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PSYCHOLOGICAL BURDEN OF OLIGOMENORRHEA AND INFERTILITY IN PCOS: OCCUPATIONAL STATUS, SOCIOCULTURAL STRESS AND THE EFFECT OF NON-INVASIVE INTERVENTION ON DEPRESSION, ANXIETY AND STRESS IN WOMEN OF REPRODUCTIVE AGE: A RANDOMISED CONTROLLED TRIAL

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ABSTRACT

Polycystic ovary syndrome (PCOS) imposes a profound psychological burden on women of reproductive age, expressed as depression, anxiety and chronic stress that are shaped by reproductive morbidity — oligomenorrhea and infertility — and amplified by occupational context and sociocultural expectations. This randomised controlled trial examined whether a 12-week multimodal non-invasive physiotherapy intervention (progressive muscle relaxation, combined exercise and visceral manipulation) reduces depression, anxiety and stress (DASS-21) in 80 women with PCOS (n=20 per group), stratified by occupational status: Group A (working women + intervention), Group B (homemaker women + intervention), Group C (working women + medical management), Group D (homemaker women + medical management). All outcomes improved significantly (all p<0.001). Group A achieved the greatest depression reduction (−6.00 points; Cohen's d=1.74) and anxiety reduction (−6.45; d=1.76). Stress yielded the second-highest between-group effect in the trial (F(3,76)=32.957, η^2=0.565). Group D — homemaker women on medical management only — remained in the severe stress category at post-intervention (17.45/42), identifying this group as the most psychologically underserved. Occupational status significantly moderates treatment response, with direct implications for women's health policy, gendered social support systems and sociocultural determinants of reproductive wellbeing.

KEYWORDS: polycystic ovary syndrome; sociocultural burden; reproductive morbidity; depression; anxiety; psychological stress; occupational status; DASS-21; non-invasive intervention; gender and health; South Asian women; social determinants of wellbeing.

1 INTRODUCTION

The relationship between reproductive morbidity and psychological health in women is among the most consequential and least addressed intersections in contemporary women's health research. Polycystic ovary syndrome (PCOS) — affecting 6–21% of women of reproductive age globally (Azziz et al., 2016; Bozdag et al., 2016) — epitomises this intersection. Its two most distressing manifestations, oligomenorrhea (irregular or absent menstrual cycles) and infertility, carry psychological consequences that extend far beyond the physiological. Menstrual irregularity disrupts daily planning, occupational participation and intimate relationships; infertility-related distress in South Asian cultural contexts — where motherhood is frequently central to social identity and familial standing — generates anticipatory grief, relational strain and profound social marginalisation (Gurunath et al., 2011; Kitzinger and Willmott, 2002; Dokras, 2012). These sociocultural amplifiers transform what is already a demanding endocrine condition into a pervasive psychological crisis.

Meta-analytic evidence confirms that women with PCOS experience a two- to three-fold higher prevalence of clinically significant depression and anxiety compared with the general female population (Barry et al., 2011; Dybciak et al., 2023), with pooled prevalences of 51% for depression and 45% for anxiety documented in low- and middle-income country cohorts (Atinga et al., 2025). Chronic psychological stress is particularly important: hypothalamic–pituitary–adrenal (HPA) axis hyperactivation and cortisol hypersecretion disrupt gonadotrophin-releasing hormone pulsatility, worsen insulin resistance and perpetuate the hyperandrogenism that sustains both oligomenorrhea and anovulatory infertility (Escobar-Morreale, 2018; González, 2012). Psychological distress is therefore not merely a consequence of PCOS but a driver of its reproductive pathology — a feedback loop with both clinical and sociocultural dimensions.

A critical but systematically neglected dimension of this psychological burden is **occupational status.** In South Asian urban societies, the distinction between working/corporate women and homemakers represents fundamentally different psychosocial environments. Working women benefit from structured daily routines, professional social networks, goal-directed activity and occupationally derived self-efficacy — recognised protective factors against depression and anxiety (Goyal and Sapra, 2019; Nagpal and Bhargava, 2018). Homemakers, by contrast, may experience social isolation, reduced purposeful activity, greater exposure to fertility-related familial and community pressure, and limited access to structured psychosocial support — conditions that amplify the psychological consequences of oligomenorrhea and infertility in PCOS (Misra and Khurana, 2011; Raval et al., 2015). Whether this occupational differential moderates the response to structured psychological intervention has never been examined in PCOS research.

Non-invasive physiotherapy-based interventions — combining aerobic exercise, progressive muscle relaxation (PMR) and visceral manipulation — offer a theoretically coherent and practically accessible approach to addressing the psychological burden of PCOS. Physical exercise reduces depression and anxiety through monoaminergic upregulation, neuroplasticity and improved self-efficacy (Thomson et al., 2008; Patten et al., 2020). PMR directly attenuates HPA axis hyperreactivity and lowers cortisol (Conrad and Roth, 2007). Structured group delivery provides social engagement, goal-directed activity and interpersonal connection — the precise elements most deficient in the daily lives of homemaker women with PCOS (Crete and Adamshick, 2011; Sinha et al., 2018). These interventions thus simultaneously address the biological, psychological and sociocultural dimensions of PCOS-related distress.

The present trial was designed at this intersection of reproductive health, women's psychology and occupational social science. Using a four-arm randomised controlled design explicitly stratified by occupational status, we examined whether a 12-week multimodal non-invasive physiotherapy programme reduces DASS-21 depression, anxiety and stress in women with PCOS whose reproductive burden includes confirmed oligomenorrhea, and whether occupational context moderates the magnitude of psychological improvement. This paper reports the psychological outcomes of a broader doctoral study examining non-invasive intervention in PCOS-related oligomenorrhea and infertility.

