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Yoga as a Complementary Intervention in Multiple Sclerosis: *A Systematic Review of Clinical Trials*

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Abstract

Background: Multiple sclerosis (MS) is a chronic autoimmune disorder of the central nervous system, leading to fatigue, mobility impairment, reduced quality of life, and psychological distress. While disease-modifying therapies remain central to management, they often overlook holistic needs, prompting interest in complementary approaches such as yoga. This systematic review evaluates the efficacy of yoga as an adjunctive intervention for symptom management in MS.

Methods: Randomised controlled and quasi-experimental trials published between January 2020 and June 2025 were identified through PubMed, the Cochrane Library, Scopus, and Google Scholar. Yoga interventions were compared with usual care, active controls, or waitlist groups. Outcomes included fatigue, quality of life, balance, strength, psychological symptoms, and biomarkers. Risk of bias was assessed using Cochrane tools, and a narrative synthesis with GRADE ratings was undertaken due to heterogeneity.

Results: Ten studies (n = 402 participants, mainly women with mild-to-moderate relapsing–remitting MS) were included. Yoga (various styles, 4–24 weeks) significantly reduced fatigue in eight studies and improved quality of life in six. Four reported better balance and strength, three showed reduced psychological distress, and one demonstrated decreased pro-inflammatory biomarkers. Effects were short-term, with overall low-to-moderate certainty due to bias, inconsistency, and imprecision. No serious adverse events occurred.

Conclusions: Yoga appears to be a safe and potentially beneficial complementary therapy for MS, particularly in reducing fatigue and enhancing quality of life. Larger, rigorous trials are needed to confirm long-term efficacy and guide clinical integration.

Keywords: *Yoga, Multiple Sclerosis, Complementary Therapy, Systematic Review, QOL.*

Running Title: *Yoga in Multiple Sclerosis*

Introduction

Multiple sclerosis (MS) is a chronic, immune-mediated neurodegenerative disorder characterised by demyelination, axonal damage, and inflammation within the central nervous system (CNS) [1]. This heterogeneous condition disrupts neural transmission, leading to a wide array of symptoms including fatigue, motor impairment, sensory disturbances, cognitive deficits, and mood disorders [2]. Globally, MS affects approximately 2.8 million individuals, with a prevalence of 35.9 per 100,000 population as reported by the Multiple Sclerosis International Federation (MSIF) in 2020 [3]. The Global Burden of Disease (GBD) study highlights a disproportionate impact in high-income regions, such as North America and Western Europe, where prevalence exceeds 100 per 100,000, attributed to genetic, environmental, and lifestyle factors [4]. In low- and middle-income countries, including parts of Asia and Africa, prevalence is lower (e.g., 5–20 per 100,000), yet underdiagnosis and limited access to care exacerbate the burden [5]. Women are disproportionately affected, with a female-to-male ratio of 2:1 to 3:1, and onset typically occurs between 20 and 40 years of age [6]. The socioeconomic toll is substantial; MS contributes to significant disability-adjusted life years (DALYs), with global estimates from the GBD indicating over 1.8 million DALYs in 2019, driven by progressive disability and reduced productivity [7].

Current management of MS centres on disease-modifying therapies (DMTs), symptomatic treatments, and rehabilitative strategies. DMTs, such as interferons, monoclonal antibodies (e.g., ocrelizumab), and oral agents (e.g., fingolimod), aim to reduce relapse rates and slow disease progression by modulating immune responses [8]. These interventions have demonstrated efficacy in relapsing-remitting MS, with meta-analyses showing reductions in annualised relapse rates by 30–70% [9]. However, DMTs are not curative, often entail high costs, and carry risks of adverse effects including infections, infusion reactions, and secondary autoimmunity [10]. Symptomatic management addresses specific manifestations; for instance, amantadine or modafinil for fatigue, and baclofen for spasticity. Rehabilitative approaches, encompassing physiotherapy and occupational therapy, focus on maintaining mobility and function, yet evidence suggests limited long-term benefits in progressive forms of MS [11]. Overall, these strategies fall short in comprehensively addressing the multifaceted psychosocial and quality-of-life (QoL) impacts, prompting many patients to seek adjunctive therapies. In response to these limitations, there is growing interest in complementary and integrative medicine (CIM) for MS, particularly non-pharmacological and mind–body interventions that promote self-management and holistic well-being [12,13]. Mind–body practices have shown promise in alleviating fatigue and improving mood, with systematic reviews reporting small-to-moderate effect sizes [14].

Amongst these, yoga emerges as a particularly accessible intervention, rooted in ancient Indian philosophy. Yoga is a multifaceted mind-body discipline originating in India, encompassing physical postures (asanas), breathing techniques (pranayama), meditation and mindfulness (dhyana), and relaxation practices [15].

