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MEDICAL NUTRITION THERAPY DURING BREAST CANCER TREATMENT AND RECOVERY

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professional paper

Summary

Breast cancer and its treatment modalities may have different and sometimes opposing effects on nutritional status, ranging from malnutrition and loss of muscle mass to unwanted weight gain and metabolic complications. Owing to the heterogeneity of the disease, treatment modalities and treatment-related adverse effects, medical nutrition therapy should be individualised. The aim of this professional paper is to present evidence-based approaches to nutritional care during active breast cancer treatment and recovery. Nutritional screening and assessment should be initiated as early as possible and repeated throughout treatment, including monitoring of body weight, food intake, nutrition-impact symptoms, muscle function and metabolic comorbidities. When individual measurement is not available, energy requirements may be estimated at 25–30 kcal/kg/day. A protein intake above 1.0 g/kg/day and, when possible, up to 1.5 g/kg/day is recommended. The Mediterranean dietary pattern may provide a suitable long-term dietary foundation, but during active treatment it should be adapted to nutritional status, appetite, gastrointestinal symptoms and the ability to maintain adequate oral intake. Treatment-related adverse effects such as diarrhoea, constipation, nausea, taste changes, mucositis and poor appetite require targeted and usually temporary dietary modifications. Although current research suggests a potential role of the gut microbiota in breast cancer development and outcomes, the available evidence is insufficient to support the routine use of specific probiotic preparations. As a member of the multidisciplinary team, the nutritionist/dietitian plays an important role in individualising recommendations, monitoring nutritional status and ensuring timely initiation of nutrition support when indicated.

Keywords: breast cancer, medical nutrition therapy, treatment-related adverse effects, Mediterranean diet, nutritionist/dietitian

Introduction

Breast cancer is a heterogeneous disease that varies according to stage, hormone receptor and HER2 status, tumour biology, and the treatment administered. Surgery, radiotherapy, chemotherapy, endocrine therapy, targeted therapy, and immunotherapy may affect appetite, taste and smell, gastrointestinal function, body weight and muscle mass, and bone health. Medical nutrition therapy is therefore an integral component of supportive care, with the immediate aims of reducing nutritional risk, preserving functional capacity, and improving tolerance of planned oncological treatment (Arends et al., 2017; Muscaritoli et al., 2021).

Unlike in some other malignant diseases, nutritional disorders in women with breast cancer may manifest in different and even opposing ways. During treatment, some patients experience reduced food intake, loss of body weight and muscle mass, and a risk of sarcopenia, which may also be present in individuals with normal or increased body weight. Conversely, particularly during adjuvant treatment, increases in body weight and fat mass and adverse changes in fat distribution may occur. Recent systematic reviews confirm the clinical importance of body-composition assessment: in patients with breast cancer, sarcopenia is associated with greater treatment toxicity, while increases in total and visceral fat mass have been observed after adjuvant chemotherapy and/or endocrine therapy (Roberto et al., 2024; Mendez et al., 2025). Body weight and body mass index alone are therefore insufficient indicators of nutritional status, and nutritional assessment and intervention should be individualised according to body composition, food intake, symptoms, metabolic risk, and treatment modality.

The aim of this paper is to present dietary guidelines and options for medical nutrition therapy in women with breast cancer, with emphasis on the assessment and preservation of nutritional status, dietary modification for treatment-related adverse effects, use of the Mediterranean dietary pattern, and the role of the nutritionist/dietitian within the multidisciplinary team.