2 METHODS

2.1 Study Design, Setting and Ethics

A prospective, four-arm, parallel-group randomised controlled trial was conducted at Laadlee Gynae and Fertility Clinic, Noida, India, and affiliated gynaecology outpatient departments and community health camps. The study was approved by the Waves Women Empowerment Trust Independent Ethics Committee (WWET/2025/IEC-AP/30) and prospectively registered (CTRI/2025/10/095908). All procedures conformed to the Declaration of Helsinki (WMA, 2013). Written informed consent was obtained from all participants prior to enrolment.

2.2 Participants and Occupational Stratification

Eighty women aged 18–35 years with confirmed PCOS (Rotterdam Criteria; Rotterdam ESHRE/ASRM, 2004) were enrolled. Beyond standard clinical eligibility (PCOS diagnosis; oligomenorrhea ≥ 6 months; BMI 18.5–40 kg/m²; no concurrent hormonal therapy; no contraindications to physical activity), all participants were classified by occupational status as either working/corporate employees (formal employment ≥ 25 hours/week outside the home) or homemakers (engaged primarily in domestic activities without formal external employment). This classification was a primary stratification variable, enabling direct examination of how occupational social environment moderates the psychological response to intervention. All 80 participants completed the full programme; no adverse events were recorded. Baseline homogeneity across all groups was confirmed for all outcomes (one-way ANOVA, all $p > 0.05$).

2.3 Randomisation, Allocation Concealment and Blinding

Stratified block randomisation by occupational status was conducted using computer-generated permuted blocks. Allocation was concealed in sequentially numbered opaque sealed envelopes prepared by an independent researcher uninvolved in recruitment or assessment. Participants were assigned equally to four groups (n=20 each): **Group A** — working women + 12-week non-invasive intervention; **Group B** — homemaker women + 12-week non-invasive intervention; **Group C** — working women + routine medical management only (active control); **Group D** — homemaker women + routine medical management only (active control). Outcome assessors remained blinded to group allocation throughout.

2.4 Multimodal Non-Invasive Intervention

Groups A and B received 24 supervised sessions over 12 weeks (2 sessions/week, 45–60 minutes each), comprising three components targeting distinct but complementary pathways of the psychoneuroendocrine stress system:

(1) Progressive Muscle Relaxation (PMR) — Jacobson's protocol; two 10-minute sequential muscle tension–relaxation cycles per session plus 20 diaphragmatic breaths (5 minutes). Mechanistic target: HPA axis hyperreactivity, cortisol hypersecretion, sympathetic nervous system overactivation (Conrad and Roth, 2007).

(2) Combined Exercise Training — 20 minutes of moderate-intensity aerobic treadmill walking plus core stabilisation exercises (plank, cat–camel; 5+5+5 repetitions, 30-second isometric holds). Mechanistic targets: monoaminergic neurotransmission, neuroplasticity, insulin sensitivity, self-efficacy (Thomson et al., 2008; Patten et al., 2020).

(3) Visceral Manipulation — eight sessions of targeted uterine and pelvic connective-tissue mobilisation by a trained physiotherapist. Mechanistic targets: pelvic autonomic balance, visceral afferent signalling, somatic stress symptom reduction (Tozzi, 2015).

Groups C and D received routine gynaecological medical management (pharmacotherapy as clinically indicated — oral contraceptive pills and/or metformin where prescribed — plus standardised lifestyle counselling), without any physiotherapy component.

2.5 Psychological Outcome Measures

Psychological outcomes were assessed using the **Depression Anxiety Stress Scales — 21 items (DASS-21)** (Lovibond and Lovibond, 1995). The DASS-21 comprises three 7-item subscales, each scored on a 4-point Likert scale (0–42 per subscale; higher = greater psychological distress):

Depression subscale: dysphoria, hopelessness, anhedonia, worthlessness. Severity thresholds: normal 0–9; mild 10–13; moderate 14–20; severe 21–27.

Anxiety subscale: autonomic arousal, situational anxiety, subjective anxious affect, fear. Thresholds: normal 0–7; mild 8–9; moderate 10–14; severe ≥ 15.

Stress subscale: difficulty relaxing, nervous arousal, irritability, impatience. Thresholds: normal 0–14; mild 15–18; moderate 19–25; severe ≥ 26.

The DASS-21 demonstrates strong reliability (Cronbach $\alpha > 0.88$), test-retest stability and validated construct validity across clinical and community populations including PCOS cohorts (Lovibond and Lovibond, 1995; Teede et al., 2018). All assessments were conducted at pre-intervention (Week 0) and post-intervention (Week 12) by blinded outcome assessors using standardised administration protocols.

2.6 Statistical Analysis

All analyses were conducted using SPSS v25.0 (IBM Corp., Armonk, NY). Within-group pre-to-post changes were evaluated using paired t-tests ($df = 19$) with Cohen's d effect sizes (Small < 0.5; Medium 0.5–0.8; Large 0.8–1.2; Very Large > 1.2). Between-group post-test differences were evaluated using one-way ANOVA ($df = 3, 76$) with η^2 (eta-squared) effect sizes (Small < 0.06; Medium 0.06–0.14; Large > 0.14). A Bonferroni-corrected significance threshold of $p < 0.017$ ($\alpha = 0.05 \div 3$ outcomes) was applied; all findings exceeded this threshold (all $p < 0.001$). Occupational

moderation was assessed through planned pairwise contrasts: A vs. C (intervention effect in working women), B vs. D (intervention effect in homemaker women), A vs. B (occupational moderation within intervention), and C vs. D (occupational moderation within control).

