

Impact of Swiss Ball-Based Exercise Programs on Health-Related Quality of Life in Climacteric Women: A Systematic Review

Tanvi Bhujbal¹, S Anandh², Rushikesh Patil³, Vedika Karmarka⁴, Sakshi Jadhav⁵, Anjali Linge⁶

¹*MPTh, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth (Deemed to be University), karad*

²*Professor and HOD, Department of Community Health Sciences, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth (Deemed to be University), karad*

³*MPTh, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth (Deemed to be University), karad*

Abstract—Background: The climacteric period represents a critical biological and psychosocial transition in a woman's life, characterized by progressive hormonal decline, musculoskeletal deterioration, vasomotor disturbances, pelvic floor dysfunction, and diminished health-related quality of life (HRQOL). Exercise-based rehabilitation, particularly instability training using the Swiss ball, has emerged as a promising non-pharmacological approach for addressing the multidimensional impairments associated with this transition.

Aim: To systematically evaluate the evidence regarding the effectiveness of Swiss ball training programs on quality of life, functional performance, and climacteric symptom burden among women during the climacteric period.

Methods: A comprehensive literature search of papers published between 2010 and 2026 was conducted using PubMed, Google Scholar, Scopus, ScienceDirect, and Web of Science. Included studies comprised randomized controlled trials (RCTs) and cross-sectional studies examining Swiss ball training, stability training, and related exercise-based therapies in climacteric women. Risk of bias was assessed using the RoB 2 tool for RCTs and the AXIS evaluation tool for cross-sectional studies.

Results: A total of 10 studies met the inclusion criteria, comprising six RCTs and four cross-sectional studies, with sample sizes ranging from 35 to 1,167 participants. Findings consistently demonstrated that Swiss ball training and related exercise interventions significantly improved core muscle strength, pelvic floor function, balance, flexibility, vasomotor symptom burden, and menopause-specific quality of life. Cross-sectional studies corroborated these findings by documenting

strong associations between physical activity, menopausal status, and HRQOL outcomes.

Conclusion: Swiss ball training represents a safe, accessible, and effective non-pharmacological intervention for improving quality of life and functional performance in climacteric women. Integration of instability-based core training into structured physiotherapy programs is supported by the available evidence. Large-scale, standardized RCTs with long-term follow-up are recommended as the focus of future research.

Index Terms—Climacteric period; Swiss ball training; Greene Climacteric Scale; pelvic floor dysfunction; health-related quality of life; exercise rehabilitation

I. INTRODUCTION

The climacteric period constitutes a prolonged biological and psychosocial transition spanning the perimenopause, menopause, and early post menopause. Given current life expectancy estimates, many women will spend more than one-third of their lives in the postmenopausal state. The average age of natural menopause is approximately 51 years worldwide [1].

The transition is driven by progressive ovarian follicular depletion resulting in declining estradiol, progesterone, and inhibin B concentrations, with compensatory rises in follicle-stimulating hormone (FSH) and luteinizing hormone (LH) [2]. The resultant hypoestrogenic state perturbs multiple physiological systems simultaneously. Vasomotor symptoms hot flushes and night sweats are the hallmark

manifestation, reported in 60–80% of transitioning women in Western populations [3].

Concurrent changes include accelerated loss of bone mineral density, sarcopenia, adiposity redistribution, pelvic floor muscle weakening, genitourinary atrophy, mood disturbances, cognitive complaints, and sleep fragmentation [4,5]. Collectively, these changes impose a substantial and multidimensional burden on health-related quality of life (HRQOL), encompassing physical functioning, psychosocial wellbeing, sexual health, and role performance [6].

Hormone therapy (HT) remains effective for many climacteric symptoms; however, its use is contraindicated in women with hormone-sensitive cancers, thromboembolic disease, and certain cardiovascular conditions, and a large proportion of women actively prefer non-pharmacological management strategies [7]. Physical exercise has accumulated a robust evidence base as a safe, effective, and accessible intervention across multiple domains of climacteric health, including vasomotor symptoms, musculoskeletal function, mood, and HRQOL [8].

Among exercise modalities, Swiss ball training also termed stability ball or gymnastic ball training occupies a distinctive therapeutic position. By providing an inherently unstable support surface, the Swiss ball challenges the neuromuscular system to recruit deep core stabilizers, including the transversus abdominis, multifidus, and pelvic floor muscles, to a greater degree than equivalent stable-surface exercises [9]. This multi-muscle co-activation pattern makes Swiss ball training uniquely capable of simultaneously addressing the core instability, pelvic floor weakness, proprioceptive deficits, and balance impairments that characterize the physical profile of climacteric women [10].