The potential of yoga as a complementary intervention in MS is supported by proposed biological and psychosocial mechanisms. Yoga may enhance neuroplasticity through increased brain-derived neurotrophic factor (BDNF) and grey matter volume in regions such as the hippocampus, potentially mitigating cognitive decline [16]. Immune modulation is another key pathway; studies demonstrate reductions in pro-

inflammatory cytokines (e.g., IL-6 [Interleukin-6], TNF-α [Tumour Necrosis Factor-alpha]) and cortisol, which could attenuate MS-related inflammation and stress responses [17]. Psychologically, yoga promotes stress reduction via hypothalamic–pituitary–adrenal axis regulation, improving mood and resilience [18,19].

Existing evidence from individual trials suggests benefits in core MS symptoms: randomised controlled trials (RCTs) have reported reductions in fatigue, enhancements in QoL, mood improvements, and better motor outcomes such as balance and walking speed [20]. Safety profiles are favourable; yoga is associated with low adverse event rates, primarily minor musculoskeletal strains, and is considered safe when supervised by qualified instructors [21].

Despite these promising findings, gaps persist in the literature synthesising yoga's efficacy in MS. Prior systematic reviews, such as Cramer et al. involving 670 patients, found short-term benefits for fatigue and mood compared to usual care, but no effects on QoL or mobility [22]. Similarly, Shohani et al. reviewed ten RCTs and reported significant fatigue reduction versus usual care, though not versus exercise, with non-significant effects on QoL domains [23]. Thakur et al., in a narrative review of yoga practices such as Hatha and pranayama, highlighted improvements in mental health, bladder function, and strength, but lacked meta-analytic rigour [24]. These reviews are limited by small sample sizes, high heterogeneity, and focus solely on RCTs, excluding quasi-experimental designs that could provide real-world insights. Moreover, they overlook biomarker outcomes and long-term effects, with most trials assessing interventions of 8–12 weeks. Addressing these shortcomings is crucial to inform evidence-based practice. The present systematic review aims to synthesise evidence from randomised controlled and quasi-experimental trials evaluating yoga's effects on physical (e.g., mobility, fatigue), psychological (e.g., mood, QoL), and biological (e.g., biomarkers) outcomes in adults with MS. By expanding inclusion criteria and incorporating recent trials, this review seeks to provide a more robust foundation for recommending yoga as a complementary intervention, ultimately guiding clinicians, patients, and policymakers in optimising MS management.

Methods

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [25]. The review question was framed using the PICO format to evaluate the effects of yoga as a complementary intervention for MS [26].

Population: Adults (aged ≥18 years) with a confirmed diagnosis of MS (any subtype, including relapsing-remitting MS [RRMS] or secondary progressive MS [SPMS]), and typically mild-to-moderate disability (e.g., Expanded Disability Status Scale [EDSS] scores unspecified but often 0–6.5). No restrictions were applied based on gender, ethnicity, or disease duration.

Intervention: Yoga as the primary intervention, encompassing any style or component (e.g., Hatha yoga, pranayama [breathing exercises], asanas [postures], or mindfulness-integrated yoga). Interventions could be delivered in-person, online, or home-based, with varying durations, frequencies, and intensities; fidelity assessments (e.g., adherence monitoring) were noted where reported.

Comparison: Usual care (standard MS management without additional exercise), active controls (e.g., physical therapy, Pilates, or acceptance and commitment therapy [ACT]), or waitlist/no-intervention groups.

Outcomes: Primary: Fatigue (e.g., assessed via Fatigue Severity Scale [FSS] or Modified Fatigue Impact Scale [MFIS]). Secondary: Quality of life (QoL; e.g., MSQoL-54 or SF-36), balance and mobility (e.g., Berg Balance Scale [BBS], Timed Up and Go [TUG] test), muscle strength (e.g., dynamometry or surface electromyography [sEMG]), psychological symptoms (e.g., Beck Depression Inventory [BDI] or State-Trait Anxiety Inventory [STAI]), self-management (e.g., Multiple Sclerosis Self-Management Scale-Revised [MSSM-R]), neurological symptoms (e.g., spasticity or paraesthesia), and biomarkers (e.g., cytokines or inflammatory markers). Outcomes were measured at baseline, post-intervention, and follow-up where applicable.

Eligibility Criteria: Studies were included if they were randomised controlled trials (RCTs) or quasi-experimental trials published between January 2020 and June 2025, aligning with the PICO framework above. Exclusions encompassed non-experimental designs (e.g., observational studies), publications before 2020, or interventions lacking core yoga elements (e.g., standalone relaxation or meditation without postures or breathing). The protocol was not prospectively registered on PROSPERO, as this review emerged ad hoc to synthesise recent evidence rather than following a predefined plan.