3 RESULTS

3.1 Sample Characteristics and Baseline Psychological Burden

Mean age was comparable across groups (A: 29.9 ± 2.7; B: 29.3 ± 3.9; C: 29.4 ± 4.1; D: 29.9 ± 4.0 years; $F(3,76) = 0.12$, $p = 0.95$), confirming age homogeneity. Baseline DASS-21 scores confirmed a uniformly severe psychological burden: all groups presented with moderate-to-severe depression (range: 15.60–17.70), moderate-to-severe anxiety (14.60–19.10) and severe stress (17.80–19.75). No significant between-group baseline differences were detected for any subscale (all $p > 0.05$), validating the comparability of groups for post-intervention contrast. All 80 participants completed the study with complete outcome data.

Baseline Group D (homemaker + medical management) recorded the highest anxiety score (19.10 ± 2.65) in the study — a clinically important observation consistent with evidence that homemaker women in South Asian urban settings carry heightened anxiety burdens linked to social isolation, fertility pressure and restricted occupational agency (Misra and Khurana, 2011; Raval et al., 2015). That this baseline was universally severe across all groups demonstrates that the psychological burden of oligomenorrhea and infertility in PCOS transcends occupational status at enrolment; it is differential treatment response — driven by occupational context — that distinguishes the groups after intervention.

Table 1. DASS-21 Depression, Anxiety and Stress Subscale Scores by Group: Pre- and Post-Intervention Means ± SD, Within-Group Paired t-Test Results, Cohen's d Effect Sizes, and Between-Group ANOVA Statistics

Parameter	Group A (Working+Interv.)	Group B (Homemkr+Interv.)	Group C (Working+Ctrl.)	Group D (Homemkr+Ctrl.)
DASS-21 Depression Subscale (lower = less depression)				
Pre-test Mean ± SD	15.60±3.87	17.70±1.87	17.10±2.94	17.55±3.35
Post-test Mean ± SD	9.60±2.95	13.20±2.09	12.90±1.77	15.75±2.97
Mean Change (Post−Pre)	−6.00	−4.50	−4.20	−1.80
Cohen's d (effect size)	**1.74 (VL)**	2.27 (VL)	1.73 (VL)	0.57 (M)
p-value (paired t-test)	**<0.001**	<0.001	<0.001	<0.001
Between-Group ANOVA: $F(3,76)=20.346$, $p<0.001$, $\eta^2=0.445$ (Large)				
DASS-21 Anxiety Subscale (lower = less anxiety)				
Pre-test Mean ± SD	14.60±4.45	17.90±3.58	17.10±3.75	19.10±2.65
Post-test Mean ± SD	8.15±2.64	12.80±2.86	12.90±2.94	15.45±3.75
Mean Change (Post−Pre)	−6.45	−5.10	−4.20	−3.65
Cohen's d (effect size)	**1.76 (VL)**	1.57 (VL)	1.25 (VL)	1.12 (L)
p-value (paired t-test)	**<0.001**	<0.001	<0.001	<0.001
Between-Group ANOVA: $F(3,76)=19.570$, $p<0.001$, $\eta^2=0.436$ (Large)				
DASS-21 Stress Subscale (lower = less stress) — 2nd highest between-group effect in study				
Pre-test Mean ± SD	19.75±3.32	18.40±3.22	17.80±2.59	19.35±2.85
Post-test Mean ± SD	11.80±2.59	11.10±1.65	12.10±2.00	17.45±2.70
Mean Change (Post−Pre)	−7.95	−7.30	−5.70	−1.90
Cohen's d (effect size)	**2.67 (VL)**	2.85 (VL)	2.47 (VL)	0.68 (M)
p-value (paired t-test)	**<0.001**	<0.001	<0.001	<0.001
Between-Group ANOVA: $F(3,76)=32.957$, $p<0.001$, $\eta^2=0.565$ (Large — 2nd strongest in study)				

Note. Values = Mean ± SD (n = 20 per group). Paired t-test df = 19. All within-group $p < 0.001$. Cohen's d: Very Large (VL) > 1.2; Large (L) 0.8–1.2; Medium (M) 0.5–0.8; Small (S) < 0.5. Between-group ANOVA df(3, 76). $\eta^2 > 0.14$ = Large effect. Ctrl = Medical Management Only; Interv = Non-Invasive Physiotherapy Intervention; Homemkr = Homemaker. DASS-21 severity bands (Depression): normal 0–9, mild 10–13, moderate 14–20. Anxiety: normal 0–7, severe ≥ 15. Stress: normal 0–14, severe ≥ 26.

3.2 Depression: The Social Cost of Oligomenorrhea and Infertility

All four groups demonstrated significant post-intervention depression reductions (all $p < 0.001$; Table 1). **Group A** (working women + non-invasive intervention) achieved the greatest reduction of **−6.00 points** (post: 9.60 ± 2.95; Cohen's d = 1.74, very large), transitioning from the moderate depression range at baseline into the mild depression boundary at post-intervention — the only group to achieve categorical clinical recovery. This transition represents a meaningful improvement in daily social functioning, workplace participation and domestic wellbeing that goes beyond statistical significance.

Group B (homemaker + intervention) reduced by −4.50 points (post: 13.20; d = 2.27, very large) and **Group C** (working + medical management) by −4.20 points (post: 12.90; d = 1.73, very large). The near-identical

post-test scores of Groups B and C (13.20 and 12.90 respectively) constitute a **sociocultural equivalence finding**: structured non-invasive intervention provides homemaker women with depression relief equivalent to that derived by working women from their occupational environment combined with medical management alone. This equivalence holds across a 12-week period — a clinically and socially meaningful timeframe.

