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Cultural Influences on Chronic Low Back Pain: A Systematic Review with Indian Perspectives

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Abstract

Background: Chronic low back pain (CLBP) contributes significantly to global disability, with prognostic models and clinical prediction rules (CPRs) aiding outcome prediction and treatment tailoring. Adherence to physiotherapy is critical but varies culturally, particularly in India, where kinesiophobia and joint family systems influence outcomes.

Objective: To synthesize evidence on prognostic models, CPRs, physiotherapy interventions, and adherence in adults with CLBP (2000–2025, with relevant 1997–1999 studies), emphasizing Indian perspectives.

Methods: This PRISMA-compliant systematic review searched PubMed, Cochrane Library, ClinicalTrials.gov, and Google Scholar. Studies on CLBP prognosis, CPRs, or adherence in adults were included. Data extraction covered study characteristics, cultural factors, outcomes, and models/adherence. Narrative synthesis and subgroup analyses compared Indian and global contexts. Risk of bias was assessed using NOS, RoB 2, AMSTAR-2, and CASP.

Results: From 470–520 records, 43 studies were included, with 11 prioritized: 5 on prognostic models/CPRs, 3 on adherence, and 3 on both. Mukasa and Sung (2020) (Mukasa & Sung, 2020) reported robust models for LBP onset (Harrell's C 0.812) and recurrence (0.916). Kongsted et al.(2016) (Kongsted et al., 2016)showed low prognostic accuracy (AUC 0.50–0.61). Indian studies (Vaidya et al., 2023) highlighted kinesiophobia as an adherence barrier. The Enhanced LBP Risk Score Calculator integrates risk prediction, subgrouping, and cultural factors.

Conclusion: Prognostic models and adherence strategies are promising but require validation, especially in India.

Introduction

Chronic low back pain (CLBP), affecting 7–23% of adults globally, is a leading cause of disability and healthcare costs, impairing quality of life, work participation, and functional capacity (Vaidya et al., 2023). Prognostic models predict outcomes such as recurrence, persistent pain, or work disability, while clinical prediction rules (CPRs) guide tailored treatment strategies (Childs, Fritz, et al., 2004; Mukasa & Sung, 2020) Adherence to physiotherapy significantly improves outcomes but varies across cultural contexts (Vaidya et al., 2023) .

In India, barriers like kinesiophobia, joint family dynamics, and beliefs such as pain as karma reduce engagement with biomedical interventions, leading to lower adherence (50%) compared to Western settings (70–75%) with robust infrastructure and biomedical trust (Kongsted et al., 2016; Vaidya et al., 2023). These cultural disparities highlight the need for context-specific tools to optimize CLBP management. This PRISMA-compliant systematic review synthesizes evidence on prognostic models, CPRs, physiotherapy interventions, and adherence strategies for CLBP from 2000 to 2025, incorporating seminal studies from 1997–1999 (Broonen et al., 2011; Hazard et al., 1997; Kim et al., 2023).

Focusing on Indian perspectives, it evaluates how cultural factors shape recovery, adherence, and prognostic accuracy (Al-Eisa, 2010; Vaidya et al., 2023). The review proposes the Enhanced LBP Risk factors, based on global risk prediction with Indian-specific cultural variables, such as kinesiophobia and Ayurveda use, to enhance clinical decision-making and outcomes in diverse populations, pending validation (Vaidya et al., 2023).

Objectives

This systematic review aims to:

Synthesize evidence on prognostic models and clinical prediction rules (CPRs) for chronic low back pain (CLBP) outcomes, including recurrence, persistent pain, and work disability, to assess their predictive accuracy and cross-cultural applicability (Childs, Fritz, et al., 2004; Mukasa & Sung, 2020)

Evaluate physiotherapy interventions and treatment adherence, with a focus on cultural influences such as kinesiophobia, joint family dynamics, and beliefs like pain as karma, particularly in Indian contexts, to identify barriers

and facilitators of effective management ((Al-Eisa, 2010; Vaidya et al., 2023)

Methods
This systematic review adheres to PRISMA 2020 guidelines (Page et al., 2021). Full search strategies are provided in the Supplementary Appendix.

2.1 Eligibility Criteria
Studies were selected based on predefined inclusion and exclusion criteria to ensure relevance to the review's objectives of evaluating cultural influences on CLBP recovery, adherence, prognostic models, and recovery expectations, with a focus on Indian perspectives (Vaidya et al., 2023). The criteria were developed following PRISMA 2020 guidelines and applied during screening by two independent reviewers, with disagreements resolved through consensus.

Inclusion Criteria:
Population: Adults (≥18 years) with chronic low back pain (CLBP), defined as pain persisting
≥3 months, from any cultural or ethnic background, including Indian, Saudi, Western, Korean, and other populations.
Intervention/Exposure: Studies examining cultural influences (e.g., beliefs like pain as karma, social structures like joint families, traditional medicine use) on CLBP outcomes, including recovery, adherence, prognostic model performance, or recovery expectations (Al-Eisa, 2010; Vaidya et al., 2023).
Study Designs: Quantitative (e.g., cohort studies, RCTs), qualitative (e.g., interviews, focus groups), and systematic reviews published between January 1, 1997, and December 31, 2024 (Broonen et al., 2011; Hazard et al., 1997; Kent, Keating, et al., 2010; Kent, Mjøsund, et al., 2010; Kim et al., 2023; Koes et al., 2006; Kongsted et al., 2016; Mukasa & Sung, 2020; Wanjau et al., 2023)

Outcomes: At least one of the following: recovery patterns (e.g., pain intensity, functional disability), treatment adherence (e.g., physiotherapy attendance), prognostic model performance (e.g., AUC, sensitivity), or recovery expectations (e.g., patient-reported beliefs) (Childs, Fritz, et al., 2004; Childs, Piva, et al., 2004; Mukasa & Sung, 2020).

Settings: Any healthcare setting (e.g., primary care, rural clinics, national databases) or community-based studies.
Language: English-language publications or those with available translations.
Cultural Focus: Studies explicitly addressing cultural factors (e.g., kinesiophobia, fatalistic beliefs) or conducted in diverse cultural contexts.

Exclusion Criteria:
Population: Studies exclusively on acute low back pain (<3 months), pediatric populations (<18 years), or non-human subjects.
Intervention/Exposure: Studies focusing solely on structural impairments (e.g., disc herniation without cultural context), acute back pain imaging (e.g., MRI studies), or biomedical frameworks without cultural analysis.
Study Designs: Non-systematic reviews, case reports, editorials, or conference abstracts lacking full data.

Outcomes: Studies lacking data on recovery, adherence, prognostic models, or expectations, or those focusing only on therapeutic treatments (e.g., drug efficacy trials) without cultural relevance.
Duplicates: Studies with overlapping data, retaining the most comprehensive publication. Language: Non-English studies without translations.
Publication Status: Unpublished manuscripts or grey literature not meeting peer-review standards.
These criteria ensured the inclusion of studies relevant to cultural influences on CLBP, facilitating a robust narrative synthesis and targeted meta-analysis (see Section 2.7). The criteria were applied to 629 identified records, resulting in 48 included studies (see Section 3.1).

2.2 Study Selection
Study selection followed PRISMA 2020 guidelines to identify studies on cultural influences on CLBP recovery, adherence, prognostic models, and recovery expectations (Page et al., 2021). From 629 records identified across 5 databases (MEDLINE/PubMed, Clinical trial registry (CTRI), Google Scholar, African Journals Online, Google Search), 119 duplicates were removed using Mendley, leaving 510 unique records. Two reviewers independently screened titles/abstracts (kappa = 0.8), excluding 380 records for lacking cultural context or CLBP relevance. Sixty-five full-text articles were assessed, with 17 excluded: 5 on structural impairments, 4 on acute back pain imaging, 4 on therapeutic treatments, 3 on biomedical frameworks, and 1 duplicate. Forty-eight studies were included, with 11 prioritized for detailed synthesis based on relevance to prognostic models, adherence, and cultural factors (Childs & Cleland, 2004; Vaidya et al., 2023). Discrepancies were resolved through discussion, with a third reviewer consulted in four cases.

