. The mean age was 39.2 ± 3.1 years, parity ranged from one to five, and the mean inter-recti distance at the umbilicus was 3.2 ± 0.8 cm. Of all participants, 46 (57.5%) reported concurrent low back pain. The time since last delivery ranged from 1 to 24 months (mean 8.4 ± 6.2 months). Caesarean delivery was the most common mode of birth (67.5%), followed by spontaneous vaginal delivery (22.5%). These characteristics reflected a clinically representative cohort of middle-aged Pakistani women at elevated risk of persistent DRA (30). Pre-testing confirmed excellent comprehensibility, with all 15 women demonstrating correct interpretation of item intent and response options. Three items required minor linguistic refinement based on cognitive interview feedback, improving clarity without altering conceptual meaning. These modifications resulted in the final Urdu PM-DRQ used for psychometric evaluation.

Internal consistency reliability for the full 15-item scale was excellent, with Cronbach's α = 0.89 (95% CI 0.85–0.92). The physical well-being domain demonstrated α = 0.85 (95% CI 0.80–0.89), whereas the psychological domain demonstrated α = 0.82 (95% CI 0.76–0.87). Item–total correlations ranged from 0.52 to 0.78, exceeding the acceptable threshold of 0.30 for all items. No item met criteria for removal. Detailed reliability metrics are presented in Table 2.

Table 1. Sociodemographic and Clinical Characteristics of Participants (n = 80)

Variable	Mean ± SD / n (%)
Age (years)	39.2 ± 3.1
Parity	
Primiparous	16 (20.0%)
Multiparous (2–3 births)	36 (45.0%)
Grand multiparous (≥4 births)	28 (35.0%)
Time since delivery (months)	8.4 ± 6.2
Mode of delivery	
Caesarean section	54 (67.5%)
Normal vaginal delivery	18 (22.5%)
Vacuum-assisted	6 (7.5%)
Forceps	2 (2.5%)
Inter-recti distance at umbilicus (cm)	3.2 ± 0.8
Low back pain present	46 (57.5%)

Table 2. Reliability Analysis: Internal Consistency and Test–Retest Reliability

Scale / Domain	Cronbach's α (95% CI)	Item–Total Correlation Range	ICC (95% CI)	p-value
Total PM-DRQ	0.89 (0.85–0.92)	0.52–0.78	0.88 (0.82–0.93)	<0.001
Physical domain	0.85 (0.80–0.89)	0.54–0.76	0.86 (0.79–0.91)	<0.001
Psychological domain	0.82 (0.76–0.87)	0.52–0.74	0.84 (0.76–0.90)	<0.001

Table 3. Exploratory Factor Analysis: Factor Loadings of PM-DRQ Items (Varimax Rotation)

Item	Physical Domain	Psychological Domain
P1	0.74	—
P2	0.81	—
P3	0.79	—
P4	0.84	—
P5	0.69	—
P6	0.58	—
P7	0.71	—
P8	0.76	—
P9	0.69	—
P10	0.62	—
M1	—	0.79
M2	—	0.74
M3	—	0.68
M4	—	0.62
M5	—	0.73

Table 4. Criterion Validity: Correlations between PM-DRQ Domains and External Measures

External Measure	Total PM-DRQ (r)	Physical Domain (r)	Psychological Domain (r)	p-value
VAS pain	0.76	0.81	0.58	<0.001
Modified Oswestry Disability Index	0.72	0.69	0.51	<0.001
Mental well-being subscale	–0.61	–0.52	–0.69	<0.001

Test–retest reliability was assessed in 30 participants who completed the retest within a mean of 10.2 ± 2.1 days. The intraclass correlation coefficient for the PM-DRQ total score was ICC = 0.88 (95% CI 0.82–0.93), indicating excellent temporal stability. The physical and psychological domains demonstrated ICC = 0.86 (95% CI 0.79–0.91) and ICC = 0.84 (95% CI 0.76–0.90), respectively, confirming substantial reliability. Content

validity was high, with item-level CVI values ranging from 0.82 to 1.00. The scale-level CVI (S-CVI/Ave) was 0.91, exceeding recommended standards and reflecting consensus among experts regarding item relevance, clarity, and cultural appropriateness.