Despite the physiological rationale and clinical promise of Swiss ball training for this population, the evidence base remains fragmented and insufficiently synthesized. This systematic review therefore aims to qualitatively synthesize and critically appraise the available evidence regarding the effectiveness of Swiss ball training programs on quality of life, functional performance, and climacteric symptom burden in women during the climacteric period.

II. METHODS

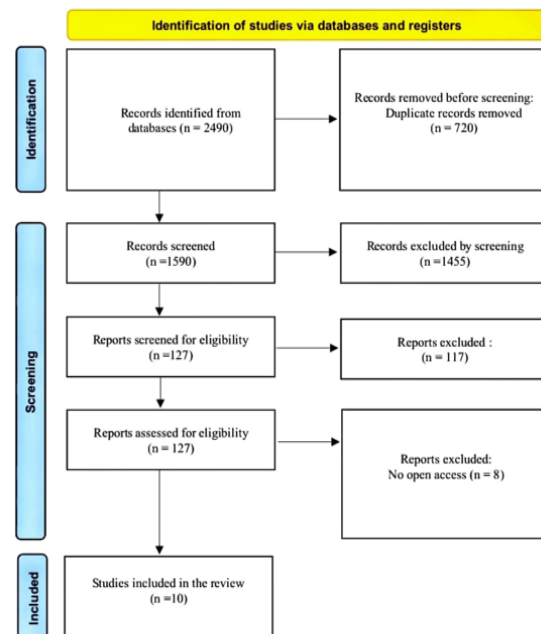
Search Strategy

A comprehensive literature search was conducted in PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar for studies published between 2010 and 2026. Keywords and MeSH terms included: climacteric period, menopause, perimenopause, Swiss ball training, stability ball exercise, core stability, and quality of life. Boolean operators (AND/OR) were applied, and reference lists of eligible studies were manually screened for additional relevant articles.

Inclusion and Exclusion Criteria

Included studies comprised randomized controlled trials (RCTs) and cross-sectional studies that examined Swiss ball training, stability training, or related exercise-based therapies in women during the climacteric period, with outcomes related to quality of life, functional performance, or climacteric symptom burden.

Studies were excluded if they involved women outside the climacteric period, did not include Swiss ball exercise as a primary or significant component of the intervention, or enrolled participants with severe neurological, musculoskeletal, cardiovascular, psychiatric, or systemic disorders. Risk of bias was assessed using the RoB 2 tool for RCTs and the AXIS evaluation tool for cross-sectional studies [11,12].



III. RESULTS

Study Characteristics

A total of 10 studies met the eligibility criteria, comprising six RCTs and four cross-sectional studies.

Sample sizes ranged from 35 to 1,167 participants. Intervention durations across RCTs ranged from 8 to 16 weeks, with exercise frequencies of two to three sessions per week. The characteristics and principal findings of included studies are summarized in Table 1.

Table 1. Characteristics and Summary of Findings of Included Studies

Author (Year)	Study Design	Sample Size	Outcome Measures	Intervention	Results	Conclusions
Sekendiz B et al. (2010)	RCT	35	Core strength, trunk endurance, flexibility, balance	8-week Swiss ball core strength training (3×/week)	Significant improvements in trunk muscle strength, endurance, flexibility, and balance in training group	Swiss ball training is effective for improving physical fitness in sedentary women
Lima AS et al. (2019)	RCT	58	SF-36 physical & psychological component scores, bodily pain, vitality	8-week Swiss ball exercise program targeting core stability & balance (3×/week)	Significant improvements in SF-36 physical component, reduced bodily pain, improved vitality scores	Swiss ball training meaningfully improves health-related QoL in perimenopausal women
Elavsky S & McAuley E (2007)	RCT	164	Positive affect, life satisfaction, menopausal symptom severity, overall QoL	Walking program vs yoga vs waitlist control	Exercise groups showed significantly greater improvements in positive affect, life satisfaction, and QoL vs control	Structured physical activity effectively reduces psychological burden and improves QoL during the climacteric
Sánchez-Jiménez A et al. (2020)	RCT	60	SF-36 mental health, role emotional domain, pain scores	Structured therapeutic exercise program (12 weeks, 3×/week)	Significant improvements in SF-36 mental health and role emotional scores; reduced pain scores	Exercise addresses both physical and psychological dimensions of QoL in climacteric women with chronic pain
Berin E et al. (2019)	RCT	65	Hot flush frequency, severity score, QoL, mood	15-week resistance training program (3×/week)	Resistance training significantly reduced hot flush severity and frequency compared to controls	Resistance training is a viable non-pharmacological intervention for vasomotor symptom management
Trujillo-Muñoz PA et al. (2025)	RCT	84	Climacteric symptoms (GCS), QoL (MENQOL), muscle strength, flexibility	Multimodal exercise program combining aerobic and resistance components (16 weeks)	Significant reductions in GCS scores and MENQOL symptom burden; improved muscle strength and flexibility	Multimodal exercise programs produce the most consistent and clinically meaningful QoL benefits in climacteric women
Bondarev D et al. (2018)	Cross-Sectional	1,167	Lower limb power, grip	Observational assessment of	Menopausal status negatively	Exercise interventions during perimenopause

