

Beyond Hot Flashes: Understanding the Physical and Mental Health Impact of Menopause Across Diverse Global Populations

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ABSTRACT

Background: Perimenopause, menopause and post-menopause represent major biological, psychological and social transitions that affect health, quality of life, work participation, relationships and long-term ageing outcomes.

Objective: This review synthesizes recent evidence from 2021–2026 on the physical and mental health consequences of the menopausal transition, with attention to global diversity, inequity, clinical management and research gaps.

Methods: Recent research paper from 2021-2026 supports a major shift from prolonged injectable-containing regimens toward six-month and nine-month all-oral regimens based on bazedoxifene, toremifene, linezolid, moxifloxacin, delamanid, clofazimine and fluoroquinolones where appropriate.

Results: Recent evidence supports a stage-specific, culturally competent, multidisciplinary model of menopause care that integrates hormonal and non-hormonal symptom management, mental health screening, sleep care, sexual and genitourinary health, chronic disease prevention, workplace adaptation and inclusive policy reform.

Conclusion: Perimenopause, menopause and post-menopause have significant physical and mental health implications, but their impact is not uniform. Symptoms are shaped by menopausal stage, mode of onset, prior health, comorbidities, sleep, pain, mental health history, culture, socioeconomic conditions, work, stigma and healthcare access.

Keywords: perimenopause, menopause, post-menopause, mental health, vasomotor symptoms

1. INTRODUCTION

Menopause is commonly defined as the permanent cessation of menstruation after 12 consecutive months without a menstrual period, in the absence of another pathological or physiological cause [1]. Perimenopause refers to the transitional period before menopause, when ovarian hormone fluctuation becomes clinically evident, while post-menopause refers to the years after the final menstrual period. This transition is not only a reproductive milestone; it is also a whole-person health event involving endocrine, neurological, metabolic, musculoskeletal, cardiovascular, urogenital, sexual, psychological and social dimensions [2]. The World Health Organization emphasizes that hormonal changes associated with menopause can affect physical, emotional, mental and social well-being, and that symptoms vary widely from person to person. Some individuals experience few symptoms, while others experience severe symptoms that disrupt daily activities and quality of life for several years. The global relevance of menopause is increasing because population ageing means more women and gender-diverse people assigned female at birth are living for decades after the final menstrual period [3]. WHO reported that women aged 50 years and above represented 26% of all women and girls globally in 2021, compared with 22% ten years earlier. Historically, menopause research has focused mainly on cisgender, White, middle-class women in high-income countries. This has limited the generalizability of clinical guidance and has left major gaps for women in low- and middle-income countries, ethnic minority groups, surgically menopausal individuals, people with premature ovarian insufficiency, breast cancer survivors, transgender men and non-binary people registered female at birth [4]. The MARIE Project Global Chapter WP2a is therefore important because it directly responds to the lack of diverse global evidence on menopausal health.

2. RATIONALE AND SIGNIFICANCE OF THE MARIE PROJECT GLOBAL CHAPTER WP2A

The MARIE Project Global Chapter WP2a is a mixed-methods study designed to explore the physical and mental health impact of perimenopause, menopause and post-menopause across diverse international settings. The quantitative component recruited eligible cisgender and transgender women experiencing perimenopause, menopause or post-menopause from clinical and community settings across 13 countries [5]. The study is valuable for three reasons. First, it shifts menopause research from a narrow high-income-country model toward a broader global health framework. Second, it recognizes that menopausal experience is not only biological but also shaped by culture, stigma, employment, healthcare access and social support. Third, it includes a wider clinical spectrum, including people with long-term conditions, disability, premature ovarian insufficiency, endometriosis and medically induced or surgically induced menopause. The MARIE-related Lancet Global Health comment also argues that menopause requires urgent global attention and that future menopause care should be inclusive, personalized and gender-sensitive, with better recognition of diverse experiences across ethnicities, races and health systems.