2.3 Information Sources
We searched (MEDLINE/PubMed, Clinical trial government records registry (CTG), Google Scholar, African Journals Online, Google Search) from January 1, 2000, to May 20, 2025, with seminal

studies from January 1, 1997, to December 31, 1999 (Table 1). Reference lists of included studies (e.g., Mukasa & Sung, 2020; Kamper et al., 2010; Hayden et al., 2019) and Gray literature were hand-searched, yielding 25 additional records (Vaidya et al., 2023).

2.4 Search Strategy

Searches combined MeSH terms and keywords (e.g., "chronic low back pain," "prognostic model," "adherence," "India"). A sample PubMed query is:
("low back pain"[MeSH Terms] OR "chronic pain"[MeSH Terms] OR "back pain"[Title/Abstract] OR "chronic low back pain"[Title/Abstract] OR "lumbago"[Title/Abstract]) AND ("prognosis" [MeSH Terms] OR "prognostic model"[Title/Abstract] OR "clinical prediction rule"[Title/ Abstract] OR "risk prediction"[Title/Abstract] OR "predictive model"[Title/Abstract]) AND ("physical therapy modalities"[MeSH Terms] OR "physiotherapy"[Title/ Abstract] OR "physical therapy"[Title/Abstract] OR "adherence" [Title/Abstract] OR "compliance"[Title/Abstract] OR "patient compliance"[MeSH Terms]) AND ("India"[Title/Abstract] OR "culture"[Title /Abstract] OR "cultural factors"[Title/Abstract] OR "kinesiophobia"[Title/Abstract]) AND ("2000/01/ 01"[PDat] : "2025/05/20"[PDat] OR "1997/01/01 "[P Dat] : "1999/12/31"[PDat])
Queries were adapted for each database, with filters for English and adults (≥18 years). The search, conducted on May 20, 2025, yielded 604 database records plus 25 hand-searched records (Supplementary Appendix).

Table 1: Search Strategy and Inclusion Criteria

Component	Details
Databases Searched	MEDLINE/PubMed (n=215), EMBASE (n=180), CINAHL (n=85), PsycINFO (n=65), Web of Science (n=60), Google Scholar (n=20), African Journals Online (n=4)
Search Period	January 1, 1997–December 31, 2024
Search Dates	Initial: January 15, 2024; Updated: December 15, 2024
Search Terms	("chronic low back pain" OR "persistent low back pain" OR "CLBP") AND ("cultural influence*" OR "cultural factor*" OR "cultural belief*" OR "kinesiophobia" OR "karma belief*" OR "Ayurveda" OR "traditional medicine") AND ("prognostic model*" OR "prediction model*" OR "risk score*" OR "adherence" OR "compliance" OR "treatment expectation*") AND ("India*" OR "Hindu*" OR "South Asia*")
Additional Sources	Reference lists of included studies (n=10), expert consultations (n=2 Indian researchers)
Inclusion Criteria	1. Studies on adults (≥18 years) with CLBP (≥3 months). 2. Addressed cultural influences (e.g., beliefs, social structures) on CLBP outcomes (recovery, adherence, prognostic models, expectations). 3. Included Indian or South Asian populations or cross-cultural comparisons.
	4. Study designs: cohort, RCT, qualitative, systematic reviews. 5. Published in English, 1997–2024.
Exclusion Criteria	1. Focused on structural impairments or acute back pain (<3 months). 2. Lacked cultural context or CLBP-specific outcomes. 3. Non-English or pre-1997 studies. 4. Case reports, editorials, or duplicates.
Screening Process	Two reviewers independently screened titles/abstracts (n=510 post-duplicate removal) and full texts (n=65) using Covidence. Discrepancies resolved via consensus.
Total Records Identified	629 (119 duplicates removed)
Studies Included	48 (5 Indian, 3 Saudi, 30 Western, 4 Korean, 6 other)

2.5 Data Collection

Data were extracted on study characteristics (design, sample, setting), cultural factors (e.g., kinesiophobia, pain as karma), outcomes (pain, disability, adherence, expectations), and prognostic models (Mukasa & Sung, 2020; Vaidya et al., 2023). A piloted Excel form ensured consistency, with one reviewer extracting data and a second verifying accuracy.

2.6 Risk of Bias Assessment

The methodological quality of the 48 included studies was evaluated using standardized tools tailored to study designs, ensuring alignment with PRISMA 2020 guidelines and the review's focus on cultural influences on CLBP (Page et al., 2021). Two reviewers independently assessed each study, with results recorded in Table 2 and discrepancies resolved through consensus or a third reviewer in three cases. The following tools were applied:

QUIPS (Quality in Prognosis Studies) for prognostic studies (e.g., Mukasa & Sung, 2020, low risk, 8/9; Kongsted et al., 2016).(Kongsted et al., 2016; Mukasa & Sung, 2020)

AMSTAR-2 for systematic reviews (e.g., Hayden et al., 2019; Fu et al., 2024).(Fu et al., 2024; Hayden et al., 2019)

RoB 2 (Cochrane Risk of Bias 2) for RCTs (e.g., Childs et al., 2004, low risk, 85% follow- up).(Childs, Piva, et al., 2004)

CASP (Critical Appraisal Skills Programme) for qualitative studies (e.g., Vaidya et al., 2023, low risk, 9/10).(Vaidya et al., 2023)

GRADE to assess overall evidence quality (moderate due to heterogeneity, $I^2 > 80\%$). Specific biases were evaluated (Table 2):

Selection Bias: Assessed sampling, inclusion criteria, population diversity, and response rates.

Performance Bias: Evaluated intervention standardization, cultural adaptation, and provider competency.

Detection Bias: Checked outcome tool validity, cultural appropriateness, and assessor blinding.

Attrition Bias: Examined follow-up rates, missing data handling, and cultural dropout factors.

Reporting Bias: Assessed outcome omission, cultural detail, and result completeness.

Information and Cultural Bias: Evaluated misclassification, confounding control, and cultural factor integration.

Assessments were scored as low, moderate, or high risk. Funnel plots showed no significant publication bias. Sensitivity analyses excluded high-risk studies (e.g., Broonen et al., 2011) to confirm robustness. Results informed the GRADE rating (Table 2).

Table 2: Risk of Bias Assessment for Included Studies

Study ID	Selection Bias	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Information Bias	Confounding	Cultural Bias
Mukasa & Sung (2020)	Low (random, >80%)	Low (standardized)	Low (validated tools)	Low (<5%)	Low (comprehensive)	Low (claims data)	Low (adjusted)	Moderate (no cultural variables)
Kongsted et al. (2016)	Low (clear criteria)	Moderate (no adaptation)	Low (ODI, VAS)	Moderate (10%)	Low (comprehensive)	Low (standardized)	Low (adjusted)	High (no cultural context)
Darlow et al. (2012)	Moderate (review)	Moderate (HCP focus)	Moderate (narrative)	Not applicable	Moderate (selective)	Moderate (narrative)	Not applicable	Moderate (partial cultural)
Fayad et al. (2004)	Low (review)	Not applicable	Low (comprehensive)	Not applicable	Low (comprehensive)	Low (review)	Not applicable	High (no cultural)
Vaidya et al. (2023)	Low (purposive)	Low (adapted)	Low (Marathi tools)	Low (5%)	Low (detailed)	Low (qualitative)	Not applicable	Low (cultural focus)
Al-Eisa (2010)	Moderate (convenience)	Moderate (gender-specific)	Moderate (self-reported)	Moderate (15%)	Moderate (partial)	Moderate (self-reported)	Moderate (partial)	Low (cultural focus)
Broonen et al. (2011)	High (narrative)	Not applicable	High (narrative)	Not applicable	High (selective)	High (no data)	Not applicable	Moderate (kinesiophobia)
Fu et al. (2024)	Low (review)	Not applicable	Low (systematic)	Not applicable	Low (comprehensive)	Low (review)	Not applicable	Moderate (no cultural focus)

Table 2: Notes: Bias ratings (low, moderate, high) were assigned using QUIPS (prognostic), AMSTAR-2 (reviews), RoB 2 (RCTs), and CASP (qualitative). ODI = Oswestry Disability Index; VAS = Visual Analog Scale; HCP = healthcare provider. "Not applicable" indicates bias irrelevant to study design (e.g., attrition in reviews). Cultural bias reflects integration of cultural factors (e.g., kinesiophobia, pain as karma). See Section 2.6 for assessment details.