Search Strategy: A comprehensive literature search was conducted across electronic databases including PubMed, Cochrane Library, Scopus, and Google Scholar, from January 2020 to June 2025. The strategy integrated Medical Subject Headings (MeSH) terms and free-text keywords such as ("yoga" OR "pranayama" OR "asana") AND ("multiple sclerosis" OR "MS"), without initial language or date restrictions beyond the specified period. Reference lists of included studies and prior reviews were hand-searched for additional eligible trials. No grey literature sources were queried.

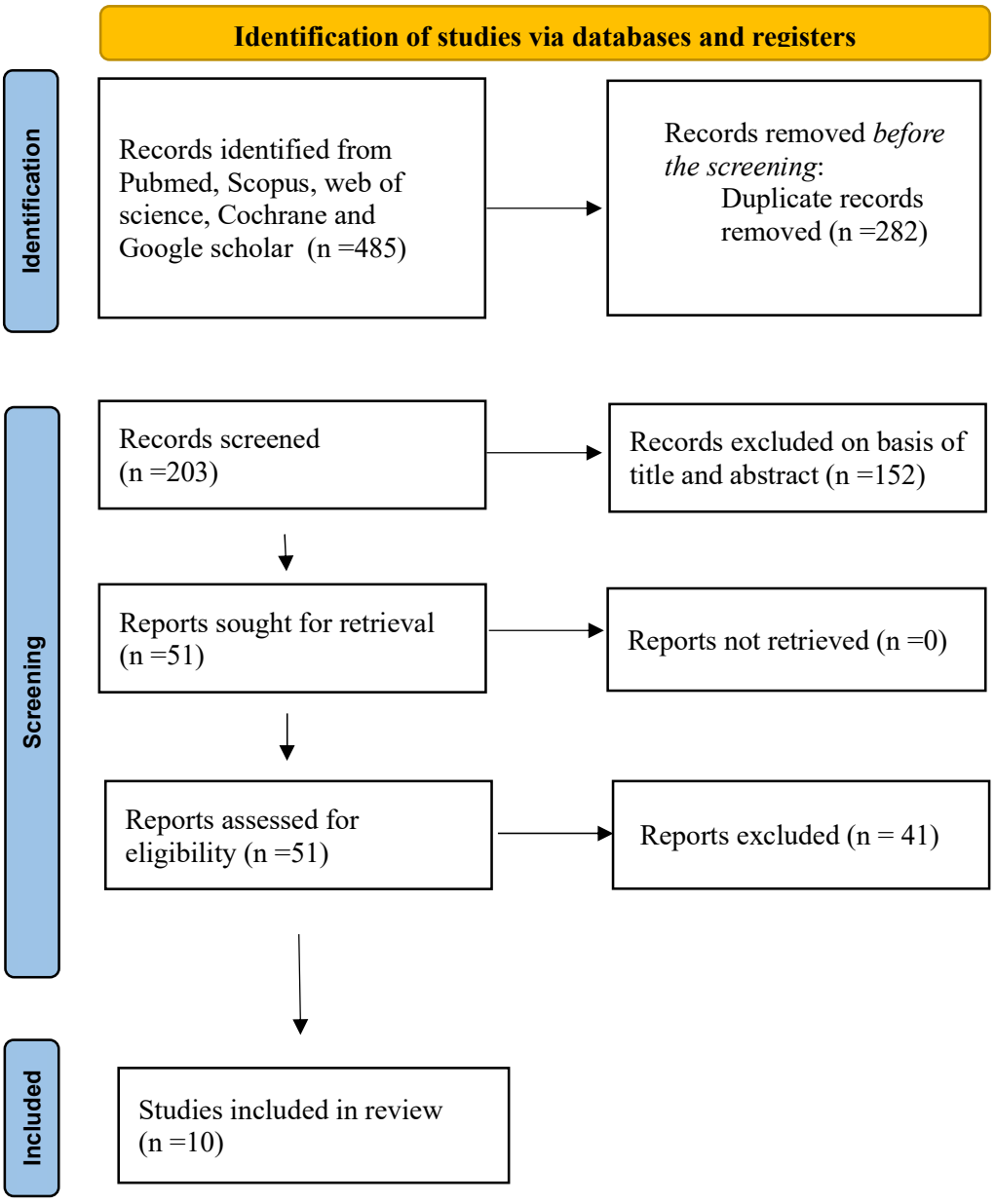
Study Selection and Data Extraction: Two independent reviewers screened titles, abstracts, and full texts using Rayyan software, resolving disagreements through consensus or consultation with a third reviewer [27]. Data extraction was performed in duplicate via a standardised proforma, capturing study details (e.g., design, location), participant characteristics (e.g., sample size, demographics, MS subtype, EDSS), intervention specifics (e.g., yoga type, duration, frequency, fidelity), comparator descriptions, outcome measures (e.g., tools, assessment timings), results (e.g., means, standard deviations, p-values, effect sizes), risk of bias, and additional notes. Discrepancies were addressed through discussion.