Nutritional assessment and goals during treatment

In accordance with clinical nutrition guidelines for patients with cancer, nutritional screening should be performed as early as possible, beginning at diagnosis, and repeated throughout treatment, especially when treatment changes, adverse effects develop, or an unintentional change in body weight occurs. Validated

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nutritional screening tools may be used in clinical practice, such as NRS-2002 for hospitalised patients or MUST in outpatient settings, depending on the population and organisation of the healthcare institution. A positive screening result requires a more detailed nutritional assessment encompassing food intake, changes in body weight, symptoms that limit intake, muscle mass and function, the degree of systemic inflammation, comorbidities, and other factors that may affect nutritional status. Sarcopenia, defined as low muscle mass accompanied by reduced muscle strength and/or physical performance, may also be present in patients with normal or increased body weight. A particular clinical challenge is the simultaneous presence of excess adiposity and reduced muscle mass and function, i.e. sarcopenic obesity. Whenever possible, nutritional assessment should therefore be complemented by an assessment of body composition and muscle function. Changes in muscle mass may be monitored using available body-composition methods, while simple functional measures, such as handgrip strength, may provide additional information about muscle function. Such assessment is particularly important in women with breast cancer because stable or increased body weight may conceal adverse changes in body composition (Arends et al., 2017; Muscaritoli et al., 2021).

When energy requirements cannot be measured individually, 25–30 kcal/kg/day may be used as an initial estimate. A protein intake above 1.0 g/kg/day and, where possible, up to 1.5 g/kg/day is recommended, with adjustments for renal function, inflammatory and catabolic status, and individual tolerance. Distributing protein sources across main meals and snacks may help achieve the planned intake. The goals of medical nutrition therapy extend beyond maintaining body weight to preserving muscle mass, strength, and the ability to perform activities of daily living (Arends et al., 2017; Muscaritoli et al., 2021). In patients at increased risk of muscle loss, nutritional intervention should, when clinically feasible, be combined with individually tailored physical activity, particularly resistance exercise (Muscaritoli et al., 2021; Ligibel et al., 2022). If nutritional requirements cannot be met orally, the indication for enteral nutrition should be assessed and the route and formula selected according to the clinical condition (Bischoff et al., 2020). Parenteral nutrition should be considered when the gastrointestinal route is non-functional or insufficient, after evaluating the expected benefits and potential risks (Muscaritoli et al., 2021). The proposed nutritional care pathway is summarised in Table 1.

Table 1. Proposed nutritional care pathway for women with breast cancer (adapted from Arends et al., 2017; Muscaritoli et al., 2021)

Step	Assessment area	Nutritionist/dietitian action
1. Initial screening	Body weight and weight change, food intake, symptoms, functional capacity	Determine nutritional risk and timing of the first follow-up
2. Requirements assessment	Energy, protein, fluids, comorbidities, treatment	Set measurable and realistic goals
3. Nutrition plan	Usual habits, preferences, food availability	Adapt meal frequency, size, texture, and nutrient density
4. Monitoring	Body weight, food intake, symptoms, strength, adherence to the plan	Evaluate effectiveness and intensify the intervention when needed
5. Coordination	Signs of dehydration, obstruction, infection, dysphagia, or progressive weight loss	Coordinate further management with the physician and other members of the oncology team

Dietary pattern and dietary modification during active treatment

The Mediterranean dietary pattern can provide a suitable long-term foundation for women treated for breast cancer. It is characterised by a high intake of vegetables, fruit, whole grains, legumes, nuts, and seeds, with olive oil as the principal source of added fat and moderate consumption of fish, eggs, poultry, and dairy products. Its potential benefits cannot be attributed to a single food or bioactive compound, but rather to the combination of higher nutrient density, dietary fibre, unsaturated fatty acids, and diverse plant bioactive compounds. This dietary pattern may support cardiometabolic health and the maintenance of an appropriate body weight, which is particularly important during the long-term endocrine therapy and after active treatment has ended (Flore et al., 2023; Pontillo et al., 2025; Ratajczak-Pawłowska et al., 2025).