			strength, walking speed, postural balance, flexibility level	menopausal status and physical activity	associated with muscle power, walking speed, and balance; physical activity partially attenuated these declines	may prevent or delay menopausal physical performance declines
Schvartzman R et al. (2014)	Cross-Sectional	80	Pelvic floor muscle activity (sEMG), sexual function, QoL questionnaire scores	Observational assessment with surface EMG and validated questionnaires	Pelvic floor muscle dysfunction significantly associated with reduced sexual health and lower QoL scores in menopausal women	Pelvic floor-targeted training should be incorporated into comprehensive exercise programs for climacteric women
De Melo Barcelos MR & da Costa (2018)	Cross-Sectional (Integrative Review)	—	Physical functioning, mental health, vitality, social functioning, general health perception	Integrative review examining climacteric symptoms and QoL associations	Climacteric symptoms, especially hot flashes, sleep disturbances, and urinary incontinence, significantly reduce multi-domain QoL scores	Multimodal interventions addressing the breadth of climacteric symptoms are essential for QoL improvement
Cauley JA et al. (1987)	Cross-Sectional	210	Grip strength, menopausal status, estrogen use, physical activity	Community-based observational assessment using hand dynamometry	Significant progressive decline in grip strength across menopausal spectrum; decline persisted after adjustment for age and body composition	Exercise can attenuate but not fully reverse menopausal grip strength decline, underscoring need for strength-focused training

RCT = Randomized Controlled Trial; GCS = Greene Climacteric Scale; MENQOL = Menopause-Specific Quality of Life questionnaire; SF-36 = Short Form 36 Health Survey; sEMG = surface electromyography; QoL = quality of life.

National Prevalence

Approximately 70–80% of climacteric women experience menopausal symptoms that negatively affect quality of life. In India, menopause occurs earlier (46–48 years) than in many Western countries, increasing the burden of physical, psychological, and social health problems among middle-aged women.

Factors Associated with Poorer Quality of Life

Factors consistently associated with poorer HRQOL during the climacteric period include declining estrogen levels, reduced muscle strength and physical performance, pelvic floor dysfunction, balance impairment, sleep disturbances, vasomotor symptoms

(hot flushes and night sweats), psychological distress, and physical inactivity. Regular exercise, particularly Swiss ball and multimodal programs, is associated with improvements across these domains.

Risk of Bias Assessment

Risk of bias was assessed for all six RCTs using the RoB 2 tool. Results are presented in Table 2. The majority of RCTs demonstrated low risk of bias for randomization and missing outcome data; however, some concerns were identified for blinding of participants and outcome assessors due to the inherent nature of exercise interventions.

Table 2. Risk of Bias Assessment of Included RCTs Using the RoB 2 Tool

Study	Bias from Randomization	Deviations from Interventions	Missing Outcome Data	Measurement of Outcome	Selection of Reported Results	Overall Risk of Bias
Sekendiz B et al. (2010)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Lima AS et al. (2019)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Elavsky S & McAuley E (2007)	Low Risk	Low Risk	Low Risk	Some Concerns	Low Risk	Low Risk
Sánchez-Jiménez A et al. (2020)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Berin E et al. (2019)	Low Risk	Some Concerns	Low Risk	Some Concerns	Low Risk	Some Concerns
Trujillo-Muñoz PA et al. (2025)	Low Risk	Low Risk	Low Risk	Some Concerns	Low Risk	Low Risk

RoB 2 = Revised Cochrane Risk of Bias Tool for Randomised Trials. Colour coding: green = Low Risk, yellow = Some Concerns.