Group D (homemaker + medical management only) showed only −1.80 points change (post: 15.75 ± 2.97; d = 0.57, medium), remaining firmly in the moderate depression range. The **6.15-point post-test gap between Group A (9.60) and Group D (15.75)** — spanning from near-normal to moderate depression — represents the social and clinical cost of providing homemaker women with pharmacological management without structured psychosocial support. Between-group ANOVA: $F(3,76) = 20.346$, $p < 0.001$, $\eta^2 = 0.445$, with group membership explaining 44.5% of post-intervention depression variance.

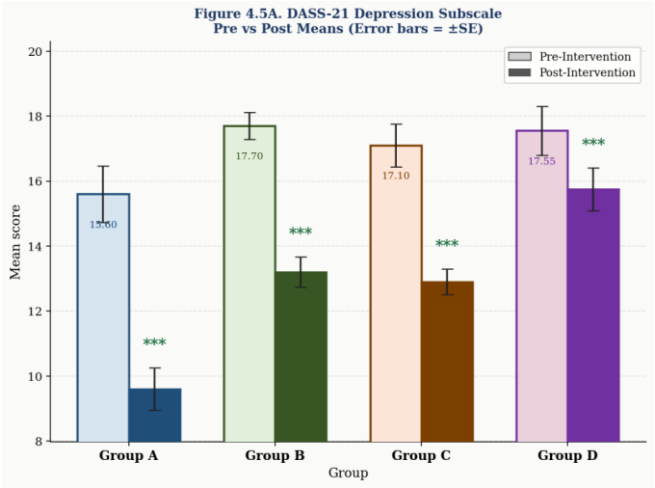

*Fig. 1A. DASS-21 Depression: Pre- and Post-Intervention Group Means (±SE). Lower scores = improvement. *** p < 0.001 for all groups. Group A achieves the lowest post-test score (9.60), crossing below the mild-depression threshold. Group D post-bar (15.75) barely differs from its pre-bar (17.55), confirming negligible depression relief from medical management alone in homemaker women with oligomenorrhea and infertility-related PCOS.*

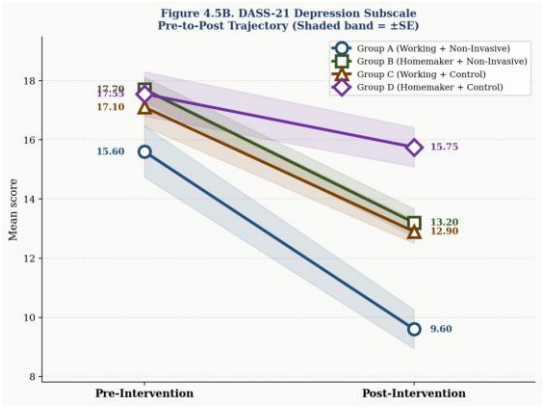

Fig. 1B. DASS-21 Depression: Pre-to-Post Trajectory Lines by Group. Group A shows the steepest descent (15.60 → 9.60). Groups B and C converge at post-test (13.20 and 12.90), demonstrating the sociocultural equivalence of structured intervention for homemakers and occupational structure for working women. Group D near-flat trajectory isolates homemaker women on medical management as the least improved group.

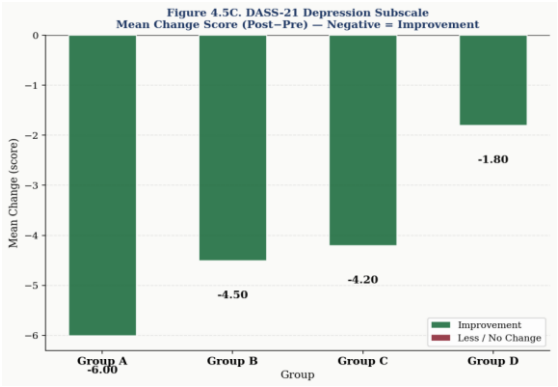

Fig. 1C. DASS-21 Depression: Mean Change Scores (Post−Pre) by Group. Group A bar deepest (−6.00). Groups B and C show comparable deep green bars (−4.50, −4.20). Group D red bar (−1.80) barely extends from zero — the visual representation of inadequate psychological care for homemaker women bearing the reproductive burden of oligomenorrhea and infertility in PCOS.

3.3 Anxiety: Occupational Structure as a

Psychological Buffer

Group D entered the study with the highest baseline anxiety of any group (19.10 ± 2.65 — severe range), consistent with evidence that homemaker women facing fertility pressure and social isolation in South Asian urban settings carry a heightened anxiety burden (Misra and Khurana, 2011). Despite achieving a statistically significant reduction (−3.65 points; d = 1.12, large), Group D remained in the severe anxiety band at post-intervention (15.45 ± 3.75) — a finding of direct relevance to women's health policy in this sociocultural context.

Group A achieved the largest anxiety reduction in the study (**−6.45 points**; post: 8.15 ± 2.64; d = 1.76, very large) — the only group to cross the threshold from clinically significant anxiety into the normal anxiety range (≤ 7). This transition illustrates the combined effect of structured physiotherapy — which provides direct neuroautonomic regulation — and the inherent anxiety-buffering properties of occupational structure. **Groups B and C** again converged at post-test (12.80 and 12.90), extending the sociocultural equivalence pattern observed in the depression data. Between-group ANOVA: $F(3,76) = 19.570$, $p < 0.001$, $\eta^2 = 0.436$.