Risk of Bias and Quality Assessment: Risk of bias (RoB) was appraised using the Cochrane RoB 2.0 tool, evaluating domains such as randomisation process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of reported results [28]. Each domain and overall RoB were rated as low, some concerns, or high, with independent assessments followed by consensus resolution.

Data Synthesis: Heterogeneity in interventions (e.g., Hatha versus pranayama), outcomes (e.g., FSS versus sEMG), and study designs precluded meta-analysis. Instead, a narrative synthesis was employed, grouping findings by outcome domain (e.g., fatigue reported in 8/10 studies) and comparator type (e.g., yoga versus active control) [29]. Evidence certainty was graded using the GRADE approach (high, moderate, low, very low), downgraded for RoB, inconsistency, indirectness, imprecision, or publication bias; no upgrades were applied [30]. Exploratory subgroup analyses examined yoga type (e.g., Hatha versus pranayama), intervention duration (<12 versus ≥12 weeks), and comparator (passive control versus active). Sensitivity analyses excluded high-RoB studies to test robustness.

Results

A comprehensive systematic literature search identified 485 records across the selected databases. After removing 282 duplicates, 203 records underwent title and abstract screening. Of these, 152 were deemed irrelevant based on predefined eligibility criteria. Full-text review of the remaining 51 articles led to the exclusion of 41 studies that did not meet the inclusion criteria. Ultimately, 10 studies were included, as documented in the PRISMA flow diagram [Figure 1].



Here we synthesise findings from the studies on yoga for MS, focusing on narrative themes across study characteristics, participants, interventions, outcomes, and risk of bias. All studies were conducted in the Middle East (Iran n=8, Turkey n=2), highlighting regional research emphasis amid rising MS prevalence in these areas. Designs were heterogeneous: 4 RCTs [31-34] and 6 quasi-experimental studies [35-40]. RCTs generally demonstrated stronger methodological

rigour, such as randomisation and intention-to-treat analysis, but were limited by small samples and unclear blinding. Quasi-experimental studies were constrained by potential confounding from non-random allocation and selection bias, often relying on convenience sampling. Sample sizes ranged from 20 to 78 (mean n=42), with low attrition (<10%) and no serious adverse events, supporting yoga's safety profile across designs.

Study Characteristics: A total of 402 participants were included across the studies, predominantly women aged 30–45 years with mild to moderate disability (EDSS 1–6, often >3.5). Multiple sclerosis (MS) subtypes were inconsistently reported but primarily relapsing–remitting (RRMS; e.g., 92.9% in Abasıyanık et al. [35]), with mean disease duration ranging from 10 to 15 years. Most studies reported baseline comparability between groups ($p>0.05$), though minor differences were noted. Inclusion criteria typically required clinical stability and absence of recent relapses, whilst exclusions targeted comorbidities that could hinder participation. Consequently, the findings may not generalise to men, individuals with severe disability (EDSS >6), or progressive MS subtypes.

Yoga interventions varied in style and structure, including Hatha, pranayama-based, mindfulness-integrated, or hybrid approaches incorporating mindfulness-based cognitive therapy. Programme durations ranged from 4 to 24 weeks (mean ≈9 weeks), delivered one to three times weekly, predominantly in group formats. Core components included asanas, pranayama, and meditation (e.g., Yoga Nidra [35]). Comparators comprised usual care or waitlist controls (n=6) and active interventions such as Pilates or Acceptance and Commitment Therapy (n=4). Intervention fidelity was maintained through supervision or practice logs, with adherence exceeding 80% in most trials. Home-based practice was uncommon, reported only in Sadr et al. The characteristics of the included studies are summarised in Table 1.

Table 1: Characteristics of Included Studies

Author and Year	Study Design	Sample Size (n)	MS Type and Severity	Mean Age (years)	Intervention	Comparator	Primary Outcomes	Main Findings
Sadr et al. [31]	RCT	67	RRMS, EDSS ≤4	39.5	Bhramari pranayama, 4 weeks, 2x/day, 20 min	Routine care	Fatigue, depression	Reduced fatigue ($p<0.01$), depression ($p=0.001$)
Sarbaz et al. [32]	RCT	22	Unspecified, mild-moderate	NR	Hatha yoga, 24 weeks, 3x/week, 90 min	Usual care	Muscle strength	Improved sEMG ($p=0.001$), no diff dynamometer