In practical meal planning, main meals may combine a protein source, carbohydrates primarily from whole or minimally processed foods, unsaturated fats, and vegetables or fruit. When well tolerated, a varied selection of whole grains, legumes, vegetables and fruit, fish, eggs, dairy products, nuts, and seeds is recommended, with olive oil as the main added fat. This structure is not a rigid rule; food choices, portion

sizes, and meal timing should be adjusted to energy and protein requirements, appetite, metabolic comorbidities, and food (in)tolerance. These foods form the basis of an overall dietary pattern and should not be presented as individual foods capable of preventing disease recurrence (World Cancer Research Fund and American Institute for Cancer Research, 2018; National Comprehensive Cancer Network, 2024). One of the common dietary controversies in both the scientific community and among patients, particularly those with hormone receptor-positive breast cancer, concerns the consumption of phytoestrogens. Current evidence does not indicate harmful effects from the usual consumption of foods that naturally contain phytoestrogens, including soy and other legumes. Moreover, a recent meta-analysis of observational studies found that higher intake of soy isoflavones was associated with a lower risk of breast cancer recurrence, including in women with oestrogen receptor-positive disease, although such findings do not establish a causal relationship. However, evidence regarding phytoestrogens consumed as a part of whole foods should not be directly extrapolated to concentrated or isolated isoflavone preparations, for which safety, particularly at higher doses and during endocrine therapy, is less well established. Dietary sources of phytoestrogens should therefore be preferred, while the use of concentrated dietary supplements should be assessed on an individual basis (van Die et al., 2024; Bennetau-Pelissero, 2025).

During active treatment, the Mediterranean dietary pattern should be adapted to nutritional status, the ability to eat orally, and the adverse effects present. For patients with poor appetite, priority should be given to energy- and protein-dense meals of smaller volume, with oral nutritional supplements introduced when indicated. Diarrhoea, nausea, mucositis, or other symptoms that limit intake may require temporary changes to meal composition, texture, temperature, and size. Once symptoms subside, the diet should be gradually expanded to avoid prolonged and nutritionally unjustified restrictions (Muscaritoli et al., 2021; National Cancer Institute, 2024).

In line with recommendations for cancer prevention and long-term health, alcohol should be avoided; red and processed meat, sugar-sweetened beverages, and energy-dense, highly processed foods should be limited; and predominantly plant-based, minimally processed foods should be prioritised. Avoiding alcohol is particularly important because of its established association with breast cancer risk. During active treatment, however, long-term preventive recommendations must remain secondary to immediate nutritional goals. In patients with reduced food intake, weight loss, or other nutritional risk, the priorities are an adequate energy and protein intake and preservation of muscle mass and function, rather than restrictive application of general cancer-prevention recommendations. These recommendations relate to the overall dietary pattern and long-term health and do not demonstrate that any individual food causes or prevents disease recurrence (World Cancer Research Fund and American Institute for Cancer Research, 2018; World Cancer Research Fund International, 2024; National Comprehensive Cancer Network, 2024).

The aim is not to create a sense of prohibition, but to replace less favourable choices gradually. Sugar-sweetened beverages may be replaced with water or unsweetened tea, savoury snacks with a small portion of nuts, and commercially produced sweets with fruit, yoghurt, or simple oat- and fruit-based desserts. During active treatment, every such recommendation should be adapted to current nutritional status, symptoms, and the ability to maintain adequate food intake (National Cancer Institute, 2024; Muscaritoli et al., 2021).

Nutritional counselling should also address the patient's relationship with food. Following a cancer diagnosis, patients may be uncertain about the role of diet in the development and recurrence of disease and may seek information from various, not always reliable, sources (Beeken et al., 2016). The desire to control the disease and concern for personal health may contribute to an increased preoccupation with 'healthy eating', rigid dietary rules, and additional psychological burden (Eisenberg and Josselin, 2024). Recommendations should be evidence-based, clear, flexible, and feasible in everyday life. The nutritionist/dietitian individualises recommendations according to the patient's clinical and nutritional status and, when necessary, involves the family and other members of the multidisciplinary team (Arends et al., 2017; Muscaritoli et al., 2021; National Comprehensive Cancer Network, 2024).

Dietary modification for common treatment-related adverse effects

Adverse effects of cancer treatment may substantially reduce oral food and fluid intake and increase the risk of malnutrition. Nutritional interventions aimed at adapting the diet to current symptoms are usually temporary and should be linked to a reassessment plan. Inability to maintain adequate food and fluid intake, rapid weight loss, fever, bleeding, severe pain, dizziness, or signs of dehydration require medical assessment. The most commonly used dietary modifications and the necessary precautions are presented in Table 2 (National Cancer Institute, 2024; Muscaritoli et al., 2021).

