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# THE EFFECTS OF PERSONALIZED NUTRITION INTERVENTION IN BREAST CANCER PATIENTS: A SYSTEMATIC REVIEW

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***Abstract***

*Breast cancer is a common cancer in women worldwide. Personalized nutrition interventions have gained attention as a promising approach in the treatment of breast cancer. This systematic review aimed to evaluate their effectiveness. A comprehensive search of ScienceDirect and PubMed databases was conducted from 2018 to 2023 using the keyword "Personalized nutrition interventions for breast cancer." Six studies met the inclusion criteria. Results showed that dietary interventions led to improvements in body weight, metabolic parameters, and quality of life in breast cancer patients. The Mediterranean diet was associated with significant improvements in body weight, BMI, waist circumference, glycemia, and triglyceride levels, as well as a greater reduction in metabolic syndrome markers. The ketogenic diet resulted in significant weight loss due to fat mass reduction, while personalized and balanced diet interventions reduced the frequency of leukopenia and abdominal pain. A triple intervention program involving nutrition, exercise, and mindfulness positively impacted the quality of life in breast cancer survivors. Individualized diet therapy based on nutritional needs also significantly reduced barriers and improved nutritional status and quality of life in breast cancer patients undergoing chemotherapy. This review employed a systematic approach, including a comprehensive literature search, clear inclusion criteria, and thorough study quality assessment. In conclusion, personalized nutrition interventions can be effective for improving outcomes in breast cancer patients.*

***Keywords :*** *Breast cancer; Personalized nutrition interventions; Precision Medicine.*

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## INTRODUCTION

Breast cancer is a common cancer in women worldwide, Personalized nutrition interventions have gained attention as a promising approach in the treatment of breast cancer (Swaminathan, 2020). Proper nutrition plays a major role in preventing diseases, and nutritional interventions constitute crucial strategies in the field of public health (Sellami et al, 2020). Nutrigenomics and nutriproteomics are specialties that focus on the interaction between nutrients and the human genome and proteome, respectively, providing insights into the role of diet in carcinogenesis (Sellami et al, 2020). Nutrigenomics and lifestyle factors play a vital role in health management and represent an exceptional prospect for the improvement of personalized diets to the individual at risk of developing diseases like cancer (Ray et al, 2022). Breast cancer patients are at high risk of developing malnutrition from the underlying disease as well as from various drug regimens, chemotherapy, and/or radiotherapy interventions (Swaminathan, 2020). An effective personalized nutritional therapy during and after cancer treatment leads to a better quality of life for breast cancer patients (Swaminathan, 2020). Clinical trials are pivotal for any recommendations to be used at the commercial level upon approval of the Food & Drug Administration (Swaminathan, 2020). Several clinical trials have been carried out, and many are

now undertaken to come up with a significant upshot conclusion based on primary and secondary outcomes to show the after-effects of particular nutrient supplements by increasing the overall survival or any other physiological upregulated/downregulated manifestation leading to disease-free survival (Swaminathan, 2020). Understanding metabolic and immune regulation inherent to patient populations is key to improving the radiation response for breast cancer patients (Shastri et al, 2021).

## RESEARCH METHODS

A comprehensive search of the ScienceDirect and PubMed databases was conducted, covering the period from 2018 to 2023 with the keyword "Personalized nutrition interventions for breast cancer". The inclusion criteria for the review were studies published between 2018 and 2023 that focused on personalized nutrition interventions in precision medicine for breast cancer patients.

