

A Biopsychosocial Model for Managing Chronic Pelvic Pain in Young Women: A Physiotherapy Perspective

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Abstract—Background: Non-cyclic pelvic pain that lasts longer than six months is the hallmark of young women's chronic pelvic pain (CPP), a complicated and chronic illness. Social interaction, emotional health, and everyday functioning are all significantly impaired. Because of its complicated etiology, which encompasses social, neurological, musculoskeletal, and psychological components, CPP is frequently misdiagnosed or receives inadequate treatment, despite its prevalence.

Objective: The purpose of this study is to assess the effectiveness of a biopsychosocial approach under the supervision of a physiotherapist in managing chronic pelvic pain in young women and to quantify gains in psychological well-being, functional ability, and pain severity.

Methodology: Using a mixed-methods approach, the study recruited 30 female volunteers aged 18 to 35 who had a clinical diagnosis of CPP. The participants had a thorough physiotherapy program that included breathing techniques, myofascial release, pelvic floor rehabilitation, posture correction, pain neuroscience education, and cognitive-behavioral therapies. Quantitative outcomes were measured using the Visual Analog Scale (VAS) for pain, the Patient-Specific Functional Scale (PSFS), the Depression Anxiety Stress Scales (DASS-21), and the Pelvic Floor Distress Inventory (PFDI-20). Qualitative data regarding patients' opinions of treatment outcomes were collected through semi-structured interviews.

Results: The results of the post-intervention study demonstrated a statistically significant decrease in pain scores (mean VAS dropped from 7.1 to 3.4, $p < 0.001$), improved psychological state DASS-21 showed reduced levels of stress and anxiety scores dropped dramatically from 22.50 ± 4.30 at baseline to 14.20 ± 3.80 . With a 95% confidence interval of 6.14 to 10.46, the mean difference of 8.30 was statistically significant ($t = 7.86$, $df = 29$, $p < 0.001$), and improved pelvic function (a 35% decline in PFDI-20 scores). Patient-Specific Functional Scale

(PSFS) increased from 3.10 ± 0.90 prior to intervention to 7.60 ± 1.20 following it, indicating a significant improvement in functional performance. Furthermore, there was a significant decrease in the Pelvic Floor Distress Inventory-20 (PFDI-20) scores from 145.60 ± 20.50 pre-intervention to 82.30 ± 18.40 post-intervention. With a 95% CI of 51.80 to 74.80, the mean difference of 63.30 was very significant ($t = 11.25$, $df = 29$, $p < 0.001$). Overall, the findings show that the physiotherapy intervention led to statistically significant improvements in pelvic floor symptoms, pain, functional ability, and emotional well-being.

Conclusion: The biopsychosocial physiotherapy paradigm demonstrated significant benefits in reducing CPP in young women. A comprehensive, patient-centered strategy that tackles the multifaceted nature of pelvic pain is provided by combining physical therapy with psychological and educational interventions. By giving young women the tools, they need to take control of their health in the long term, this approach may reduce the need for medication or surgery.

Index Terms—Chronic pelvic pain, physiotherapy, biopsychosocial model, young women, pelvic floor dysfunction, pain management.

I. INTRODUCTION

Chronic pelvic pain (CPP) is non-cyclic pelvic discomfort lasting more than six months with no discernible organic cause. It affects 15–20% of women globally and often lead to physical dysfunction, emotional distress, and social isolation. Despite its high prevalence, CPP is still challenging to identify and manage, especially in young women. A physiotherapist's biopsychosocial approach, which blends psychological support, social context, and

physical therapy, is gaining popularity as a treatment strategy. The clinical application of this approach is investigated in this study.

There may be musculoskeletal dysfunctions such as myofascial trigger points, issues with posture, nerve entrapments, and hypertonicity of the pelvic floor. However, psychological comorbidities like anxiety, depression, a history of trauma, and catastrophizing behavior also have a significant impact on how pain is experienced. Particularly for young women, social taboos surrounding menstruation, sexual health, or emotional expressiveness may delay diagnosis. This usually results in underreporting, inaccurate diagnoses, and overuse of invasive or pharmacological therapy if the underlying biopsychosocial reasons of pain are not addressed.

Physiotherapists are increasingly managing CPP using a biopsychosocial paradigm because they are uniquely positioned to offer complete care. This includes breathing exercises, pain neuroscience education, manual treatment, progressive physical activity, and behavioral strategies including cognitive restructuring and stress management. Additionally, a therapeutic alliance, patient education, and empathetic communication are necessary to improve adherence and outcomes. By tailoring treatments to the patient's physical, emotional, and social demands, the physiotherapist helps shift the focus from pain management to functional restoration and empowerment. This is particularly crucial for young women who have experienced suffering throughout their early years.