Jahangiri et al. [33]	RCT	66	Unspecified	37	Yoga, 8 weeks, 3x/week, 90 min	Waitlist/ ACT	Self-management	No significant improvement for yoga ($p>0.05$)
Ilbeigi et al. [34]	RCT	30	Unspecified	35.5	Yoga, 8 weeks, 3x/week, 60 min	Control	Muscle fatigue, balance	Improved balance ($p=0.002$), reduced fatigue ($p=0.001$)
Abasiyanik et al. [35]	Quasi-experimental	28	93% RRMS, EDSS 2.37	42.7	Hatha yoga, 8 weeks, 1x/week + home, 60 min	Pilates	Walking, cognition, respiratory, QoL	Both improved; Pilates superior ($p<0.05$)
Maddah et al. [36]	Quasi-experimental	20	Unspecified, EDSS >3.5	36.8	Yoga, 8 weeks, 3x/week, NR min	Usual activities	Biomarkers, body composition	Decreased cytokines ($p=0.001$); no body change
Nazarian et al. [37]	Quasi-experimental	30	Unspecified	NR	Yoga, 8 weeks, 3x/week, 60 min	Control	Fatigue, balance, strength, neurological	Reduced fatigue/neurological ($p\leq0.05$); improved balance/strength
Rahmani et al. [38]	Quasi-experimental	24	Unspecified	NR	Conscious yoga, NR weeks, NR freq, 120 min	Control	QoL, fatigue	Improved QoL/fatigue ($p<0.05$)
Rezaeian et al. [39]	Quasi-experimental	60	Unspecified	NR	Yoga, NR weeks, NR freq, NR min	ACT psychotherapy	Fatigue, QoL	Reduced fatigue, improved QoL ($p<0.001$)
Shakhs Bolandghadr et al. [40]	Quasi-experimental	30	Unspecified	NR	Yoga, 8 weeks, 1x/week, 60 min	Usual care	Depression, anxiety	Reduced depression/anxiety ($p<0.05$)

Abbreviations: **RCT**: Randomised Controlled Trial, **RRMS**: Relapsing-Remitting Multiple Sclerosis, **EDSS**: Expanded Disability Status Scale (a measure of MS disability, scored 0–

10), **NR**: Not Reported, **sEMG**: Surface Electromyography (a technique to measure muscle activity), **ACT**: Acceptance and Commitment Therapy (a psychological intervention), **QoL**: Quality of Life

Outcomes by Domain: Yoga demonstrated consistent within-group benefits, with between-group superiority in approximately 60% of comparisons. Effects were most robust for fatigue and QoL, moderate for balance/strength and psychological symptoms, and preliminary for biomarkers. No harms were noted, aligning with broader reviews.

Fatigue: Eight studies assessed fatigue, reporting reductions in 80% ($p<0.05$ within-group; e.g., Sadr et al.: ES -2.80, 95% CI -25.34 to -17.81[31]). Yoga outperformed ACT (-5.29±0.69 units, $p<0.001$ [39]) but was comparable to Pilates [35]. Sustained effects at 2 months were observed with combined MBCT+yoga ($p<0.05$) [38]. Mixed findings emerged in Ilbeigi et al. (EMG fatigue improved $p=0.02$) [34] and Nazarian et al. ($p\leq0.05$) [37]. No change in body composition despite fatigue gains ($p>0.05$) [36].

Quality of Life: Six studies evaluated QoL (MSQoL-54/SF-36), with improvements in 83% ($p<0.05$ in 8/9 subscales such as physical functioning and energy [38]). Yoga was superior to ACT (+8.39±1.11 units, $p<0.001$) [39] but inferior to Pilates in some comparisons ($p=0.019$ overall) [35]. Short-term gains faded without follow-up ($p=0.05$ post-intervention, non-significant at 2 months) [33]. Consistent with external reviews, mental domains (vitality, well-being) benefited most.

Balance and Strength: Five studies showed gains: balance improved on the Berg Balance Scale ($p=0.002$ [34]; $p\leq0.05$ static/dynamic [37]) and Timed Up and Go (TUG) test ($p\leq0.05$ [37]), but no group differences versus Pilates or physical therapy were observed [35]. Strength was enhanced via dynamometry (+16.82 Nm, $p=0.037$ within-group [32]) and surface electromyography (sEMG) ($p=0.007$ within-group, $p=0.001$ between-group). Moderate Cohen's d effect sizes (0.5–0.8) were noted in Nazarian et al. [37].

Psychological Symptoms: Three studies demonstrated reductions in depression and anxiety ($p<0.05$ on Beck Depression Inventory/State-Trait Anxiety Inventory [40]; ES -1.92 BDI-II, $p=0.001$ [31]). Short-term effects were observed in Jahangiri et al. ($p=0.028$ versus ACT) [33].

Biomarkers and Other Outcomes: One study reported reductions in IL-6, TNF-α, and IL-10 ($p=0.001$), suggesting anti-inflammatory mechanisms [36]. Neurological disorders decreased ($p\leq0.05$ [37]). Self-management improved in the short term ($p=0.028$ [33]).

Risk of Bias and GRADE Assessment: Risk of bias assessments differentiated between RCTs and quasi-experimental studies. RoB 2.0 assessments indicated low risk in Sadr et al. [31], with "some concerns" in other RCTs [32–34], mainly due to unclear blinding and allocation concealment. Quasi-experimental studies [35–40] showed moderate to serious risk on ROBINS-I, primarily from non-random allocation and baseline imbalances [Figures 2-5].