IV. DISCUSSION

The present systematic review synthesized evidence from six RCTs and four cross-sectional studies examining the effectiveness of Swiss ball training and related exercise interventions on quality of life and functional outcomes in women during the climacteric period. The collective findings support the conclusion that instability-based exercise training, particularly Swiss ball programs, produces clinically meaningful improvements across the physical, psychological, and quality-of-life dimensions most affected during this transition.

The foundational evidence for Swiss ball training in sedentary women was established by Sekendiz et al. (2010), whose eight-week RCT demonstrated significant gains in trunk muscle strength, core endurance, spinal flexibility, and balance [9]. These physical parameters are precisely those compromised by the hypoestrogenic state of the climacteric: estrogen decline accelerates sarcopenia, reduces neuromuscular coordination, and impairs postural stability [13]. The magnitude of improvement observed with moderate to large effect sizes underscores the clinical relevance of Swiss ball training for this population. The unstable surface of the Swiss ball elicits greater trunk muscle co-contraction than stable-surface exercise, engaging the transversus abdominis, pelvic floor, and deep stabilizers simultaneously within each exercise repetition [9,10].

Lima et al. (2019) extended these findings by demonstrating that an eight-week Swiss ball training protocol produced significant improvements in SF-36 physical component scores, bodily pain, and vitality in perimenopausal women [14]. These results align with evidence from De Melo Barcelos & da Costa (2018), whose integrative review established that hot flushes, sleep disturbances, and urinary incontinence collectively and independently erode multi-domain HRQOL [15].

The psychological dimension of climacteric HRQOL was addressed by Elavsky & McAuley (2007), whose RCT demonstrated that both walking and yoga programs significantly improved positive affect, life satisfaction, and overall QoL compared to a waitlist control [16]. Similarly, Sánchez-Jiménez et al. (2020) demonstrated significant improvements in SF-36 mental health and role-emotional domains following a structured therapeutic exercise program in climacteric women with chronic musculoskeletal pain [17].

The vasomotor symptom domain was specifically addressed by Berin et al. (2019), whose 15-week resistance training RCT demonstrated significant reductions in hot flush severity and frequency compared to controls [18]. The mechanisms underlying this finding are multifactorial and include exercise-induced thermoregulatory adaptations, reductions in central norepinephrine turnover, and modulation of hypothalamic thermostat sensitivity. Trujillo-Muñoz et al. (2025) further demonstrated that

a 16-week multimodal exercise program combining aerobic and resistance components produced significant reductions in GCS scores and MENQOL symptom burden alongside improvements in muscle strength and flexibility [19].

Cross-sectional evidence from Bondarev et al. (2018), in a large sample of 1,167 women, demonstrated that menopausal status was independently and negatively associated with muscle power, walking speed, and balance, while habitual physical activity partially attenuated these declines [20]. Schwartzman et al. (2014) provided important mechanistic data by demonstrating that pelvic floor muscle dysfunction in menopausal women is significantly associated with reduced sexual health scores and lower overall QoL [21]. Swiss ball exercises performed in closed-chain positions generate significant intra-abdominal pressure, demanding coordinated pelvic floor engagement and representing a functional training modality for this often-neglected component of climacteric rehabilitation.

V. CONCLUSION

This systematic review provides evidence that Swiss ball training programs are safe, feasible, and effective non-pharmacological interventions for improving quality of life and functional performance in women during the climacteric period. The instability-based core training mechanism of the Swiss ball simultaneously addresses multiple physical impairments characteristic of the climacteric including core weakness, pelvic floor dysfunction, balance deficits, reduced flexibility, and vasomotor symptom burden within a single, time-efficient training format. Both RCT and cross-sectional evidence support the integration of Swiss ball training into physiotherapy-based management programs for climacteric women. Multimodal programs combining Swiss ball exercises with aerobic and flexibility components may yield the most comprehensive quality-of-life benefits. Further large-scale, standardized clinical trials with long-term follow-up are recommended to establish definitive training guidelines and determine the optimal dose-response relationship for this intervention in climacteric populations.

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