3. MATERIALS & METHODS

This is a narrative review informed by recent peer-reviewed literature, clinical guidelines and global health sources published mainly within the last five years. Evidence was synthesized from the MARIE Global Chapter WP2a study, MARIE UK-WP2a data, WHO menopause guidance, NICE menopause recommendations, Lancet menopause series papers, JAMA review evidence, European Society of Endocrinology guidance, systematic reviews on depression and sleep, and literature on menopausal symptom management in breast cancer survivors [5].

The review focuses on five domains:

- Physical health impact of perimenopause, menopause and post-menopause.

- Mental health impact, including depression, anxiety, cognition, sleep and burnout.
- Cross-cultural and global inequalities in symptom burden and care access.
- Clinical management, including hormonal, non-hormonal and psychosocial interventions.
- Research, policy and practice implications for inclusive menopause care.

4. PHYSICAL HEALTH IMPACT OF THE MENOPAUSAL TRANSITION

Vasomotor Symptoms

Vasomotor symptoms, including hot flushes and night sweats, are among the most recognized menopausal symptoms. These symptoms can occur during perimenopause and continue into post-menopause. They may disrupt sleep, worsen fatigue, reduce concentration and impair social and occupational functioning [6]. NICE recommends offering hormone replacement therapy to people with vasomotor symptoms associated with menopause and also supports menopause-specific cognitive behavioral therapy as an additional option, or as an alternative when HRT is contraindicated or not preferred. The MARIE Global WP2a findings showed that vasomotor symptom burden varied substantially across countries and menopausal stages, with higher overall burden reported in some country groups and lower burden in others [7]. This international variation supports the argument that symptom reporting is influenced not only by biology but also by climate, work conditions, cultural language, stigma, expectations, health literacy and access to care.

Sleep Disturbance And Fatigue

Sleep disturbance is one of the most disabling symptoms during and after the menopausal transition. It may result from night sweats, anxiety, pain, urinary symptoms, mood disturbance, work stress or independent insomnia. In the MARIE UK-WP2a preprint, validated tools such as the Insomnia Severity Index were used alongside mental health, pain, burnout and quality-of-life measures, showing that insomnia and burnout were moderately prevalent among employed participants, especially when complex conditions such as endometriosis coexisted [8]. Sleep problems are clinically important because they can amplify anxiety, depressive symptoms, cognitive complaints, pain sensitivity and metabolic risk. Recent systematic review evidence also indicates that sleep disturbances during post-menopausal years can substantially reduce health-related quality of life.

Musculoskeletal Pain And Functional Limitation

Joint pain, muscle pain, back pain and generalized aches are common but often under-recognized menopausal complaints. These symptoms can reduce mobility, physical activity and workplace productivity. In MARIE UK-WP2a, people experiencing surgical menopause showed increased back pain, insomnia, vasomotor symptoms and poorer quality of life compared with other groups [9]. The global MARIE WP2a analysis also identified lower-back pain and quality of life as important secondary domains. Musculoskeletal symptoms should not be dismissed as normal ageing without assessment. They may coexist with osteoporosis risk, vitamin D deficiency, obesity, inflammatory conditions, endometriosis-related pain, occupational strain or depression. A complete clinical approach should include pain assessment, mobility screening, lifestyle evaluation and fracture risk assessment when indicated [10].

Genitourinary And Sexual Health

Genitourinary syndrome of menopause includes vaginal dryness, irritation, dyspareunia, recurrent urinary symptoms, urinary urgency and sexual discomfort. These symptoms may persist or worsen after menopause because local estrogen deficiency affects the urogenital epithelium. NICE recommends

vaginal estrogen for genitourinary symptoms in people without a personal history of breast cancer and notes that local absorption is minimal compared with systemic HRT. For individuals with a personal history of breast cancer, NICE recommends non-hormonal moisturizers or lubricants first, with vaginal estrogen considered only when symptoms persist despite non-hormonal treatment and after appropriate clinical discussion [11]. Sexual health is often neglected in clinical consultations because of stigma, embarrassment and limited consultation time. A global menopause care model should normalize sexual health questions and include culturally sensitive counselling, treatment options and partner-aware support where appropriate.