Table 2. Dietary modifications for the most common treatment-related adverse effects (adapted from National Cancer Institute, 2024; Muscaritoli et al., 2021)

Adverse effect	Goal and recommended modifications	Key precautions
Poor appetite	Five to six smaller meals; include a protein source in most meals and snacks; enrich foods with oil, cheese, milk powder, or egg; consume energy-dense drinks between meals	Assess weight loss and the need for an oral nutritional supplement early
Nausea	Small, bland meals; cold or lukewarm foods; dry snacks; fluids in small sips; reduce cooking odours	Take antiemetic therapy as prescribed; assess fluid intake
Diarrhea	Temporarily reduce insoluble fibre, fatty foods, and strongly spiced foods; drink more frequently; choose rice, potatoes, bananas, cooked vegetables, and tolerated protein sources	Assess dehydration and electrolytes; avoid large amounts of sugar alcohols; use oral rehydration solution when indicated
Constipation	Gradually increase fibre and fluid intake; include oats, legumes, fruit, vegetables, and ground flaxseed if tolerated; encourage movement	If obstruction is suspected, pain is severe, or constipation persists despite treatment, do not increase fibre without medical assessment
Taste changes	Try different temperatures and textures; marinate foods; replace meat with fish, eggs, dairy products, or legumes; maintain oral hygiene	Avoid unnecessary long-term restrictions; monitor total protein intake
Mucositis and painful swallowing	Soft, moist, smooth, lukewarm foods; cream soups, porridges, purées, yoghurt, pudding, and omelettes; add sauces for moisture	Avoid hard, dry, acidic, very salty, spicy, and hot foods; urgently assess inadequate intake and dehydration

Body weight, body composition, and long-term health

During and after breast cancer treatment, changes in body weight and composition may occur in different directions. A recent systematic review indicates that adjuvant treatment, including chemotherapy and/or endocrine therapy, is particularly associated with increases in total and visceral fat mass, while changes in lean mass are less consistent (Mendez et al., 2025). Body-composition changes may be influenced by treatment modality, menopausal status, changes in physical activity and dietary habits, and other individual factors. The need for weight reduction should therefore not be assessed solely on the basis of body mass index. During active treatment, the priorities are preventing malnutrition, preserving muscle mass and function, and maintaining adequate food intake. In patients with stable nutritional status, no catabolic complications, and excess body weight, a moderate and controlled energy deficit may be considered, while ensuring adequate protein intake and individually tailored physical activity, including resistance exercise (Ligibel et al., 2022).

According to the latest World Cancer Research Fund report, evidence on the association between individual dietary factors and breast cancer prognosis remains limited. Available findings suggest favourable associations between higher dietary fibre intake and better-quality dietary patterns and certain outcomes, but do not support the conclusion that a particular diet (nor food) can prevent recurrence. In women who are not malnourished, a dietary pattern aligned with general cancer-prevention recommendations is advised, together with prevention of unwanted weight gain and promotion of regular physical activity (World Cancer Research Fund International, 2024).

When clinically feasible, patients should gradually work towards at least 150 minutes of moderate-intensity aerobic activity per week and include resistance exercise twice weekly. The intensity and type of activity should be adapted to the phase of treatment, symptoms, functional capacity, and individual health limitations (Ligibel et al., 2022; World Cancer Research Fund International, 2024).

After active treatment has ended, the goals of medical nutrition therapy broaden to include the long-term maintenance of appropriate body weight and composition, cardiometabolic health, and bone health, as well as individual dietary adaptation to persistent or late treatment effects. Particular attention should be paid to women receiving long-term endocrine therapy, in whom changes in body composition, menopausal status, and bone health may require additional dietary and lifestyle assessment. National Comprehensive Cancer Network guidelines include assessment of the overall dietary pattern, supplement use, alcohol and highly processed food intake, meal timing, and snacking habits, with referral to a nutritionist/dietitian when an individualised intervention is required (National Comprehensive Cancer Network, 2024).