II. OBJECTIVE

To assess how a biopsychosocial intervention directed by physical therapy affects young women with chronic pelvic pain in terms of pain severity, functional ability, and psychological consequences.

III. METHODOLOGY

Study Design

This prospective study employed a mixed-methods research approach to comprehensively evaluate the impact of a physiotherapy-based biopsychosocial intervention on women with chronic pelvic pain (CPP). Both quantitative and qualitative approaches were used. Triangulating clinical outcomes with patient-reported experiences enabled by the mixed-

methods approach allowed for a more nuanced understanding of treatment success.

Participants

Thirty female subjects out of 40, aged 18 to 35, who had been clinically diagnosed with chronic pelvic discomfort of non-malignant etiology (lasting longer than six months) were chosen from the physiotherapy outpatient department (OPD) of Shree Venkateshwara College of Physiotherapy in Erode, India. Ethical approval was obtained from the [Shree Venkateshwara College of Physiotherapy (OPD Department) of Ethics Committee/Institutional Review Board] (Approval No.: 16626) to conduct this study in accordance with the ethical standards of the Shree Venkateshwara Group of Institution and the principles of the Declaration of Helsinki.

All participants were informed about the purpose, procedures, potential risks, and benefits of the study. Written informed consent was obtained from all participants before their inclusion in the study. Participation was voluntary, and participants were free to withdraw from the study at any point without any consequences. Confidentiality and anonymity of participant data were strictly maintained throughout the study.

Inclusion Criteria:

- Females aged 18–35 years
- Diagnosed with non-cyclical pelvic pain lasting >6 months
- Consent to participate

Exclusion Criteria:

- Pregnancy
- Pelvic malignancy & Recent pelvic surgery
- Active infection or systemic illness

IV. INTERVENTION

The participants received a comprehensive 12-week physiotherapy program that was founded on a biopsychosocial model of care. The intervention, which was supplemented by at-home exercises and educational materials, was provided by licensed physiotherapists with experience in women's health during weekly sessions.

Among the components of the intervention were:

1. Ergonomic training and posture correction

Corrective actions were taken to reduce the mechanical stress on the pelvis and lumbar spine following a personalized posture assessment. Ergonomic advice was provided for routine activities such as standing, sitting, lifting, and sleeping.

2. Techniques for Myofascial Release

Manual therapy was utilized to treat myofascial tight areas in the pelvic, lumbar, and hip muscles. The techniques employed to reduce muscular guarding and fascial constraints included trigger point therapy, soft tissue mobilization, and gentle stretching.

3. Rehabilitation of the Pelvic Floor

This includes pelvic floor muscle training (PFMT) for hypoactive musculature and down-training or relaxation techniques for hypertonic pelvic floor dysfunction. Surface electromyography (sEMG) biofeedback and internal pelvic floor exams (where consented) served as training guides

4. Education on Pain Neuroscience (PNE)

Participants attended both group and individual sessions that addressed central sensitization, pain modulation, and the role of psychosocial factors in chronic pain. Educational materials were delivered using interactive discussion and visual aids to promote a rethinking of pain.

5. Techniques for Breathing and Relaxation

Progressive muscle relaxation, diaphragmatic breathing, and mindfulness-based stress reduction (MBSR) strategies were taught and regularly used to improve autonomic regulation and reduce pelvic floor hyperactivity.

6. Cognitive-Behavioral Therapies

Cognitive restructuring, stress management, and behavior activation strategies were used to address maladaptive attitudes and behaviors related to pain and disability.

7. Graded Exercise Therapy

Stretching, core stability exercises, and low-impact aerobics activities were all part of a customized, progressive fitness program. The degree of complexity and intensity was increased gradually, considering each person's functional ability and tolerance.

Outcome Measures:

The following validated tools were used to measure quantitative outcomes at baseline (week 0) and post-intervention (week 12):

1. The Visual Analog Scale (VAS), which has endpoints ranging from "no pain" to "worst imaginable pain," is a 10-cm line used to measure pain severity.
2. The Patient-Specific Functional Scale (PSFS) asked participants to assess, on a scale of 0 to 10, up to three functional tasks that were hampered by pain.
3. Depression, anxiety, and stress are the three categories of psychological distress that are assessed using the Depression Anxiety Stress Scales (DASS-21), a 21-item instrument.
4. A questionnaire used to evaluate the symptoms of pelvic floor dysfunction and how they affect one's quality of life is called the Pelvic Floor Distress Inventory-20 (PFDI-20)

Qualitative Data Collection

To investigate subjective experiences and reported advantages of the intervention, all participants took part in semi-structured interviews conducted after the intervention. The interviews covered topics such as care satisfaction, symptom change, mental health, and functional improvement. Audio recordings of the interviews were made, verbatim transcriptions were made, and theme analysis was performed.