Cardiometabolic And Bone Health

Post-menopause is associated with increased long-term risk of osteoporosis, adverse body composition change, insulin resistance, dyslipidemia and cardiovascular disease. These risks are shaped by ageing, reduced estrogen exposure, lifestyle, genetics, socioeconomic position and comorbidities. The European Society of Endocrinology 2025 guideline recommends that menopause should be understood as a spectrum including perimenopause and post-menopause, and that management should be holistic rather than focused only on hormone therapy [12]. Menopause consultations should therefore be used as opportunities for preventive care. This includes blood pressure assessment, diabetes screening, lipid review, smoking cessation, alcohol reduction, physical activity counselling, nutrition support, bone health assessment and discussion of weight, sleep and mental health.

5. MENTAL HEALTH IMPACT

Depression

Depressive symptoms are among the most studied mental health outcomes in menopause research. A 2024 systematic review and meta-analysis in the *Journal of Affective Disorders* found that perimenopausal women had a significantly higher risk of depressive symptoms and diagnoses compared with premenopausal women [13]. However, the Lancet menopause mental health series cautions against assuming that all women are universally at increased risk. It reviewed prospective studies and found no compelling evidence for a universal rise in major depressive disorder or depressive symptoms across all people during menopause; rather, risk appears higher in specific subgroups, especially those with severe vasomotor symptoms, sleep disruption, long menopausal transition, stressful life events or previous major depressive disorder. This distinction matters clinically. Menopause can contribute to mood symptoms, but attributing every episode of depression to menopause may delay appropriate psychiatric diagnosis and treatment. The best approach is integrated assessment: clinicians should ask about menopausal symptoms, sleep, vasomotor burden, psychosocial stress, trauma, medical history and prior depression [14].

Anxiety

Anxiety is commonly reported during perimenopause, and MARIE UK-WP2a found anxiety severity was significantly higher during perimenopause than post-menopause at both baseline and follow-up. The global WP2a findings also showed country-level differences in anxiety burden. Anxiety during this transition may be linked to hormonal fluctuation, poor sleep, hot flushes, life stress, caregiving demands, work pressure, physical symptoms and uncertainty about ageing [15]. In many settings, women are not told that anxiety can occur during perimenopause, which may lead to fear, misdiagnosis or unnecessary investigations. Routine screening with culturally validated tools can improve recognition.

Cognition, Brain Fog And Concentration

Cognitive symptoms such as forgetfulness, reduced concentration, word-finding difficulty and “brain fog” are frequently reported during perimenopause. MARIE UK-WP2a reported that cognitive symptoms, including forgetfulness and difficulty concentrating, were most pronounced among perimenopausal participants [16]. These symptoms may be influenced by sleep disturbance, anxiety, depression, vasomotor symptoms, pain, work stress and hormonal fluctuation. Clinicians should avoid dismissing cognitive complaints but should also assess for reversible contributors such as insomnia, thyroid disease, vitamin deficiency, medication effects, depression and chronic stress.

Burnout And Workplace Mental Health

The menopausal transition often coincides with peak professional responsibilities, caregiving for children or ageing parents, financial pressure and leadership roles. Symptoms such as night sweats, fatigue, mood disturbance, pain and cognitive difficulty can affect work performance and confidence. MARIE UK-WP2a specifically identified workplace impact, insomnia and burnout as important domains, especially among employed participants with complex medical histories [17]. Workplace responses should not stigmatize menopause or frame all midlife women as impaired. Instead, employers should provide flexible, confidential and practical support, including temperature control, flexible scheduling, rest breaks, access to occupational health, manager training and protection from discrimination.