Figure 2: Traffic Light Plot of Risk of Bias Assessments for RCTs

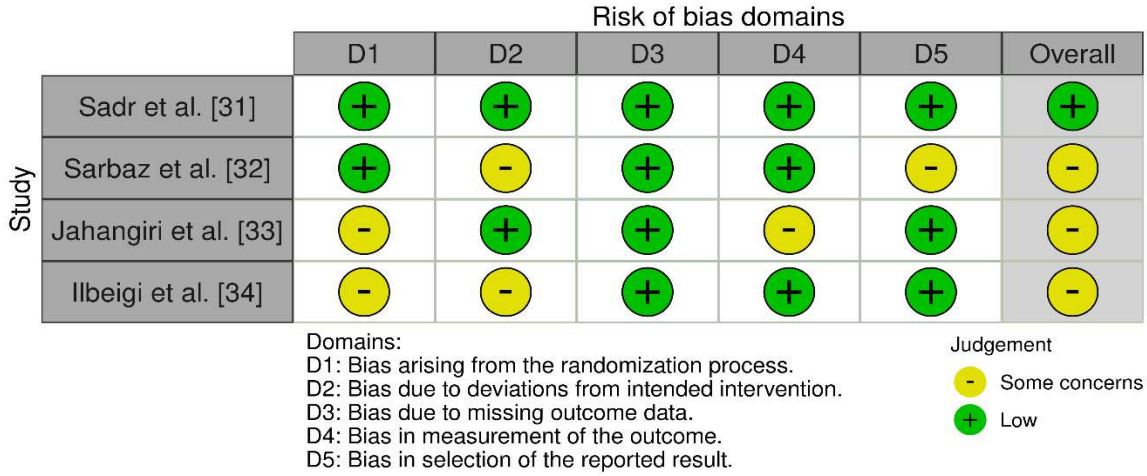


Figure 3: Summary Plot of Risk of Bias Assessments for RCTs

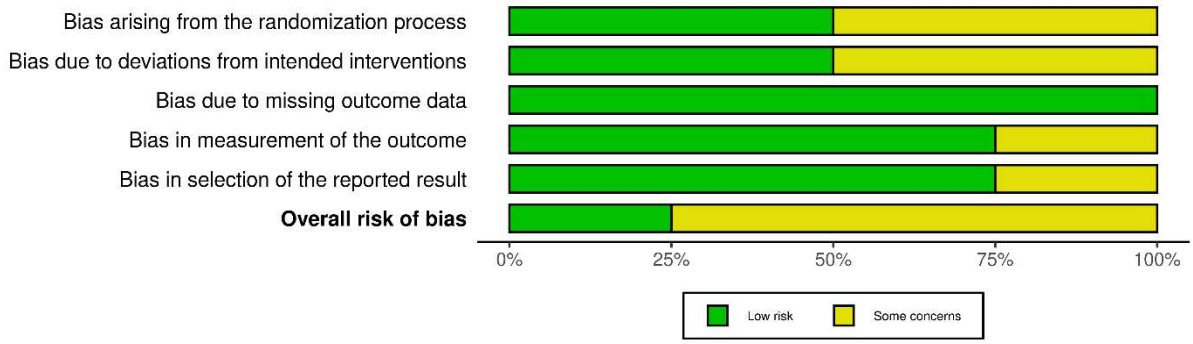


Figure 4: Traffic Light Plot of Risk of Bias Assessments Across Non-RCTs

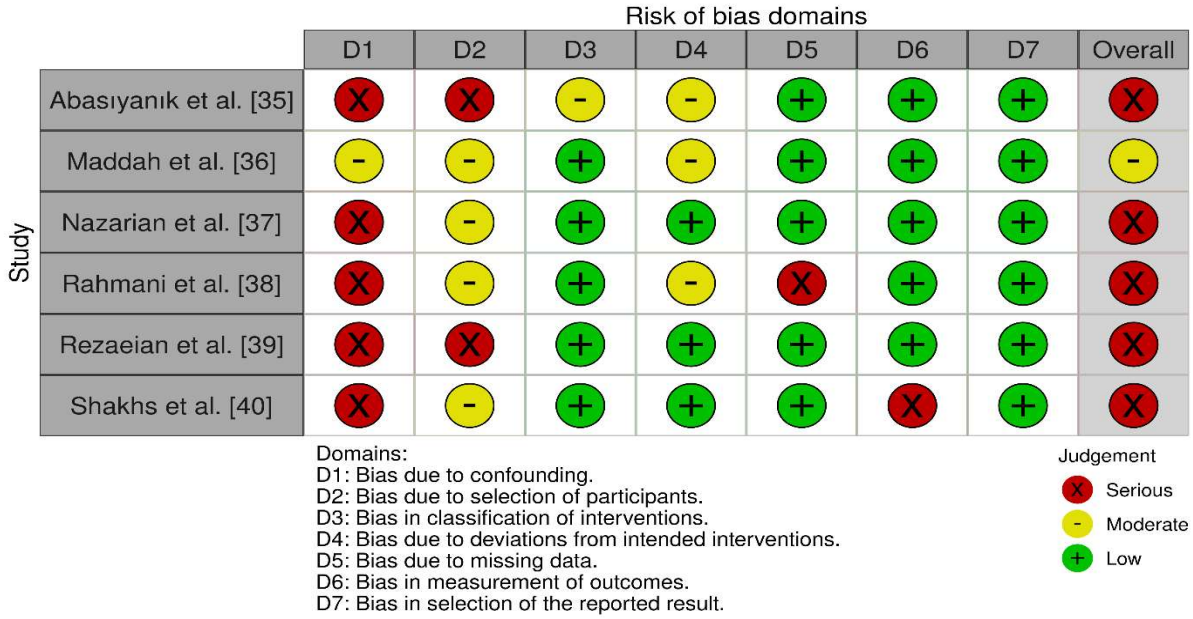
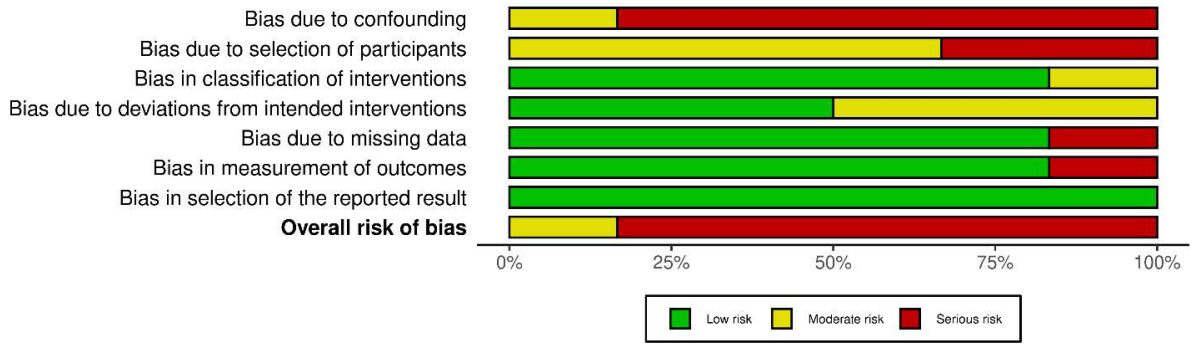


Figure 5: Summary Plot of Risk of Bias Assessments Across Non-RCTs



GRADE assessments yielded overall low to moderate certainty. Fatigue and QoL were rated moderate in RCTs and low in quasi-experimental studies; balance, strength, and psychological outcomes were low; biomarker evidence was very low due to limited data. No large effect sizes or dose–response relationships warranted upgrading [Table 2].

Table 2: GRADE Assessment by Outcome Domain

Outcome Domain	Studies (RCTs/Quasi)	Certainty (GRADE)	Downgrades	Key Rationale
Fatigue	8 (3/5)	Low-Moderate	Imprecision (1 level for RCTs); Serious bias, inconsistency (2 levels for quasi)	Small n in RCTs; confounding in quasi; variable comparators
Quality of Life	6 (2/4)	Low-Very Low	Bias, imprecision (2 levels for RCTs); Serious bias, indirectness, inconsistency (3 levels for quasi)	Unclear blinding in RCTs; female skew and confounding in quasi