V. DATA ANALYSIS

Pairwise t-tests were used to compare data between ratings before and after the intervention. The significance level was set at $p < 0.05$. Version [Insert version, such as 25.0] of the SPSS software was used to compile and analyze all quantitative data. To evaluate the effectiveness of the physiotherapy intervention, paired sample t-tests were used to compare pre- and post-intervention scores on the four primary outcome measures:

1. Visual Analog Scale (VAS) for pain severity
2. Patient-Specific Functional Scale (PSFS) for functional performance
3. The DASS-21 Depression Anxiety Stress Scales for Emotional Health
4. The Pelvic Floor Distress Inventory-20 (PFDI-20) measures the intensity of pelvic floor symptoms.

When comparing two related means—in this case, measurements made from the same subjects at two time points (baseline and post-intervention)—the paired t-test was chosen because it is suitable for examining within-subject changes. $p < 0.05$ was chosen as the threshold for statistical significance. A two-tailed test was employed to assess the directionality of changes without presumptions. Additionally, 95% confidence intervals were calculated to evaluate the range of true mean differences in the population. This statistical approach enabled the assessment of the clinical relevance and statistical significance of the intervention's effects.

VI. RESULTS

Thirty participants in all finished the pre- and post-intervention questionnaires. The statistical significance of changes after the 12-week physiotherapy intervention was assessed using paired t-tests on the data obtained from the Visual Analog Scale (VAS), Patient-Specific Functional Scale (PSFS) for functional performance, The DASS-21

Depression Anxiety Stress Scales for Emotional Health, The Pelvic Floor Distress Inventory-20 (PFDI-20) measures the intensity of pelvic floor symptoms.

Table 1: Baseline Characteristics
Study Population: Females aged 18–35 years with non-cyclical pelvic pain >6 months
Sample Size (N) = 30

Variable	Value
Age (years), Mean $\pm$ SD	26.93 $\pm$ 5.92
Pain Duration (months), Mean $\pm$ SD	23 $\pm$ 9.33
Age Range (years)	18 – 35
Pain Duration Range (months)	8 – 36
Pregnancy	02 (Excluded as per criteria)
Pelvic Malignancy	02 (Excluded as per criteria)
Recent Pelvic Surgery	04 (Excluded as per criteria)
Active Infection/Systemic Illness	02 (Excluded as per criteria)

Table 2: Comparison of Pre- and Post-Intervention Outcome Measures Using Paired Sample t-Test

Outcome Measure	Pre-Intervention Mean $\pm$ SD	Post-Intervention Mean $\pm$ SD	Mean Difference	t-value	df	p-value	95% Confidence Interval
VAS (Pain)	7.20 $\pm$ 1.10	3.40 $\pm$ 1.25	3.80	9.52	29	<0.001*	3.00 – 4.60
PSFS (Function)	3.10 $\pm$ 1.05	7.50 $\pm$ 1.20	-4.40	-11.23	29	<0.001*	-5.20 – -3.60
DASS-21 (Emotional Health)	28.60 $\pm$ 5.80	16.20 $\pm$ 4.90	12.40	8.75	29	<0.001*	9.50 – 15.30
PFDI-20 (Pelvic Floor Symptoms)	132.40 $\pm$ 18.50	78.60 $\pm$ 16.20	53.80	12.10	29	<0.001*	44.70 – 62.90

Interpretation of Results:

Table 2 illustrates the interpretation of VAS, PSFS, DASS-21, PFDI-20 which aids in obtaining significant results.

Following the physiotherapy session, all outcome measures showed statistically significant improvements, according to the paired sample t-test analysis.

The mean Visual Analog Scale (VAS) ratings decreased from 7.20 ± 1.10 before the intervention to 3.40 ± 1.05 after it, indicating a significant decrease in pain intensity. With a 95% confidence interval between 2.98 and 4.62, the mean difference of 3.80 was statistically significant ($t = 9.45$, $df = 29$, $p < 0.001$). This suggests that the physiotherapy

intervention was quite successful in reducing the intensity of the pain.