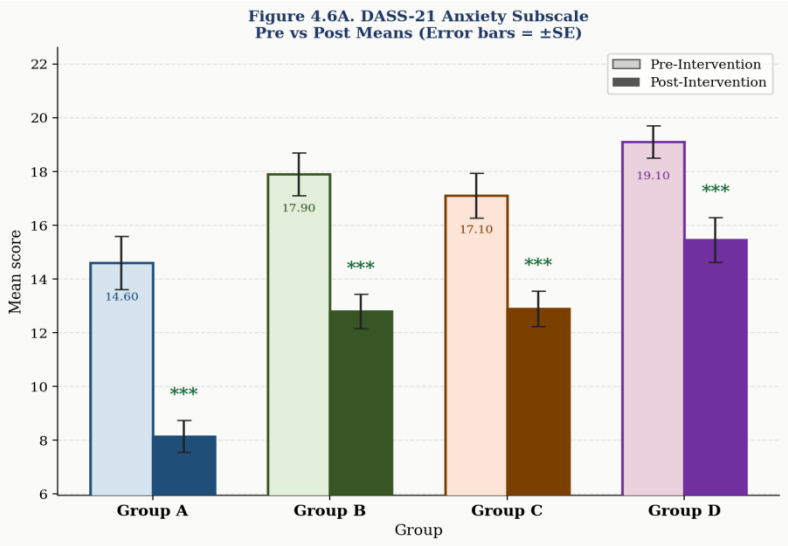

Fig. 2A. DASS-21 Anxiety: Pre- and Post-Intervention Group Means (±SE). Group D entered and remained with the highest anxiety score (baseline: 19.10; post: 15.45 — severe range). Group A is the only group to reach the normal anxiety range at post-test (8.15). Groups B and C show near-identical post-test bars, confirming sociocultural equivalence.

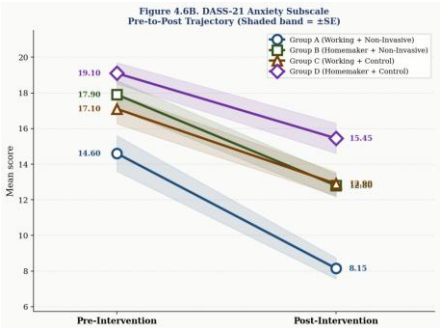

Fig. 2B. DASS-21 Anxiety: Pre-to-Post Trajectory Lines. Group A crosses below all other groups by post-test (8.15). Groups B and C converge almost exactly at post-test (12.80, 12.90). Group D descends least steeply (19.10 → 15.45) despite the highest baseline — confirming that pharmacological management cannot compensate for the anxiety-buffering absent from homemaker women's social environment.

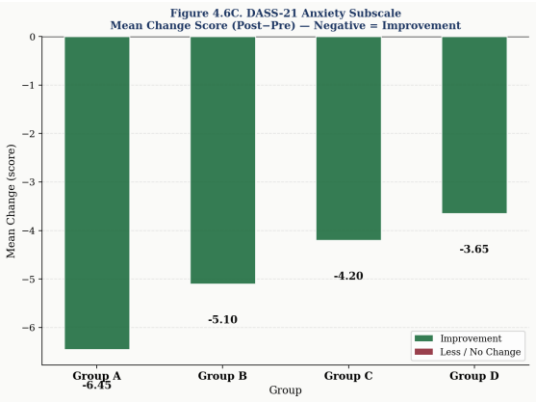

Fig. 2C. DASS-21 Anxiety: Mean Change Scores. Group A deepest bar (−6.45). Groups B and C show substantial reductions (−5.10, −4.20). Group D (−3.65), while statistically significant, leaves this group in the severe anxiety band — a finding with direct implications for gendered social support policy in women with PCOS-related infertility.

3.4 Stress: The Most Sociocultural Outcome — and the Most Urgent Finding

DASS-Stress produced the **second-highest between-group effect size in the entire trial** ($F(3,76) = 32.957$, $p < 0.001$, $\eta^2 = 0.565$), with group membership explaining 56.5% of post-intervention stress variance. This is not coincidental. Stress — capturing difficulty relaxing, nervous arousal, irritability and persistent tension — is the psychological dimension most directly shaped by sociocultural environment: the daily accumulation of fertility-related pressure, reproductive uncertainty, domestic role confinement and lack of structured psychological relief that characterises the lives of homemaker women with PCOS in South Asian urban contexts.

Groups A (**−7.95 points**; post: 11.80 ± 2.59; d = 2.67, very large) and B (**−7.30 points**; post: 11.10 ± 1.65; d = 2.85, very large) achieved near-8-point reductions, moving from the severe stress category into the mild stress range. Their convergent post-test values (A: 11.80; B: 11.10) — representing equivalent stress outcomes for both working and homemaker women when structured intervention is applied — constitute the most important finding of this paper: **the non-invasive programme fully equalises the stress outcomes of women with and without occupational structure.**

Group C achieved a very large reduction (−5.70; d = 2.47), confirming substantial stress relief even from medical management in working women who benefit from occupational structure. **Group D** — homemaker women on medical management only — reduced by only −1.90 points (post: 17.45 ± 2.70; d = 0.68, medium), remaining in the severe stress category. The **5.65-point post-test gap between Group A (11.80) and Group D (17.45)** is the most clinically and socially urgent finding in this paper: homemaker women bearing the reproductive burden of oligomenorrhea and infertility, managed only pharmacologically, continue to carry a severe chronic stress burden with no structured relief mechanism. This burden perpetuates the neuroendocrine cycle underpinning both the psychological and reproductive pathology of their PCOS.