6. GLOBAL DIVERSITY AND HEALTH INEQUITY

The experience of menopause is shaped by culture, language, religion, ethnicity, gender norms, education, income, work, healthcare access and social support. WHO notes that menopause is often not discussed within families, communities, workplaces or healthcare settings, and that many healthcare providers may not be trained to recognize or counsel patients on perimenopausal and post-menopausal symptoms. The MARIE Global WP2a study is important because it included countries from multiple regions, including Africa, South Asia, Southeast Asia, the Middle East, Europe and South America. Its findings showed substantial cross-country variation in symptom burden, with the UK and Rwanda reporting higher anxiety, depression, somatic burden, vasomotor symptoms and overall Menopause Rating Scale scores, while Nepal, Sri Lanka, Malaysia and Singapore showed lower reported burden [18]. These differences should not be interpreted simplistically as biological differences between populations. They may reflect differences in symptom language, cultural acceptance, stigma, reporting behavior, healthcare access, economic stress, comorbid disease, climate, employment conditions and recruitment methods. Future research should combine quantitative symptom scales with qualitative data to understand how people interpret and describe menopausal symptoms in different contexts.

7. CLINICAL COMPLEXITY: SURGICAL MENOPAUSE, POI, ENDOMETRIOSIS AND CANCER SURVIVORSHIP

Not all menopause is natural or gradual. Surgical menopause after oophorectomy, medically induced menopause after chemotherapy or GnRH analogue use, and premature ovarian insufficiency can cause abrupt estrogen withdrawal and severe symptoms. MARIE WP2a identified clinical complexity, including endometriosis, disability, long-term conditions, premature ovarian insufficiency and GnRH analogue use, as being strongly associated with worse outcomes. Breast cancer survivors represent another important group [19]. A review on menopausal symptom management in breast cancer survivors highlights that vasomotor symptoms, sleep disturbance, mood changes and sexual dysfunction are highly prevalent and can be severe and persistent in this population. It also notes that hormone replacement therapy is often contraindicated or avoided in estrogen receptor-positive breast cancer survivors, making non-hormonal pharmacological and non-pharmacological strategies especially important. This evidence supports a risk-stratified model. People with surgical menopause, POI, cancer survivorship, endometriosis, disability or multiple long-term conditions should have earlier specialist

referral, individualized management and coordinated care across gynecology, endocrinology, oncology, mental health, primary care, sexual health and occupational health.

8. MANAGEMENT APPROACHES

Menopausal Hormone Therapy

Menopausal hormone therapy remains one of the most effective treatments for vasomotor symptoms and can also benefit sleep, mood symptoms linked to vasomotor disturbance, genitourinary symptoms and bone health in selected individuals. NICE recommends offering HRT to people with vasomotor symptoms associated with menopause and advises that benefits and risks should be tailored to the person's age, circumstances and risk factors. The European Society of Endocrinology 2025 guideline recommends shared decision-making before starting hormone therapy and emphasizes that treatment should be individualized according to medical history, preferences, formulation, dose, route and duration.

Non-Hormonal Pharmacological Options

Non-hormonal options are important for people who cannot use HRT, prefer not to use it, have contraindications, or have cancer-related concerns. NICE now includes fezolinetant as an option for moderate to severe vasomotor symptoms when HRT is unsuitable. The review also highlights neurokinin-3 receptor antagonists as a promising mechanism-based, non-hormonal treatment class for vasomotor symptoms, particularly relevant to breast cancer survivors, while noting the need for safety monitoring and further evidence in survivor populations. Other non-hormonal options may include selected SSRIs, SNRIs, gabapentin or clonidine depending on local guidelines, symptom profile and patient risk. However, NICE advises against routinely offering SSRIs, SNRIs or clonidine as first-line treatment for vasomotor symptoms alone.

