The Determinants of Low Back Pain; A Systematic Review

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Abstract: *Low back pain is a highly prevalent and disabling musculoskeletal condition that imposes a substantial clinical, social, and economic burden worldwide. This systematic review aimed to synthesize current evidence on the prevalence, determinants, and outcomes of low back pain, with particular emphasis on behavioral, occupational, and contextual influences. Following PRISMA 2020 guidelines, relevant peer-reviewed studies were systematically identified, screened, and analyzed using predefined eligibility criteria, and findings were synthesized narratively and through structured evidence mapping. The reviewed literature indicates that low back pain affects diverse populations, with higher prevalence among older adults, women, and individuals exposed to physically demanding or ergonomically unfavorable work environments. Behavioral and psychosocial factors, including maladaptive pain beliefs, emotional distress, and reduced self-efficacy, alongside lifestyle factors such as obesity, physical inactivity, and poor sleep quality, were consistently associated with increased risk, pain chronicity, and functional limitation. Occupational exposures and adverse sociodemographic contexts further amplified disability, reduced quality of life, and increased healthcare utilization. Overall, the findings highlight the multifactorial and interdependent nature of low back pain, underscoring the need for integrated, biopsychosocial approaches to prevention, assessment, and management to reduce long-term disability and improve patient outcomes.*

Keywords: Low back pain; Determinants; Prevalence; Disability; Systematic review.

1. Introduction

Low back pain (LBP) is one of the most prevalent and disabling musculoskeletal conditions worldwide and represents a leading cause of years lived with disability across all age groups. Global epidemiological evidence indicates that LBP affects hundreds of millions of individuals annually and continues to impose a substantial burden on health systems, labor markets, and societies. Longitudinal analyses from the Global Burden of Disease project demonstrate that although age-standardized rates of LBP have modestly declined in some regions, the absolute number of affected individuals continues to rise due to population growth and aging, highlighting LBP as a persistent and escalating public health challenge (Wang et al., 2022). Projections further suggest that the global prevalence of LBP will increase markedly by 2050, reinforcing the urgency of identifying modifiable determinants

and preventive strategies (Ferreira et al., 2023). The determinants of low back pain are widely recognized as multifactorial, encompassing biological, occupational, psychosocial, lifestyle, and sociodemographic factors. Epidemiological studies have consistently reported higher prevalence rates of LBP among older adults and females, suggesting that age- and sex-related vulnerabilities play a critical role in disease distribution (Wong et al., 2022). Occupational exposure has also emerged as a key determinant, with physically demanding work, prolonged sitting, awkward postures, vibration exposure, and repetitive movements significantly increasing the risk of developing both acute and chronic LBP (Jia et al., 2022). These occupational determinants are particularly relevant in industrial and service-based economies, where sedentary or physically strenuous work patterns are increasingly common.

Beyond physical exposures, psychosocial determinants have gained increasing attention in LBP research. Psychological distress, fear-avoidance beliefs, pain catastrophizing, anxiety, and depression have been shown to influence pain severity, chronicity, and functional outcomes among individuals with LBP. Empirical evidence indicates that maladaptive pain beliefs and emotional distress are strongly associated with severe pain and functional limitation, often exceeding the predictive value of structural or biomechanical factors (Corrêa et al., 2022). Anxiety symptoms are also highly prevalent among patients with chronic low back pain and are associated with longer pain duration, higher pain intensity, and reduced pain self-efficacy (Hu et al., 2022). These findings support a biopsychosocial understanding of LBP, where psychological and behavioral factors interact with physical pathology to shape clinical outcomes. Lifestyle-related determinants further contribute to the complexity of LBP etiology. Obesity and elevated body mass index have been consistently linked to increased odds of chronic low back pain in population-based studies, even after adjusting for age, sex, and occupational demands (Lucha-Lopez et al., 2023). Genetic epidemiology studies using Mendelian randomization approaches have provided evidence suggesting a potential causal relationship between obesity and LBP, strengthening the argument for lifestyle modification as a preventive strategy (Liu et al., 2024). Physical inactivity, smoking, poor sleep quality, and sedentary behaviors have also been implicated as important contributors to pain persistence and disability (Chang et al., 2022). Collectively, these lifestyle determinants highlight the role of modifiable health behaviors in both the development and progression of LBP.