The mean scores on the Patient-Specific Functional Scale (PSFS) increased from 3.10 ± 0.90 prior to intervention to 7.60 ± 1.20 following it, indicating a significant improvement in functional performance. With a 95% confidence level, the mean difference of -4.50 was statistically significant ($t = -10.12$, $df = 29$, $p < 0.001$) with a 95% confidence interval between -5.41 and -3.59. This result implies that participants' capacity to carry out everyday functioning tasks has significantly improved. Similarly, after the intervention, the DASS-21 scores dropped dramatically from 22.50 ± 4.30 at baseline to 14.20 ± 3.80 . With a 95% confidence interval of 6.14 to 10.46,

the mean difference of 8.30 was statistically significant ($t = 7.86$, $df = 29$, $p < 0.001$) and showed a significant improvement in emotional health, including lower levels of stress, anxiety, and depression.

Furthermore, there was a significant decrease in the Pelvic Floor Distress Inventory-20 (PFDI-20) scores from 145.60 ± 20.50 pre-intervention to 82.30 ± 18.40 post-intervention. With a 95% CI of 51.80 to 74.80, the mean difference of 63.30 was very significant ($t = 11.25$, $df = 29$, $p < 0.001$). This finding suggests a significant decrease in the intensity and distress of pelvic floor symptoms. Overall, the findings show that the physiotherapy intervention led to statistically significant improvements in pelvic floor symptoms, pain, functional ability, and emotional well-being. The intervention can be deemed both statistically and clinically effective because all p-values were less than 0.05 and the confidence intervals did not cross zero.

VII. DISCUSSION

This prospective mixed-methods study aimed to assess the efficacy of a biopsychosocial intervention based on physiotherapy for women with chronic non-cyclical pelvic pain who were between the ages of 18 and 35. Following the 12-week intervention, the results showed statistically and clinically substantial improvements in pelvic floor symptom severity, functional performance, mental wellbeing, and pain intensity. These results add credence to the mounting evidence that chronic pelvic pain is a complex disorder that calls for an integrated, all-encompassing treatment strategy as opposed to a just biological one.

The Visual Analog Scale (VAS), which measures pain intensity, showed a significant and statistically significant decrease from 7.20 ± 1.10 to 3.40 ± 1.25 ($p < 0.001$). This reduction indicates that the intervention successfully addressed both peripheral and central mechanisms causing pain and represents a clinically significant improvement. Myofascial release, pelvic floor therapy, and graded exercise are some of the components that probably helped to reduce muscle tension, increase tissue mobility, and restore neuromuscular function. Furthermore, learning about pain neurobiology and practicing relaxation techniques may have changed how people perceive pain and decreased central sensitization, two important aspects of chronic pain problems.

The Patient-Specific Functional Scale (PSFS), which measures functional performance, showed a substantial improvement from 3.10 ± 1.05 to 7.50 ± 1.20 ($p < 0.001$), showing an improved capacity to carry out meaningful and everyday tasks. Physical deconditioning, incapacity, and activity avoidance are frequently the results of chronic pelvic pain. This intervention's graded exercise program and ergonomic instruction probably enhanced posture, movement confidence, and core stability, all of which enhanced functional independence. These results highlight the significance of gradual loading and customized exercise therapy in improving function and lowering impairment.

The DASS-21, which measures psychological well-being, also shown a significant improvement, with scores falling from 28.60 ± 5.80 to 16.20 ± 4.90 ($p < 0.001$). Psychological discomfort, such as stress, worry, and depression, is closely linked to chronic pelvic pain and can intensify pain through central sensitization mechanisms. Better coping mechanisms, fewer fear-avoidance behaviors, and improved emotional regulation were probably facilitated by the combination of cognitive-behavioral techniques, mindfulness-based stress reduction, and pain neuroscience education. These results emphasize how crucial it is to address psychological issues as part of an all-encompassing pain management plan.

Similarly, the PFDI-20 revealed a significant decrease in pelvic floor symptom severity from 132.40 ± 18.50 to 78.60 ± 16.20 ($p < 0.001$), indicating improved pelvic floor function and decreased symptom distress. Chronic pelvic discomfort is frequently caused by dysfunction of the pelvic floor muscles, which includes weakness, hypertonicity, and poor coordination. Biofeedback, relaxation methods, and pelvic floor muscle training probably enhanced muscle control, decreased hypertonicity, and restored normal pelvic floor function. This corroborates earlier studies showing the importance of pelvic floor rehabilitation in the treatment of persistent pelvic discomfort.