## RESULTS AND DISCUSSION

### RESULT

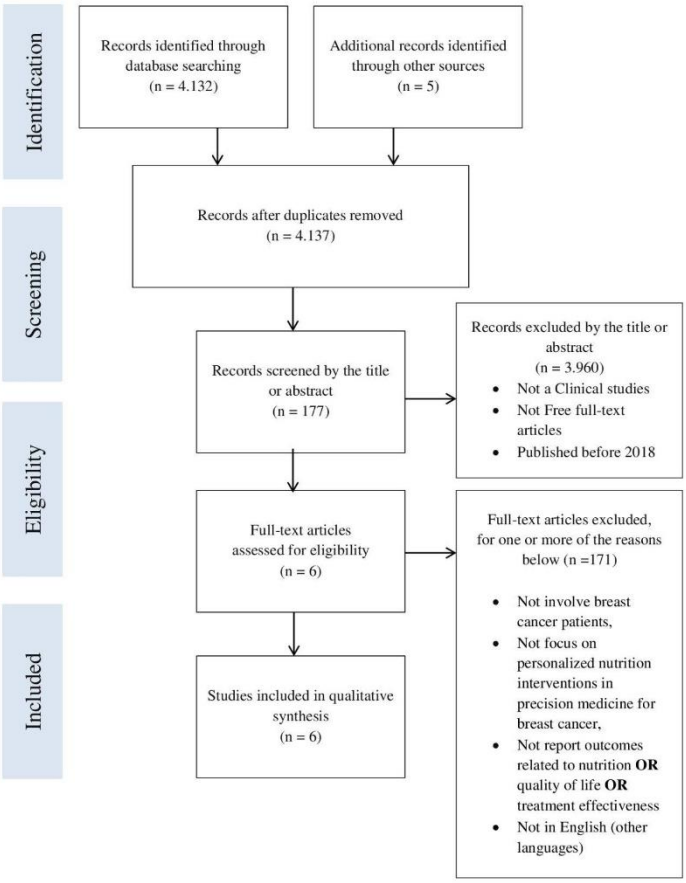



Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the literature search and filtering results.

Table 1. Characteristics of Studies

| Study | Population | Intervention | Comparison | Outcome | Design Study | Country | Sample Size |
|---|---|---|---|---|---|---|---|
| Bruno et al., (2021) | Women aged 35-70 years diagnosed with invasive breast cancer within the previous 5 years | A dietary intervention based on Mediterranean diet principles and recipes, including some fermented foods from the Macrobiotic tradition | The comparison group (CG) consisted of women who made some adjustments in their dietary habits after receiving information on the 2007 WCRF/AICR lifestyle recommendations for cancer prevention | The study aimed to assess adherence to dietary recommendations after one year of intervention in breast cancer women | Randomized Controlled Trial | Italy | 1.542 women |
| Montagnese et al. (2021) | Women with breast cancer. | Treatment program including dietary modifications, physical activity, and vitamin D supplementation | Comparison between two treatment groups: (a) low glycemic index traditional Mediterranean diet, daily brisk walking, and vitamin D supplementation;<br><br>(b) traditional Mediterranean diet, avoidance of physical inactivity, and vitamin D supplementa | Health-related quality of life (HRQoL) and adherence to the Mediterranean diet | Non-Randomized Controlled Trial | Italy | 227 women |

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| Klement et al. (2020) | Breast cancer patients undergoing radiotherapy. | Ketogenic diet (KD) with or without Master Amino Acid Pattern (MAP) supplement. | Standard diet (SD) without specific dietary advice. | Changes in body composition, quality of life (QoL), and hormone levels. | Non-Randomized Controlled Trial | Germany | 59 women |
| Ruiz-Vozmediano et al. (2020) | Women with stage IIA-IIB breast cancer who had completed their cancer treatment more than 12 months earlier. | A triple intervention program consisting of nutrition, physical exercise, and mindfulness. | The control group received conventional treatment without the triple intervention program. | The study aimed to evaluate the impact of the intervention program on the quality of life, symptoms, complications, weight control, and healthy lifestyle habits of the participants. | Randomized Controlled Trial | Spain | 72 women |
| Fallah et al. (2021) | Breast cancer patients undergoing chemotherapy | Individual diet therapy | Control group receiving routine nutritional recommendations | Anthropometric measures, dietary intake, nutritional barriers, quality of life, serum albumin, ferritin, and hemoglobin levels | Randomized Controlled Trial | Iran | 70 women |
| de Souza et al. (2021) | Women diagnosed with breast cancer | Dietary intervention consists of a personalize | Control group receiving standard care without | Primary outcome is the effect of the dietary intervention | Randomized Controlled Trial | Brazil | 34 women |

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| | indicated for neoadjuvant chemotherapy at a reference center for cancer treatment in the city of Natal, RN, Brazil. | d and balanced diet according to individual needs, aimed at preventing nutritional deficiencies, maintaining and/or recovering nutritional status, and improving quality of life. | dietary intervention | on quality of life (QoL) measured using the European Organization for Research and Treatment of Cancer QLQ C-30 questionnaire. Secondary outcomes include gastrointestinal and hematological toxicities related to chemotherapy and nutritional status | | | |