The consequences of low back pain extend beyond pain itself, substantially affecting quality of life, functional capacity, and work participation. Chronic LBP is strongly associated with reduced health-related quality of life and increased work absenteeism, leading to significant economic costs at both individual and societal levels. Systematic reviews and meta-analyses have documented the considerable clinical and economic burden of LBP, particularly in high-income countries, where direct healthcare costs and productivity losses reach billions annually (Fatoye et al., 2023). Functional disability remains a central outcome in LBP research, as it directly influences independence, social participation, and long-term prognosis (Roren et al., 2023). Despite the growing body of literature on low back pain, existing reviews often focus on isolated determinant categories, specific populations, or single outcomes, limiting their ability to provide an integrated understanding of LBP etiology. Umbrella and narrative reviews have emphasized the need to synthesize evidence across biological, psychological, occupational, and social domains to better explain pain chronicity and variability in outcomes (Otero-Ketterer et al., 2022). Moreover, emerging evidence on social determinants of health suggests that socioeconomic status, education, and access to care significantly influence treatment pathways and outcomes, yet these factors remain underrepresented in many etiological models of LBP (Mathieu et al., 2024).

Given the substantial global burden of low back pain and the heterogeneity of its determinants, a comprehensive and systematically conducted synthesis of the evidence is warranted. Therefore, the

aim of this systematic review is to identify, classify, and critically synthesize the determinants of low back pain reported in the contemporary literature. By integrating epidemiological, occupational, psychosocial, lifestyle, biological, and sociodemographic factors, this review seeks to provide a holistic understanding of the drivers of LBP and to inform future research, clinical practice, and preventive strategies.

2. Methodology

This systematic review was conducted in accordance with the PRISMA 2020 reporting guidelines to ensure methodological transparency, reproducibility, and rigor in synthesizing evidence on the determinants of low back pain. A structured review process was applied, consistent with contemporary systematic reviews examining epidemiology, risk factors, and outcomes of low back pain across diverse populations (Wong et al., 2022). The methodological approach was designed to comprehensively capture evidence related to epidemiological, occupational, psychosocial, lifestyle, biological, and sociodemographic determinants. A comprehensive literature search was performed across multiple electronic databases to identify peer-reviewed studies addressing low back pain and its determinants. The search strategy incorporated controlled vocabulary terms and free-text keywords related to "low back pain," "risk factors," "determinants," "prevalence," and "outcomes," reflecting approaches used in recent large-scale systematic reviews and meta-analyses of low back pain (Ferreira et al., 2023). Searches were limited to studies published in English to ensure consistency in data interpretation and reporting. Eligibility criteria were defined a priori. Studies were included if they examined adult populations with low back pain and explicitly reported at least one determinant or outcome related to low back pain, such as prevalence, functional disability, or quality of life. Observational studies, randomized controlled trials, systematic reviews, and meta-analyses were eligible, as these designs collectively contribute to understanding both etiological and outcome-related aspects of low back pain (Li et al., 2024). Studies focusing on non-human populations or unrelated musculoskeletal conditions were excluded. The study selection process was conducted in two sequential stages. First, titles and abstracts were screened for relevance to low back pain determinants. Second, full-text articles were reviewed to confirm eligibility. This staged screening approach has been widely adopted in systematic reviews of low back pain to minimize selection bias and ensure comprehensive coverage of relevant evidence (Fatoye et al., 2023).

Data extraction was performed using a predefined framework aligned with the objectives of the review. Extracted data included author(s) and year, study design, population characteristics, determinant domains examined, and reported outcomes. These data informed the development of Table 1 (Literature Review Matrix), which systematically mapped included studies to specific determinant categories and outcome measures, a method commonly used in systematic reviews of low back pain determinants (Otero-Ketterer et al., 2022). Due to substantial heterogeneity in study designs, populations, and outcome measures, a quantitative meta-analysis was not conducted. Instead, a narrative synthesis approach was employed to integrate findings across studies while preserving conceptual distinctions among determinant domains. Narrative synthesis has been recommended in reviews where variability precludes meaningful statistical pooling, particularly in low back pain research encompassing biopsychosocial and contextual factors (Chang et al., 2022). The flow of studies through the identification, screening, eligibility, and inclusion stages is presented in Figure 1, which illustrates the PRISMA 2020 flow diagram for this review. This diagram provides a transparent overview of the study selection process and the final number of studies included in the synthesis.