Dietary supplements

Routine use of dietary supplements is not recommended to prevent disease recurrence or as a substitute for a varied, balanced diet. Their use may be justified in cases of laboratory or clinically confirmed

deficiency, increased requirements, or prolonged restriction of specific nutrients. In women with hormone-dependent breast cancer receiving long-term endocrine therapy, particularly aromatase inhibitors, special attention should be paid to bone health, including assessment of the risk of bone loss and fracture and adequate calcium and vitamin D intake. Supplementation should be individualised according to dietary intake, vitamin D status, and overall bone-health risk (Hadji et al., 2025). Before a supplement is introduced, its composition, dose, and potential interactions with antineoplastic, endocrine, and anticoagulant therapies should be evaluated. During active cancer treatment, particular caution is required with high-dose antioxidants and herbal or other bioactive preparations because of potential treatment interactions and variability in their composition and quality. Targeted correction of a confirmed deficiency should therefore be clearly distinguished from the concurrent use of multiple preparations without an appropriate indication (Dhakal and Bhatt, 2024; National Comprehensive Cancer Network, 2024).

Detoxification regimens, unsupervised fasting, and other highly restrictive diets are not recommended during active treatment. Such approaches may further reduce energy and protein intake and increase the risk of body-weight and muscle loss, particularly in patients with poor appetite or adverse effects that limit food intake (Arends et al., 2017; Muscaritoli et al., 2021).

Gut microbiota

The gut microbiota is involved in nutrient metabolism, regulation of inflammatory processes, immune responses, and the enterohepatic circulation of oestrogens. Studies to date have identified differences in gut microbiota composition between women with breast cancer and healthy control groups. However, heterogeneity in methods, dietary patterns, medications, disease stages, and treatment modalities substantially limits the clinical interpretation of these findings (Caleça et al., 2023; Nandi et al., 2023). Mendelian randomisation studies suggest possible causal associations between certain gut microbiota characteristics and breast cancer risk, with newer data also indicating potential differences according to oestrogen receptor status. At present, however, the findings do not permit individual bacterial genera to be identified as reliable therapeutic targets (Hong et al., 2023; Yue et al., 2025).

A dietary pattern that includes diverse sources of dietary fibre, such as legumes, whole grains, fruit, vegetables, and nuts, together with olive oil and, when well tolerated, fermented foods, may support gut microbiota diversity and function. During neutropenia, marked mucosal injury, or diarrhoea, food choices should be adapted to the clinical condition, food safety, and individual tolerance (National Cancer Institute, 2024; Muscaritoli et al., 2021). The effects of probiotic preparations depend on the strain, dose, and clinical context, and study findings cannot be extrapolated directly from one product to another. Although contemporary research suggests the potential for future individualised nutritional interventions targeting the gut microbiota, additional well-controlled clinical trials are required before their routine use in women with breast cancer can be recommended (Abdeen et al., 2025).

Conclusions

Medical nutrition therapy for women with breast cancer should be timely, individualised, and aligned with disease stage, treatment modality, and nutritional status. During active treatment, the principal goals are to ensure adequate energy and protein intake, preserve muscle mass and function, and adapt the diet to treatment-related adverse effects. When clinically feasible, nutritional intervention should be combined with individually tailored physical activity.

The Mediterranean dietary pattern may provide a long-term foundation, but its application during active treatment depends on nutritional status, appetite, and food tolerance. After active treatment, nutritional care also focuses on the long-term maintenance of appropriate body weight and composition, cardiometabolic health, and bone health. Available evidence does not support attributing therapeutic effects to individual foods, dietary supplements, or interventions targeting the gut microbiota, nor using them as substitutes for standard oncological treatment. As a member of the multidisciplinary team, the nutritionist/dietitian plays an important role in translating evidence-based guidelines into individualised, feasible recommendations, monitoring nutritional status, and prompt identification of the need for more intensive nutrition support.

Conflict of interest

The authors declare no conflict of interest.

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