Table 2. A table including the research question posed by each study, the conclusions derived from the research, and the recommendations stated in each included study.

| Study | Research Question | Conclusion | Recommendation |
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| Bruno et al., (2021) | The research question in this study was to assess adherence to dietary recommendations after one year of intervention in breast cancer women | In conclusion, the study found that a dietary intervention based on Mediterranean diet principles and recipes, including some fermented foods from the Macrobiotic tradition, can lead to improved adherence to dietary recommendations, weight loss, and improvements in metabolic parameters in women with breast cancer. This suggests that adopting a comprehensive qualitative dietary | This study found that a dietary intervention based on the Mediterranean diet and macrobiotic principles can lead to improvements in body weight and metabolic parameters in women with breast cancer. Adherence to the dietary recommendations was associated with greater improvements in these outcomes. The findings suggest that this dietary intervention may be effective in managing breast cancer risk and |

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| | | change can be beneficial for breast cancer survivors. | improving overall health in breast cancer patients. |
| Montagnese et al. (2021) | The research question of this study is to evaluate the effects of a combined lifestyle program, including dietary modifications, physical activity, and vitamin D supplementation, on health-related quality of life (HRQoL) in women with breast cancer. | The study found that a lifestyle program consisting of a low glycemic index traditional Mediterranean diet, daily brisk walking, and vitamin D supplementation had positive effects on HRQoL in breast cancer survivors. The program was associated with improvements in physical functioning, emotional well-being, and breast cancer-related symptoms. | Based on the findings of this study, it is recommended that breast cancer survivors consider adopting a healthy lifestyle program that includes a Mediterranean diet, regular physical activity, and vitamin D supplementation to improve their quality of life. |
| Klement et al. (2020) | Does a ketogenic diet (KD) with or without Master Amino Acid Pattern (MAP) supplement have an impact on body composition, quality of life, and hormone levels in breast cancer patients undergoing radiotherapy? | The study found that a ketogenic diet during radiotherapy improved body composition, with reductions in body weight due to fat loss and water loss. It also induced some favorable hormonal changes. However, the improvement in quality of life was not statistically significant. | The study suggests that a ketogenic diet may be a feasible and effective intervention to improve body composition in breast cancer patients undergoing radiotherapy. However, further research is needed to determine its impact on quality of life and to standardize the diet protocol. |
| Ruiz-Vozmediano et al. (2020) | Can a triple intervention program consisting of nutrition, physical exercise, and mindfulness improve the quality of life, symptoms, complications, weight control, and healthy lifestyle habits of women with stage IIA-IIB breast cancer who have completed their cancer treatment more than 12 months earlier? | The study found that the triple intervention program had positive effects on the quality of life, symptoms, complications, weight control, and healthy lifestyle habits of the participants. The intervention program improved adherence to the Mediterranean Diet, reduced symptoms such as fatigue and dyspnea, and promoted a healthy | Based on the findings of the study, it is recommended to implement a triple intervention program consisting of nutrition, physical exercise, and mindfulness for women with stage IIA-IIB breast cancer who have completed their cancer treatment more than 12 months earlier. This program can improve their quality of life, symptoms, |

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| | | lifestyle. | complications, weight control, and healthy lifestyle habits. |
| Fallah et al. (2021) | Does individual diet therapy improve the nutritional status and quality of life in breast cancer patients undergoing chemotherapy? | Individual diet therapy based on nutritional needs significantly reduces nutritional barriers, improves nutritional status, and enhances the quality of life in breast cancer patients undergoing chemotherapy. | It is recommended to implement individualized dietary interventions based on patients' nutritional needs to improve their nutritional status and quality of life during chemotherapy treatment for breast cancer. |
| de Souza et al. (2021) | Does a dietary intervention improve quality of life and reduce toxicities in women with breast cancer undergoing neoadjuvant chemotherapy? | The dietary intervention did not significantly improve quality of life or reduce toxicities in women with breast cancer undergoing neoadjuvant chemotherapy. However, it did help maintain handgrip strength compared to the control group. | Further research is needed to explore other non-pharmacological strategies that may effectively reduce adverse effects of cancer treatments and improve quality of life in breast cancer patients |

## DISCUSSION

The findings from this study provide valuable insights into the potential benefits of various dietary interventions for breast cancer patients. However, it is important to discuss some considerations and recommendations based on these findings.