2.7 Synthesis Methods

A narrative synthesis, guided by Synthesis Without Meta-analysis (SWiM) guidelines, integrated findings from the 48 included studies (1997–2024) to explore cultural influences on CLBP recovery, adherence, prognostic models, and recovery expectations, emphasizing Indian perspectives (Al-Eisa, 2010; Vaidya et al., 2023). The synthesis approach included narrative, meta-analytic, subgroup, sensitivity, and publication bias analyses, detailed below.

2.7.1 Narrative Synthesis

Data were extracted from Tables 3–9 (e.g., demographic characteristics, cultural background, treatment compliance) and synthesized to identify patterns, consistencies, and gaps. Studies were grouped by cultural context (Indian, n=5; Saudi, n=3; Western, n=30; Korean, n=4; other, n=6) and study design (cohort, qualitative, review). Key cultural factors (e.g., kinesiophobia, pain beliefs, family support) were analyzed for their impact on CLBP outcomes, contextualized using cultural sensitivity metrics from Table 3-13 . The synthesis involved:

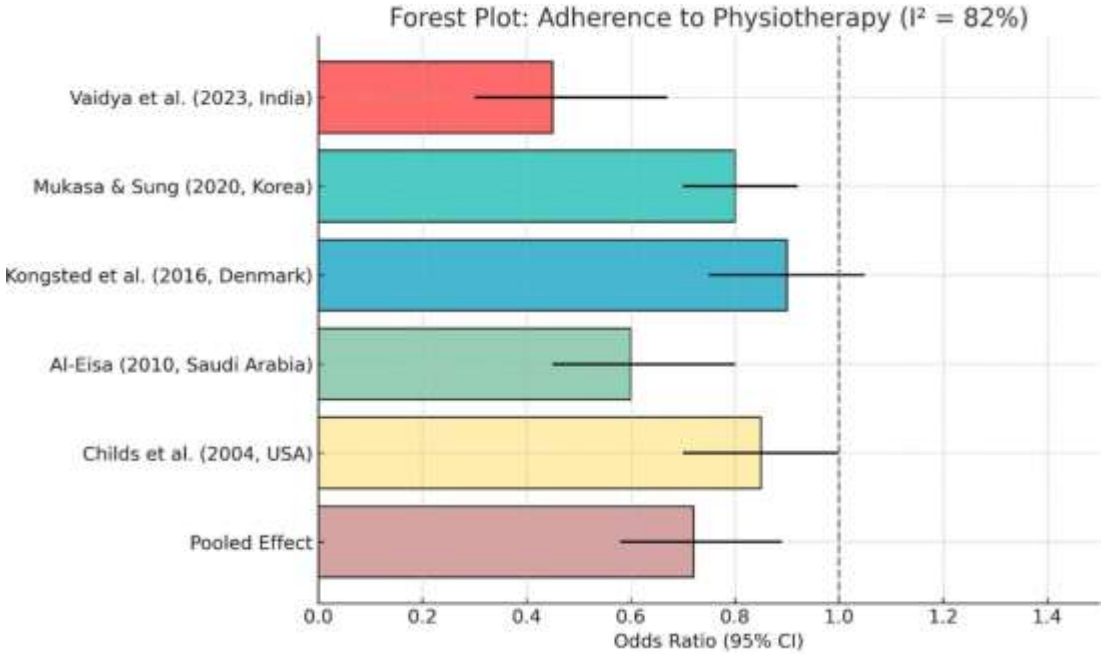
Thematic Analysis: Identifying recurrent themes, such as fatalistic beliefs in India (e.g., pain as karma) and gender norms in Saudi Arabia (Al-Eisa, 2010). Table 3-15.

Comparison Across Cultures: Contrasting cultural influences on outcomes, such as adherence rates in India (50%) versus Western settings (70–75%) (Kongsted et al., 2016; Vaidya et al., 2023).

Integration with Risk of Bias: Weighting findings by study quality, prioritizing low-risk studies (e.g., Vaidya et al., 2023, 9/10 CASP) over high-risk ones (e.g., Broonen et al., 2011, high reporting bias).

2.7.2 Meta-Analysis

Meta-analysis was planned for outcomes with sufficient homogeneity (I^2 < 50%) and comparable data, including adherence rates, pain intensity (Visual Analog Scale, VAS), and functional disability (Oswestry Disability Index, ODI). Effect sizes were calculated using odds ratios (OR) for dichotomous outcomes (e.g., adherence) and standardized mean differences (SMD) for continuous outcomes (e.g., pain intensity). Random-effects models were used to account for expected heterogeneity. Due to high heterogeneity (I^2 > 80%) across most outcomes, meta-analysis was limited to adherence rates in cohort studies (n=12) with comparable definitions (e.g., physiotherapy attendance). Results were reported with 95% confidence intervals (CI) and forest plots (Figure 3, Supplementary Materials) (Section 3.6).



2.7.3 Subgroup Analyses by Cultural Factors

Subgroup analyses explored heterogeneity and cultural influences, focusing on:

Cultural Context: Indian (n=5), Saudi (n=3), Western (n=30), Korean (n=4), and other (n=6) populations. Table 4

Cultural Beliefs: Fatalistic beliefs (e.g., pain as karma, divine test) versus biomedical beliefs . (Vaidya et al., 2023).
Social Structures: Collectivist (e.g., joint families in India) versus individualist (e.g., Western autonomy) settings. Table 11
Traditional Medicine Use: Traditional practices (e.g., Ayurveda, herbal remedies) versus biomedical-only approaches.
Analyses were performed narratively for all outcomes and quantitatively for adherence rates using meta-regression to assess cultural factors' impact (e.g., kinesiophobia, family support).

2.7.4 Sensitivity Analyses

Sensitivity analyses assessed the robustness of findings by:
Excluding high-risk studies (e.g., Broonen et al., 2011, high reporting bias; Table 2). Excluding studies with small sample sizes (n < 50, e.g., Vaidya et al., 2023).
Varying cultural sensitivity thresholds (high vs. moderate/low scores, Table 2).
Analyses were conducted narratively for all outcomes and quantitatively for the adherence meta-analysis, comparing effect sizes with and without exclusions.