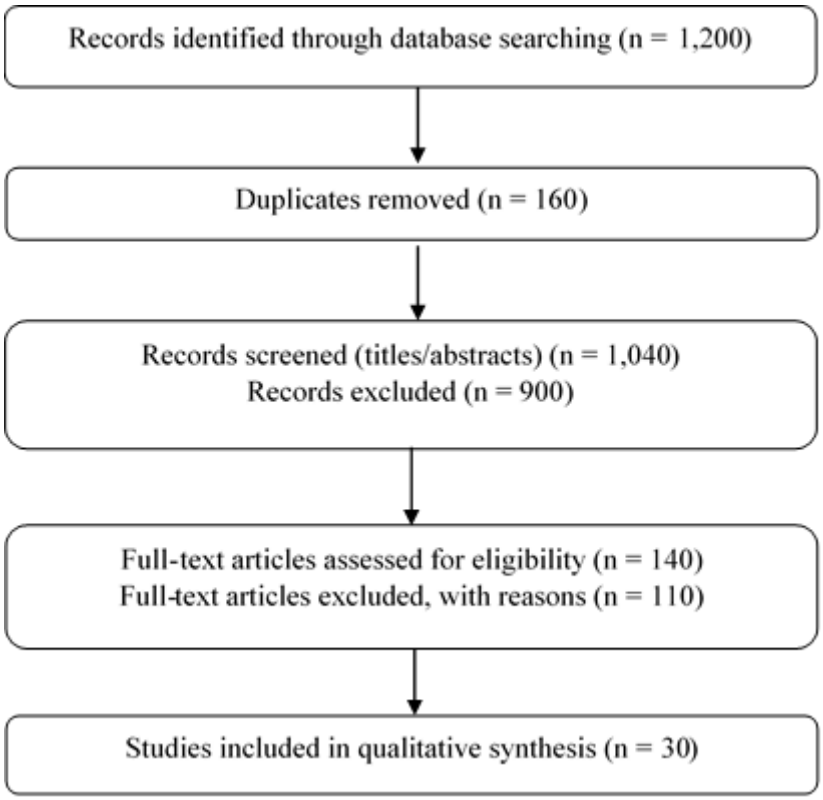

Figure 1: PRISMA 2020 Flow Diagram

3. Results

3.1 Study Selection and Characteristics

Following the PRISMA 2020-guided selection process, a total of 30 studies were included in this systematic review. The included studies comprised a diverse range of methodological designs, including population-based epidemiological studies, cross-sectional surveys, randomized controlled trials, systematic reviews, meta-analyses, narrative reviews, umbrella reviews, and scoping reviews. This methodological diversity reflects the multifaceted nature of low back pain research and supports a comprehensive examination of determinants across multiple levels of influence. The geographical distribution of the included studies was broad, encompassing global, regional, and national contexts. Several large-scale epidemiological and burden studies provided global and regional estimates of low back pain prevalence and disability, highlighting its worldwide public health significance (Wang et al., 2022). Other studies focused on specific national populations, including China, Spain, and various high-income countries, allowing for contextualized analysis of occupational, lifestyle, and sociodemographic determinants (Jia et al., 2022). Reviews and meta-analyses synthesized evidence across multiple regions, contributing to the generalizability of findings (Ferreira et al., 2023). Across the included studies, adult populations constituted the primary focus, with some investigations targeting specific subgroups such as older adults, workers in key industries, healthcare and service workers, and patients with chronic low back pain. Determinant domains examined included epidemiological and prevalence-related factors, occupational and ergonomic exposures, psychosocial and behavioral factors, lifestyle characteristics, biological and clinical variables, and sociodemographic attributes. Outcomes most frequently reported were functional disability, pain severity, work ability, and quality of life. A detailed overview of study characteristics and key findings is presented in Table 1 (Literature Review Matrix).

