

OPTIMIZING NUTRITION DURING MENOPAUSE: A COMPREHENSIVE REVIEW ON DIETARY NEEDS

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Abstract: The number of menopausal women worldwide is increasing, with an estimated 1.2 billion worldwide by 2030. The absence of the cycle and the lack of periodic exposure to estrogen and progesterone cause changes in the target tissues of sex hormones, as well as the reproductive system. During menopause, the risk and occurrence of several chronic diseases increase due to the decrease in estrogen levels, which can result in complications such as cardiovascular diseases, tumours (especially hormone-sensitive breast cancer), insulin resistance, type 2 diabetes (T2DM), and osteoporosis, the risk of which can be reduced by lifestyle modification and proper dietary management. Consuming a diet rich in phytoestrogens alleviates the menopausal symptoms. A balanced diet for menopausal women should focus on nutrient-dense foods rich in calcium, vitamin D, fibre, healthy fats, and high quality proteins, while limiting processed foods, added sugars, and excessive salt to support bone health, hormonal balance, and overall wellbeing during this transition. This review explores key nutritional strategies to optimize health during menopause, offering insight into the impact of dietary choices for long-term wellness, to enhance quality of life and smoother transition.

Keywords: Menopausal nutrition, role of phytoestrogen, stages of menopause.

Introduction

Menopause is characterized by the cessation of monthly menstruation due to decline in ovarian follicular function. Majority of women go through menopause between the ages of 45 to 55. Medical or surgical procedures may also result in menopause. Some women may not detect any changes during this period as the menopausal transition can begin so subtly. Others, however, exhibit symptoms that are highly apparent. Their periods may occasionally be heavier or lighter, or the intervals between them may become erratic (WHO, 2024). Changes in women's menstrual cycle patterns, frequently accompanied by hot flashes or other symptoms, typically mark the beginning of the menopause transition. Menopausal symptoms can linger for two to eight years; however, each woman experiences them at a different time. In addition to outside influences including a woman's race and ethnicity, culture, lifestyle, and surroundings, these factors are probably impacted by her genetic makeup.

Stages of menopause

The premenopause and perimenopause

The perimenopause, often referred to as the pre-menopause, occurs three to five years before menopause. Females can go through this stage at a wide range of ages. In their mid to late forties, the majority of women start to exhibit symptoms. Progesterone and estrogen levels start to change throughout this phase. The major changes experienced include, mood swings, irregular menstruation periods, and other menopausal symptoms. Since pregnancy is still possible at this point, it's critical to keep using birth control.

Menopause

The cessation of menstruation for 12 consecutive months without any other explanation, such as illness, medicine, or pregnancy is known as menopause. Menopause can occur at any age, although the average age is 51.

Post menopause

Reproductive years come to an end at the post-menopause stage. Women will no longer menstruate or ovulate as ovaries produce low amounts of progesterone and estrogen. They may continue to experience the same symptoms that they had during the perimenopause and menopausal phases for several years after their last menstrual cycle. Fortunately, these symptoms typically disappear over time. However, because of the drop in estrogen, women in this stage are more likely to develop osteoporosis and heart disease [1].

Menopause and body composition

Lowering estrogen levels has been linked to an increase in fat mass (FM) and a decrease in lean body mass (LBM) during the menopausal transition. Changes in body composition were linked to a higher risk of coronary heart disease, which could jeopardize the overall health of the women. Women with low LBM and high FM had the highest risk of cardiovascular and overall mortality [1].

A cohort study conducted assessed body composition by dual energy x-ray absorptiometry and it was found that fat and lean mass increased prior to the menopausal transition (MT). At the start of the MT, rate of fat gain doubled, and lean mass declined; gains and losses continued until two years after the final menstrual period [2].

Longterm health implications

The regulation of bone growth and resorption is aided by oestrogen. Fragility fractures are more common in women who experience early menopause and premature ovarian insufficiency [28]. A cross-sectional study conducted among 379 post-menopausal women residing in rural and

urban areas of Ernakulam district, Kerala, India found that a high proportion of participants were at risk for osteoporosis. Majority of them also had a history of fracture [27].

Individuals who have early menopause or premature ovarian insufficiency are more likely to die from cardiovascular illness, coronary heart disease, and stroke. Kar and Roy (2023), studied the variations in body fat pattern and cardio vascular disease (CVD) risk factors between Hindu caste and Lodha tribal postmenopausal women and the results showed significant differences in body fat pattern and CVD risk factors between caste and tribal groups owing to socioeconomic disparities and, differences in reproductive characteristics and lifestyle factors [3].

