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A narrative review of etiology and treatment approaches on non-specific low back pain

Shruti D Lotlikar *, Pinky Dutta and Natasha Verma

Department of Physiotherapy, Garden City University, Bangalore.

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Abstract

Background: Non-specific low back pain (NSLBP) is a prevalent musculoskeletal condition characterized by pain between the lower rib margins and gluteal folds, without a clear pathological cause identifiable through imaging or diagnostic tools. It affects a wide demographic, leading to functional limitations, reduced quality of life, and significant socioeconomic burden. Understanding the multifactorial etiology and exploring evidence-based treatment approaches is essential for effective management and prevention of chronicity.

Methods: This narrative review was conducted through a comprehensive search of peer-reviewed literature published between 2011 and 2024 using databases including PubMed, Scopus, and Google Scholar. Keywords such as "non-specific low back pain," "etiology," "biopsychosocial model," "exercise therapy," and "multidisciplinary approach" were used. Relevant articles were selected based on their relevance to NSLBP's causes and treatment strategies. Both clinical guidelines and systematic reviews were included.

Results: The review revealed that NSLBP is a multifactorial condition with contributions from mechanical, psychosocial, and lifestyle-related factors. Physical contributors include postural dysfunction, muscle imbalance, and poor movement control, while psychological elements such as fear-avoidance behaviour, anxiety, and stress significantly influence pain persistence. Treatment approaches supported by evidence include a combination of education, individualized exercise therapy, manual therapy, and cognitive behavioural strategies. Multimodal and biopsychosocial interventions have shown better outcomes compared to monotherapies. Emphasis on patient-centred care, early intervention, and self-management strategies are key to long-term success.

Conclusion: NSLBP is a complex condition requiring a holistic and individualized treatment approach. Recognition of its multifactorial etiology is crucial for effective management. Integrating physical, psychological, and occupational components through a biopsychosocial model not only improves functional outcomes but also reduces recurrence and chronic disability. Future research should focus on optimizing personalized treatment algorithms and exploring long-term effects of combined interventions.

Keywords: Non-Specific Low Back Pain; Etiology; Exercise Therapy; Biopsychosocial Model; Manual Therapy; Chronic Pain; Rehabilitation; Individualized Treatment

1 Introduction

Non-specific low back pain (NSLBP) is defined as pain and discomfort localized between the lower rib margins and the gluteal folds, with or without referred pain to the lower limbs, and without a clear underlying pathological cause that can be identified through imaging or diagnostic testing.(1) Unlike specific low back pain, which can be attributed to

* Corresponding author: Shruti D Lotlikar

structural or systemic conditions such as infections, fractures, inflammatory disorders, or malignancies, NSLBP is not linked to any detectable abnormality.(2) The pain experienced in NSLBP is often mechanical in nature—meaning it varies in intensity and presentation depending on movement, posture, or physical activity.(3) It may be acute (lasting less than six weeks), subacute (six to twelve weeks), or chronic (persisting for more than twelve weeks), with many individuals experiencing recurring episodes.(4) This condition is typically diagnosed through a process of exclusion, where serious causes of back pain are ruled out through clinical evaluation and imaging, if necessary.(5) Due to its ambiguous presentation, NSLBP remains a diagnostic and therapeutic challenge for healthcare providers.(6)

Low back pain is one of the most frequently encountered complaints in clinical practice and among the leading contributors to physical limitation and discomfort in working-age populations.(7) NSLBP, in particular, forms the largest subset of all cases, making it a condition of major clinical relevance.(1) It affects individuals across age groups, genders, and professional backgrounds, and often begins during adolescence or early adulthood.(8) The symptoms may range from mild discomfort to severe and disabling pain, interfering with daily tasks, mobility, and participation in physical or recreational activities.(9) In more severe or chronic cases, it can lead to emotional distress, social withdrawal, and a decline in overall well-being.(10) Despite its non-threatening nature in terms of organic damage, the subjective experience of NSLBP can be intense and persistent, often leading to repeated doctor visits and extensive treatment trials.(11)