Balance/Strength	5 (2/3)	Low-Very Low	Imprecision, inconsistency (2 levels for RCTs); Serious bias, indirectness (3 levels for quasi)	Small n and mixed measures in RCTs; confounding in quasi
Psychological Symptoms	3 (2/1)	Low-Very Low	Imprecision (2 levels for RCTs); Serious bias, limited studies (3 levels for quasi)	Small n in RCTs; single quasi study with confounding
Biomarkers/Other	2 (0/2)	Very Low	Serious bias, imprecision, indirectness (3 levels)	Single/small quasi studies; confounding and female bias

Abbreviations: RCTs: Randomised Controlled Trials, Quasi: Quasi-experimental, GRADE: Grading of Recommendations Assessment, Development and Evaluation, n: Sample size, RoB: Risk of Bias

Narrative Synthesis: A narrative synthesis was employed instead of meta-analysis due to marked heterogeneity in interventions, outcome measures, study designs, and small sample sizes, which precluded quantitative pooling. This approach enabled thematic integration of findings and identification of consistent patterns and evidence gaps. According to GRADE criteria, the certainty of evidence was low to moderate overall: fatigue and QoL were downgraded for bias, inconsistency, and imprecision; balance and strength for indirectness; and psychological and biomarker outcomes for limited and potentially biased data. No upgrades were applied, as large or dose–response effects were not consistently observed.