Firstly, the study highlighted the effectiveness of a dietary intervention based on the Mediterranean diet and macrobiotic principles in improving body weight and metabolic parameters in women with breast cancer. The positive outcomes were associated with adherence to the dietary recommendations. These findings suggest that implementing this dietary intervention may be beneficial for managing breast cancer risk and improving overall health in breast cancer patients. It is recommended that healthcare professionals consider incorporating such interventions into the treatment plans for breast cancer patients, providing them with guidance and support to adhere to these dietary recommendations.

Furthermore, based on the results demonstrating the positive effects on quality of life among breast cancer survivors, it is recommended that these individuals consider adopting a healthy lifestyle program. This program should include a Mediterranean diet, regular physical activity, and vitamin D supplementation. Implementing such a program may help improve their overall well-being and enhance their quality of life.

Regarding the potential benefits of a ketogenic diet during radiotherapy, further research is needed to fully understand its impact on quality of life and to establish standardized protocols. While the study showed improvements in body composition, it is crucial to consider the potential

risks and long-term effects of this diet. Therefore, caution should be exercised, and healthcare professionals should closely monitor patients who choose to follow a ketogenic diet during radiotherapy.

Based on the findings supporting the triple intervention program consisting of nutrition, physical exercise, and mindfulness, it is recommended to implement this program for breast cancer patients who have completed their cancer treatment more than 12 months earlier. This program has demonstrated positive effects on their quality of life, symptoms, complications, weight control, and healthy lifestyle habits. By incorporating these interventions into comprehensive care plans, healthcare providers can potentially improve the overall well-being and outcomes of these patients.

Additionally, individualized dietary interventions based on patients' nutritional needs should be implemented during chemotherapy treatment for breast cancer. This approach has been shown to improve nutritional status and quality of life. By tailoring dietary recommendations to each patient's specific needs, healthcare professionals can address nutritional barriers and optimize outcomes during chemotherapy.

Finally, the study highlights the need for further research to explore additional non-pharmacological strategies that can effectively reduce adverse effects of cancer treatments and improve quality of life in breast cancer patients. Understanding and implementing such strategies can provide holistic support for patients throughout their cancer journey, promoting overall well-being and enhancing treatment outcomes.

## CONCLUSION

In conclusion, the collective findings from these studies suggest that personalized nutrition interventions can have a positive impact on the outcomes and quality of life of breast cancer patients. Specifically, adopting a dietary intervention based on Mediterranean diet principles and recipes, along with incorporating fermented foods from the Macrobiotic tradition, can lead to improved adherence to dietary recommendations, weight loss, and improvements in metabolic parameters. This comprehensive qualitative dietary change appears to be beneficial for breast cancer survivors.

Additionally, a lifestyle program combining a low glycemic index traditional Mediterranean diet, daily brisk walking, and vitamin D supplementation has shown positive effects on health-related quality of life (HRQoL) in breast cancer survivors. This program has been associated with improvements in physical functioning, emotional well-being, and breast cancer-related symptoms.

The use of a ketogenic diet during radiotherapy has shown improvements in body composition, with reductions in body weight due to fat loss and water loss. It also induced some favorable hormonal changes. However, the impact on quality of life was not statistically significant.

Furthermore, a triple intervention program consisting of nutrition, physical exercise, and mindfulness has demonstrated positive effects on the quality of life, symptoms, complications, weight control, and healthy lifestyle habits of breast cancer patients. This intervention has improved adherence to the Mediterranean Diet, reduced symptoms such as fatigue and dyspnea, and promoted a healthy lifestyle.

Individualized diet therapy based on nutritional needs has been shown to significantly reduce nutritional barriers, improve nutritional status, and enhance the quality of life in breast cancer patients undergoing chemotherapy.

Although a dietary intervention during neoadjuvant chemotherapy did not significantly improve quality of life or reduce toxicities, it did help maintain handgrip strength compared to the control group.