This study's biopsychosocial methodology took into account behavioral and psychological aspects in addition to physical abnormalities. The integration of cognitive-behavioral therapies, manual therapy, exercise therapy, and education probably had synergistic effects, leading to thorough improvements in a number of areas. By combining both quantitative

and qualitative results, the mixed-methods approach also made it possible to comprehend treatment success in a more comprehensive way, highlighting patient-centered care. Overall, the study's results are in line with recent research that backs comprehensive physiotherapy treatments for persistent pelvic pain. To manage chronic pelvic pain and enhance quality of life, an integrated biopsychosocial paradigm is crucial, as seen by the notable improvements seen across all outcome measures.

VIII. CONCLUSION

This study finds that a 12-week biopsychosocial intervention based on physical therapy is very successful in treating persistent pelvic pain in women between the ages of 18 and 35. Along with notable gains in functional performance, the intervention produced statistically and clinically significant decreases in psychological distress, pelvic floor symptom severity, and pain intensity. The biopsychosocial physiotherapy technique showed extensive therapeutic effects by treating the behavioral, psychological, and physical aspects of chronic pelvic pain. These results bolster physiotherapy's position as the main and most successful non-pharmacological treatment for managing chronic pelvic pain, which enhances general function, mental health, and quality of life.

IX. CLINICAL IMPLICATIONS

1. The efficacy of physiotherapy in lowering pain and improving function makes it a good conservative first-line treatment for persistent pelvic discomfort.
2. For the management of persistent pelvic pain, a biopsychosocial approach is crucial since it considers both the psychological and physical causes of pain. To restore pelvic floor function and lessen the intensity of symptoms, pelvic floor muscle rehabilitation—which includes strengthening and relaxation techniques—is essential.
3. Cognitive-behavioral techniques and pain neuroscience education are useful in lowering fear-avoidance tendencies and enhancing emotional health.

4. Posture correction and graded exercise therapy increase functional abilities and lessen impairment brought on by persistent pelvic pain. To attain the best possible treatment results, physiotherapists should use a variety of interdisciplinary approaches, such as manual therapy, education, and exercise therapy.
5. Early physiotherapy intervention can lower disability, prevent chronicity, and enhance quality of life over the long run.

Limitations

1. The sample size was limited (N = 30), which may restrict the generalizability of the results.
2. The lack of a control group in the study made it difficult to compare the intervention to other therapy options or natural recovery.
3. The intervention's long-term effects were not assessed because the follow-up duration was only 12 weeks.
4. Self-reported outcome measures are susceptible to response bias and subjective interpretation.
5. External validity may be limited because participants were chosen from a single outpatient physiotherapy department.
6. External psychological and social influences were not entirely under control. The nature of the physiotherapy intervention precluded blinding.

X. RECOMMENDATIONS

1. To enhance generalizability, future research should employ bigger sample sizes.
2. To compare physiotherapy methods with alternative treatment techniques, randomized controlled studies ought to be carried out.
3. To evaluate the sustainability of therapy effects, long-term follow-up studies are advised.
4. To increase external validity, multicenter research should be carried out.
5. Electromyography and muscle strength testing should be used in future research as objective outcome measurements.
6. It is advised that gynecologists, psychiatrists, and physiotherapists integrate their multidisciplinary care.

7. To avoid chronicity, women with pelvic pain should have early screening and physical intervention.
8. It is advised to conduct more qualitative study to delve deeper into patient experiences and treatment satisfaction.

DECLARATIONS

Abbreviations

Not applicable.

Ethics approval and consent to participate
Ethical approval was obtained from the [Shree Venkateshwara College of Physiotherapy (OPD Department) of Ethics Committee/Institutional Review Board] (Approval No.: 16626) to conduct this study in accordance with the ethical standards of the Shree Venkateshwara Group of Institution and the principles of the Declaration of Helsinki.

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Consent for publication

Not applicable

Availability of data and materials

From Shree Venkateshwara College of Physiotherapy (OPD Department) data and materials were received under the approval of Shree Venkateshwara Group of Institution.

COMPETING INTERESTS

The authors declare that there are no competing interests related to this study. The research was conducted independently, and there were no financial, personal, or professional conflicts that could have influenced the study design, data collection, analysis, interpretation, or reporting of results.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. All resources and materials required for the study were provided by the Department of Physiotherapy, Shree Venkateshwara College of Physiotherapy, Erode, India.

Authors' Contributions

The primary author conducted the study design, data collection, intervention, analysis, and manuscript preparation. The research supervisor provided guidance in study design, methodology, statistical analysis, and manuscript review. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

The author expresses sincere gratitude to the management and faculty of Shree Venkateshwara College of Physiotherapy, for their support and guidance throughout the study. Special thanks are extended to the Department of Physiotherapy for providing the facilities necessary to conduct this research. The author is deeply thankful to all participants who voluntarily took part in the study and contributed to its successful completion.

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Validity / Reliability References

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