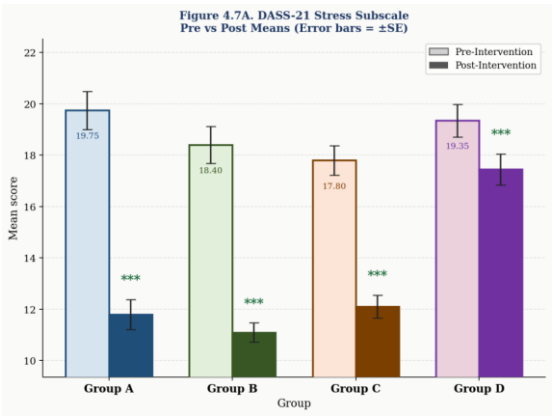

Fig. 3A. DASS-21 Stress: Pre- and Post-Intervention Group Means (±SE). All groups enter with severely elevated stress (17.80–19.75/42). Groups A, B and C post-bars drop dramatically to the 11–12 range. Group D post-bar (17.45) remains nearly as tall as its pre-bar (19.35) — visually confirming that pharmacological management alone cannot disrupt the chronic stress architecture of homemaker women with PCOS-related oligomenorrhea and infertility.

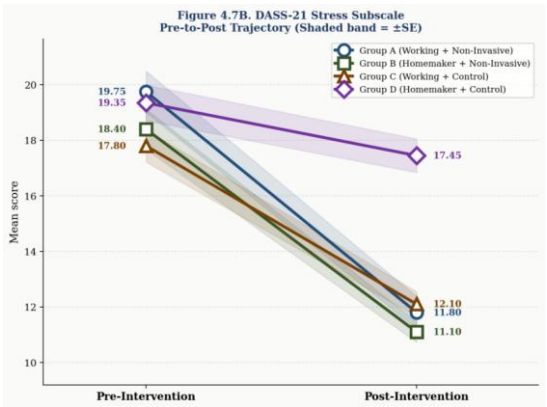

Fig. 3B. DASS-21 Stress: Pre-to-Post Trajectory Lines. Three steep parallel descents (Groups A, B, C) contrast

against Group D's near-horizontal trajectory — the defining visual of this paper. The convergence of Groups A and B at post-test (~11.5) demonstrates that the non-invasive intervention fully compensates for the absence of occupational stress-buffering in homemaker women.

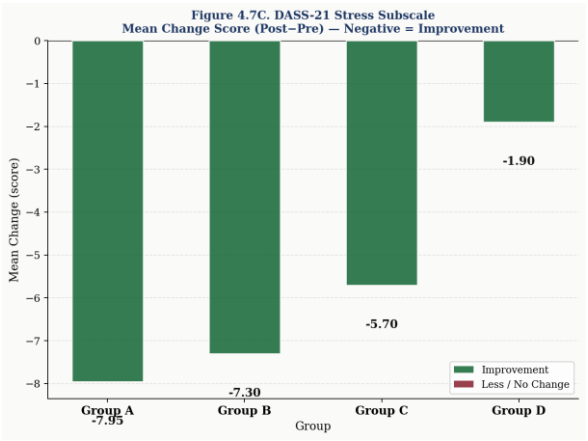

Fig. 3C. DASS-21 Stress: Mean Change Scores. Groups A (−7.95) and B (−7.30) show the deepest green bars in the study. Group D red bar (−1.90) is approximately one-quarter the depth of Group A — representing four times less stress reduction for homemaker women on medical management, the group most burdened by the sociocultural consequences of oligomenorrhea and infertility in PCOS.

4 DISCUSSION

4.1 Reproductive Morbidity as a Source of Sociocultural Psychological Burden

The psychological consequences of oligomenorrhea and infertility in PCOS are not merely clinical sequelae of hormonal dysregulation; they are socioculturally constructed and socioculturally amplified. This study provides the first RCT evidence that occupational context — working versus homemaker status — significantly moderates the psychological burden of these reproductive morbidities and their response to structured intervention, with between-group ANOVA η^2 values of 0.436–0.565 demonstrating that social context explains a substantial proportion of post-intervention variance.

The burden of irregular menstruation in PCOS disrupts every dimension of women's daily social lives: occupational attendance and performance, intimate relationships, social planning and the anticipation of normal female lifecycle events (Jones et al., 2008; Kitzinger and Willmott, 2002). Infertility in PCOS — particularly in South Asian cultural contexts — generates a layer of social stigma, relational pressure and identity threat that amplifies the underlying biological distress into a comprehensive sociocultural crisis (Gurunath et al., 2011; Dokras, 2012). For homemaker women, this crisis occurs in a social environment already characterised by reduced structured activity, limited peer support and heightened exposure to family fertility pressure — a context that maximises psychological vulnerability (Misra and Khurana, 2011; Raval et al., 2015). The present findings quantify this vulnerability: Group D's persistent severe stress, moderate depression and severe anxiety at post-intervention despite pharmacological management represent the measurable cost of failing to address the sociocultural dimensions of PCOS psychological burden.

4.2 Occupational Context as Moderator: Social Science Interpretation

The most theoretically important finding of this study is the **sociocultural equivalence** of Groups B and C across all three DASS-21 subscales at post-test. Group B (homemaker + non-invasive intervention) and Group C (working + medical management) achieved near-identical depression scores (13.20 and 12.90), near-identical anxiety scores (12.80 and 12.90) and comparable stress scores (11.10 and 12.10) — despite being in opposite corners of the study design: different occupational status and different treatment modality.