Overall, these conclusions highlight the potential benefits of personalized nutrition interventions in breast cancer patients, including improvements in adherence to dietary recommendations, weight management, metabolic parameters, quality of life, and overall well-being. Further research is needed to explore the optimal strategies and long-term effects of personalized nutrition interventions in this population.

## REFERENCES

Bruno, E., Krogh, V., Gargano, G., Grioni, S., Bellegotti, M., Venturelli, E., Panico, S., Santucci de Magistris, M., Bonanni, B., Zagallo, E., Mercandino, A., Bassi, M. C., Amodio, R., Zarcone, M., Galasso, R., Barbero, M., Simeoni, M., Mano, M. P., Berrino, F., & Villarini, A. (2021). Adherence to Dietary Recommendations after One Year of Intervention in Breast Cancer Women: The DIANA-5 Trial. *Nutrients*, *13*(9), 2990. https://doi.org/10.3390/nu13092990

de Souza, A. P. S., da Silva, L. C., & Fayh, A. P. T. (2021). Nutritional Intervention Contributes to the Improvement of Symptoms Related to Quality of Life in Breast Cancer Patients Undergoing Neoadjuvant Chemotherapy: A Randomized Clinical Trial. *Nutrients*, *13*(2), 589. https://doi.org/10.3390/nu13020589

Fallah, A., Parnian, K., Abdolazimi, H., Tezerji, S., & Mazloom, Z. (2021). The Effects of Individual Diet Therapy on Food Intake, Quality of Life, and Related Serum Proteins in Patients with Breast Cancer: A Randomized Clinical Trial. *Basic & Clinical Cancer Research*. https://doi.org/10.18502/bccr.v12i3.5768

Klement, R. J., Champ, C. E., Kämmerer, U., Koebrunner, P. S., Krage, K., Schäfer, G., Weigel, M., & Sweeney, R. A. (2020). Impact of a ketogenic diet intervention during radiotherapy on body composition: III—final results of the KETOCOMP study for breast cancer patients. *Breast Cancer Research*, *22*(1). https://doi.org/10.1186/s13058-020-01331-5

Montagnese, C., Porciello, G., Vitale, S., Palumbo, E., Crispo, A., Grimaldi, M., Calabrese, I., Pica, R., Prete, M., Falzone, L., Libra, M., Cubisino, S., Poletto, L., Martinuzzo, V., Coluccia, S., Esindi, N., Nocerino, F., Minopoli, A., Grilli, B., & Fiorillo, P. C. (2021). Quality of Life in Women Diagnosed with Breast Cancer after a 12-Month Treatment of Lifestyle Modifications. *Nutrients*, *13*(1), 136. https://doi.org/10.3390/nu13010136

Sellami, M. and Bragazzi, N.L. (2020) 'Nutrigenomics and breast cancer: State-of-art, Future Perspectives and insights for prevention', *Nutrients*, 12(2), p. 512. doi:10.3390/nu12020512.

Shastri, A.A. *et al.* (2021) 'Personalized nutrition as a key contributor to improving radiation response in breast cancer', *International Journal of Molecular Sciences*, 23(1), p. 175. doi:10.3390/ijms23010175.

Swaminathan (2020) 'Breast Cancer Nutritional Chemistry Cachexia Oncology – A Clinical Trials Perspective', *Indian Journal of Chemistry -Section A*, 59(9). doi:10.56042/ijca.v59i9.41289.

Ray, S.K. and Mukherjee, S. (2022) 'Nutrigenomics and lifestyle facet- A modulatory molecularevidence in progression of breast and colon cancer withemerging importance', *Current Molecular Medicine*, 22(4), pp. 336–348. doi:10.2174/1566524021666210331151323.

Ruiz-Vozmediano, J., Löhnchen, S., Jurado, L., Recio, R., Rodríguez-Carrillo, A., López, M., Mustieles, V., Expósito, M., Arroyo-Morales, M., & Fernández, M. F. (2020). Influence of a Multidisciplinary Program of Diet, Exercise, and Mindfulness on the Quality of Life of Stage IIA-IIB Breast Cancer Survivors. *Integrative Cancer Therapies*, *19*, 153473542092475. https://doi.org/10.1177/1534735420924757