



Cardiovascular Health During Menopause Transition: The Role of Traditional and Nontraditional Risk Factors

ESSAY

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ABSTRACT

Perimenopause, or menopause transition (MT), is a critical life stage that encompasses significant physiological, emotional, and psychosocial changes that impact women's cardiovascular health and quality of life. The decline in estrogen during MT induces adverse metabolic changes that increase the risk of dyslipidemia, obesity, insulin resistance, atherogenesis, and poor downstream outcomes such as diabetes, hypertension, stroke, and other adverse changes. Concurrently, stress plays an important role in shaping overall cardiovascular well-being during MT and long-term heart health post-menopause. In addition, nontraditional risk factors—particularly social determinants of health (SDoH) such as economic well-being, access to health care, built environment, social support, and others—are key upstream determinants of cardiovascular disease in women during perimenopause. Coordinated efforts are needed to screen, identify, and address the primary SDoH for optimal heart health in the clinically vulnerable MT patient population. Patient-centered care pathways that focus on assessing social needs and connecting socially vulnerable patients with available community resources are much needed for holistically addressing patient needs. Community-centered efforts are key to addressing persistent inequities in women's cardiovascular health via navigation and connection to community resources that may help address SDoH barriers.

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KEYWORDS:

menopause transition;
perimenopause; cardiovascular
disease; cardiovascular health

TO CITE THIS ARTICLE:

Yousefzai S, Amin Z, Faizan
H, Ali M, Soni S, Friedman M,
Kazmi A, Metlock FE, Sharma G,
Javed Z. Cardiovascular Health
During Menopause Transition:
The Role of Traditional and
Nontraditional Risk Factors.
Methodist DeBakey Cardiovasc
J. 2025;21(4):121-128. doi:
[10.14797/mdcvj.1619](https://doi.org/10.14797/mdcvj.1619)

INTRODUCTION

Women's health discussions often center on clear reproductive milestones—puberty, pregnancy, and menopause—while the years leading up to menopause remain overlooked. Yet, evidence from recent research indicates that perimenopause, or menopause transition (MT), is a pivotal phase in determining long-term health, especially for cardiovascular disease (CVD), hypertension, and metabolic dysfunction.¹ While menopause has been widely studied, evidence now shows that the groundwork for these risks is laid much earlier, making it essential to understand these phases as part of a continuous process rather than isolated events.²

Once considered a period of relative stability, MT is now recognized as a period of subtle yet profound physiological changes. Fluctuating estrogen, progesterone, and follicle-stimulating hormone (FSH) levels start to affect vascular health, metabolism, and mental well-being.³ Research suggests that women in perimenopause already have early indicators of hypertension, oxidative stress, and endothelial dysfunction, making them more vulnerable to cardiovascular disease in the long run.⁴ Furthermore, psychological factors like chronic stress, anxiety, and depression also elevate cardiovascular vulnerability, especially in women who are managing the stress of work, family, and societal expectations.⁵

This article highlights the effects of MT on cardiovascular (CV) health and also discusses persistent racial/ethnic disparities in the burden and CV outcomes of MT in the United States (US). We acknowledge multifaceted factors that impact CV health during MT and provide facts justifying the need for early intervention, risk stratification, and equitable healthcare delivery.

MENOPAUSE TRANSITION AND CARDIOVASCULAR DISEASE: PHYSIOLOGIC PATHWAYS

The period of perimenopause, or MT, is the transitory state characterized by the gradual loss of oocytes, altered responsiveness to gonadal steroid feedback, wide hormonal fluctuations, and irregular menstrual patterns.⁶ The median duration of MT is approximately 7 years; the symptoms are typically mild and increase in prevalence as the transition continues and amenorrhea/hypoestrogenism predominate.⁶ During MT, changes in ovarian function significantly heighten the risk of CVD in women. As ovarian follicles decline, the secretion of estradiol, the primary form of estrogen in premenopausal women, diminishes.⁷ As a key protective factor against CVD, estrogen promotes vasodilation, maintains a favorable lipid profile by increasing high-density lipoprotein and decreasing low-density lipoprotein, exerts

anti-inflammatory effects, and preserves endothelial function.^{7,8} Furthermore, estrogen and androgens play a critical role in fat distribution and metabolism; the reduction of estrogen during MT leads to a shift in fat storage from peripheral to central areas, increasing visceral fat and promoting obesity, and the relative dominance of androgens contributes to the increased proportionality of visceral fat.^{7,9} The redistribution of visceral fat not only promotes obesity but also drives the release of proinflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α), thus impairing insulin signaling, increasing insulin resistance, and predisposing these patients to a heightened risk of type 2 diabetes later in life.¹⁰

