

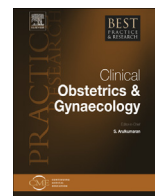


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Obesity and Menopause



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Over the recent decades, the prevalence of obesity in the United States has increased to epidemic proportions to more than 35% of adults, along with an increased risk of a number of health conditions, including hypertension, adverse lipid concentrations, and type 2 diabetes. The relationships between menopausal transition, weight gain, and obesity are reported but incompletely understood. The association between menopause and these measures has been the subject of many studies, along with examining their effect on reproductive hormones and menopausal symptoms. The purpose of this review is to summarize what is published in the literature on this subject and examine it through: (1) the possible impact of obesity on the timing of menopause; (2) the effect of obesity on menopausal symptoms and reproductive hormones around the time of menopause; and (3) the effect of menopause on obesity, weight gain, and body composition.

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Introduction

Menopause is the permanent cessation of menses, with a median age of 51 years in North America. In the 21st century, Western women are expected to spend more than a third of their lifetime beyond the menopausal transition. The Stages of Reproductive Aging Workshop (STRAW) staging system was developed in 2001 to describe various stages of the menopausal transition. This staging system was revised in 2012 [1] to take into account more hormonal changes and to pinpoint more precisely the timing of symptoms (Fig. 1). With increasing longevity, the proportion of women who are menopausal in the general population is on the rise. Most women undergo physiological changes associated with menopause in the 3–5 years preceding the final menstrual period (FMP). Several short-term changes in

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	Menarche											FMP (0)				
Stage	-5	-4	-3b	-3a	-2	-1	+1 a	+1b	+1c	+2						
Terminology	REPRODUCTIVE				MENOPAUSAL TRANSITION			POSTMENOPAUSE								
	Early		Peak		Late		Early		Late		Early		Late			
Duration	variable				variable		1-3 years		2 years (1+1)		3-6 years		Remaining lifespan			
PRINCIPAL CRITERIA																
Menstrual Cycle	Variable to regular	Regular	Regular	Subtle changes in Flow/Length	Variable Length Persistent ≥7- day difference in length of consecutive cycles	Interval of amenorrhea of ≥60 days										
SUPPORTIVE CRITERIA																
Endocrine																
FSH			Low	Variable*	↑ Variable*	↑ >25 IU/L**	↑ Variable	Stabilizes								
AMH			Low	Low	Low	Low	Low	Very Low								
Inhibin B			Low	Low	Low	Low	Low	Very Low								
Antral Follicle Count			Low	Low	Low	Low	Low	Very Low								
DESCRIPTIVE CHARACTERISTICS																
Symptoms							Vasomotor symptoms Likely	Vasomotor symptoms Most Likely						Increasing symptoms of urogenital atrophy		

* Blood draw on cycle days 2-5 ↑ = elevated

**Approximate expected level based on assays using current international pituitary standard⁶⁷⁻⁶⁹

Fig. 1. The Stages of Reproductive Aging Workshop +10 staging system for reproductive aging in women. From: Harlow, S.D., et al., Executive summary of the Stages of Reproductive Aging Workshop + 10: addressing the unfinished agenda of staging reproductive aging. Fertil Steril, 2012.

health and quality of life, such as vasomotor symptoms, sleep disturbance, and affective symptoms, are frequent causes to seek medical attention. At the same time, some long-term changes in several health outcomes (i.e., urogenital symptoms, bone, and lipids) may result in significant morbidity [1]. This review will describe the latest evidence on the impact of obesity on menopause and menopausal transition.

Obesity and age at menopause

The age at the FMP is of intrinsic clinical and public health interest as it could represent a marker of general aging and health [2]. The impact of body mass and obesity has been extensively studied as a potential determinant of the FMP [3]. Weight gain among midlife women has been frequently reported, but the interrelationships between obesity, weight gain, and the menopausal transition remain incompletely understood. Due to differences in study designs, analysis, or varying control of confounding variables, inconsistent findings were seen when examining the relationship between body mass and age at menopause. Some studies have reported that both increased body mass index (BMI) and upper body fat distribution (indicated by waist-to-hip ratio) were associated with later age at natural menopause [4–6], while many other studies have reported no significant association of BMI with age at natural menopause [7–11]. In the Study of Women's Health Across the Nation (SWAN), cross-sectional analysis showed no relationship between obesity and age at natural menopause, but obesity was associated with a higher likelihood of surgical menopause [3].

Obesity and menopausal symptoms

Vasomotor symptoms (VMS), commonly known as hot flashes and night sweats, are sudden episodes of intense heat that usually begin in the face or chest and spread throughout the body,

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