

# A Biopsychosocial Rehabilitation Approach Integrating Cognitive Behavioural Therapy in Patients with Chronic Low Back Pain: A Case Series

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**Abstract:** ***Background:** Low back pain (LBP) is a major public health problem and one of the leading causes of disability worldwide. Chronic low back pain (LBP), defined as low back pain persisting for more than 3 months, is a multifactorial condition influenced by biological, psychological, and social factors. A biopsychosocial rehabilitation approach integrating cognitive behavioral therapy (CBT) is effective in reducing pain, disability, and fear-avoidance. **Methods:** Four patients with chronic LBP, along with functional limitations and psychosocial risk factors such as fear-avoidance, catastrophizing, stress, and anxiety, were included. Each patient received an individualized rehabilitation program consisting of cognitive behavioral therapy (CBT) techniques, pain neuroscience education (PNE), graded exposure, and exercise therapy. Outcome were Visual Analogue Scale (VAS) for pain, the Oswestry Disability Index (ODI) for functional disability, and the Fear-Avoidance Beliefs Questionnaire (FABQ) for fear-avoidance, assessed at baseline and 6 weeks of intervention. **Results:** All patients demonstrated clinically meaningful improvements in pain, disability, and fear avoidance. VAS improved by 42–62%, ODI by 55–60%, FABQ-PA by 33–53%, and FABQ-W by 47–68%. **Conclusion:** A structured rehabilitation program with CBT techniques led to significant reductions in pain, disability, and fear-avoidance in chronic LBP. This case series supports addressing psychosocial factors in comprehensive management.*

**Keywords:** Chronic low back pain, Cognitive behavioural therapy, Biopsychosocial model, Rehabilitation, Case series

## 1. Introduction

Low back pain (LBP) is a major public health problem that contributes to years lived with disability globally.<sup>1</sup> Globally, the estimated age-standardized point prevalence of LBP was 7.50% in 2017.<sup>2</sup> Approximately 10–15% of patients with low back pain go on to develop chronic low back pain (LBP), which is defined as pain lasting over 3 months.<sup>3</sup> A review published in 2015 reported that the chronic LBP prevalence was 19.6% in those aged between 20 and 59.<sup>3</sup> Chronic LBP results from the complex interplay of various factors, including biological, psychological, and social influences. Psychological factors, such as anxiety, fear-avoidance, catastrophizing, stress, sleep disturbance, and low self-efficacy, have been identified as contributing factors that increase the risk of persistent low back pain and are associated with a higher rate of functional impairment and disability in individuals with chronic LBP. People who catastrophically misinterpret harmless bodily sensations, including pain, are likely to develop fear of pain, avoidance behaviour, and

increased body hypervigilance, worsening pain sensation.<sup>3</sup> Fear-avoidance, the tendency to avoid movements or activities because of fear, has been proposed as a key mechanism in the development of persistent back pain, particularly due to its central role in the development of the so-called deconditioning syndrome. Patients with chronic LBP tend to develop a fear of movement, believing that physical activity exacerbates their pain, resulting in reduced participation in daily activities.<sup>4,5</sup> The management of chronic LBP includes medication, exercise, physical modalities, and interventional treatment. Cognitive behavioural therapy (CBT) is an intervention that promotes cognitive changes by addressing pain catastrophizing and fear avoidance via psychological counselling. It specifically targets pain-related fear beliefs, as these beliefs may negatively impact expected treatment outcomes with routine treatment.<sup>6</sup> Pain neuroscience education (PNE) further assists patients in reconceptualizing chronic pain as a sensitized nervous system rather than ongoing tissue injury. The purpose of this case series is to describe the clinical outcomes of a

biopsychosocial rehabilitation approach integrated with CBT techniques in four patients with chronic low back pain.

## 2. Methods

Four patients were included in the study. The study was conducted in the department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal, Manipur, India, for a duration of 1 year commencing from October 2024. Inclusion criteria were age group 18–45 years, patients with low back pain persisting for more than 3 months, ODI > 20% and psychosocial risk factors such as fear-avoidance, catastrophizing, stress, and anxiety. Exclusion criteria were infection, fracture, tumor, progressive neurological deficits, saddle anaesthesia, previous lumbar spine surgery, and systemic inflammatory disorders. Written informed consent was obtained from all patients for publication of this case series.