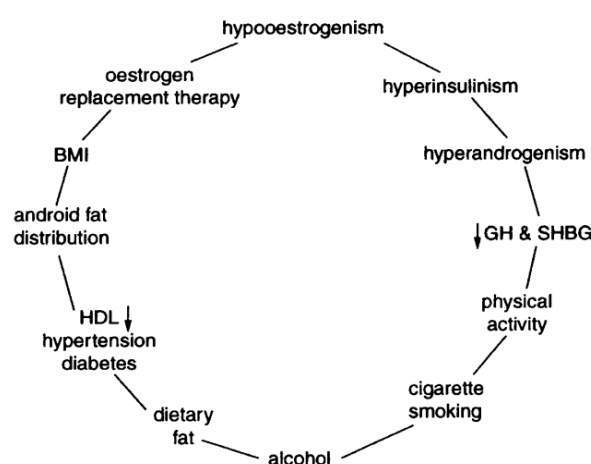


Fig 1: Factors involved in weight gain and cardiovascular risk factors in the post-menopausal woman [4].

Both immediate and long-term effects on mental health may result from premature ovarian insufficiency. Although surgical menopause at or before age 45 has been linked to a higher risk of dementia and a quicker rate of cognitive decline. Overall, it is unclear how exactly early menopause is related to neurological disorders and premature ovarian insufficiency [30]. A study done to assess the stress among women during menopause in the Madakasira village, Sathya Sai district found that women who are in the age group of 45 -55 years experience a great deal of irritation and fury during menopause, along with anxiety, forgetfulness, low self-esteem, confidence loss, low mood, and feelings of melancholy or despair [29].

Majority of breast cancers are oestrogen-sensitive, and it is the most prevalent cancer in high income countries. Compared to women who menopause between the ages of 50 and 54, those who menopause before the age of 45 have a decreased relative risk of breast cancer (by 27% for early menopause and 33% for premature ovarian insufficiency), as well as a lower risk of endometrial and ovarian malignancies [31].

Role of diet

A comprehensive strategy for managing a healthy menopause should include dietary adjustments in addition to adjustments for the physiological changes brought on by the decline in estrogen levels. By removing and lowering dietary risk factors, all of the illnesses and poor laboratory results that are typical of this stage of women's lives can be greatly improved. Dietary therapy ought to be a crucial component of treatment for any disease that already exists. One crucial component of the primary prevention of chronic diseases is nutritional intervention [9]. Weight gain is a symptom of menopause, experienced by 60–70% of middle-aged women, due to the hormonal changes. To calculate the nutritional requirements during this transition period, it is not sufficient to use the body mass index (BMI) combined with the waist circumference measurement, but it is necessary to use body composition analyzers based on the principle of bioelectrical impedance which are suitable for measuring body composition. Depending on the results obtained, the daily energy requirement and the ratio of the nutrients required can be determined [11].

Role of energy

The female body's basal metabolism drastically declines throughout the perimenopause and menopausal period due to changes in hormone levels (a reduction in sex steroids). Hormonal changes are associated with a decrease in skeletal muscle mass (SMM) and fat-free mass (FFM), which can result in sarcopenia. This can result in a daily drop in the basal metabolic rate (BMR) of as much as 250–300 kcal followed by 2 kg yearly weight gain or obesity. The most crucial aspect of treating obesity with nutrition is attaining a negative energy balance. The current body weight is always used to determine the actual energy needs. The optimal weight reduction rate is between 0.5 and 1 kg per week, which is achieved by losing body fat while keeping the muscle mass. This indicates an intake of 500–1000 kcal, or 15–30%, less energy than the requirement. It roughly equates to a daily energy intake of 25 kcal/kg [12].

Role of Carbohydrate

The role of dietary carbohydrate for promoting fat mass loss remains to be elucidated. Glycemic index (GI) should be regarded as very significant in lowering total body FM and controlling weight, in addition to other methods of defining carbohydrate diets, such as fiber and whole grain content. When a high GI meal is consumed, the pancreas quickly responds to the elevated blood glucose levels by secreting a lot of insulin, which quickly decreases blood glucose levels [32].

A cross-sectional study done on 393 post menopausal women to determine the relationship between carbohydrate quality intake and menopausal symptoms found that enhancing the quality of dietary carbohydrate intake may alleviate menopausal symptoms. Higher intake of fiber, lower intake of liquid carbohydrates and a lower value of the dietary glycemic index are associated with lower rates of hot flashes and night sweats during menopause [8].