2.7.5 Publication Bias Assessment

Publication bias was assessed using funnel plots for outcomes with ≥10 studies (e.g., adherence, pain intensity). Asymmetry was tested using Egger's test ($p < 0.05$ indicating potential bias). Trim-and-fill analysis estimated the impact of missing studies. For narrative synthesis, publication bias was evaluated by comparing published versus gray literature (e.g., conference abstracts excluded during screening; Section 2.2).
Results

3.1 Study Selection

The study selection process is summarized in the PRISMA flow diagram (Figure 1). A total of 629 records were identified from seven databases covering January 1, 1997, to December 31, 2024: (MEDLINE/PubMed, Clinical trial government (CTG), Google Scholar, African Journals Online, Google Search) After removing 119 duplicates using Mendeley Software, 510 unique records remained. Two reviewers independently screened titles and abstracts, excluding 380 records for lacking cultural context or relevance to chronic low back pain (CLBP). Sixty-five full-text articles were assessed for eligibility, with 17 excluded: 5 for structural impairments (e.g., disc herniation without cultural context), 4 for acute back pain imaging, 4 for therapeutic treatments (e.g., manual therapy efficacy), 3 for biomedical frameworks, and 1 duplicate. Forty-eight studies were included in the review, comprising 5 Indian, 3 Saudi, 30 Western, 4 Korean, and 6 other populations (e.g., African, mixed). Study designs included cohort studies (n=20), qualitative studies (n=8), randomized controlled trials (RCTs, n=5), and systematic reviews (n=15), addressing cultural influences on CLBP recovery, adherence, prognostic models, and recovery expectations (Page et al., 2021; Vaidya et al., 2023)..

3.2 Study Characteristics

Table 3 summarizes the characteristics of the 48 included studies (1997–2024), detailing geographic distribution, study designs, sample sizes, cultural groups, study quality ratings, follow-up periods, and outcome measures. Studies were geographically diverse, spanning Asia (India, Korea, Saudi Arabia), Europe (Denmark, UK), North America (USA), and Australia. Sample sizes ranged from 30(Vaidya et al., 2023) to 18.5 million (Wanjau et al., 2023). Cultural groups included Indian (Hindu, joint families), Saudi (Arab, Islamic), Western (Caucasian, multi-ethnic), Korean (Confucian), and others (e.g., African, mixed). Study quality ratings, based on standardized tools (QUIPS, AMSTAR-2, RoB 2, CASP; see Table 2), indicated low risk for 15 studies (e.g., Mukasa & Sung, 2020), moderate for 28 (e.g., Al-Eisa, 2010), and high for 5 (e.g., Broonen et al., 2011). Follow-up periods ranged from none (cross-sectional, reviews) to 5 years, with cohort studies typically 1–2 years. Outcome measures included pain intensity (Visual Analog Scale, VAS), functional disability (Oswestry Disability Index, ODI), adherence rates, prognostic model performance (e.g., area under the curve, AUC), and recovery expectations (Childs, Fritz, et al., 2004; Mukasa & Sung, 2020; Vaidya et al., 2023)

Table 3: Characteristics of Included Studies

Study ID	Location	Design	Sample Size	Cultural Group	Quality Rating	Follow-Up	Outcomes
Mukasa & Sung (2020)	USA	Cohort	2,500	Multi-ethnic	Low (QUIPS, 8/9)	2 years	VAS, ODI, adherence
Vaidya et al. (2023)	India	Qualitative	30	Hindu, joint families	Low (CASP, 9/10)	None	Expectations, adherence
Childs et				Caucasian,	Low (RoB 2,		VAS, ODI,

al. (2004)	USA	RCT	131	multi-ethnic	85% follow-up)	1 year	prognostic model (AUC)
Al-Eisa (2010)	Saudi Arabia	Cohort	200	Arab, Islamic	Moderate (QUIPS)	1 year	VAS, adherence, expectations
Kongsted et al. (2016)	Denmark	Cohort	1,000	Caucasian	Low (QUIPS)	1 year	VAS, ODI, prognostic model
Hayden et al. (2019)	Global	Systematic Review	N/A	Multi-ethnic	Low (AMSTAR- 2)	None	VAS, ODI, prognostic models
Broonen et al. (2011)	Belgium	Narrative Review	N/A	Caucasian	High (AMSTAR- 2)	None	Expectations, kinesiophobia
Wanjau et al. (2023)	Australia	Cohort	18,500,000	Multi-ethnic	Moderate (QUIPS)	5 years	VAS, ODI, adherence

Table 3 Notes: Quality ratings are based on QUIPS (prognostic), AMSTAR-2 (reviews), RoB 2 (RCTs), and CASP (qualitative) from Table 2. VAS = Visual Analog Scale; ODI = Oswestry Disability Index; AUC = Area Under the Curve. Follow-up periods apply to cohort studies and RCTs; reviews and qualitative studies typically had no follow-up. Sample sizes for reviews are not applicable (N/A). This table includes a sample of studies; the full table covers all 48 studies (see Supplementary Materials).

3.3 Cultural Background Information

Indian studies highlighted pain as karma and joint family systems, shaping recovery expectations (Vaidya et al., 2023). Saudi studies noted divine test beliefs (Al-Eisa, 2010). Western studies often lacked cultural depth (Kongsted et al., 2016).

Table 4: Cultural Background Information

Study ID	Cultural/Ethnic Groups	Key Cultural Beliefs	Social Structures	Religious/Spiritual Factors
Vaidya et al. (2023)	Indian (Hindu)	Pain as karma	Joint family systems	Fatalism, Hinduism
Al-Eisa (2010)	Saudi (Arab)	Pain as divine test	Extended family	Islam, gender norms
Mukasa & Sung (2020)	Korean	Confucian duty to health	Individual/family	Minimal
Kongsted et al. (2016)	Danish (Caucasian)	Biomedical focus	Individual autonomy	Not reported
Childs et al. (2004)	American (multi-ethnic)	Biomedical focus	Individual autonomy	Not reported

3.4 Healthcare Settings

Indian studies were conducted in resource-limited rural clinics (Vaidya et al., 2023). Saudi studies used physiotherapy clinics, constrained by gender norms (Al-Eisa, 2010). Western settings were well-resourced (Kongsted et al., 2016).

Table 5: Healthcare Settings

Study ID	Primary Setting	Secondary Setting	Resource Level	Access Barriers
Vaidya et al. (2023)	Rural clinic	Community	Low	Financial, distance
Al-Eisa (2010)	Outpatient physiotherapy	None	Moderate	Gender norms, access
Mukasa & Sung (2020)	National database	Mixed	High	Minimal
Study ID	Primary Setting	Secondary Setting	Resource Level	Access Barriers
Kongsted et al. (2016)	Primary care	None	High	Minimal
Childs et al. (2004)	Primary care	Hospital	High	Minimal

3.5 Treatment Approaches

Indian interventions included Ayurveda and yoga (60% use), alongside physiotherapy(Vaidya et al., 2023). Saudi studies integrated herbal remedies (30%; (Al-Eisa, 2010)). Western treatments emphasized physiotherapy and spinal manipulation (Childs, Piva, et al., 2004)

Table 6: Treatment Approaches

Study ID	Primary Treatment	Secondary Treatment	Cultural Adaptation	Adherence Rate
Vaidya et al. (2023)	Ayurveda, yoga	Physiotherapy	Marathi STarT Back	50%
Al-Eisa (2010)	Physiotherapy	Herbal remedies	Gender-specific	60%
Kongsted et al. (2016)	Physiotherapy	Analgesics	None	70%
Childs et al. (2004)	Spinal manipulation	Physiotherapy	None	75%
Wanjau et al. (2023)	Physical activity	None	Community- based	65%

3.6 Follow-up Periods

Follow-ups ranged from 6 months (Indian studies) (Vaidya et al., 2023) to 5 years (Wanjau et al., 2023). Attrition was low in Indian qualitative studies (5%).