Table 5. Known-Groups Validity: Differences in PM-DRQ Scores by DRA Severity and Low Back Pain

Group Comparison	n	Mean ± SD	Mean Difference (95% CI)	t-value	p-value	Effect Size (Cohen's d)
DRA Severity						
Moderate (2.5–4.0 cm)	68	36.8 ± 6.9	—	—	—	—
Severe (>4.0 cm)	12	48.6 ± 7.2	11.8 (7.1–16.5)	4.82	<0.001	1.60
Low Back Pain						
Absent	34	34.2 ± 7.4	—	—	—	—
Present	46	42.1 ± 8.1	7.9 (4.3–11.4)	4.35	<0.001	1.05

Construct validity was supported through exploratory factor analysis (EFA) in a randomly assigned subsample of 40 participants. Sampling adequacy was confirmed with a KMO value of 0.78, and Bartlett's test of sphericity was significant ($\chi^2 = 642.18$, df = 105, $p < 0.001$). Two components with eigenvalues >1 were extracted, explaining 68.4% of the total variance. Factor 1 (physical well-being) accounted for 45.2% of the variance, and Factor 2 (psychological well-being) accounted for 23.2%. All items demonstrated factor loadings ≥0.58 on their respective domains without problematic cross-loadings. Loadings are presented in Table 3.

Confirmatory factor analysis (CFA) conducted on the independent subsample of 40 participants demonstrated acceptable model fit: $\chi^2/df = 2.11$, CFI = 0.92, TLI = 0.90, and RMSEA = 0.076 (90% CI 0.054–0.098). Standardized loadings ranged from 0.52 to 0.79 for physical items and from 0.55 to 0.77 for psychological items, all significant at $p < 0.001$.

Criterion validity was supported by statistically significant correlations between PM-DRQ scores and external measures. The total PM-DRQ score demonstrated strong association with VAS pain ($r = 0.76$, $p < 0.001$) and the Modified Oswestry Disability Index ($r = 0.72$, $p < 0.001$). As hypothesized, the physical domain correlated most strongly with VAS pain ($r = 0.81$, $p < 0.001$) and disability ($r = 0.69$, $p < 0.001$), whereas the psychological domain correlated more strongly with mental well-being ($r = –0.69$, $p < 0.001$), with higher PM-DRQ scores corresponding to poorer mental health. These results are detailed in Table 4.

Known-groups validity was demonstrated by significantly higher PM-DRQ scores among women with severe DRA (>4.0 cm) compared with those with moderate DRA (2.5–4.0 cm). Women reporting low back pain also showed significantly higher scores across both domains. Group differences are presented in Table 5 and were consistent with the theoretical expectation that DRA severity and pain burden influence functional and psychological outcomes (31). No evidence of floor or ceiling effects was observed. The total PM-DRQ score ranged from 14 to 69 out of a maximum possible 75. None of the participants scored the lowest possible value, and only 3 participants (3.75%) scored within the top 10% of the scale, indicating that the instrument is neither too easy nor too difficult for the target population. Taken together, the reliability, factor structure, correlation patterns, and group comparisons support the PM-DRQ Urdu version as a valid and reliable measure of physical and psychological impacts of DRA in middle-aged Pakistani postpartum women.

DISCUSSION

This study provides the first cross-cultural adaptation and psychometric validation of an Urdu-language, DRA-specific patient-reported outcome measure for middle-aged Pakistani postpartum women. The PM-DRQ was designed to address both physical and psychological consequences of diastasis recti abdominis, building upon accumulating evidence that DRA is associated not only with abdominal wall deformity but also with low back pain, pelvic dysfunction, functional limitations, and body image disturbance (1–7,9,11–13,27,28). By integrating items derived from established disability and postpartum quality-of-life instruments into a DRA-focused framework, and by rigorously adapting the questionnaire for a Pakistani context, this study responds to the recognized need for condition-specific tools that capture the multidimensional burden of DRA in non-Western populations (10,12–15,20,24–28).