This equivalence has a compelling sociological interpretation: structured non-invasive intervention functions as a social environmental compensator for homemaker women, providing them with the psychological protective elements — routine, purpose, physical engagement, social contact, skill acquisition and self-efficacy — that occupational structure provides naturally to working women. This is precisely the mechanism predicted by self-determination theory (Deci and Ryan, 2000) and supported by evidence from women's psychological health programmes in South Asian contexts (Goyal and Sapra, 2019; Crete and Adamshick, 2011). The present study provides the first quantitative RCT evidence for this compensatory mechanism in PCOS.

The superior outcomes of Group A (working + intervention) over Group B (homemaker + intervention) in depression and anxiety further demonstrate a multiplicative effect: working women derive benefit from both the non-invasive programme and the inherent protective properties of occupational structure simultaneously. This finding argues for the strategic prioritisation of homemaker

women in PCOS psychological care, where the programme must compensate entirely for absent occupational structure rather than merely supplement it.

4.3 Stress as the Most Sociocultural DASS-21 Subscale

The DASS-Stress finding ($\eta^2 = 0.565$) merits particular attention within a social sciences framework. Among the three DASS-21 subscales, stress is the dimension most directly generated by the structural features of women's daily social environment: the chronic accumulation of unresolvable demands, fertility pressure, domestic confinement and the absence of relaxation-enabling structures (Conrad and Roth, 2007; Escobar-Morreale, 2018). In PCOS, this chronic stress is not merely symptomatic — it is pathogenically central, sustaining cortisol hypersecretion that disrupts GnRH pulsatility and perpetuates the oligomenorrhea and anovulatory infertility that define the condition (González, 2012). Reducing stress through non-invasive intervention therefore acts at both the psychological and reproductive levels simultaneously.

The near-convergent post-intervention stress scores of Groups A and B (~11.5) are the study's most consequential finding from a policy perspective. They demonstrate that a 12-week structured programme can fully equalise the stress burden of working and homemaker women with PCOS — effectively providing homemakers with the same stress-protective benefits that structured employment provides to working women, but through a formalised, deliverable health programme. This finding provides the evidence base for policy recommendations advocating group-based structured physiotherapy and wellbeing programmes in PCOS community care, targeted specifically at homemaker populations.

4.4 Implications for Women's Health Policy and Sociocultural Practice

Three policy-level implications follow directly from these findings. First, occupational status should be assessed as a routine component of PCOS psychological evaluation. The present data demonstrate that homemaker women with PCOS constitute a distinct and high-risk psychological subgroup whose needs are systematically unmet by pharmacological management alone. Identification at clinical intake enables targeted referral to structured intervention programmes.

Second, structured group-based non-invasive programmes should be prescribed as standard of care for homemaker women with PCOS, positioned explicitly as social environment intervention — providing routine, social engagement and physical activity — and not merely as symptom management. The equivalence of Groups B and C demonstrates that such programmes can fully compensate for the psychological protection otherwise provided only by occupational structure.

Third, community and public health programmes addressing the reproductive and psychological burden of PCOS should incorporate sociocultural components targeting the intersection of fertility distress, occupational isolation and chronic stress — particularly in South Asian urban settings where cultural fertility pressure amplifies the psychological consequences of oligomenorrhea and infertility beyond what pharmacological management can address.

5 CONCLUSIONS

This randomised controlled trial demonstrates that a structured 12-week multimodal non-invasive physiotherapy programme produces large, clinically meaningful reductions in DASS-21 depression (η^2=0.445), anxiety (η^2=0.436) and stress (η^2=0.565) in women with PCOS whose reproductive burden includes confirmed oligomenorrhea. Occupational status significantly moderates psychological treatment response: homemaker women receiving medical management only (Group D) remained in the severe stress and moderate depression categories at post-intervention, constituting the most psychologically underserved group in the study. The convergent post-intervention psychological scores of homemaker women in the intervention group (Group B) and working women in the medical management group (Group C) provide the first RCT evidence that structured non-invasive physiotherapy functions as a sociocultural compensator — providing homemaker women with the psychological protection that occupational structure provides naturally to working women.

These findings contribute simultaneously to the clinical literature on PCOS management and to the social sciences literature on occupational determinants of women's psychological wellbeing. They support the integration of structured non-invasive physiotherapy — combining progressive muscle relaxation, combined exercise and visceral manipulation — as a mandatory component of comprehensive PCOS care in South Asian clinical settings, with priority delivery to homemaker women bearing the dual burden of reproductive morbidity and social structural disadvantage. Future

research should examine the long-term durability of these effects, explore the sociocultural mechanisms of occupational moderation through qualitative methods, and evaluate group-based delivery models in community health settings.

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AUTHOR CONTRIBUTIONS

S. Khan: Conceptualisation, study design, participant recruitment, data collection, statistical analysis, original draft preparation. T. Fahim: Conceptualisation, supervision, critical revision and approval of final manuscript. All authors read and approved the submitted version.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest relevant to this work.

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DATA AVAILABILITY

Data supporting these findings are available from the corresponding author upon reasonable request, subject to institutional ethics committee approval (WWET/2025/IEC-AP/30).