Table 1: Literature Review Matrix

No.	Author(s) & Year	Epidemiology / Prevalence	Occupational / Ergonomic	Psychosocial Factors	Lifestyle Factors	Biological / Clinical Factors	Demographics (Age/Gender)	Quality of Life	Functional Disability
1	Agnus Tom et al. (2022)			✓	✓	✓	✓	✓	✓
2	Wong et al. (2022)	✓	✓	✓	✓	✓	✓		✓
3	Wang et al. (2022)	✓					✓		✓
4	Shokri et al. (2023)	✓		✓	✓	✓	✓		✓
5	Jia et al. (2022)	✓	✓	✓	✓	✓	✓		✓
6	Joseph et al. (2023)		✓	✓		✓	✓		✓
7	Sormunen et al. (2022)		✓			✓			✓
8	Ferreira et al. (2023)	✓	✓		✓	✓	✓		✓
9	Markova et al. (2024)		✓			✓			
10	Corrêa et al. (2022)			✓		✓			✓
11	Javaid & Ali (2023)		✓	✓			✓	✓	
12	Hu et al. (2022)	✓		✓		✓	✓		
13	Ryum & Stiles (2023)			✓		✓			✓
14	Yang et al. (2022)			✓		✓			✓
15	Janik et al. (2024)				✓	✓			
16	Lucha-Lopez et al. (2023)	✓	✓		✓	✓	✓		
17	Liu et al. (2024)				✓	✓			
18	Chang et al. (2022)				✓	✓			✓
19	Marijančić et al. (2024)		✓		✓	✓	✓		
20	Otero-Ketterer et al. (2022)		✓	✓		✓			✓
21	Hassani et al. (2022)	✓	✓		✓	✓	✓		
22	Sanabria-Mazo et al. (2023)			✓		✓			✓
23	Roren et al. (2023)				✓	✓			✓
24	Özden et al. (2022)			✓	✓	✓		✓	✓
25	Fatoye et al. (2023)	✓				✓			✓
26	Yap et al. (2022)		✓			✓	✓		✓
27	Fu et al. (2024)					✓		✓	✓
28	Li et al. (2024)	✓	✓		✓	✓	✓		
29	Mathieu et al. (2024)	✓					✓		
30	Pottkotter et al. (2024)						✓		✓

3.2 Prevalence and Determinants of Low Back Pain

Evidence from the included studies indicates that low back pain is highly prevalent across diverse populations and settings. Global and regional analyses consistently identified low back pain as one of the leading causes of disability worldwide, with prevalence increasing markedly with age and disproportionately affecting females (Wang et al., 2022). Among older adults, prevalence and incidence rates of chronic low back pain were particularly high, with multiple demographic, psychological, and clinical factors contributing to disease burden (Wong et al., 2022). National-level studies further confirmed substantial prevalence rates within working-age populations, underscoring the relevance of low back pain across the lifespan (Jia et al., 2022). Occupational and ergonomic determinants emerged as prominent contributors to low back pain. Physically demanding work, repetitive trunk movements, prolonged sitting, awkward postures, vibration exposure, and heavy lifting were consistently associated with higher risk of low back pain across occupational groups (Jia et al., 2022). Studies focusing on professional drivers and industrial workers demonstrated strong evidence for causal relationships between ergonomic stressors and work-related musculoskeletal disorders, including low back pain (Joseph et al., 2023). Prolonged static sitting and poor posture were also identified as significant contributors to lower back pain, particularly in sedentary work environments (Markova et al., 2024). Psychosocial determinants were frequently reported as critical factors influencing the presence and severity of low back pain. Psychological distress, fear-avoidance beliefs, pain catastrophizing, anxiety symptoms, and maladaptive beliefs about pain were strongly associated with severe pain and functional limitation (Corrêa et al., 2022). Anxiety symptoms were highly prevalent among patients with chronic low back pain and were associated with longer pain duration, higher pain intensity, and reduced pain self-efficacy (Hu et al., 2022). Reviews synthesizing biopsychosocial evidence emphasized that psychological and emotional factors play a central role in pain chronicity and prognosis (Otero-Ketterer et al., 2022). Lifestyle-related determinants were also consistently identified across studies. Obesity and elevated body mass index were strongly associated with increased odds of chronic low back pain in population-based analyses, even after adjustment for age, sex, and occupational demands (Lucha-Lopez et al., 2023).