### Intervention

All patients received an individualized biopsychosocial rehabilitation program, including:

- 1) Pain Neuroscience Education (PNE)
- 2) CBT techniques (cognitive restructuring, behavioural activation, activity pacing, relaxation techniques)
- 3) Graded exposure to feared movements and activities
- 4) Exercise therapy (core muscle strengthening, lumbar mobility)
- 5) Relapse prevention and self-management planning

Each patient received six sessions of therapy at a weekly interval over 6 weeks; each session lasted for 60 minutes. All patients were instructed in home exercises between the sessions.

### Outcome measures

Outcomes were assessed using the Visual Analogue Scale (VAS) for pain intensity, the Oswestry Disability Index (ODI) for functional disability and Fear-Avoidance Beliefs Questionnaire (FABQ) for fear avoidance. VAS measures the intensity of pain as perceived by the patient. It is a 10cm horizontal line with '0' indicating no pain and '10' indicating the worst imaginable pain. The patients mark a point on the line that corresponds to their pain intensity. ODI is a self-administered questionnaire used to measure the level of disability in individuals with low back pain. It assesses limitations in daily activities across 10 sections, each scoring 0-5. The total score is converted into a percentage, with scores ranging from 0 to 100, indicating severity, from minimal disability (0-20%) to extreme disability (81-100%).<sup>7</sup> FABQ is a self-report questionnaire that assesses how much a patient's beliefs about pain lead to avoidance of physical activity or work. It consists of 16 items, scored on a 7-point scale, ranging from 0 (completely disagree) to 6 (completely agree). It includes two subscales: FABQ-Physical Activity (FABQ-PA) and FABQ-Work (FABQ-W). Higher scores indicate firmer fear-avoidance beliefs.<sup>8</sup> Outcome measures were assessed at baseline before intervention, and 6 weeks of intervention

## 3. Case Descriptions

Case 1: A 25-year-old female presented with low back pain radiating to bilateral lower limbs for a duration of 1 year. The pain was increased by walking and bending forward, leading to avoidance of these activities due to fear. She also reported catastrophic thinking about pain. Clinical examination showed no neurological deficit except for mild tenderness in the lower paraspinal muscles. Routine investigations and X-ray of the lumbosacral spine were normal. She had been treated with analgesics, muscle relaxants, and an epidural injection of a steroid, but there was no improvement. An MRI of the lumbosacral spine was taken, which showed a mild L5-S1 disc bulge. Baseline VAS score was 7, ODI was 40, FABQ-PA was 16, and FABQ-W was 30. She was treated with pain neuroscience education, cognitive restructuring, and graded exposure. There was a significant reduction in pain and fear of bending and walking. Disability decreased by 60%.

Case 2: A 22-year-old female presented with low back pain radiating to the right lower limbs for a duration of 9 months. The pain was increased by lifting heavy weights, prolonged standing, and walking. She reported avoidance of daily activities due to fear of pain. There was a history of stress and anxiety. Clinical examination showed no neurological deficit. Diagnostic evaluation, including X-ray of the lumbosacral spine, was normal. She had been treated with analgesics, muscle relaxants, and an epidural injection of a steroid, but there was no improvement. An MRI of the lumbosacral spine was taken, which showed no significant findings. Baseline VAS score was 7, ODI was 45, FABQ-PA was 18, and FABQ-W was 31. She was treated with pain neuroscience education, cognitive restructuring, relaxation techniques such as breathing exercises, mindfulness, and progressive muscle relaxation, and graded exposure to standing and walking. The pain was reduced by 57%. There was a marked reduction in fear of movement and activity avoidance with significant improvement in functional disability.

Case 3: A 35-year-old male presented with low back pain for a duration of 1 year with a history of catastrophic thinking about pain, work-related stress, and fear avoidance. The pain was increased by forward bending, prolonged standing, and walking. Clinical examination showed no neurological deficit. Diagnostic evaluation, including X-ray of the lumbosacral spine, was normal. He had been treated with analgesics, muscle relaxants, and physical therapy, but no benefits. An MRI of the lumbosacral spine was taken, which showed a mild disc bulge at the L4-L5 and L5-S1 levels. Baseline VAS score was 9, ODI was 60, FABQ-PA was 22, and FABQ-W was 36. He was treated with pain neuroscience education, cognitive restructuring, relaxation techniques such as breathing exercises, mindfulness, progressive muscle relaxation, activity pacing, and graded exposure to activity. There was marked improvement in pain, fear avoidance, and functional disability at 6 weeks of therapy.