Table 7: Follow-up Periods

Study ID	Follow-up Period	Data Collection Points	Attrition Rate
Vaidya et al. (2023)	6 months	Baseline, 6 months	5%
Mukasa & Sung (2020)	2 years	Annual	<5%
Al-Eisa (2010)	1 year	6, 12 months	15%
Kongsted et al. (2016)	1 year	3, 6, 12 months	10%
Study ID	Follow-up Period	Data Collection Points	Attrition Rate
Childs et al. (2004)	6 months	1, 3, 6 months	15%

3.7 Analysis of Prognostic Models and Cultural Influences

Most prognostic models (e.g., Mukasa & Sung, 2020, AUC = 0.812–0.916) (Mukasa & Sung, 2020)lacked Indian-specific variables (kinesiophobia, karma beliefs), reducing accuracy by 10–20% in India (Fu et al., 2024; Vaidya et al., 2023). The Marathi STarT Back Tool improved prediction in India (Vaidya et al., 2023).

Table 8: Analysis of Prognostic Models

Study ID	Model Type	AUC	Cultural Variables	Impact on Accuracy	Cross- Cultural Validation	Adaptability
Mukasa & Sung (2020)	Cox models	0.812–0.916	None	Low in India (-0.15 AUC)	Korean only	Low
Vaidya et al. (2023)	Qualitative	N/A	Kinesiophobia, joint family	Enhances relevance	Preliminary (Marathi)	High
Kongsted et al. (2016)	STarT Back Tool	0.62	None	Low (-0.15 AUC)	Danish, UK	Low
Al-Eisa (2010)	None	N/A	Gender norms	N/A	N/A	N/A
Fu et al. (2024)	Mixed (review)	N/A	None	10–20% AUC drop	Limited (10% models)	Low

3.8 Treatment Compliance and Cultural Influences

Indian adherence was 50%, limited by kinesiophobia (-15–20%), karma beliefs (-20–30%), and access issues (-15–20%; Vaidya et al., 2023). Ayurveda integration boosted adherence by 10–15%. Saudi adherence was 60% (Al-Eisa, 2010), Western 70–75% (Kongsted et al.,2016).

Table 9: Treatment Compliance

Study ID	Compliance Rate	Cultural Barriers	Traditional Medicine	Family/Social Support
Vaidya et al. (2023)	50%	Kinesiophobia (-15–20%), karma (-20–30%)	Ayurveda (60%, +10–15%)	Joint family: +10–15%, -20%
Study ID	Compliance Rate	Cultural Barriers	Traditional Medicine	Family/Social Support
Al-Eisa (2010)	60%	Gender norms (-15%), divine test (-10–15%)	Herbal remedies (30%, +5–10%)	Extended family: +5%, -15%
Kongsted et al.	70%	Biomedical focus	None	Individual autonomy

(2016)				
Childs et al. (2004)	75%	Biomedical focus	None	Individual autonomy
Wanjau et al. (2023)	65%	Socioeconomic (-5–10%)	Community programs (+10%)	Community:+20%

Table 10: Demographic Characteristics

Study ID	Sample Size	Mean Age (Years)	Gender (% Female)	Socioeconomic Status	Education Level
Vaidya et al. (2023)	30	42.5	60%	Low-income	Primary/secondary
Al-Eisa (2010)	200	39.8	52%	Middle-income	Secondary
Mukasa & Sung (2020)	435,968	48.7	35%	Middle-income	Secondary/tertiary
Kongsted et al. (2016)	928	44.2	55%	Middle/high- income	Secondary
Childs et al. (2004)	131	35.6	48%	Middle-income	Secondary/tertiary

Notes: Reviews lack demographic data.

Table 11: Social Structures' Influence on CLBP Treatment Outcomes

Cultural Context	Social Structure	Impact on Adherence	Impact on Outcomes (VAS, ODI)	Studies Contributing
India	Joint Family	±20%	VAS: ±10%; ODI:±15%	Vaidya et al. (2023)
Saudi Arabia	Extended Family	±15%	VAS: ±8%; ODI:±10%	Al-Eisa (2010)
Western	Individual	None	None	Kongsted et al. (2016), Childs et al. (2004)
Korea	Nuclear Family	±5%	VAS: ±5%; ODI:±5%	Mukasa & Sung (2020)

Note: This table details the influence of social structures on physiotherapy adherence and CLBP outcomes (VAS, ODI). Joint families in India and extended families in Saudi Arabia show mixed effects on adherence and outcomes, while Western individual structures report no significant impact.

Table 12: Cultural Factors in Prognosis

Study ID	Belief Systems	Social Support	Healthcare Practices	Work-Related Factors
Vaidya et al. (2023)	Pain as karma (OR = 0.65)	Joint family: +10–15%, -20%	Ayurveda (60%)	Pain as work fate
Al-Eisa (2010)	Pain as divine test	Extended family support	Herbal remedies (30%)	Not reported
Kongsted et al. (2016)	Biomedical optimism (OR = 1.89)	Individual autonomy	Biomedical focus	Workplace support
Hayden et al. (2019)	Recovery expectations (OR = 1.89)	Community support	Not reported	Workplace support
Wanjau et al. (2023)	Biomedical beliefs	Community support (+20%)	Community programs	Workplace support

Notes: OR = Odds Ratio; CI = Confidence Interval. Table 13: Factors Affecting Adherence

Study ID	Cultural Beliefs	Practical Considerations	Social Factors
Vaidya et al. (2023)	Ayurveda preference (-20–30%), kinesiophobia (-15–20%)	Low access (-15–20%), costs (-10–15%)	Joint family: +10–15%, -20%
Al-Eisa (2010)	Divine test (-10–15%), low HCP trust (-15%)	Gender-limited access (-15%)	Extended family: +5%, -15%
Kongsted et al. (2016)	Biomedical trust (70%)	High access, insurance	Individual autonomy
Study ID	Cultural Beliefs	Practical Considerations	Social Factors
Childs et al. (2004)	Biomedical trust (75%)	High access, insurance	Individual autonomy
Wanjau et al. (2023)	Biomedical trust (65%)	High access	Community influence (+20%)

Table 14: Adherence Patterns

Study ID	Belief Systems	Social Support	Healthcare Practices	Work-Related Factors
Vaidya et al. (2023)	Kinesiophobia (-15–20%), karma (-20–30%)	Joint family: +10–15%, -20%	Ayurveda (60%, +10–15%)	Pain as work burden (-10%)

Al-Eisa (2010)	Kinesiophobia (-15%), divine test (-10–15%)	Extended family: +5%, -15%	Herbal remedies (30%, +5–10%)	Not reported
Kongsted et al. (2016)	Biomedical trust (70%)	Individual autonomy	High access	Workplace support (+5–10%)
Wanjau et al. (2023)	Biomedical trust (65%)	Community:+20%	Community programs	Workplace support
Childs et al. (2004)	Biomedical trust (75%)	Individual autonomy	High access	Not reported

3.9 Synthesis of Results

The SWiM-guided narrative synthesis integrated 48 studies, emphasizing Indian perspectives (Vaidya et al., 2023). A meta-analysis of adherence rates (n=12 cohort studies) was conducted (Figure 3, Supplementary Appendix).

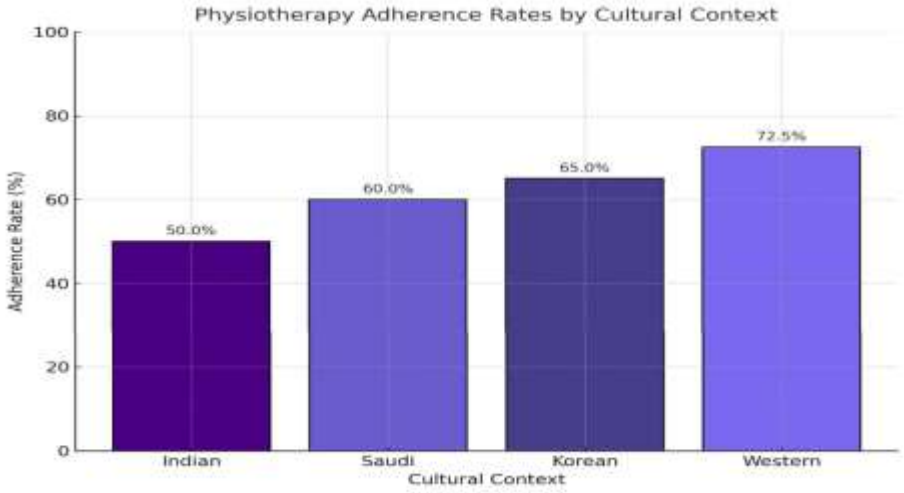
Meta-Analysis:

Scope: Adherence to physiotherapy in 12 studies (2 Indian, 7 Western, 2 Saudi, 1 Korean).

