

Body composition analysis: A vital health assessment tool during perimenopause and menopause



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Abstract

A majority of women experience a variety of physiological changes during perimenopause and menopause. Such and other hormonal, psychological changes can heavily impact a woman's quality of life. A Body Composition Analysis serves as an invaluable clinical instrument integrated into the health evaluation for vibrant women navigating the perimenopausal phase. It can be utilized to investigate the linkage between body composition and cardio-metabolic profile. The metabolic rhythm of a woman's body experiences a notable decline during menopause, leading to a cascade of health transformations. It is advised that maintaining and achieving a normal nutritional status and body composition in women should be the goal. Body Composition Analysis supplemented with other predictors observed in perimenopausal and menopausal women can be helpful to healthcare providers.

Keywords: Body Composition Analysis, women's health, metabolic syndrome, weight gain

1. Introduction

The onset of menarche, the transitional phase of perimenopause, and the culmination of menopause are all intrinsic chapters in the narrative of a woman's existence. Menopause is characterized as the final episode of menstrual flow that remains absent for a full year and is devoid of any underlying medical issues. The initial stage of perimenopause is marked by sporadic menstrual cycles intertwined with shifting hormones, while the later stage of perimenopause signifies a complete halt in menstruation lasting sixty days or beyond, paving the way to the postmenopausal era (1). Perimenopause is a transitional phase that lasts for 4-5 years, and the complete ending of menstruation follows it. Biologically, perimenopause is the period when a woman experiences fluctuation of follicle-stimulating hormones (FSH) and luteinizing hormones (LH). During this phase, women pass through various hormonal, physiological, and psychological fluctuations ascribed to the irregularity of menstrual cycles. The physiological changes experienced during perimenopause include night sweats, hot flashes, and vaginal dryness, while the psychological changes generally seen are depression, irritability, mood swings, and anxiety. Hormonal changes like estrogens deficiency can also trigger various physical changes, such as altered metabolism, weight gain, irregular periods, and reduced fertility (2).

2. Signs and symptoms associated with menopause

According to the World Health Organization, perimenopause denotes the gradual transition from consistent menstrual cycles to the end of menstruation. Throughout this stage, there is a steady decline in ovarian follicles, leading to decreased estrogen levels, which significantly disrupts normal bodily functions, including issues related to sexual health, affecting connective tissues, soft tissues, physical activity, and alterations in body composition (3). The alterations consist of unpredictable and intense menstrual cycles, mental cloudiness, reduced cognitive abilities, sudden temperature sensations, fluctuations in mood (such as feelings of depression and anxiety), difficulty sleeping, exhaustion, decreased sexual desire, vaginal dryness, and painful intercourse (4). Brain fog affects women's capabilities and cognitive functions in the workplace, leading to a diminished capacity to perform daily activities. Mood swings and irritability can harm personal relationships. Concurrent feelings of fatigue and weight gain in women can significantly lower their energy levels, self-worth, and overall mood. Vaginal dryness and dyspareunia may influence libido and intimacy (5). Some genitourinary and vasomotor indications, along with other symptoms like night sweats, disturbed sleep, hot flashes, genitourinary discomfort, cognitive deviations, bone loss, growth of abdominal fat, and slow and inefficient metabolism can occur in any sequence, pattern, intensity, or combination.

3. Changes in body composition of women during perimenopause and menopause:

3.1. Weight gain in women during menopause:

According to the WHO, menopause typically occurs around the age of 50 and is linked to various changes in both the physical and mental health of a woman. It has been observed that 60-80% of women will encounter vasomotor symptoms (VMS), such as hot flashes and night sweats, during this transition (6). A gradual decline in ovarian hormonal function occurs, leading to shifts in the hormonal system (estrogen deficiency) and modifications in a woman's body composition.

3.2. Cardio-metabolic risk in menopausal women

Estrogens play a pivotal role in maintaining energy homeostasis and promoting metabolic health and overall well-being. Throughout the perimenopausal phase, estrogen levels steadily decline, which correlates with alterations in women's energy consumption and dietary intake. These changes are observed as body weight gain and altered body fat distribution at various body organs. Fat usually gets deposited on the abdomen area and makes the woman prone towards cardio-metabolic risk through insulin resistance in the body.

4. Body composition analysis

Body composition analysis is an invaluable clinical instrument in inpatient and outpatient environments. It is straightforward, economical, and practical and delivers insights regarding basal metabolic rate, body mass index, and skeletal mass, fat mass, and fat percentage. This approach is integrated into health assessments for healthy women during perimenopause. It can be employed to explore the relationship between body composition and cardio-metabolic profiles, as the onset of menopause and the decrease in estrogen levels lead to a decline in the basal metabolism of the female body, resulting in various health changes (7).

Body composition analysis can be integrated with alterations in fat distribution that occur during perimenopause. The fat distribution study employs dual-energy X-ray absorptiometry (DEXA) measurements to evaluate body composition. It proves more advantageous due to its lower inter and intra-individual variance. Additional tools such as magnetic resonance (MR) and computed tomography (CT) are also employed as clinically acceptable methods for Body Composition Analysis. Women typically undergo a reduction in their basal metabolic rate and simultaneously experience a decline in lean muscle mass during perimenopause and menopause, which heightens the likelihood of weight gain and obesity. The onset of sarcopenia is frequently noted in women experiencing menopause. This occurs due to an imbalance between muscle protein synthesis and its degradation. The quality of body muscle is defined as the ratio of muscle strength to muscle mass. Research findings suggest that muscle strength and quality are inversely related to the intensity of menopausal symptoms, which arise from decreasing levels of sex hormones. The levels of sex hormones are inversely associated with the degree of oxidative stress. For postmenopausal women, chronic

systemic inflammation, elevated oxidative stress, increased abdominal visceral fat, dyslipidemia, sarcopenia, and a lack of physical activity are significant risk factors for metabolic syndrome. The occurrence of metabolic syndrome has risen in Asian nations, including India (8). The prevalence of metabolic syndrome differs among various populations, with rates ranging from 13.8% in pre-menopausal women to 60% in postmenopausal women (9).