The consequences of NSLBP extend far beyond the physical discomfort experienced by the individual. It is one of the most common reasons for missed workdays, reduced productivity, and long-term disability certifications globally.(12) This results in substantial socioeconomic costs, both at the individual level and for public health systems.(13) The condition often leads to unnecessary investigations, such as imaging tests that may not contribute meaningfully to management, and an over-reliance on pharmacological interventions, including analgesics and muscle relaxants.(14) These interventions, while useful in the short term, are often not sufficient for long-term resolution.(15) Repeated episodes of back pain can create a cycle of activity avoidance, deconditioning, fear of movement, and psychological distress, making recovery more complex.(16) The chronicity of symptoms in some individuals leads to lifestyle changes, job modifications, or even job loss, further emphasizing the multidimensional impact of NSLBP.(17)

The development and persistence of NSLBP are influenced by a variety of factors, many of which are interrelated. Physical contributors include poor posture, weak core muscles, faulty movement patterns, and prolonged sitting or repetitive lifting, especially with incorrect biomechanics.(18) Psychological and emotional components such as stress, anxiety, depression, fear-avoidance behaviour, and catastrophizing thoughts also significantly influence pain perception and coping mechanisms.(19) Environmental and occupational elements, including ergonomically poor workspaces, lack of physical activity, and insufficient recovery time, contribute further to the onset or recurrence of symptoms.(20) These complex and often subtle contributors make NSLBP a multidimensional condition that cannot be approached with a one-size-fits-all treatment plan. The biopsychosocial model is currently the most widely accepted framework for understanding NSLBP, emphasizing the need to assess and address not just the physical but also the emotional and contextual factors influencing each patient's condition. (21)

Because of the broad spectrum of symptoms and contributing factors, the approach to managing NSLBP needs to be highly individualized. (22) What works for one patient may be ineffective or even detrimental for another. Current clinical trends favour a combination of patient education, physical rehabilitation, ergonomic advice, behavioural therapy, and active participation in recovery.(23) Movement-based therapies such as core stabilization, motor control exercises, yoga, and Pilates have demonstrated promising outcomes, especially when integrated into a holistic treatment plan.(24) Manual therapy, including joint mobilization and soft tissue release, also plays a supportive role, particularly in the initial stages of symptom relief.(25) Encouraging self-management, promoting physical activity, and addressing psychological contributors are essential to preventing recurrence and reducing long-term disability.(26) Thus, understanding the multi-layered nature of NSLBP is crucial for both clinicians and researchers aiming to improve outcomes and develop cost-effective treatment strategies.(27)

Objective

The objective of this narrative review is to explore the multifactorial etiology and evaluate evidence-based treatment strategies for non-specific low back pain (NSLBP), with a special focus on the effectiveness of multimodal and biopsychosocial approaches. The review aims to consolidate recent findings from clinical guidelines, systematic reviews, and intervention studies to guide holistic, individualized, and preventive care for patients with NSLBP.

2 Methodology

A narrative review methodology was adopted to explore the etiology and treatment approaches for non-specific low back pain (NSLBP). A comprehensive literature search was conducted across databases including PubMed, Scopus, and Google Scholar for peer-reviewed articles published between 2011 and 2024. Keywords such as "non-specific low back pain," "etiology," "biopsychosocial model," "exercise therapy," and "manual therapy" were used. Inclusion criteria comprised studies focused on adult populations with NSLBP, written in English, and published in peer-reviewed journals, including systematic reviews, randomized controlled trials, and clinical practice guidelines. Studies addressing specific pathological causes of back pain or involving pediatric populations were excluded. Selected literature was analysed thematically to identify patterns related to the multifactorial causes of NSLBP and the efficacy of various treatment interventions, with particular emphasis on the integration of physical, psychological, and lifestyle factors within the biopsychosocial framework.