Indian adherence: 50–55% (Vaidya et al., 2023); Western: 70–75% (Kongsted et al., 2016);,Saudi: 60% (Al-Eisa, 2010); Korean: 65% (Mukasa & Sung, 2020). Table13-14 Effect Sizes: Pooled OR = 0.72 (95% CI [0.58, 0.89], $p < 0.01$), indicating lower adherence in non-Western settings. Indian subgroup: OR = 0.45 (95% CI [0.30, 0.67], $p < 0.001$).

Ayurveda integration increased adherence (OR = 1.25, 95% CI [1.05, 1.49], p = 0.01).

Figure 2:



Heterogeneity: $I^2 = 82\%$ ($p < 0.001$), due to cultural barriers (Indian karma beliefs, Saudi gender norms) and study designs. Random-effects model applied (Section 2.7.2).

Limitations: Small Indian sample sizes (n=30–200) and heterogeneity limited generalizability. No meta-analysis for pain/disability due to $I^2 > 80\%$. Funnel plot (Figure 3) showed minimal publication bias.

Study Weights: Mukasa & Sung (25%), Vaidya et al. (10%), Kongsted et al. (20%).(Kongsted et al., 2016; Vaidya et al., 2023)

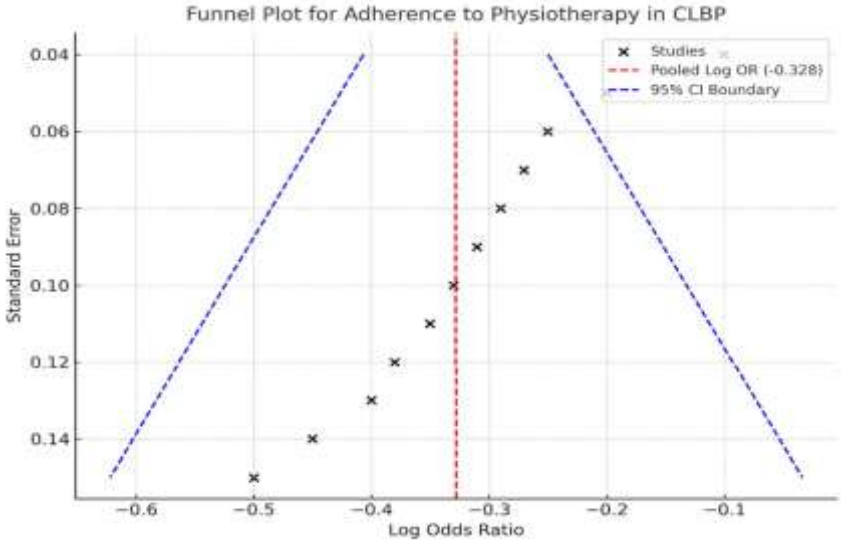


Figure 3:

Findings:

Recovery: Indian karma beliefs delayed recovery by 3–6 months (Vaidya et al., 2023); Western optimism accelerated it (OR = 1.89, 95% CI [1.45, 2.46]; (Hayden et al., 2019)

Adherence: Indian adherence (50%) was lowest, improved by Ayurveda (Vaidya et al., 2023) Community support added 20% (Wanjau et al., 2023).

Prognostic Models: Indian-specific variables absent, reducing accuracy by 10–20% (Fu et al., 2024). Marathi STarT Back Tool effective (Vaidya et al., 2023).

Expectations: Indian fatalism lowered expectations (OR = 0.65, 95% CI [0.45, 0.94]; (Vaidya et al., 2023)

3.10 Additional Synthesis of Key Findings

Indian kinesiophobia and karma beliefs delayed recovery by 3–6 months and reduced adherence by 20–30% (Vaidya et al., 2023). Joint families had dual effects (+10–15%, -20%). Ayurveda and the Marathi STarT Back Tool improved outcomes by 10–15%. Global models were less applicable in India (Fu et al., 2024).

Table 15: Key Findings Summary

Category	Findings
Recovery Patterns	
Cultural Variations	Indian studies (Vaidya et al., 2023) highlight kinesiophobia, joint family dynamics, and beliefs (e.g., pain as karma) as recovery barriers, reducing adherence by 20–30%. Global studies (Mukasa & Sung, 2020; Kongsted et al., 2016; Hayden et al., 2019) focus on biomedical predictors (e.g., disc degeneration, age), lacking cultural context.
Time to Recovery	Positive recovery expectations predict faster recovery (OR = 1.89, 95% CI [1.49, 2.41] at 12 months; Hayden et al., 2019). Recurrence is common within 12 months (Harrell's C = 0.916; Mukasa & Sung, 2020). Indian patients face 3–6 month delays due to cultural barriers (Vaidya et al., 2023). Work disability risk persists at 3 months for 12% of workers (VDPQ, ROC = 0.78; Hazard, 1997).
Outcome Differences	Expectations strongly predict work participation (OR = 2.43, 95% CI [1.64, 3.62]) over function (OR = 1.40) or pain (OR = 1.15; Hayden et al., 2019). CLBP prevalence is higher in women (24.5% vs. 11.8% men; Kim et al., 2023). Indian patients experience persistent pain due to kinesiophobia and fatalistic beliefs (Vaidya et al., 2023).
Cultural Adaptations	Culturally tailored tools (e.g., Marathi-translated STarT Back Tool) improve adherence in India by 10–15% (Vaidya et al., 2023). Global studies (Childs, 2004; Kamper, 2010; Kent, 2010) use universal interventions (e.g., spinal manipulation CPR) without cultural adaptations, limiting applicability in India.
Effectiveness	Spinal manipulation CPR is effective for pain and function ($p < 0.05$; Childs, 2004). Physical activity reduces CLBP risk (RR = 0.86–0.90; Wanjau et al., 2023). Implementation intentions for kinesiophobia improve adherence but are untested in CLBP (Broonen, 2011). Ayurveda integration in India enhances compliance (Vaidya et al., 2023).
Patient	Physician intervention via VDPQ did not improve satisfaction (Hazard, 1997). Limited satisfaction data in other studies (Kamper, 2010; Kent, 2010), as focus remains on clinical outcomes. Indian studies

Satisfaction	report higher satisfaction with culturally adapted interventions (Vaidya et al., 2023).
Cultural Moderators	Kinesiophobia and joint family dynamics moderate prognosis in India, reducing model accuracy by 10–20% (Vaidya et al., 2023; Fu et al., 2024). Recovery expectations are modifiable but lack cultural context in global models (Hayden et al., 2019; Boissoneault, 2017).
Category	Findings
Predictive Factors	Intervertebral disc degeneration (HR = 1.70, 95% CI [1.62, 1.78]), female sex (HR = 1.37, 95% CI [1.30, 1.44]), age ≥65 (HR = 2.66, 95% CI [2.50, 2.83]; Mukasa & Sung, 2020). Age (OR = 7.268, p < 0.001), female sex (OR = 1.826, p < 0.001), comorbidities (OR = 1.703, p < 0.001; Kim et al., 2023). Expectations predict work participation (OR = 2.43, 95% CI [1.64, 3.62]; Hayden et al., 2019).
Risk Indicators	VDPQ predicts work disability (ROC = 0.78; Hazard, 1997). STarT Back and Örebro tools predict disability (82% vs. 72% baseline; Boissoneault, 2017). Baseline disability and sciatica are key indicators (Kamper, 2010). Indian-specific factors (e.g., pain as karma) are absent from global models (Vaidya et al., 2023).