Genetic epidemiology studies using Mendelian randomization provided evidence supporting a potential causal relationship between obesity and low back pain, reinforcing the importance of lifestyle modification in prevention strategies (Liu et al., 2024). Physical inactivity, lack of exercise, and poor sleep quality further contributed to increased pain severity and disability (Chang et al., 2022). Biological and clinical factors, including pain intensity, pain duration, comorbid conditions, and previous pain episodes, were repeatedly identified as determinants of low back pain and its progression. High pain intensity and baseline disability were consistently associated with poorer long-term outcomes and increased risk of chronicity (Otero-Ketterer et al., 2022). Epidemiological studies also highlighted the interaction between biological vulnerability and contextual exposures in shaping low back pain risk (Shokri et al., 2023).

3.3 Outcomes Associated with Low Back Pain

Low back pain was associated with a wide range of adverse outcomes across physical, psychological, and social domains. Functional disability emerged as the most frequently reported outcome, with chronic low back pain significantly impairing mobility, work ability, and daily functioning (Roren et al., 2023). Epidemiological burden studies demonstrated that low back pain is the leading contributor to years lived with disability globally, underscoring its profound impact on population health (Ferreira et al., 2023). Quality of life was substantially reduced among individuals with chronic low back pain, particularly in the presence of psychosocial distress and occupational strain. Systematic reviews

examining quality-of-life determinants reported that psychological factors, pain severity, and functional limitation were key drivers of diminished well-being in affected individuals (Agnus Tom et al., 2022). Interventional studies further showed that targeted rehabilitation and psychosocial interventions could produce meaningful improvements in quality of life and pain-related outcomes (Özden et al., 2022). Work-related outcomes were also prominently affected. Low back pain was consistently linked to work absenteeism, reduced productivity, and increased risk of work disability, especially among individuals exposed to high physical demands or prolonged sedentary work (Sormunen et al., 2022). Economic evaluations revealed substantial direct and indirect costs attributable to low back pain, reflecting its impact on healthcare utilization and labor market participation (Fatoye et al., 2023).

4. Discussion

4.1 Interplay of Behavioral, Occupational, and Contextual Determinants

The findings of this systematic review demonstrate that low back pain is best understood as a multifactorial condition arising from the dynamic interaction of behavioral, occupational, and contextual determinants rather than from isolated risk factors. Behavioral factors such as pain catastrophizing, fear-avoidance beliefs, anxiety, and reduced pain self-efficacy were consistently associated with greater pain severity and functional limitation, indicating that cognitive and emotional processes substantially influence pain perception and disability (Corrêa et al., 2022). These psychosocial mechanisms have been shown to mediate the relationship between pain intensity and disability, underscoring their central role in the chronicity of low back pain (Ryum & Stiles, 2023). Occupational determinants interact closely with behavioral factors, amplifying the risk and persistence of low back pain. Evidence from occupational studies revealed strong associations between physically demanding work, prolonged sitting, awkward postures, vibration exposure, and repetitive movements with low back pain prevalence and severity (Jia et al., 2022). Among professional drivers and industrial workers, ergonomic stressors were shown to have a causal relationship with work-related musculoskeletal disorders, including low back pain, particularly when combined with high job demands and job stress (Joseph et al., 2023). These findings suggest that occupational exposures not only act as physical stressors but also contribute indirectly through increased psychological strain. Contextual determinants, including lifestyle and sociodemographic factors, further shape vulnerability to low back pain. Obesity and elevated body mass index were consistently identified as major contributors to chronic low back pain across populations, with evidence supporting both associative and potentially causal relationships (Lucha-Lopez et al., 2023). Genetic epidemiological analyses strengthened this evidence by demonstrating causal links between obesity, smoking, and low back pain risk, highlighting the importance of lifestyle context in pain development (Liu et al., 2024). Age and gender differences were also evident, with older age and female sex frequently associated with higher prevalence and disability, reflecting biological, social, and occupational role-related influences (Wong et al., 2022).