Discussion

This systematic review synthesises evidence from ten clinical trials on yoga as a complementary intervention for managing multiple sclerosis (MS) symptoms, building on prior systematic reviews [22-24]. These earlier works established a foundation for yoga's potential in MS, and the current analysis extends their findings with updated data, offering a narrative synthesis that addresses evolving research gaps, particularly in tele-yoga adaptations and biomarker outcomes.

Comparison with Previous Evidence: The current findings align with Cramer et al.'s meta-analysis, which reported short-term fatigue reductions and mood improvements in seven RCTs, though effects were not robust against bias or sustained against exercise comparators [22]. Our review corroborates significant fatigue reductions in 80% of studies, consistent with Shohani et al.'s meta-analysis of five RCTs showing a stronger effect (SMD = -0.72) on fatigue, alongside QoL gains (SMD = 0.58) [23]. The present data extend these results, with yoga outperforming acceptance and commitment therapy (ACT) in fatigue reduction (-5.29 units, $p<0.001$ [39]) and showing sustained benefits when combined with mindfulness-based cognitive therapy ($p<0.05$ at 2 months [38]). However, like Cramer et al., we found no consistent superiority over active comparators such as Pilates ($p=0.019$ QoL favouring Pilates [35]), suggesting yoga's effects may be context-specific.

Thakur et al. emphasised yoga's broad symptom management potential, including mobility, depression, and cognitive function, though with limited long-term data [24]. Our review supports these claims with moderate balance/strength gains (Berg $p=0.002$ [34]; sEMG $p=0.001$ [32]) and psychological benefits (depression ES -1.92, $p=0.001$ [31]), but highlights short-term efficacy in psychological domains ($p=0.028$ fading at follow-up [33]). The novel finding of anti-inflammatory cytokine reductions (IL-6/TNF-α/IL-10 $p=0.001$ [36]) aligns with Thakur's suggestion of yoga's neuroprotective mechanisms, though evidence remains preliminary due to single-study representation.

This review introduces recent evidence, including tele-yoga feasibility [37] and diverse yoga styles (Bhramari pranayama [31]), reflecting pandemic-driven adaptations not covered in prior reviews. The inclusion of self-management ($p=0.028$ [33]) and neurological disorder outcomes ($p\leq0.05$ [37]) expands the outcome spectrum, suggesting yoga's holistic potential. However, gaps persist: long-term follow-up (>2 months) is absent in 90% of studies, and severe MS (EDSS >6) or male participants are

underrepresented, limiting generalisability compared to Thakur et al.'s call for diverse cohorts [24]. Biomarker data, whilst promising, require replication across larger samples.

Clinical Implications: Yoga's safety and accessibility support its role as an adjunct to disease-modifying therapies (DMTs), consistent with prior recommendations [22,23]. Fatigue and QoL improvements align with clinical guidelines advocating exercise for MS, though superiority over established therapies remains unproven. The moderate effect sizes (e.g., Cohen's d 0.5–0.8 [37]) suggest practical significance for mild-to-moderate cases, particularly women, but tailored protocols (e.g., Hatha for strength, pranayama for mood) are needed based on outcome priorities.

Strengths and Limitations: Strengths include a comprehensive update of recent studies, dual extraction, and a broad outcome range. Limitations mirror prior reviews: small samples, high/some risk of bias in 90%, and female bias. Narrative synthesis addressed heterogeneity (e.g., 4–24-week durations), but precluded meta-analysis, GRADE ratings (low-moderate certainty) reflect bias and imprecision, consistent with Cramer et al.'s caution on methodological rigour.

Future Directions: Future RCTs should target larger, diverse samples (e.g., men, progressive MS), standardise yoga protocols, and extend follow-ups (≥6 months) to assess durability. Exploring biomarkers (e.g., IL-6 trends) and tele-yoga scalability could enhance evidence. Collaboration with MS societies could improve recruitment and adherence monitoring.

Conclusion

This systematic review identifies yoga as a promising complementary intervention for symptom management in multiple sclerosis, particularly amongst women with mild-to-moderate disease. Evidence indicates short-term benefits in fatigue reduction, quality of life, balance, strength, and psychological well-being, alongside a favourable safety profile. However, the overall certainty of evidence remains low to moderate due to small sample sizes, methodological variability, and risk of bias. Limited representation of men, severe, or progressive MS subtypes further constrains generalisability. Whilst emerging outcomes—such as self-management and tele-yoga feasibility—expand the evidence base, robust, adequately powered randomised trials are needed to confirm efficacy, standardise protocols, and assess long-term effects.

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Author Contributions
All authors have read and approved the final version of the manuscript.

Ethical statement
Ethical approval was not required for this study, as it was a review article with data obtained through a literature search.

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Conflict of Interests
The authors declare no conflicts of interest in relation to the publication of this paper.

Data Availability Statement
The data analysed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible via databases.

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