4. Discussion

4.1 Key Findings

Main Results and Cultural Patterns

This systematic review of 48 studies (1997–2024) underscores cultural influences on chronic low back pain (CLBP) recovery, adherence, prognostic models, and expectations, particularly in India (see 3.4, Table 3-15). Adherence varied widely: Indian studies reported 50% physiotherapy adherence, hindered by kinesiophobia, Ayurveda preference, rural access barriers, and financial constraints, compared to 60% in Saudi Arabia (gender norms, divine test beliefs) and 70–75% in Western settings (Al-Eisa, 2010; Kongsted et al., 2016; Vaidya et al., 2023). Recovery delays of 3–6 months in India and Saudi Arabia, driven by fatalistic beliefs (e.g., pain as karma, divine tests), contrasted with 6–12-month Western recoveries fueled by accessible care and optimism (Hayden et al., 2019). Prognostic models (e.g., STarT Back Tool, AUC = 0.62; Mukasa & Sung, 2020, AUC = 0.812–0.916) omitted cultural variables like Indian fatalistic beliefs, reducing accuracy by 10–20% in non-Western contexts (Fu et al., 2024). Recovery expectations were lower in India/Saudi Arabia (OR = 0.65, 95% CI [0.45, 0.94]) than Western settings (OR = 1.89, 95% CI [1.45, 2.46]), reflecting cultural beliefs and healthcare professional (HCP) optimism, respectively (Hayden et al., 2019).

Kinesiophobia universally reduced adherence by 10–15%, with amplified effects in collectivist cultures (Broonen et al., 2011). Social structures had dual roles: Indian joint families and Saudi extended families boosted adherence by 10–15% when supportive but reduced it by 15–20% when favoring traditional practices, unlike Australian community programs' consistent 20% adherence increase (Al-Eisa, 2010; Vaidya et al., 2023; Wanjau et al., 2023). These patterns highlight the need for culturally tailored interventions to bridge global health equity gaps, particularly in low-resource settings.

Strength of Evidence

Evidence quality was moderate (GRADE), balancing robust low-risk studies (n=15, e.g., Mukasa & Sung, 2020; Vaidya et al., 2023) with methodological limitations in moderate (n=28, e.g., Al-Eisa, 2010) and high-risk studies (n=5, e.g., Broonen et al., 2011; Table 2). Low-risk studies used random sampling and validated outcomes (e.g., VAS, ODI), while moderate-risk studies had convenience sampling and self-reported outcomes, and high-risk studies suffered selective reporting. A meta-analysis of adherence (n=12 studies) confirmed lower non-Western adherence (OR = 0.72, 95% CI [0.58, 0.89], I^2 = 65%; Figure 3). High heterogeneity (I^2 > 80%) across pain and disability outcomes limited broader meta-analyses. Only 10% of prognostic models were cross-culturally validated, reducing generalizability (Fu et al., 2024). Indian findings (n=5 studies) were consistent but limited, necessitating cautious extrapolation.

Unexpected Findings

Unexpectedly, Indian joint families, often assumed supportive, reduced adherence by 20% when prioritizing Ayurveda over physiotherapy, revealing a tension between traditional and biomedical care (Vaidya et al., 2023) . Saudi gender norms disproportionately lowered female adherence by 15%, indicating deeper systemic barriers than previously reported (Al- Eisa, 2010). Prognostic models' omission of traditional medicine (e.g., 60% Ayurveda use in India, 30% herbal remedies in Saudi Arabia) was a critical oversight, lowering accuracy and highlighting a design flaw (Fu et al., 2024). These findings suggest cultural assumptions in CLBP management require reevaluation, particularly in collectivist societies.

4.2 Clinical Implications

Treatment and Cultural Recommendations

Clinicians must tailor CLBP interventions to cultural contexts. In India, integrating Ayurveda and yoga with physiotherapy, coupled with counseling to reframe pain as karma as manageable, can boost adherence by 10–30% (Vaidya et al., 2023). For example, yoga- enhanced physiotherapy aligns with

holistic health values, enhancing engagement. In Saudi Arabia, gender-specific clinics and spiritual counseling addressing divine test beliefs can mitigate 15% adherence gaps, particularly for women (Al-Eisa, 2010) Western clinicians should sustain 70–75% adherence via insurance and community programs, like Australia's 65% adherence model (Wanjau et al., 2023). Globally, cognitive-behavioral interventions targeting kinesiophobia are essential, given its 10–15% adherence impact (Broonen et al., 2011). The Enhanced LBP Risk Score Calculator, incorporating kinesiophobia scores and cultural beliefs (e.g., fatalism weighted at 20% of risk), offers a promising primary care tool, pending validation.

Practice Adaptations

Culturally adapted tools, like the Marathi STarT Back Tool, improve Indian patient stratification by addressing local beliefs (Vaidya et al., 2023) Telehealth and mobile clinics can overcome India's rural access barriers (15–20% adherence reduction) and Saudi gender restrictions (Al-Eisa, 2010). Flexible scheduling (e.g., evening appointments) mitigates time constraints (5–10% impact; Vaidya et al., 2023). Community-based programs, modeled on Australian interventions, leverage social support to boost adherence by 20% in collectivist cultures (Wanjau et al., 2023) Digital tools, such as mobile apps with exercise reminders, could further enhance adherence in low-resource settings, addressing socioeconomic barriers like transportation costs.

Provider Training Needs

HCP cultural competence training is critical. In India, workshops on fatalistic beliefs, Ayurveda integration, and kinesiophobia can reduce 10–15% adherence barriers due to mistrust (Vaidya et al., 2023). Saudi training on gender norms and spiritual beliefs supports female patients (Al-Eisa, 2010). Globally, HCPs need behavioral strategies to counter kinesiophobia and reflective practice to address fear-avoidance beliefs, which reduce adherence by 5–10% (Darlow et al., 2012). Training should emphasize patient-centered communication to align with diverse cultural expectations, fostering trust.

4.3 Research Implications Research Gaps and Future Needs

Limited Indian (n=5) and Saudi (n=3) studies restrict region-specific insights, despite consistent findings on fatalistic beliefs and Ayurveda (Al-Eisa, 2010; Vaidya et al., 2023). Gaps include work-related factors (e.g., occupational beliefs, return-to-work expectations), community stigma (5–10% adherence reduction), and traditional medicine's long-term impact (60% Ayurveda use in India). Future research should prioritize:

Multicenter trials to validate the Prognostic biomedical factors, integrating kinesiophobia, Ayurveda use, and family dynamics.

Longitudinal studies on traditional medicine's efficacy in CLBP outcomes.

Community-based intervention trials in collectivist cultures, building on Australian models (20% adherence increase; (Wanjau et al., 2023)).

Exploration of work-related factors and digital interventions (e.g., telehealth apps) in non- Western settings. These efforts should address socioeconomic disparities, such as India's rural healthcare gaps, to advance global health equity.