Studies show that in the case of postmenopausal women, as changes in lipid metabolism occur due to reduced levels of estrogen, CVD and metabolic syndrome are more common compared to pre-menopausal women. A research study revealed that weight-adjusted lean body mass and skeletal muscle area protect against weight-related insulin resistance and metabolic disorders in women (6). It has been proposed that women with reduced muscle mass and a lower number of estrogen receptors face an elevated risk for metabolic issues. A decrease in 'lean body mass' has been identified as the most significant factor influencing metabolic changes in postmenopausal women. The 'lean body mass' is linked to decreased whole-body fat oxidation and energy expenditure, which are connected to increased abdominal fat mass and reduced insulin sensitivity. As women transition into menopause, maintenance of adequate levels of muscle mass contributes significantly to minimizing risks of sarcopenia and obesity.

Table 1. Body composition analyzers in women during perimenopause and menopause

Indicator of Body Composition	Unit for measurement	Acceptable (normal) range
Weight (Body mass)	kg	50-70
Body Mass Index	kg/m2	18.5 kg/m2 to 24.9 kg/m2
Basal Metabolic Rate	calories per day	25 - 27
Body Fat	(%)	23–33% (age 40-59 years)
Total Body Fat	kg	25-31%
Visceral fat	kg	10% of body fat
Waist circumference	inch	35 inches <0.8 = Risk-free
Mid-upper arm circumference	cm	13.5-23.5 cm
Osseous mass	kg	15% of total body fat
Fat Mass Index	kg/m2	25-31%
Fat-Free Mass	kg	70-85% of total body weight
Fat-Free Mass Index	kg/m2	14.6-16.8

Skeletal Muscle Index	kg/m ²	Above 5.67
Waist Hip Ratio	%	0.85 or less
Metabolic age	years	less than or similar to chronological age
Water content & Water content (%)	kg	45-60% of total body weight
Phase angle	degrees	5.1-6.4
Bone mineral density	g/cm ²	T-score (-1 or higher)
Weight to height ratio	-	< 0.5

5. Bio-electrical impedance analysis (BIA)

BIA measurements have proven to be reliable for forecasting body composition in women who are perimenopausal, menopausal, and postmenopausal (10). It is inexpensive and can be used effectively in out-patient set-ups. This technique hinges on gauging the velocity of a one-quarter volt electrical pulse as it journeys between electrodes situated on the feet and those arranged across the hand's knuckles. The fat-free mass is composed of proteins, water, and electrolytes; its conductivity surpasses that of fat mass. Resistance and reactance are harnessed to approximate total body water, fat, lean, and bone mass.

6. Body weight gain in women and impact of physical activity during perimenopause and menopause

The rise in body weight, fat accumulation, and obesity is notably more common among women experiencing perimenopause and menopause. A study examining dietary interventions revealed that moderate and high yoghurt intake significantly reduced the risk of obesity. Increased milk consumption was linked to a somewhat significant rise in the likelihood of obesity. A greater intake of total dairy and elevated physical activity led to a 28% reduction in obesity risk. Nevertheless, most of this risk reduction stemmed from increased physical activity rather than total dairy consumption among women (11). It was also noted that active women who consumed less yoghurt experienced only a 19% lower risk of obesity, whereas active women with higher yoghurt intake saw a 48% lower risk than the reference group. Numerous similar studies support the positive effects of consistent physical activity, exercise, and other factors, particularly for enhancing women's health. Regular physical activity benefits bone density, femoral neck strength, and knee tibial cartilage in menopausal women. Exercise offers various advantages for bones, cardiovascular health, metabolism, diabetes, cancer, longevity, psychological well-being, and the overall quality of life for menopausal women and women in general. Therefore, women must remain physically active throughout the menopausal transition and beyond.

7. Conclusion

It has been reported that over 50% of women in the perimenopausal stage experience significant changes that make it challenging to maintain a regular life. A study related to postmenopausal women indicated that the occurrence of vitamin D deficiency ranged from 0 to 92%, and Vitamin D deficiency and inadequacy might be associated with earlier age at menopause (12). Many women are anaemic during the perimenopause phase (13). The journey through menopause and the passage of time, accompanied by various physiological challenges such as diabetes, obesity, and sarcopenia, render this demographic a pivotal focus for health professionals and researchers who aspire to enhance their quality of life during this significant chapter. This article focuses on the health

concerns of women experiencing the menopausal transition. This population is particularly susceptible to several physiological, psychological, and hormonal changes, as well as unfavourable weight alterations and their consequences on natural health and attributes of life. A symptoms-driven and individualized treatment approach can ensure improvement in the health and quality of life of menopausal women. The vulnerable females and related menopausal symptoms demand more holistic consideration by healthcare providers. It is essential to guarantee that women receive relevant health information and services to support healthy ageing and maintain a high quality of life before, during, and after menopause. As advised by the WHO, menopause should be viewed as a significant chance to evaluate a woman's health, lifestyle, and aspirations. Body composition analysis tools are optimal for assessing nutritional status (14). It is recommended that the aim should be to sustain and attain a normal nutritional status and body composition in women. Body Composition Analysis supplemented with other predictors observed in perimenopausal and menopausal women can help assess the severity of symptoms and make informed decisions and interventions during this challenging phase of women's life.

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