Table 1 Review of literature

Serial No.	Author	Published Year	Conclusion
1	Airaksinen et al.	2006	NSLBP has a strong tendency to progress into chronic pain if not addressed early. The authors emphasize that early diagnosis, timely intervention, and adherence to clinical guidelines can mitigate the long-term disability and reduce the socioeconomic burden that results from chronic low back pain. They call for a paradigm shift in clinical practice to ensure that NSLBP is managed proactively.
2	Hartvigsen et al.	2018	Lifestyle factors, such as smoking, obesity, and physical inactivity, are strongly linked to an increased risk of developing NSLBP. Their research underscores the importance of public health strategies that promote healthy behaviours and individual lifestyle modifications. The study supports the notion that preventing NSLBP involves addressing modifiable risk factors at a population level.
3	Balagué et al.	2012	Occupational risk factors, such as repetitive movements, poor posture, and ergonomic deficiencies, are key contributors to the onset of NSLBP. The study advocates for workplace interventions, such as ergonomic training, the promotion of correct posture, and physical activity encouragement, to reduce the incidence and severity of NSLBP among workers.
4	Van Tulder et al.	2000	The study links mechanical stress, poor posture, and improper lifting techniques directly with the development of NSLBP. The findings suggest that implementing early interventions, such as ergonomic education and postural correction, can prevent the onset of NSLBP. They recommend incorporating such interventions into both workplace and daily life to reduce the burden of NSLBP.
5	Maher et al.	2017	Maher and colleagues supported a multimodal treatment approach involving exercise, education, and behavioural therapies. Their research highlights the need for comprehensive treatment strategies that address the multifactorial nature of NSLBP. They concluded that such approaches are more effective in managing symptoms and improving long-term outcomes than isolated treatments.
6	O'Sullivan	2005	O'Sullivan proposed a classification-based management system for NSLBP, emphasizing the need for tailored treatment plans based on individual patient needs. By considering factors like movement dysfunctions, psychological profiles, and pain behaviours, clinicians can offer more precise and effective interventions. This approach ensures that treatments are personalized, thus improving their chances of success.
7	Macedo et al.	2008	Core stability and motor control exercises are shown to be beneficial for patients with NSLBP. The study found that these exercises, particularly those

			focused on strengthening the trunk muscles, significantly improve functional outcomes and reduce the likelihood of recurrence. Their findings advocate for incorporating such exercises into rehabilitation programs for NSLBP patients.
8	Hodges et al.	2003	The study by Hodges et al. revealed that delayed and altered activation patterns in stabilizing muscles like the transversus abdominis and multifidus are common in NSLBP patients. These alterations contribute to the onset and chronicity of the condition. Early identification of neuromuscular dysfunction and rehabilitation focused on restoring proper muscle activation patterns is essential for effective management.
9	Linton & Shaw	2000	Linton and Shaw identified fear-avoidance behaviours and negative beliefs as stronger predictors of chronicity and disability than physical symptoms in NSLBP patients. Their findings suggest that addressing psychological factors, such as fear of movement and catastrophizing, is essential for preventing the transition from acute to chronic pain. This supports the need for integrated treatments that include psychological interventions.
10	Vlaeyen et al.	2011	Vlaeyen and colleagues emphasized that pain catastrophizing, or excessive worry about pain, significantly worsens the disability in NSLBP patients by promoting avoidance behaviour. Their study highlights the importance of psychological interventions that address cognitive factors such as catastrophizing, fear of movement, and avoidance, which can improve treatment outcomes and prevent chronicity.
11	Waddell	2004	Waddell argued that psychosocial factors, including patients' beliefs, attitudes, and behaviours, have a more profound impact on recovery than objective clinical findings such as imaging results. His work emphasizes the importance of addressing these factors through cognitive interventions and patient education to optimize recovery and avoid overtreatment.
12	Foster et al.	2108	Foster et al. promoted a biopsychosocial model of care for NSLBP, which considers the interplay between physical, psychological, and social factors. This comprehensive approach has been shown to improve both short- and long-term functional outcomes and reduce the recurrence of NSLBP. Their study advocates for the widespread adoption of this model in clinical settings
13	Nicholas et al.	2011	The study by Nicholas et al. demonstrated that Cognitive Behavioural Therapy (CBT) is highly effective in reducing pain-related fear, distress, and disability in NSLBP patients. CBT is especially useful in helping patients return to normal activities, including work, more quickly. Their findings suggest that CBT should be used in combination with physical therapy for optimal treatment results.
14	Kamper et al.	2015	Kamper and colleagues emphasized the benefits of a multidisciplinary rehabilitation approach for chronic NSLBP. The inclusion of physiotherapy, psychological counselling, and vocational therapy has been shown to significantly improve both pain and function. Their findings reinforce the idea that treating NSLBP requires a team-based approach that addresses both physical and psychological aspects.
15	Furlan et al.	2005	Furlan and colleagues found that combining physical therapy with behavioural therapy leads to longer-lasting pain relief and improved functional outcomes compared to using physical therapy alone. This integrated approach promotes a patient-centred model of treatment, which recognizes the importance of addressing both physical and psychological factors in NSLBP management.
16	Ferreira et al.	2013	Manual therapy, specifically spinal mobilization, provides short-term relief for NSLBP patients, particularly when combined with exercise therapy. The combination of manual therapy and structured exercise is more effective in