The sample characteristics align with known risk profiles for persistent DRA. The majority of participants were multiparous or grand multiparous, with a high prevalence of caesarean deliveries and substantial inter-recti separation, reflecting the intersection of biomechanical loading, tissue changes, and obstetric practice documented in previous epidemiological work (1–7,11–13,28,29). More than half of the women reported low back pain, which is consistent with systematic reviews suggesting an association between increased inter-recti distance and lumbopelvic symptomatology, although causality remains debated (5–7,11–13,28). The inclusion of middle-aged postpartum women aged 35–45 years ensured a focus on a subgroup at elevated risk of persistent DRA, in whom rehabilitation decisions may be particularly consequential for long-term musculoskeletal health and quality of life (5–7,27–29).

The PM-DRQ demonstrated excellent internal consistency for both the total scale and its physical and psychological domains, with Cronbach's α values comparable to or exceeding those reported for other postpartum and mental health instruments, such as the Postpartum Bonding Questionnaire, Postpartum Depression Screening Scale, and newly adapted childbirth and pregnancy questionnaires in other languages (14,15,18,23–26). Reliability estimates for the physical and psychological domains ($\alpha = 0.85$ and 0.82, respectively) are within the range considered optimal for clinical research, avoiding both under- and over-homogeneity (14,18). The strong item–total correlations support the contribution of each item to the underlying constructs and argue against item redundancy. Test–retest reliability was similarly robust, with ICC values above 0.80 for all scales, mirroring the stability reported in recent validations of postpartum psychometric tools in Chinese, Iranian, and Indonesian populations (15,24–26). These findings suggest that the Urdu PM-DRQ is reproducible over short-term intervals during which true clinical change is unlikely, enhancing its utility for monitoring outcomes in clinical practice and research (14,18,23–26).

Construct validity was supported by a coherent two-factor structure and acceptable model fit indices. EFA identified distinct physical and psychological dimensions that closely match the theoretical model guiding item development and domain assignment, while accounting for a high proportion of variance. The factor loadings were strong across items, and the absence of problematic cross-loadings reinforces the discriminant validity between physical and psychological domains, despite their moderate inter-correlation. The subsequent CFA, although conducted on a modest subsample, yielded fit indices (CFI 0.92, TLI 0.90, RMSEA 0.076) that meet conventional thresholds for acceptable model fit in psychometric research (14,18). These findings align with cross-cultural validations of other postpartum instruments, including childbirth

experience and pregnancy–childbirth quality-of-life questionnaires, which have similarly demonstrated two- or multi-factor structures reflecting physical, emotional, and social dimensions of maternal health (14,15,20,24–26). Nonetheless, the CFA sample size warrants cautious interpretation, and replication in larger cohorts will be important to consolidate the factor structure.

Criterion validity analyses demonstrated that PM-DRQ scores behave in clinically meaningful ways relative to external measures. Strong correlations with pain intensity and the Modified Oswestry Disability Index confirm that the physical domain captures functional limitations and symptoms consistent with lumbopelvic disability, paralleling evidence that core instability and altered trunk mechanics are common in women with DRA (5–7,9,11–13,19,20,27,28). The psychological domain's stronger association with mental well-being aligns with research documenting elevated distress, reduced self-acceptance, and body image concerns among postpartum women experiencing musculoskeletal dysfunction and changes in abdominal contour (8,20,23,27–29). The direction and magnitude of these correlations are comparable to those observed in other postpartum psychometric studies, where condition-specific scales demonstrate both convergent and discriminant validity with broader QoL and mental health measures (14,15,20,23–26).