Role of Protein

A daily protein intake of 1–1.2 g/kg body weight (20% of calories) and frequent exercise with free weights or against resistance are necessary to maintain or improve skeletal muscle mass and fat-free body weight. A low energy diet with a high protein content (at least 20% of calories) can cause weight loss. Simultaneously, maintaining and growing skeletal muscle requires meeting the protein requirement of 1–1.2 g/kg/day [10].

The ability of skeletal muscles to activate protein synthesis in response to anabolic stimuli decreases as people age, presumably as a result of insulin resistance so the dietary protein requirements increases. Indeed, observational studies have shown that postmenopausal women who consume more protein have larger lean body mass [5]. Higher protein consumption (1.2 g/kg body weight) was linked to improved physical performance and a 32% decreased risk of frailty in the women's health. The Institute of Medicine advises a protein allowance of 0.8 g/kg body weight for people of all ages, while the mean protein consumption linked to a greater skeletal muscle mass index in postmenopausal women was 1.6 g/kg body weight [6].

A cohort study done in 85,682 women, from their premenopausal stage till menopause suggested that dietary protein sources may be associated with infertility, rate of ovarian aging, oocyte quality, and timing of menopause [7].

Role of fat

Diets high in heart healthy fats can lower the risk of heart disease. Polyunsaturated fats found in extra virgin olive oil, fatty fish like mackerel, salmon, tuna, and seeds like flax and chia may help with menopause related symptoms and promote heart health [18].

Foods such as avocados, flax seeds, chia seeds, and fatty fish, might aid in your body's absorption of nutrients and may lessen the occurrence and intensity of menopausal symptoms. Salinero *et al.*, (2024) studied the effects of high fat diet on metabolic health and concluded that it varies by age of menopausal onset. Menopause increased weight gain, regardless of age and diet, while chronological aging drove changes in adipose tissue distribution towards more visceral vs. subcutaneous adiposity [15].

Role of Fibre

Adequate amount of fibre need to be included in the diet during menopausal period. This can have many health benefits such as, it supports digestive health, weight management, boosts gut health, prevents risk of colorectal cancer and promotes cardiovascular health. Diets including three or more servings of whole grains, such as quinoa, barley, brown rice, and rye can lower the risk of heart disease [17]. To make sure they become a mealtime staple, include them in salads and serve them at every meal. Rich in fiber, vitamins, minerals, and antioxidants, fruits and vegetables can help control blood sugar levels and inhibit the production of excessive amounts of insulin. Consuming veggies before meals may also help to minimize the amount of insulin produced by any subsequent items you eat. It has also been demonstrated that eating a lot of fruit and vegetables might help with symptoms like hot flashes [16].

Role of calcium

Each stage of life has a different calcium need for bone growth and remodelling. Life stages, gender, ethnicity, genetics, geography, a range of hormones, ions, foods, illnesses, and medications have an impact on the Dietary Reference Intake (DRI) of calcium absorption and excretion. A longitudinal cohort study did, to assess rates of bone loss at each stage of the transition and examine major factors that modify those rates in the menopausal stage found that there was little change in Bone Mineral Density (BMD) during the pre- or early perimenopause stage and BMD declined substantially in the late perimenopause [21].

Organization	RDA (mg)	Country
MHLW 2015	650	Japan
BNHS	700	UK
NORDIC	800-900	Nordic
INFH-CAPM (1991)	800	China
KBMS	800-1000	Korea
NHMRC	1300	Australia
USPSTF 2018	1000	USA
NIH, IOM 2011, NOF	1200	USA
ICMR NIN 2020	1200	India
ICMR NIN 2010, IMS 2020	800	India

Table :1 Recommended daily allowance for women over the age of 50 years [20]

It is advised to consume roughly 1,300 milligrams of calcium per day. Three to four servings of dairy (yoghurt, for example) are equivalent to this. Almonds, Brazil nuts, dark green leafy vegetables, tofu, and fish with edible bones (like sardines) are additional excellent sources of calcium.

Vitamin D aids in the body's absorption of calcium, so make sure to include enough of it. It is produced in the skin after being exposed to the sun and is present in trace amounts in some foods. Vitamin D levels can be determined with a straightforward blood test and supplement can be included if necessary [19].