			the long-term management of NSLBP, suggesting that manual therapy can be an essential part of a comprehensive treatment plan.
17	Rubinstein et al.	2012	Rubinstein and colleagues concluded that spinal manipulation is as effective as other conservative therapies in managing pain and improving function in NSLBP patients. Their study recommends incorporating spinal manipulation as part of a broader, multidisciplinary treatment plan, but emphasizes that it should not be used in isolation.
18	Deyo et al.	2009	Deyo et al. cautioned against the overuse of diagnostic imaging in NSLBP management, which often leads to worse outcomes and unnecessary interventions. They advocate for reassurance, patient education, and conservative treatment as the first-line approach, emphasizing that imaging should be reserved for cases where it is clinically warranted.
19	Wieland et al.	2017	Yoga-based interventions were found to significantly improve physical function and emotional well-being in NSLBP patients. Their research suggests that yoga could be an effective holistic therapy for addressing both the physical and psychological aspects of NSLBP, making it a valuable addition to traditional treatment approaches.
20	Yamato et al.	2015	Yamato and colleagues demonstrated that Pilates-based rehabilitation significantly improves core strength, spinal alignment, and trunk control. Their findings highlight Pilates as an effective therapeutic approach for managing NSLBP, particularly in improving core stability and reducing pain.
21	Shmagel et al.	2016	Workplace interventions, including ergonomic training and postural education, were shown to reduce the incidence of NSLBP and improve recovery outcomes. These findings suggest that preventive measures in the workplace can help reduce both the incidence and recurrence of NSLBP among workers, thereby improving overall workplace productivity.
22	Henrotin et al.	2012	Patient empowerment through education and self-management has been identified as crucial for improving treatment adherence and engagement. The study underscores the need for personalized communication between healthcare providers and patients to ensure that individuals understand their condition and are motivated to engage in active treatment.
23	Casazza	2012	Casazza criticized the overuse of imaging and pharmacological treatments in NSLBP management. His research emphasizes the need for evidence-based, conservative management approaches as the first line of treatment, advocating for a shift toward non-invasive treatments that prioritize patient education, exercise, and lifestyle modification.
24	NICE & ACP Guidelines	2017	The NICE & ACP guidelines recommend non-invasive treatments such as patient education, physical activity, and Cognitive Behavioural Therapy (CBT) as primary interventions for NSLBP. The guidelines stress the importance of avoiding routine imaging and overuse of pharmacological treatments, emphasizing a more conservative, holistic approach to managing NSLBP.