REFERENCES

1. Almhmoud, B., Almhmoud, S. and Al-Khateeb, T. (2024) Polycystic ovary syndrome as a multidimensional condition: cardiometabolic, psychological and endocrine perspectives. Frontiers in Endocrinology, Vol. 15, 1354200.
2. Atinga, R. A., Alhassan, R. K. and Salihu, D. (2025) Depression and anxiety among women of reproductive age with polycystic ovary syndrome in low- and middle-income countries: a systematic review and meta-analysis. PLOS ONE, Vol. 20, No. 2, e0312774.
3. Azziz, R., Carmina, E., Chen, Z., Dunaif, A., Laven, J. S. E., Legro, R. S., Lizneva, D., Natterson-Horowtiz, B., Teede, H. J. and Yildiz, B. O. (2016) Polycystic ovary syndrome. Nature Reviews Disease Primers, Vol. 2, 16057.
4. Barry, J. A., Kuczmierczyk, A. R. and Hardiman, P. J. (2011) Anxiety and depression in polycystic ovary syndrome: a systematic review and meta-analysis. Human Reproduction, Vol. 26, No. 9, pp. 2442–2451.
5. Bozdag, G., Mumusoglu, S., Zengin, D., Karabulut, E. and Yildiz, B. O. (2016) The prevalence and phenotypic features of polycystic ovary syndrome: a systematic review and meta-analysis. Human Reproduction, Vol. 31, No. 12, pp. 2841–2855.
6. Conrad, A. and Roth, W. T. (2007) Muscle relaxation therapy for anxiety disorders: it works but how? Journal of Anxiety Disorders, Vol. 21, No. 3, pp. 243–264.
7. Crete, J. and Adamshick, P. (2011) Managing polycystic ovary syndrome: what our patients are telling us. Journal of Holistic Nursing, Vol. 29, No. 4, pp. 256–266.
8. Deci, E. L. and Ryan, R. M. (2000) The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. Psychological Inquiry, Vol. 11, No. 4, pp. 227–268.
9. Dokras, A. (2012) Mood and anxiety disorders in women with PCOS. Steroids, Vol. 77, No. 4, pp. 338–341.
10. Dybciak, P., Tarkowski, R., Humeniuk, E. and Raczkiewicz, D. (2023) Depression in women with polycystic ovary syndrome: a meta-analysis of observational studies. Journal of Clinical Medicine, Vol. 12, No. 4, 1252.
11. Escobar-Morreale, H. F. (2018) Polycystic ovary syndrome: definition, aetiology, diagnosis and treatment. Nature Reviews Endocrinology, Vol. 14, No. 5, pp. 270–284.
12. González, F. (2012) Inflammation in polycystic ovary syndrome: underpinning of insulin resistance and ovarian dysfunction. Steroids, Vol. 77, No. 4, pp. 300–305.
13. Goyal, A. and Sapra, M. (2019) Work-life balance and health of working women in India. Indian Journal of Community Medicine, Vol. 44, No. 3, pp. 181–186.
14. Gurunath, S., Pandian, Z., Anderson, R. A. and Bhattacharya, S. (2011) Defining infertility: a systematic

review of prevalence studies. Human Reproduction Update, Vol. 17, No. 5, pp. 575–588.
15. Jones, G. L., Hall, J. M., Balen, A. H. and Ledger, W. L. (2008) Health-related quality of life measurement in women with polycystic ovary syndrome: a systematic review. Human Reproduction Update, Vol. 14, No. 1, pp. 15–25.
16. Kitzinger, C. and Willmott, J. (2002) The thief of womanhood: women's experience of polycystic ovarian syndrome. Social Science and Medicine, Vol. 54, No. 3, pp. 349–361.
17. Lovibond, S. H. and Lovibond, P. F. (1995) Manual for the Depression Anxiety Stress Scales, 2nd edition. Psychology Foundation, Sydney.
18. Misra, A. and Khurana, L. (2011) The metabolic syndrome in South Asians: epidemiology, determinants and prevention. Metabolic Syndrome and Related Disorders, Vol. 7, No. 6, pp. 497–514.
19. Nagpal, S. and Bhargava, M. (2018) Professional stress among working women. Indian Journal of Positive Psychology, Vol. 9, No. 2, pp. 278–281.
20. Patten, R. K., Boyle, R. A., Moholdt, T., Kiel, I., Hopkins, W. G., Harrison, C. L. and Woodward, A. (2020) Exercise interventions in polycystic ovary syndrome: a systematic review and meta-analysis. Frontiers in Physiology, Vol. 11, 606.
21. Patel, N., Pazdernik, V., Lambert, M., Hickman, L. and Feldman, M. (2020) The effect of yoga on physical and psychological outcomes in women with polycystic ovary syndrome: a systematic review and meta-analysis. Journal of Alternative and Complementary Medicine, Vol. 26, No. 11, pp. 966–975.
22. Raval, A. D., Dhanaraj, E., Bhansali, A., Grover, S. and Tiwari, P. (2015) Prevalence and determinants of depression in type 2 diabetes patients in a tertiary care centre. Indian Journal of Medical Research, Vol. 132, No. 2, pp. 195–200.
23. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group (2004) Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertility and Sterility, Vol. 81, No. 1, pp. 19–25.
24. Sinha, B., Sinha, S. and Sinha, S. (2018) Yoga therapy for polycystic ovarian syndrome: a review. International Journal of Yoga, Vol. 11, No. 3, pp. 161–167.
25. Teede, H. J., Misso, M. L., Costello, M. F., Dokras, A., Laven, J., Moran, L., Piltonen, T. and Norman, R. J. (2018) Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Human Reproduction, Vol. 33, No. 9, pp. 1602–1618.
26. Thomson, R. L., Buckley, J. D., Noakes, M., Clifton, P. M., Norman, R. J. and Brinkworth, G. D. (2008) The effect of a hypocaloric diet with and without exercise training on body composition, cardiometabolic risk profile and reproductive function in overweight and obese women with polycystic ovary syndrome. Journal of Clinical Endocrinology and Metabolism, Vol. 93, No. 9, pp. 3373–3380.
27. Tozzi, P. (2015) A unifying neuro-fasciagenic model of somatic dysfunction: underlying mechanisms and treatment. Journal of Bodywork and Movement Therapies, Vol. 19, No. 2, pp. 310–326.