Role of Iron

Women in the perimenopausal age range frequently suffer from nutritional iron insufficiency. Women who experience irregular or absent menstruation are at risk of iron deficiency anemia or iron deficiency. For a better quality of life, iron deficiency and iron deficiency anemia must be managed and treated. There are few studies examining the prevalence of iron insufficiency in India's perimenopausal age range. According to a study done in North India on over 250 postmenopausal women between the ages of 45 and 80, the prevalence of anemia in these women was 85.2%. During perimenopause, periods can become unpredictable and heavier, this can lead to substantial iron loss over time, and they are a common cause of IDA in perimenopausal women [22].

The way the body handles iron can also be impacted by fluctuating estrogen levels during perimenopause. By reducing the hormone hepcidin, which often slows down iron absorption, estrogen aids in the body's iron absorption. Hepcidin levels may increase as estrogen levels fall, which can hinder the body's ability to absorb iron from diet. The body depletes iron stores more quickly than it can replenish them, this, together with excessive bleeding, which is typical during this time, can result in iron shortage [33].

Fluid intake

During menopause, drinking enough water is also crucial, particularly for cellular metabolism and preserving haemostasis at its best. It plays a crucial part in controlling thermal balance, detoxifying, maintaining the healthy functioning of digestive system, mucous membrane moisture, and controlling skin turgor. In addition to supporting the health of the skeletal system, an adequate daily fluid intake is crucial for the transportation of nutrients and oxygen. Progesterone and estrogen have a major impact on fluid and electrolyte balance in addition to the cardiovascular system [13]. Hormonal changes during menopause might also impact thirst,

perhaps leading to a notable reduction in fluid intake. 33 mL/kg/day is the recommended daily consumption of fluids.

Role of Phytoestrogen in managing menopausal symptoms

Phytoestrogens are a group of non-steroidal polyphenolic plant-based substances. They have genomic and non-genomic effects, displaying weak affinity for estrogen receptors (ER) and preferentially binding to ER-B over ER-A. Phytoestrogens may have a similar effect to estrogen in the body. They are also antioxidants and are anti-inflammatory. Khapre *et al.*, (2022) conducted a study to evaluate the efficacy of soy isoflavone supplementation on menopausal symptoms in perimenopausal and postmenopausal women. It was found that Soy isoflavone supplementation is beneficial in both perimenopausal and postmenopausal women, more so in perimenopausal women [24].

There is a reduction in the vasomotor symptoms of menopause with phytoestrogen intake; however, it is likely small and slow in onset. Phytoestrogens helps to improve bone mineral density and markers of cardiovascular risk [23].

Consuming soy-based phytoestrogens can lower blood pressure, C-reactive protein (CRP), plasma triglyceride levels, block oxidized LDL, and impact plasma lipoprotein levels (lowering LDL cholesterol and increasing HDL cholesterol). Lower serum total cholesterol and LDL levels, as well as higher HDL levels, are the outcomes of increased phytoestrogen consumption [26]. Green and Indian turmeric contain phytoestrogens that can influence the release of steroid hormones by animal ovarian cells, enhance apoptosis, and limit proliferation. Additionally, isoflavones have the ability to alter the sexual development of animals, including puberty, ovarian function, and oestrous cycle disruption [25].

The Role of Microbiome in Menopause

Menopause and perimenopause are often linked to gastrointestinal tract issues and dysbiosis. Probiotic supplementation in menopausal women may have a positive impact on certain cardiovascular risk factors by preserving the intestinal barrier's integrity, which lowers bacterial translocation across the gut wall and reduces inflammation throughout the body. Certain microbial strains produce SCFA (acetate, propionate, and butyrate) by the fermentation of polysaccharides and undigested proteins, which may be advantageous for a number of metabolic processes. Liu *et al.*, (2022) investigated the relationship between gut microbiota dysbiosis and menopausal syndrome (MPS) and found that there was gut microbiota dysbiosis in MPS, which is reflected in the deficiency of certain gut microbiota such as *Aggregatibacter segnis*, *Bifidobacterium animalis* and *Acinetobacter guillouiae* [14].

Conclusion

Managing menopausal symptoms through proper diet and lifestyle is essential for promoting health and well-being during this transition. A balanced diet rich in essential nutrients such as calcium, vitamin D, and phytoestrogens, combined with regular physical activity, stress management, and adequate sleep, can significantly alleviate common symptoms like hot flashes, mood swings, and osteoporosis. By adopting healthy habits, menopausal women can not only manage their symptoms more effectively, but also reduce the risk of long-term health issues, enhancing their quality of life during this natural phase of aging.

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