Psychological And Behavioural Interventions

Cognitive behavioral therapy has a growing role in menopause care, especially for vasomotor distress, sleep disturbance and depressive symptoms associated with menopause. NICE recommends discussing CBT as an option and considering menopause-specific CBT for vasomotor symptoms, sleep problems and depressive symptoms in appropriate cases. Psychological care should include screening for depression, anxiety, trauma, domestic abuse, workplace stress and caregiver burden where clinically relevant. Supportive counselling, mindfulness-based approaches, psychoeducation, sleep interventions and structured exercise may improve coping and quality of life, although they should not be used to dismiss severe symptoms or deny access to evidence-based medical treatment.

9. TOWARD A VALUE-ADDED MODEL OF GLOBAL MENOPAUSE CARE

A strong global menopause model should move beyond a narrow "HRT versus no HRT" debate. The Lancet empowerment model argues for an approach that goes beyond treating specific symptoms and supports women as active partners in their care. This is highly relevant to the MARIE Project because symptom burden is shaped by both individual biology and wider systems.

A value-added care model should include:

- Early recognition of perimenopause, including symptoms before menstrual cessation.
- Use of validated tools for vasomotor, sleep, mood, pain, sexual and quality-of-life assessment.
- Routine mental health screening for people with severe symptoms or prior psychiatric history.
- Culturally competent counselling in local languages.

- Specific pathways for surgical menopause, POI, endometriosis, cancer survivorship and disability.
- Shared decision-making around HRT and non-hormonal options.
- Workplace adjustments that protect dignity and confidentiality.
- Integration of menopause care into primary care, reproductive health, oncology, mental health and healthy ageing services.
- Better inclusion of transgender men and non-binary people registered female at birth.
- Research investment in low- and middle-income countries and underrepresented populations.

10. RESEARCH GAPS AND FUTURE DIRECTIONS

The MARIE Project Global Chapter WP2a has advanced the evidence base, but several gaps remain. First, cross-sectional data cannot prove causality or fully capture symptom trajectories over time. Longitudinal follow-up is needed to understand how symptoms change from perimenopause to post-menopause and how treatment, social support and comorbidities alter outcomes. Second, global symptom scales require cultural validation. A score developed in one setting may not capture symptom meanings in another. Third, more research is needed on surgical menopause, medically induced menopause, premature ovarian insufficiency, endometriosis, disability and cancer survivorship. Fourth, workplace studies should examine not only productivity loss but also stigma, career progression, disclosure safety and employer responsibility. Fifth, future research should include biomarkers, clinical diagnosis, treatment exposure and patient-reported outcomes to better connect biological mechanisms with lived experience.

11. CONCLUSION

Perimenopause, menopause and post-menopause have significant physical and mental health implications, but their impact is not uniform. Symptoms are shaped by menopausal stage, mode of onset, prior health, comorbidities, sleep, pain, mental health history, culture, socioeconomic conditions, work, stigma and healthcare access. The MARIE Project Global Chapter WP2a provides important cross-national quantitative evidence showing that symptom burden varies across countries and menopausal stages, and that clinical complexity is associated with poorer outcomes. Recent WHO, NICE, Lancet, JAMA, European Society of Endocrinology and evidence supports a comprehensive, inclusive and multidisciplinary approach to menopause care. The future of menopause health must be global, culturally competent, evidence-based and person-centred, with equal attention to physical symptoms, mental health, sexual health, chronic disease prevention, workplace participation and quality of life.

AUTHOR CONTRIBUTION STATEMENT

Wang Jun & Liu Xiaomei: Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work, Drafting the work or reviewing it critically for important intellectual content; AND Final approval of the version to be published, and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Data Availability: The datasets and information used in this study are publicly available from the sources cited within the article. No proprietary or restricted data were used.

Trial Registration: Trial registration is not applicable to this study, as it does not involve clinical trials, human participants, or experimental interventions.

Generative AI Disclosure: Generative artificial intelligence tools were not used for generating research data, conducting analyses, or producing scientific conclusions in this study. The authors take full responsibility for the content and accuracy of the manuscript.

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SUPPLEMENTAL MATERIAL

No supplementary files, datasets, figures, or additional materials are associated with this study. Any information necessary to understand and evaluate the work is included in the main article.