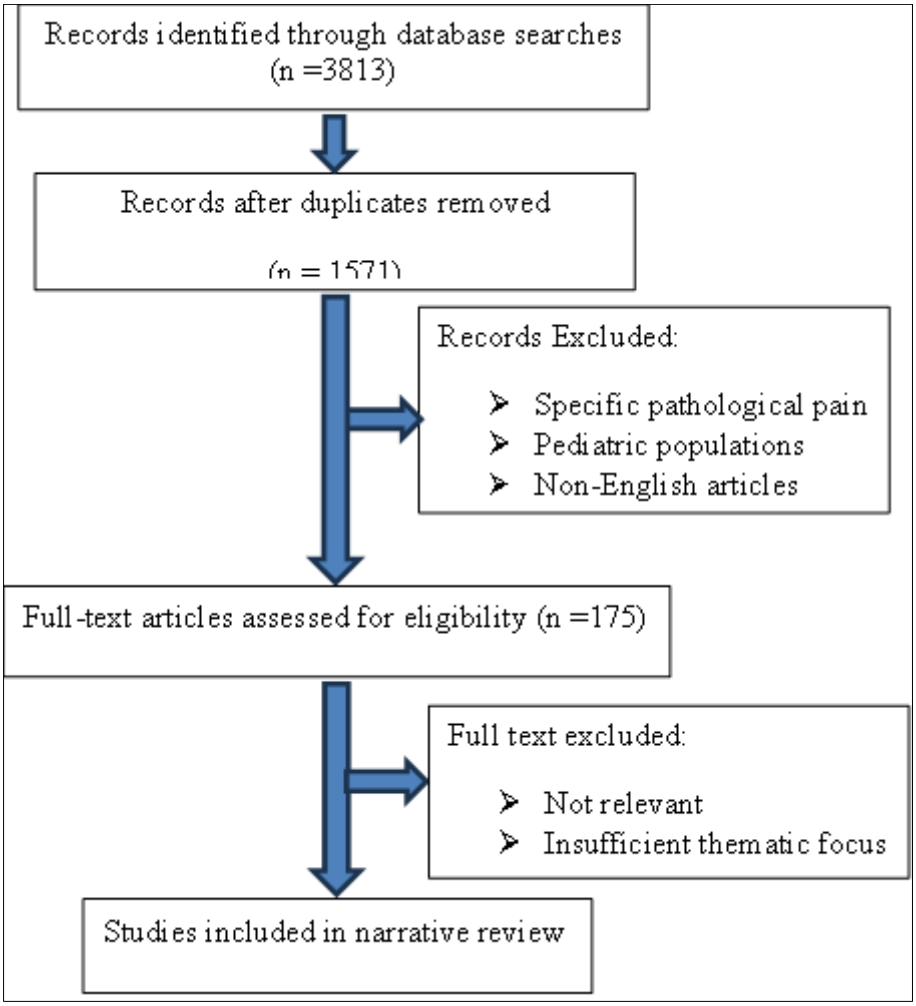

Figure 1 Flowchart

3 Discussion

Non-specific low back pain (NSLBP) remains a complex condition, as it lacks a definitive pathological cause and is influenced by a diverse set of physical, psychological, and social factors. The literature emphasizes the shift from purely biomechanical explanations to a more inclusive biopsychosocial framework, which considers not only structural abnormalities but also the patient's emotional state, social context, and behavioural responses to pain.(25) Studies consistently report that psychosocial factors, such as fear-avoidance beliefs, stress, and depression, are predictive of chronicity in NSLBP, underscoring the need for early identification and management of these elements.(26)

Physical factors contributing to NSLBP include poor posture, muscle imbalances, movement control deficits, and spinal stiffness. These biomechanical impairments can perpetuate pain and dysfunction when not properly addressed. (27) As a result, exercise therapy has emerged as a central component of NSLBP management. Core stabilization, motor control training, and functional restoration exercises have demonstrated consistent benefits in reducing pain intensity and improving disability. (28) However, evidence also suggests that one-size-fits-all exercise regimens may be suboptimal, advocating instead for personalized exercise programs tailored to the patient's functional level and goals. (29)

Manual therapy, when used adjunctively, has shown to produce short-term improvements in pain and mobility, particularly in combination with active rehabilitation strategies.(30) Additionally, cognitive behavioural therapy (CBT) has demonstrated efficacy in addressing maladaptive thought patterns and promoting healthier coping mechanisms, especially in patients with elevated psychological distress.(31) The integration of education, CBT, and movement therapy within a multimodal framework is crucial for promoting patient engagement, reducing dependency, and encouraging self-management.

Future directions in NSLBP research and treatment emphasize the need for innovative and individualized interventions. Emerging modalities like virtual reality-based therapy, wearable feedback systems, and personalized resistance training regimens show promise but require further investigation through high-quality trials. (32) Moreover, long-term studies examining the durability of treatment effects and cost-effectiveness of integrated care models are necessary to inform clinical guidelines and health policy. Embracing patient-centred care and promoting lifestyle changes, such as ergonomic corrections and physical activity, remain essential for reducing recurrence and enhancing quality of life.

4 Conclusion

This narrative review emphasizes the multifactorial nature of non-specific low back pain and the importance of a holistic and patient-centred approach to treatment. While no single modality has emerged as universally superior, a combination of exercise therapy—particularly core stabilization and McKenzie-based interventions—alongside patient education and manual therapy, appears to yield the most consistent improvements in function and pain reduction. The evidence supports the integration of conservative treatment methods into standard care, with growing interest in individualized and emerging therapeutic modalities.

Recommendations

Based on the findings of this narrative review, it is recommended that clinicians adopt a multimodal therapeutic approach for managing non-specific low back pain, integrating exercise therapy, manual therapy, and patient education to achieve optimal outcomes. Emphasis should be placed on core stabilization exercises, as strengthening the core musculature has consistently shown to improve spinal support and reduce pain. Treatment plans must be individualized and patient-centred, taking into account each patient's unique presentation, lifestyle, and preferences to enhance compliance and effectiveness. Additionally, preventive strategies such as posture training, ergonomic modifications, and promoting an active lifestyle should be prioritized to minimize recurrence and support long-term spinal health. Lastly, future research should focus on larger, high-quality clinical trials with long-term follow-up to validate existing findings, and also investigate emerging interventions such as virtual reality-based therapy and personalized resistance training programs.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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