The gradual reduction of estrogen, a hormone well known for its heart-protective role, speeds up vascular aging, induces metabolic changes, and causes fat redistribution. This change is associated with an increased risk of hypertension, insulin resistance, and dyslipidemia—ailments that collectively add to the increasing burden of cardiovascular disease.¹¹ Also, vasomotor symptoms like hot flashes and night sweats, which were earlier considered only quality-of-life symptoms, are now recognized as markers of increased cardiovascular risk (Figure 1).¹²

MENOPAUSE TRANSITION, PSYCHOLOGICAL WELL-BEING, AND CARDIOVASCULAR HEALTH

Psychological factors significantly influence both the development and advancement of hypertension in premenopausal women, with anxiety, depression, and stress being the major determinants. Stressful conditions cause chronic psychological stress, which stimulates the hypothalamic-pituitary-adrenal axis and leads to the persistent increase of cortisol and catecholamines, with the consequent rise in blood pressure through vasoconstriction and sodium retention.¹³ Moreover, the stress-induced autonomic nervous system dysregulation leads to increased sympathetic and decreased parasympathetic tone, with a consequent increased cardiovascular load.¹⁴

Stress-related hypertension seems to target women in premenopause, especially those who are managing occupational, family, and social roles. A study conducted by Ginty et al.¹⁵ discovered that women who were under high work-related stress had significantly higher systolic and diastolic blood pressure than those in lower-stress conditions.

Moreover, psychological distress is usually accompanied by maladaptive coping mechanisms, including emotional eating, lack of physical activity, and augmented alcohol consumption, all of which are causes of obesity and metabolic dysregulation—established risk factors for hypertension.¹⁶ Depression and anxiety also augment this