Case 4: A 24-year-old female presented with low back pain radiating to the left lower limb for a duration of 2 years with a history of boom-bust activity pattern, work-related stress, and fear avoidance. The pain was increased by household work, prolonged standing, and walking. Clinical examination showed no neurological deficit. Diagnostic evaluation, including X-ray of the lumbosacral spine, was normal. She

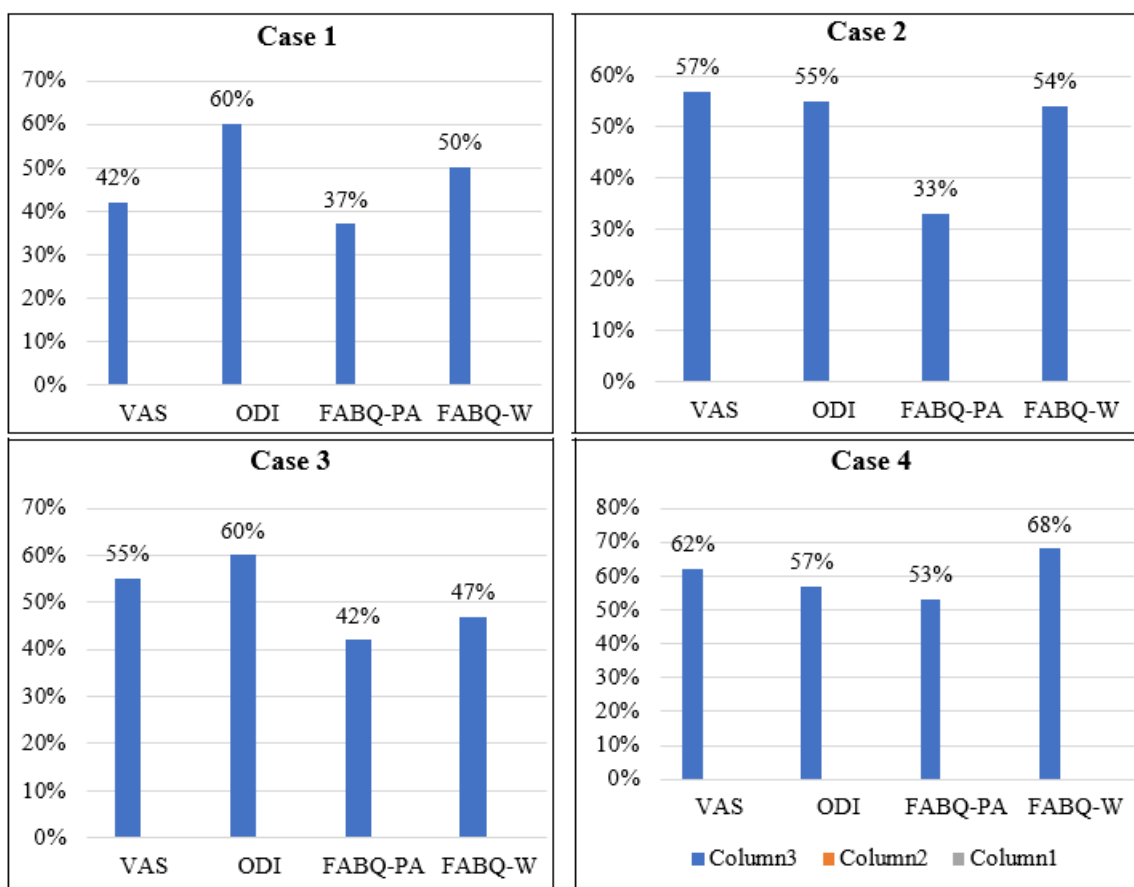
had been treated with analgesics, muscle relaxants, physical therapy, and epidural injection of a steroid, but there was minimal improvement. An MRI of the lumbosacral spine was taken, which showed a mild disc bulge at the L4-L5 and L5-S1 levels. Baseline VAS score was 8, ODI was 35, FABQ-PA was 17, and FABQ-W was 32. She was treated with pain neuroscience education, cognitive restructuring, relaxation techniques, activity pacing, and graded exposure to activity. There was meaningful clinical improvement in pain, fear avoidance behaviour, and functional disability at 6 weeks post-intervention.