Known-groups validity analyses further support the PM-DRQ's sensitivity to clinically relevant distinctions. Women with severe DRA had substantially higher total scores and a very large effect size relative to women with moderate DRA, which is congruent with evidence that larger inter-recti distance is associated with greater symptom severity, functional impairment, and aesthetic concerns (1–7,11–13,27–29). Similarly, the large difference in PM-DRQ scores between women with and without low back pain underscores the instrument's ability to differentiate subgroups based on musculoskeletal symptom burden, reinforcing the interconnection between DRA, trunk function, and global lumbopelvic outcomes reported in observational and interventional studies (5–7,9,11–13,21,22,27,28). The absence of floor and ceiling effects indicates that the scale has sufficient range to detect both mild and severe impairment without clustering at extremes, an important property for monitoring change over time and for evaluating interventions (14,18).

From a cultural and contextual perspective, the translation and adaptation process was critical in ensuring that the instrument was both linguistically and conceptually appropriate for Pakistani postpartum women. The use of forward–back translation, expert committee review, and cognitive debriefing aligns with best-practice guidelines and mirrors procedures used in adaptations of other maternal health scales across languages and settings (14–17,23–26). The high content validity indices and positive qualitative feedback suggest that the adapted items resonate with women's lived experiences in this setting, including the inclusion of culturally salient examples such as extended family gatherings and religious activities. This is particularly important in Pakistan, where sociocultural norms around maternity, modesty, and body image may shape both symptom expression and help-seeking behaviors, making direct adoption of Western instruments problematic without careful adaptation (9,15–17,20,23–27).

The study has several limitations. First, the cross-sectional design precludes assessment of responsiveness to clinical change, and minimal clinically important difference values could not be estimated. These metrics are important for interpreting change scores in intervention studies targeting DRA and related symptoms (14,18). Second, the sample size, while meeting minimum recommendations for initial psychometric testing, is relatively modest for confirmatory factor analysis and for subgroup analyses; the CFA results should therefore be considered preliminary and require confirmation in larger, independent samples (14,18). Third, participants were recruited from major urban hospitals in Karachi, and the generalizability of findings to rural populations or other provinces with different sociocultural characteristics is uncertain. Fourth, the study relied on palpation and caliper-based assessment of inter-recti distance rather than ultrasound imaging, which may introduce some measurement variability, although the methods used are consistent with clinical practice in many low- and middle-income settings (9,11–13,28). Finally, while the PM-DRQ integrates physical and psychological constructs, it does not explicitly measure broader domains such as sexual function or partner relationship quality, which may also be affected by DRA and warrant consideration in future instrument development.

Despite these limitations, the present study has several important implications. Clinically, the Urdu PM-DRQ offers physiotherapists, obstetricians, and other health professionals a concise, culturally appropriate tool for assessing DRA-related physical and psychological impact in Pakistani postpartum women. This can facilitate more holistic assessment, guide rehabilitation planning, and improve communication with patients about goals and outcomes. For researchers, the availability of a validated DRA-specific PROM enables the design of higher-quality observational studies and clinical trials, allowing evaluation of interventions such as targeted exercise, manual therapy, or surgical repair using patient-centered outcomes alongside anatomical measures (5–7,11–13,21,22,27–29). Future research should focus on longitudinal validation, responsiveness to change, multi-centre sampling, and potential adaptation of the PM-DRQ to other Urdu-speaking populations or translations into additional regional languages, thereby contributing to a more inclusive global evidence base on DRA rehabilitation.

CONCLUSION

The Urdu version of the Physical and Mental Well-being related to Diastasis Recti Postpartum Questionnaire (PM-DRQ) demonstrates excellent reliability, a coherent two-factor structure, strong criterion and known-groups validity, and acceptable model fit when applied to middle-aged Pakistani postpartum women with DRA. The rigorous cross-cultural adaptation process and robust psychometric performance support its use as a culturally appropriate, condition-specific tool for assessing both physical and psychological impacts of DRA in clinical practice and research. Wider implementation and further longitudinal validation could enhance the assessment of DRA-related burden and treatment outcomes across diverse Pakistani maternal health settings.

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