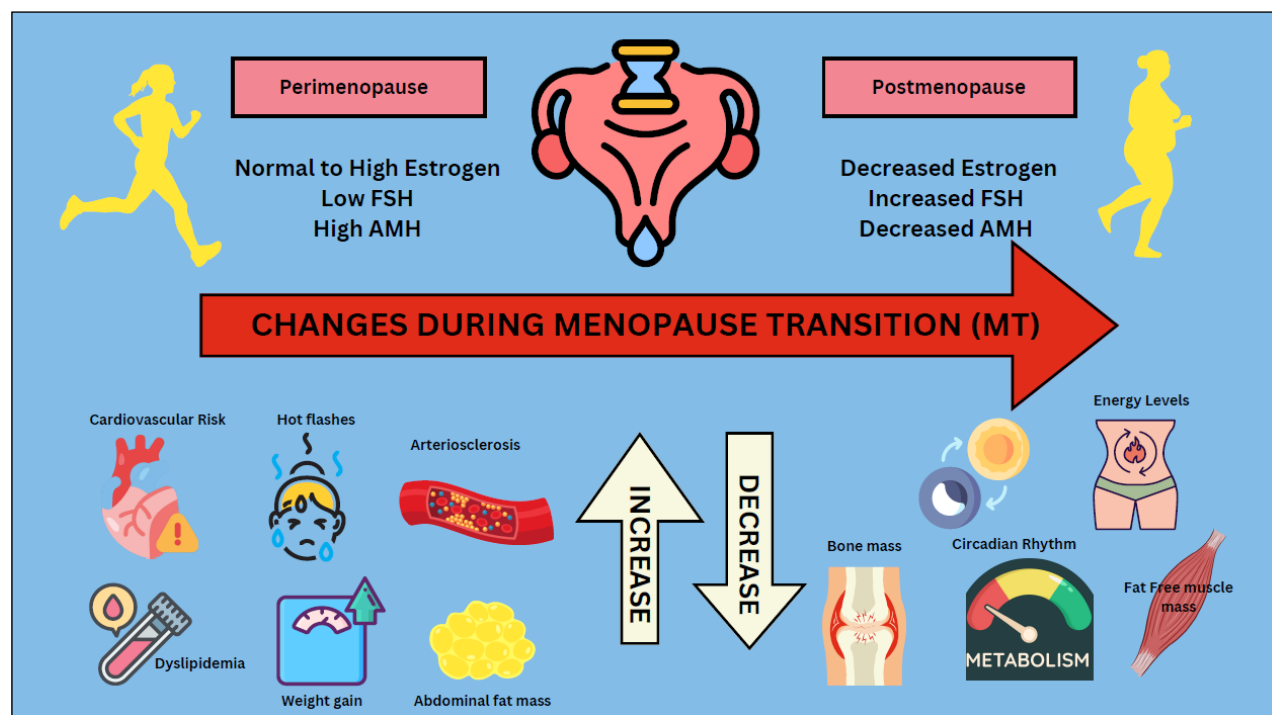


Figure 1 Changes during menopause transition.

risk through their influence on inflammatory processes; individuals with chronic psychological distress have been found to have higher levels of proinflammatory cytokines, like IL-6 and TNF- α , which exacerbate endothelial dysfunction and arterial stiffness.¹⁷

Additionally, hormonal fluctuations during the premenopausal years, in particular the decline in estrogen levels, can maximize the effect of psychological stress on blood pressure control. Estrogen's function in enhancing vasodilation via an increase in nitric oxide production and a decrease in oxidative stress implies that its gradual loss can predispose women in premenopause to the blood pressure-increasing effects caused by psychological stressors.¹⁸ Additionally, sleep disruption, typically induced by stress and anxiety, further increases nocturnal blood pressure, worsening hypertension risk in this group.¹⁹ Recognition of the multifaceted interaction between mental health and hypertension highlights the need for comprehensive intervention, such as stress management techniques, cognitive-behavioral therapy, and mindfulness-based interventions, which have already demonstrated a decrease in blood pressure among those at risk.²⁰

SOCIAL DETERMINANTS OF CARDIOVASCULAR HEALTH IN MENOPAUSE TRANSITION

Social and environmental factors, collectively defined as social determinants of health (SDoH), can significantly

influence how women experience and manage these changes, often exacerbating or alleviating symptoms. It is known that many Black and Hispanic women are more likely to live in resource-poor neighborhoods with very limited access to healthy food, green spaces, and high-quality health care, contributing to sustained hypertension and cardiovascular disease risk.²¹ The synergistic impact of these stressors is responsible for increased allostatic load, which in turn adds to the disparities in hypertension and elevates the risk of severe cardiovascular complications like stroke and heart failure. Stress has been well documented to worsen menopause symptoms, with limited and contradictory literature regarding how social support can influence these symptoms.

Annot et al. found that while stress did influence the frequency of vasomotor symptoms, there was no evidence indicating that emotional support would reduce the frequency of vasomotor symptoms in menopausal women.²² On the other hand, studies conducted by Divya et al. and Bahri et al. found that higher degrees of social support, particularly when training spouses on menopausal health, can yield better symptoms and quality of life in women undergoing MT.^{23,24} Furthermore, Woods and colleagues discovered that, for women undergoing MT, traditional stressors—such as employment status, depressed mood, and poor health—were more significant predictors of daily stress than menopause-specific factors such as hot flashes or other MT-related symptoms (Figure 2).²⁵