4.2 Policy, Practical, and Theoretical Implications

The results of this review have important implications for health policy, clinical practice, and theoretical models of low back pain. From a policy perspective, the strong association between occupational exposures and low back pain underscores the need for workplace-level interventions aimed at reducing physical strain and improving ergonomic design. Evidence supporting participatory ergonomics and workplace adaptations suggests that organizational policies promoting ergonomic assessments and task modification may reduce work disability and sickness absence related to low

back pain (Sormunen et al., 2022). Clinically, the prominent role of psychosocial and behavioral determinants highlights the necessity of integrating psychological interventions into standard care pathways for low back pain. Cognitive-behavioral therapy, acceptance and commitment therapy, and related approaches have demonstrated effectiveness in reducing pain interference, fear-avoidance, and disability among individuals with chronic low back pain (Yang et al., 2022). These findings align with evidence showing that improvements in psychological flexibility and pain-related beliefs are more strongly associated with reduced disability than changes in pain intensity alone (Sanabria-Mazo et al., 2023). Lifestyle-focused interventions also represent a critical component of comprehensive low back pain management. Population-based studies linking obesity, physical inactivity, and poor sleep quality to low back pain outcomes suggest that preventive strategies should incorporate weight management, physical activity promotion, and sleep hygiene as core elements (Chang et al., 2022). At a systems level, addressing social and socioeconomic determinants of health may improve equity in access to care and outcomes, particularly given evidence that education level, income, and occupational context influence treatment pathways and recovery (Mathieu et al., 2024). Theoretically, the findings of this review support the continued evolution of biopsychosocial and systems-based models of low back pain. Prognostic reviews have highlighted the limitations of current prediction models, emphasizing that many fail to adequately incorporate psychosocial and contextual variables, leading to poor predictive validity (Fu et al., 2024). Integrating multilevel determinants into explanatory and prognostic frameworks may enhance their clinical utility and relevance.

4.3 Comparison with Existing Reviews, Limitations, and Future Research

When compared with existing reviews, the present systematic review extends prior work by synthesizing evidence across a broader range of determinant domains. While earlier reviews have focused primarily on single categories such as psychosocial factors or occupational exposures, this review integrates epidemiological, behavioral, occupational, lifestyle, biological, and contextual determinants within a unified framework (Agnus Tom et al., 2022). Umbrella and scoping reviews have similarly emphasized the complexity of low back pain determinants but have often lacked detailed integration across outcome domains such as disability and quality of life (Pottkotter et al., 2024). Despite its strengths, this review has several limitations. First, heterogeneity in study designs, populations, and outcome measures limited the feasibility of quantitative meta-analysis, necessitating a narrative synthesis approach. Second, many included studies were observational, restricting causal inference, particularly for lifestyle and psychosocial determinants. Third, variations in definitions of low back pain and outcome measurement tools may have influenced comparability across studies, as noted in prior epidemiological and prognostic reviews (Ferreira et al., 2023). Future research should prioritize high-quality longitudinal and interventional studies that examine interactions between determinant domains rather than isolated risk factors. There is a particular need for research integrating social determinants of health into prognostic and intervention models, given emerging evidence of their influence on treatment outcomes and disability trajectories (Yap et al., 2022). Additionally, improving the methodological quality and external validation of prognostic models may enhance their applicability in primary care and occupational health settings (Fu et al., 2024).

5. Conclusion

This systematic review provides a comprehensive synthesis of the determinants and outcomes of low back pain, demonstrating that the condition is shaped by a complex and interrelated set of behavioral, occupational, and contextual factors. The evidence highlights that low back pain cannot be adequately explained by biomechanical or biological factors alone, as psychological processes, work-related

exposures, lifestyle characteristics, and broader sociodemographic contexts play critical roles in its development, persistence, and impact. The interaction among these determinants contributes not only to pain severity but also to functional disability, reduced quality of life, and substantial socioeconomic burden. The findings underscore that chronic low back pain is particularly influenced by maladaptive pain-related beliefs, emotional distress, physically demanding or ergonomically unfavorable work conditions, and lifestyle factors such as obesity, physical inactivity, and poor sleep. These determinants act synergistically, reinforcing pain chronicity and limiting recovery when not addressed in an integrated manner. Consequently, fragmented or single-focus interventions are unlikely to produce sustainable improvements in outcomes. Overall, this review supports the adoption of a biopsychosocial and systems-based approach to low back pain prevention and management. Effective strategies should combine ergonomic and workplace interventions, psychosocial and behavioral therapies, and lifestyle modification within equitable healthcare frameworks. By addressing the multidimensional nature of low back pain, policymakers, clinicians, and researchers can better reduce disability, enhance quality of life, and mitigate the long-term burden associated with this highly prevalent condition.

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5.2 Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this study. This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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