#### 4. Results

All four patients demonstrated significant improvement in pain intensity, functional disability, and fear avoidance. All patients reported increased understanding of pain, reduced fear of movement, and activity avoidance. They also reported that graded exposure and activity pacing helped them in increasing confidence and engaging in daily activities. Outcome measures at baseline and 6 weeks of therapy are outlined in Table 1. Percentage improvement in outcome measures at 6 weeks of therapy is shown in Fig. 1.

**Table 1:** Outcome measures at baseline and 6 weeks of therapy

Outcome measures	Case 1		Case 2		Case 3		Case 4	
	Baseline	6 weeks	Baseline	6 weeks	Baseline	6 weeks	Baseline	6 weeks
VAS	7	4	7	3	9	4	8	3
ODI	40	15	45	20	60	24	35	15
FABQ-PA	16	10	18	12	22	10	17	8
FABQ-W	30	13	31	14	36	15	32	10



**Figure 1:** Percentage improvement in VAS, ODI and FABQ from baseline to 6 weeks

#### 5. Discussion

This case series demonstrated that a biopsychosocial rehabilitation approach integrating CBT produced significant improvements in pain, disability, and fear-avoidance in individuals with chronic low back pain. These findings support growing evidence that addressing cognitive and behavioral factors alongside physical rehabilitation is essential for effective management of chronic low back pain. The reduction in pain intensity observed is consistent with the findings of Yang et al.<sup>3</sup>, who reported that CBT significantly

improves pain outcomes in patients with chronic low back pain by modifying maladaptive pain-related cognitions and enhancing self-efficacy. CBT targets negative thought patterns such as catastrophizing and helplessness, which are known to amplify pain perception. By enhancing pain coping strategies and self-regulation, CBT likely contributed to the pain reduction observed in this case series. The significant improvement in fear-avoidance was also noted, which aligns with the results of Yang J et al.<sup>3</sup>, who demonstrated that CBT effectively reduces fear-avoidance beliefs and improves self-efficacy in patients with chronic low back pain. The reduction in fear-avoidance observed in the present case series suggests

that CBT helped patients reframe their beliefs about pain and movement, encouraging gradual exposure to activity and functional restoration. In this study, there was a meaningful improvement in functional disability following the intervention. This finding aligns with the study conducted by Tran TH et al.<sup>9</sup>, who reported that the combination of CBT with physical therapy produces superior outcomes compared to physical therapy alone. CBT components such as behavioral activation, activity pacing, or problem-solving may have facilitated greater participation in physical rehabilitation, resulting in improved functional outcomes. The reduction in pain and disability observed in this case series is consistent with the findings of Hekac A et al.<sup>10</sup>, who reported superior clinical outcomes in patients receiving supervised exercise therapy combined with a biopsychosocial approach compared to exercise therapy alone. Hekac A et al.<sup>10</sup> emphasized that reductions in fear-avoidance beliefs were more pronounced in patients exposed to a biopsychosocial framework, supporting the fear-avoidance model of chronic pain. The integration of CBT in the present case series likely facilitated cognitive restructuring and gradual exposure to movement, enabling patients to overcome activity-related fear and avoidance. The findings also align with the case series by Walston Et al.<sup>12</sup>, which demonstrated that the use of CBT alongside usual physical therapy improved pain-related outcomes and functional engagement in individuals unemployed due to chronic low back pain. Chronic low back pain is influenced by persistent maladaptive beliefs, fear of movement, and behavioral avoidance, all of which contribute to disability. Addressing these factors through CBT in the treatment of chronic LBP provides a comprehensive and patient-centered approach to rehabilitation. Despite the positive outcomes, this case series has certain limitations. The small sample size and lack of a control group limit the generalizability of the results. Additionally, long-term follow-up was not assessed, preventing conclusions regarding the sustainability of treatment effects.

## 6. Conclusion

In this case series, all four patients reported meaningful clinical improvement in pain, functional disability, and fear-avoidance. These findings support the biopsychosocial model in the pathogenesis of chronic low back pain and support the use of cognitive behavioral therapy to modify maladaptive beliefs and attitudes as an adjunct to medical or surgical treatment of low back pain. Future studies with a larger sample size, a control group, and extended follow-up are recommended to confirm these findings and evaluate the long-term effects of CBT-integrated biopsychosocial rehabilitation.

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