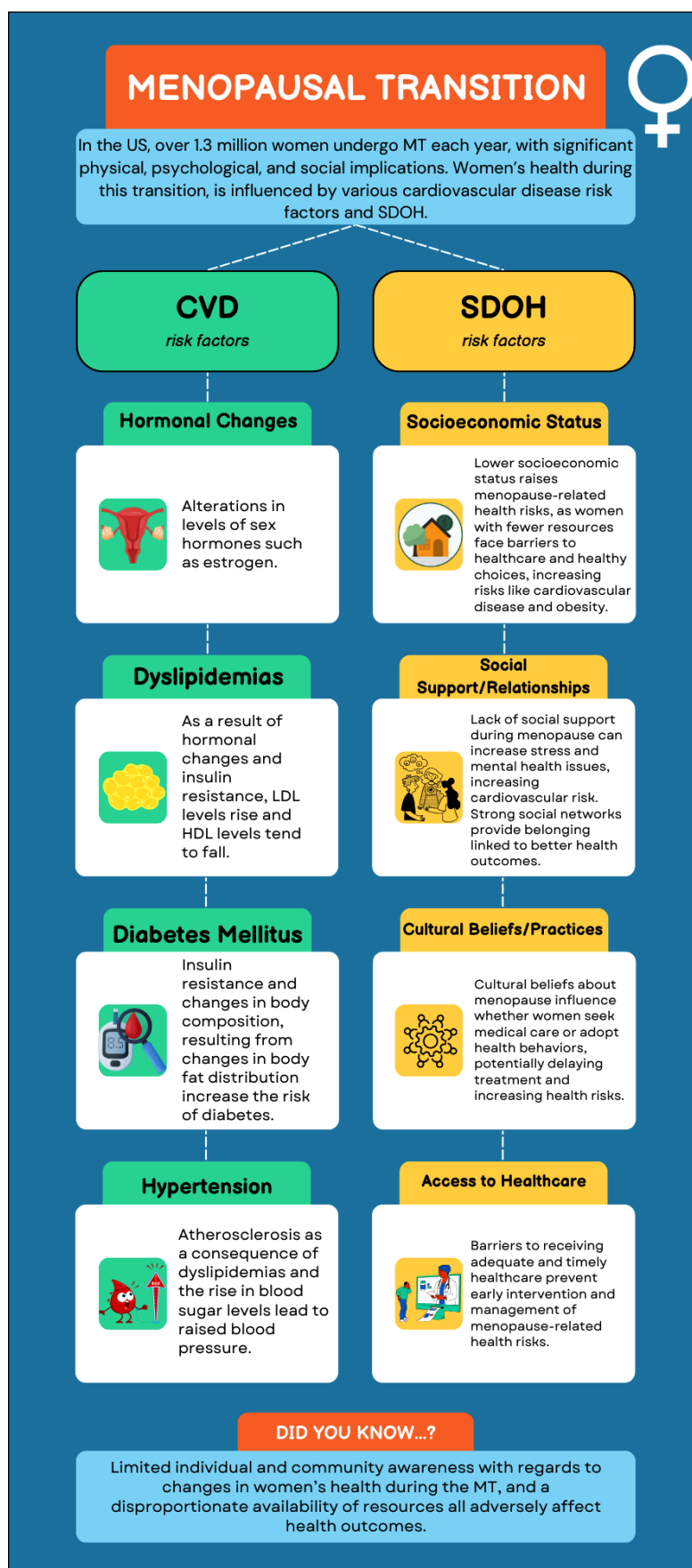


Figure 2 Traditional and social determinants of cardiovascular disease during menopause transition. MT: menopause transition; SDOH: social determinants of health; LDL: low-density lipoprotein; HDL: high-density lipoprotein

Simultaneously, stress from traditional life challenges—such as employment instability, poor perceived health, and depression—further compounds the risk, as chronic stress has been shown to dysregulate the autonomic nervous system and promote sustained hypertensive states.²⁶ Matthews et al. observed that the progression of CVD risk factors, including hypertension, during MT significantly differed from those in premenopausal women of the same age; this suggests that the increased risk of hypertension is not solely due to aging but is also influenced by the distinct physiological changes associated with MT.²⁷

MT also prompts women to become more aware of aspects of their health that they previously may have overlooked. Community initiatives designed to empower women during this transition have proven effective in supporting them by promoting increased physical activity, healthy eating, stress management, and adopting behaviors that encourage overall wellness; these programs also focus on preventing conditions like osteoporosis, thus fostering healthier lifestyles during and beyond MT.²⁸ A study conducted among participants in Dubai revealed that the majority had limited overall knowledge about menopause, including the uses and contraindications of hormone therapy. This study highlights the need for community medicine educators and primary healthcare providers to implement educational intervention programs to better prepare women for this critical phase of life.²⁹

RACIAL/ETHNIC DISPARITIES

Hypertension is a significant public health concern, the burden of which falls disproportionately on women of minoritized racial and ethnic groups. Significant research demonstrates how non-Hispanic Black, Hispanic, and Indigenous women experience significantly higher hypertension prevalence than non-Hispanic White and non-Hispanic Asian women. This is not only shown in genetic risk factors; SDoH, system-level disparities in care, and culture also play a role in the prevalence, trajectory, and control of disease.³⁰

The 2022 National Health and Nutrition Examination Survey indicates that non-Hispanic Black women are most vulnerable to the development of hypertension prior to menopause, with prevalence rates nearly twice as high as those of White women.³¹ This gap remains even after adjusting for lifestyle factors of diet, physical activity, and socioeconomic status, implying inherent biological and environmental factors as a major role in their heightened vulnerability. The hormonal environment of women in premenopause generally provides cardioprotective benefits, primarily due to estrogen's vasodilatory effects.