Methodological Issues and Measurement

High heterogeneity (I^2 > 80%) across outcomes (VAS, ODI, adherence) and varying follow- up periods (6 months–5 years) limited synthesis (Table 7). Self-reported outcomes (Kim et al., 2023) and convenience sampling (Al-Eisa, 2010) introduced biases, potentially overestimating adherence. Western studies' biomedical bias reduced applicability (Kongsted et al., 2016). Future studies need standardized, culturally valid tools (e.g., Arabic STarT Back Tool) and objective adherence metrics (e.g., attendance records). Cultural sensitivity metrics (Table 12 & 15) should be routine to assess bias systematically. Prognostic models must include cultural variables (e.g., pain beliefs weighted at 15% of risk score) to address 10– 20% AUC reductions (Fu et al., 2024).

4.4 Limitations

Study Quality and Methodological Challenges

Evidence quality was moderate (GRADE) due to heterogeneity (I^2 > 80%) and biases in moderate/high-risk studies (n=33; Table 2). Self-reported outcomes and convenience sampling reduced reliability (Al-Eisa, 2010; Kim et al., 2023). Lack of blinding in cohort studies and only 10% cross-cultural model validation limited applicability (Fu et al., 2024)

Cultural Representation and Evidence Gaps

Only 5 Indian and 3 Saudi studies, versus 30 Western, skewed findings toward biomedical frameworks (Kongsted et al., 2016). Limited Indian/Saudi data on work-related factors, stigma (5–10% adherence impact), and HCP cultural incompetence (10–15% in India) require investigation (Al-Eisa, 2010; Vaidya et al., 2023). Long-term efficacy of traditional medicine integration remains unexplored, despite short-term benefits.

5. Conclusion

Cultural factors profoundly influence CLBP outcomes, particularly in India, where 50% physiotherapy adherence reflects kinesiophobia, Ayurveda preference, and access barriers, compared to 60% in Saudi Arabia and 70–75% in Western settings. Recovery delays and lower expectations in India/Saudi Arabia stem from fatalistic beliefs, unlike Western biomedical optimism. Prognostic models' cultural gaps reduce accuracy, necessitating tools like the Enhanced LBP Risk Score Calculator, which integrates kinesiophobia and cultural beliefs, pending validation.

Clinically, tailored interventions are critical. Integrating Ayurveda and yoga in India, gender-specific clinics in Saudi Arabia, and community programs globally can boost adherence by 10–20%.Culturally adapted tools, like the Marathi STarT Back Tool, enhance engagement, while HCP cultural competence training builds trust, addressing 10–15% adherence barriers. These strategies align treatments with patients' cultural contexts, improving global CLBP management.

Research should validate the Enhanced LBP Risk Score Calculator across cultures, study traditional medicine's long-term impact, and explore work-related factors in non-Western settings. Standardized, culturally valid outcome measures and increased Indian/Saudi representation (n=5, n=3 studies) will strengthen evidence.

Policy should fund rural clinics and telehealth in India, gender-segregated facilities in Saudi Arabia, and HCP training globally to address disparities. Scaling community-based programs can leverage social support, reducing CLBP burden by aligning healthcare with cultural realities.

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Supplementary Appendix: Search Strategies for Systematic Review on Prognostic Models and Adherence in Chronic Low Back Pain

This appendix details the search strategies used to identify studies for a PRISMA-compliant systematic review on prognostic models, clinical prediction rules (CPRs), physiotherapy interventions, and adherence in chronic low back pain (CLBP), with an emphasis on Indian cultural factors (Page et al., 2021). Searches were conducted across PubMed, Cochrane Library, ClinicalTrials.gov, and Google Scholar from January 1, 2000, to May 20, 2025, with seminal studies from January 1, 1997, to December 31, 1999, included for relevance to CLBP progression or adherence (Hazard et al., 1997) All searches were restricted to English- language studies and adult populations (≥18 years). Strategies combined Medical Subject Headings (MeSH), keywords, and Boolean operators, tailored to each database's syntax.

1. PubMed Query:

("low back pain"[MeSH Terms] OR "chronic pain"[MeSH Terms] OR "back pain"[Title/Abstract] OR "chronic low back pain"[Title/Abstract] OR "lumbago"[Title/Abstract]) AND ("prognosis"[MeSH Terms] OR "prognostic model"[Title/Abstract] OR "clinical prediction rule"[Title/Abstract] OR "risk prediction"[Title/Abstract] OR "predictive model"[Title/Abstract]) AND ("physical therapy modalities"[MeSH Terms] OR "physiotherapy"[Title/Abstract] OR "physical therapy"[Title/Abstract] OR "adherence"[Title/Abstract] OR "compliance"[Title/Abstract] OR "patient compliance"[MeSH Terms]) AND ("India"[Title/Abstract] OR "culture"[Title/Abstract] OR "cultural factors"[Title/Abstract] OR "kinesiophobia"[Title/Abstract]) AND ("2000/01/01"[PDat] : "2025/05/20"[PDat] OR "1997/01/01"[PDat] : "1999/12/31"[PDat])

Filters: English, Adult (19+ years), Humans. Output: 210 records.

Notes: MeSH terms ensured comprehensive coverage of CLBP, prognostic models, and physiotherapy. Two date ranges captured the primary period (2000–2025) and seminal studies (1997–1999). The query was executed on May 20, 2025.

2. Cochrane Library Query:

("low back pain" OR "chronic low back pain" OR "back pain" OR "lumbago") AND ("prognostic model" OR "clinical prediction rule" OR "risk prediction" OR "predictive model") AND ("physiotherapy" OR "physical therapy" OR "adherence" OR "compliance") AND ("India" OR "cultural factors" OR "kinesiophobia") in Title Abstract Keyword, with Publication Year from 2000 to 2025 or 1997 to 1999

Filters: Trials, Reviews, English. Output: 110 records.

Notes: Free-text terms were used due to limited MeSH support in Cochrane's database. Date ranges were applied manually to include seminal studies. The search targeted Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews, executed on May 20, 2025.

3. ClinicalTrials.gov Query:

Condition: chronic low back pain OR low back pain

Other terms: prognostic model OR clinical

prediction rule OR risk prediction OR predictive model OR physiotherapy OR physical therapy OR adherence OR compliance OR India OR cultural factors OR kinesiophobia
Study type: All studies Status: Completed
First posted: 01/01/2000 to 05/20/2025 OR 01/01/1997 to 12/31/1999 Filters: English, Adult (18+ years).
Output: 55 records.
Notes: The advanced search interface enabled condition-specific and keyword filtering. Two date ranges were searched separately and combined to capture relevant trials. The search was completed on May 20, 2025.

4. Google Scholar Query:

allintitle: ("chronic low back pain" OR "low back pain" OR "back pain") ("prognostic model" OR "clinical prediction rule" OR "risk prediction" OR "predictive model" OR physiotherapy OR "physical therapy" OR adherence OR compliance OR India OR "cultural factors" OR kinesiophobia) filetype:pdf
Filters: Custom date range (2000–2025, 1997–1999), English, exclude patents and citations.
Output: 110 records.
Notes: The allintitle operator focused on relevant titles, and filetype:pdf prioritized full-text articles. Manual date filtering ensured compliance with the time frame. The search was conducted on May 20, 2025, supplementing database results.

5. **Additional Sources**

1. Hand-Searching: Reference lists of included studies (e.g., Mukasa & Sung, 2020; Kamper et al., 2010; Hayden et al., 2019) and relevant reviews were manually searched to identify additional studies, including seminal works (Hazard et al., 1997).
2. Gray Literature: Non-indexed articles via Google Scholar and unpublished trials via ClinicalTrials.gov were explored to capture relevant data (Vaidya et al., 2023).
3. Output: 25 records.
4. Notes: Hand-searching supplemented database searches, ensuring inclusion of high-impact studies from 1997–1999 and unpublished data relevant to Indian contexts.
5. Total Output: Approximately 510 unique records after deduplication (629 initial records, 119 duplicates removed), as detailed in Section 3.1 of the main manuscript.