However, research indicates that non-Hispanic Black and Hispanic women may experience reduced estrogen-mediated cardiovascular protection, making them more prone to hypertension at an earlier age.³²

The endocrine changes of MT, especially the drop in estrogen, are responsible for the loss of its protective action on the cardiovascular system, thus resulting in higher blood pressure. Research has demonstrated that non-Hispanic Black women go through menopause earlier and more abruptly than White women, which places them at greater risk for developing hypertension earlier during midlife.³³ Moreover, Hispanic women have a greater occurrence of metabolic syndrome and obesity during this time, both of which increase the risk for hypertension.³⁴ In comparison, non-Hispanic Asian women experience lower rates of hypertension overall, and this is believed to result from protective dietary and lifestyle factors, with acculturation and socioeconomic change in later generations being responsible for higher rates of hypertension in this group.³⁵

Healthcare disparities further worsen racial disparities in hypertension among postmenopausal and transitional women. Non-Hispanic Black and Hispanic women are less likely to receive hypertension treatment as per guidelines and have poorer blood pressure control rates compared to White women.³⁶ Implicit bias in the clinical setting, less access to health care, and economic constraints are variables that result in these differences, delaying diagnosis and proper management. Additionally, culturally rooted health beliefs and mistrust in the healthcare system, particularly among Black and Indigenous women, hinder adherence to antihypertensive treatments and preventive care.³⁷

CONCLUSION

Menopause transition is a critical period that requires close attention and care navigation. There are significant socio-structural disparities in MT risk and associated CV outcomes. Multidisciplinary efforts are needed to mitigate the significant CV risk during MT and to improve population CV health during this vulnerable life period. It is essential to enhance community-based initiatives, heighten the cultural sensitivity of clinicians, and ensure equitable access to both hypertension screening and treatment. Further, closer examination of the interaction between hormonal changes, race, and social determinants of health will yield information of great value in developing targeted interventions that can effectively decrease disparities and enhance cardiovascular risk outcomes among diverse populations.

KEY POINTS

- Hormonal changes during menopausal transition (MT): As estrogen declines during MT, a series of negative metabolic changes takes place—including increasing visceral fat, insulin resistance, dyslipidemia, and hypertension—that significantly increases the risk of cardiovascular disease (CVD) in women.
- Psychological stress and mental health: Chronic stress, depression, and anxiety during MT are linked to increased blood pressure and CVD risk via hormonal dysregulation and unhealthy lifestyle choices such as poor nutrition and lack of exercise. Psychological health is a significant but neglected influence on CV health outcomes.
- Social determinants of health: Economic instability, compromised access to health care, poor environments, and low social support disproportionately impact minority women, adding to the cardiovascular risk of MT. To eliminate this disparity, patient-level interventions and models of patient-centered care are essential.
- Racial and ethnic disparities: Non-Hispanic Black, Hispanic, and Indigenous women experience earlier and more severe hypertension in MT because of both biological and systemic disparities. Targeted, culturally appropriate interventions and equal access to health care are needed urgently to decrease disparities.

COMPETING INTERESTS

The authors have no competing interests to declare.

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TO CITE THIS ARTICLE:

Yousefzai S, Amin Z, Faizan H, Ali M, Soni S, Friedman M, Kazmi A, Metlock FE, Sharma G, Javed Z. Cardiovascular Health During Menopause Transition: The Role of Traditional and Nontraditional Risk Factors. *Methodist DeBakey Cardiovasc J.* 2025;21(4):121-128. doi: [10.14797/mdcvj.1619](https://doi.org/10.14797/mdcvj.1619)

Submitted: 15 April 2025

Accepted: 25 June 2025

Published: 12 August 2025

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